

# Division 274100

## Audio Visual

### DESIGN GUIDE

January 22, 2024

PREPARED BY:

**Summit Engineering & Consulting**  
8350 W. Grandridge Blvd, Suite 200  
Kennewick WA, 99336  
(509) 457-6100

PREPARED FOR:



**Central Washington University**

# Table of Contents

TABLE OF CONTENTS .....	2
1 PREFACE .....	5
1.1 INTRODUCTION .....	5
1.2 GUIDING PRINCIPLES .....	5
1.3 STANDARDS AND GUIDELINES .....	6
1.4 DOCUMENT INTENT .....	7
1.5 DOCUMENT STRUCTURE .....	7
1.6 CWU PERSONNEL .....	8
1.7 COPYRIGHT .....	9
2 PROJECT PROCEDURES .....	10
2.1 DESIGNER QUALIFICATIONS .....	10
2.2 DESIGN REVIEW PROCESS .....	11
2.2.1 Independent Review Consultant or Owner's Representative .....	11
2.3 GENERAL PROCEDURES .....	11
2.3.1 Procurement And Installation .....	11
2.4 ARCHITECT/ENGINEER TEAMS .....	12
2.4.1 Cross Discipline Coordination .....	12
2.4.1.1 CEILING COORDINATION .....	12
2.4.1.2 ELECTRICAL .....	12
2.4.1.3 HVAC .....	12
2.4.1.4 INTERIOR DESIGN .....	12
2.4.2 CAD Files .....	13
2.4.3 Alternative Design Request (ADR) .....	13
2.5 PROCEDURES RELATED TO PROJECT PHASES .....	15
2.5.1 Schematic Design and Fieldwork .....	15
2.5.2 Design Development .....	15
2.5.3 Construction Documents .....	16
2.5.4 Bidding .....	16
2.5.5 Construction Observation .....	17
2.5.6 Post-Construction .....	18
3 AV EQUIPMENT .....	19
3.1 GENERAL .....	19
3.2 SOURCING AND INPUT DEVICES .....	21
3.2.1 Microphones .....	21
3.2.1.1 CEILING .....	21
3.2.1.2 WIRELESS .....	21
3.2.2 Cameras .....	22
3.2.2.1 DOCUMENT CAMERAS .....	22
3.2.2.2 VIDEO CONFERENCING CAMERAS .....	22
3.2.3 Blu-ray Player .....	22
3.2.4 Computer .....	22
3.2.5 Portable Devices .....	23
3.2.5.1 NOTEBOOKS, TABLETS AND OTHER BYOD DEVICES .....	23
3.3 DISTRIBUTION AND ROUTING EQUIPMENT .....	23

3.3.1	Video Scaling Equipment.....	23
3.3.2	Audio and Video Routing Equipment.....	23
3.3.3	Amplifiers .....	23
3.3.4	Codec.....	24
3.4	OUTPUT DEVICES .....	24
3.4.1	Speakers.....	24
3.4.1.1	CEILING-MOUNTED .....	24
3.4.1.2	SOUNDBARS.....	25
3.4.2	Assisted Listening System.....	25
3.4.3	Video Output Devices .....	25
3.4.3.1	PROJECTORS .....	25
3.4.3.2	IDEAPAINTE .....	26
3.4.3.3	PROJECTION SCREENS .....	26
3.4.3.4	VIDEO PANELS .....	28
3.5	ROOM CONTROL SYSTEMS .....	29
3.5.1	Crestron .....	29
3.5.2	Touch Panel.....	29
3.5.3	Room Scheduler .....	29
3.6	EQUIPMENT RACKS AND CABINETS.....	30
3.6.1	Small Roll-out Cabinets .....	30
3.6.2	Mid-Height Rolling Cabinets .....	30
3.6.3	Tall Cabinets .....	30
4	APPLICATION SPACES .....	31
4.1	GENERAL REQUIREMENTS .....	31
4.1.1	Architectural.....	31
4.1.1.1	WALL COLOR .....	31
4.1.1.2	SOUND TRANSFER THROUGH WALLS .....	31
4.1.1.3	ACOUSTICS .....	31
4.1.1.4	WINDOWS .....	31
4.1.1.5	FURNITURE .....	31
4.1.1.5.1	Instructor's Console.....	31
4.1.1.5.2	Conference Table .....	32
4.1.1.5.3	Credenza or Casework.....	32
4.1.1.6	PROJECTION SCREENS.....	34
4.1.1.7	FURNITURE .....	34
4.1.2	Mechanical.....	34
4.1.3	Electrical .....	34
4.1.3.1	POWER REQUIREMENTS .....	34
4.1.3.2	LIGHTING REQUIREMENTS.....	35
4.1.4	Low-Voltage Pathways and Boxes .....	35
4.1.4.1	WIRE BASKET CABLE TRAYS.....	36
4.1.4.2	CONDUITS, DEVICE BOXES AND FACEPLATES .....	36
4.1.4.3	AV JUNCTION PANELS .....	36
4.1.4.4	FLOOR BOXES.....	37
4.1.5	Telecommunications Requirements .....	39
4.2	MEETING SPACES.....	40
4.3	INSTRUCTIONAL SPACES.....	41
4.3.1	Special Cases .....	42
4.3.1.1	ENHANCED CONFERENCING .....	42
4.3.1.1.1	Level 1 .....	42
4.3.1.1.1.1	Video Panels .....	42
4.3.1.1.1.2	Ceiling Microphones.....	42
4.3.1.1.1.3	Cameras .....	42
4.3.1.1.2	Level 2 .....	42

4.3.1.2	COLLABORATIVE LEARNING ENVIRONMENTS .....	42
4.4	OTHER SPACES AND APPLICATIONS .....	44
4.4.1	Audio/visual Equipment Rooms .....	44
4.4.2	Video Walls .....	44
4.4.3	Digital Signage .....	44
4.4.4	Room Scheduler .....	45
5	CONSTRUCTION DOCUMENT CONTENT .....	46
5.1	PLANS AND DRAWINGS .....	46
5.1.1	General .....	46
5.1.2	Site Plan Drawings.....	47
5.1.3	Floor Plan and Reflected Ceiling Plan Drawings.....	47
5.1.4	Demolition .....	47
5.1.5	Elevation Diagrams.....	48
5.2	PROJECT MANUAL .....	48
5.2.1	Specifications.....	48
5.2.1.1	CWU AUDIO VISUAL CONSTRUCTION GUIDE SPECIFICATION.....	48
5.2.1.2	TYPICAL SPECIFICATION SECTIONS .....	49
5.3	RECORD DRAWINGS AND DOCUMENTATION .....	50
5.3.1	Record Drawing Content.....	50
5.3.2	Record Drawing Deliverables .....	50



# 1 Preface

## 1.1 Introduction

- A. The Audio/Visual Design Guide (AVDG) is written to communicate the requirements of Central Washington University (CWU) for the design and installation of audio/visual systems and distribution infrastructure at CWU 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 CWU 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 CWU facilities.
  - This document also applies to infrastructure designed and installed by CWU staff, when a formal design is not developed.
- B. Audio/visual systems designed for CWU are expected to operate via fiber optic and unshielded twisted pair (UTP) copper cable.
- C. 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.

## 1.2 Guiding Principles

The overall guiding principles for audio/visual systems at CWU are:

- Systems should be simple to use.
- Meet the reasonable expectations that users might have.
- Focus system design on the sweet spot between cost and functionality.
- All other things held equal, a quality video display experience is a higher priority than quality audio output.
- Video conferencing features should be incorporated wherever reasonably possible.
- Audio/visual systems in spaces that are accessible to the public should be designed with the best, most impressive aesthetics.



## 1.3 Standards and Guidelines

- A. CWU has adopted all applicable industry standards and guidelines related to the design and construction of audio/visual systems. Architectural and engineering consultants shall design applications for CWU that comply with industry standards, as well as with the requirements of this document.
- B. The audio/visual industry is continually evolving and updating its standards, as well as developing new ones. The following is a non-comprehensive list of applicable industry standards that are current as of this writing. Compliance with new standards not listed here is required, as they become officially adopted by industry.
- A102.01:2017 - *Audio Coverage Uniformity*
  - ANSI/AVIXA D401.01:201X - *Standard Guide for Audiovisual Systems Design and Coordination Processes*
  - V201.01:2022 - *Image System Contrast Ratio*
  - AVIXA S601.01:2021 - *Energy Management for Audiovisual Systems*
  - 10:2013 - *Audiovisual Systems Performance Verification*
  - STD-710 - *Audio, Video and Control Architectural Drawing Symbols*
  - AVIXAF501.01:2015 - *Cable Labeling for Audiovisual Systems*
  - 202.01:2016 - *Display Image Size for 2D Content in Audiovisual Systems*
  - RP-C303.01:2018 - *Recommended Practices for Security in Networked AV Systems*
  - RP-38-17 - *Recommended Practice for Lighting Performance for Small to Medium Sized Videoconferencing Rooms*
  - AVIXA F502.01:2018 - *Rack Building for Audiovisual Systems*
  - R-111:2019 - *Unified Automation for Buildings*
  - F502.02:201X - *Rack Design for AV Systems*
  - ANSI S12.60-2002 - *American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools*
  - ANSI InfoComm 3M-2011 - *Projected Image System Contrast Ratio*



- C. Audio/visual infrastructure shall fully comply with the current CWU AVDG, CWU Telecommunications Distribution Design Guide (TDDG), and the National Electrical Code (NEC).
- D. Audio/visual systems shall be designed for construction using materials from the current product lines of the manufacturers upon which CWU has standardized, including Crestron, TOA, Corning and CommScope.
- E. The Designer is required to incorporate only the manufacturers listed in this document into the design (unless otherwise directed by CWU) and to design systems that will be suitable for the use of products from these manufacturers. The construction documents shall require that the AV Contractor's installation workmanship fully comply with the current installation requirements from the manufacturers of these products.

## 1.4 Document Intent

- A. 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 CWU's requirements.
- B. The AVDG is not intended to serve as a master specification nor for stand-alone use on design build projects. This document should serve as a guide for making standards-compliant design decisions that, in due course, will be reflected in construction drawings and specifications for a project.
- C. Any request to deviate from the requirements of the National Electrical Code will not be accepted. The Designer shall seek approval for designs that are not consistent with CWU AVDG requirements. Requests to deviate from industry standards or CWU design solutions will be considered on a case-by-case basis by CWU ITS-Media Services representatives. Designers shall contact the CWU ITS-Media Services representatives to discuss proposed alternatives before spending significant time pursuing the option.

## 1.5 Document Structure

The AVDG is organized in the following sections:

1. Preface
2. Project Procedures
3. AV Equipment
4. Application Spaces
5. Construction Document Content



- 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 **Project Procedures** section discusses the activities that should occur during each phase of a project.
- C. The **AV Equipment** section describes the devices that serve as components in Audio/Visual systems at CWU facilities.
- D. The **Application Spaces** section describes how the components introduced in the AV Equipment section will be deployed in specific room types.
- E. The **Construction Document Content** section describes the content that is required in a complete set of drawings and specifications.

## 1.6 CWU Personnel

- A. There are several defined CWU personnel roles referenced in this document. The Designer shall interact with these individuals as direct points of contact:
  - **Capital Planning Director (CPD)** – overall responsibility for project management, oversight and budget.
  - **Capital Planning Project Manager (CPPM)** – assigned by the CPD to run and manage the project and administer the budget budget.
  - **Electrical Power Lighting & Systems Manager (ELSM)** – assigned by the CPD to serve as the Owner’s subject matter expert for the electrical power, lighting and systems aspects of the project.
  - **Mechanical HVAC Manager (MHM)** – assigned by the CPD to serve as the Owner’s subject matter expert for the mechanical heating and cooling system aspects of the project.
  - **Space Allocation & Ergonomics Manager (SAEM)** – assigned by the CPD to serve as the Owner’s subject matter expert for ergonomics and be responsible for space allocation decisions in coordination with the Program representatives who will use each space.
  - **Room Numbering & Signage Manager (RNSM)** – assigned by the CPD to be responsible for room numbering and room signage for the project.
  - **Audio Visual Manager (AVM)** – assigned by the CPD to serve as the Owner’s subject matter expert for the audio/visual systems for the project.
  - **Information Services Manager (ISM)** – assigned by the CPD to serve as





the Owner's subject matter expert for the information technology aspects of the project, including telecommunications/ICT features.

- **Record Drawing & Documentation Manager (RDM)** – assigned by the CPD to be responsible for managing the record drawings, as-built drawings, BIM content and operations & maintenance (O&M) content for the project.
- **Cabinetry & Millwork Manager (CMM)** – assigned by the CPD to serve as the Owner's subject matter expert for the cabinetry and millwork features of the project.
- **Auxiliary Standards Manager (AUXM)** – assigned by the Director of Housing Facilities within Housing and Residence Life to serve as their representative for projects that serve their organization.

## 1.7 Copyright

Summit Engineering & Consulting retains the copyright for this document. Central Washington University is authorized to edit and adapt the document.

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 Project Procedures

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

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

### 2.1 Designer Qualifications

For the purposes of this document, the term “Designer” shall mean an Avixa Certified Technology Specialist who is currently in good standing with Avixa (<http://www.avixa.org>). The audio/visual design shall be produced by the Designer.

In addition to the CTS certification, it is desirable that the Designer have one or more of the following qualifications:

- Avixa CTS-D (preferred) or CTS
- Professional Engineer (P.E.) in the electrical engineering field
- RCDD certification from BICSI

In addition, the CTS-certified Designer shall have the following qualifications:

- The Designer shall have 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 they have designed or have had personal design oversight of a minimum of five projects similar in size and construction cost to the current CWU project.
- The Designer shall be independent from and unaffiliated with any manufacturer associated with the audio/visual equipment industry.
- The Designer shall be knowledgeable about the applicable industry standards. See Section 1.3 - Standards and Guidelines.



## 2.2 Design Review Process

As noted in Section 2.5 titled “Procedures Related to Project Phases”, the project documents will pass through the design review process at the end of each design phase plus follow-up reviews when necessary. These requirements are in addition to those contained in the *State of Washington Conditions of the Agreement and the Instructions for Architects and Engineers*.

Each time a review is required, the complete project documents set (drawings and specifications for all disciplines involved in the project) shall be provided to the AVM.

It is essential that adequate time be provided for the review process before proceeding to the next phase of the project. It is also important that any resulting review comments be addressed by the A&E Design Team.

The Designer shall work with the prime consultant, the CPPM and the AVM to ensure that adequate review time is provided.

The Prime Consultant shall be responsible to determine that the review process is conducted in accordance with CWU’s requirements and shall participate in the review process to determine that the review comments are satisfactorily addressed.

### 2.2.1 INDEPENDENT REVIEW CONSULTANT OR OWNER’S REPRESENTATIVE

CWU may elect to hire an independent review consultant or Owner’s Representative to assist with the review process or other consultation on the project. This consultant will not perform any design services. All resulting direction to the Design Team shall come from the CPPM through normal channels.

## 2.3 General Procedures

### 2.3.1 PROCUREMENT AND INSTALLATION

Early in the project the Designer shall inquire with the CPPM to determine which procurement method will be used for the project and receive guidance about the project document structure and content that will be appropriate for this method.

The Designer shall also inquire about whether the AV scope of the project will be handled as a bid alternate. This is sometimes desired for budget accounting purposes and other times for bid protection purposes. It is important to consider whether the conduits and boxes to be installed by an electrician should remain in the base bid while AV wiring and equipment can be designated as an alternate bid.



## 2.4 Architect/Engineer Teams

It is imperative that the audio/visual design be incorporated during the preliminary architectural design phase. To accomplish this, the architects and engineers on the Design Team shall work closely with the designated AVM, ISM and CPPM from the beginning of the project.

### 2.4.1 CROSS DISCIPLINE COORDINATION

Successful audio/visual projects require frequent, thorough design coordination between the disciplines involved in the project. The Designer shall be primarily responsible to coordinate the audio/visual requirements and design features with the designs produced by the other Designers on the project.

At a minimum, the following aspects of the design shall be coordinated:

#### 2.4.1.1 CEILING COORDINATION

- Routing of wire basket cable trays through ceiling spaces in congested areas (HVAC ductwork, plumbing, electrical, etc.)
- Projector and projection screen mounting relative to HVAC ductwork, light fixtures and other ceiling features.
- Ceiling-mounted microphones and speakers coordinated with HVAC ductwork, light fixtures and other ceiling features.
- Proximity of microphone and speaker wiring to sources of EMI.
- Light fixture zoning to avoid undesirable light wash and reflections on projection screens and video panels.

#### 2.4.1.2 ELECTRICAL

- Power requirements for AV equipment
- Projection screen wall switch

#### 2.4.1.3 HVAC

- Adequate cooling to accommodate AV equipment heat load. Direct view LED video walls are significant heat producers.

#### 2.4.1.4 INTERIOR DESIGN

- Acoustic treatments
- Wall treatments
- Liquid marker board coordination with projection screens and video panels.



## 2.4.2 CAD FILES

The Designer shall coordinate with the A/E to determine that the electronic CAD files used for backgrounds for the audio/visual design are consistent with the CAD file backgrounds used by the other disciplines on the project.

## 2.4.3 ALTERNATIVE DESIGN REQUEST (ADR)

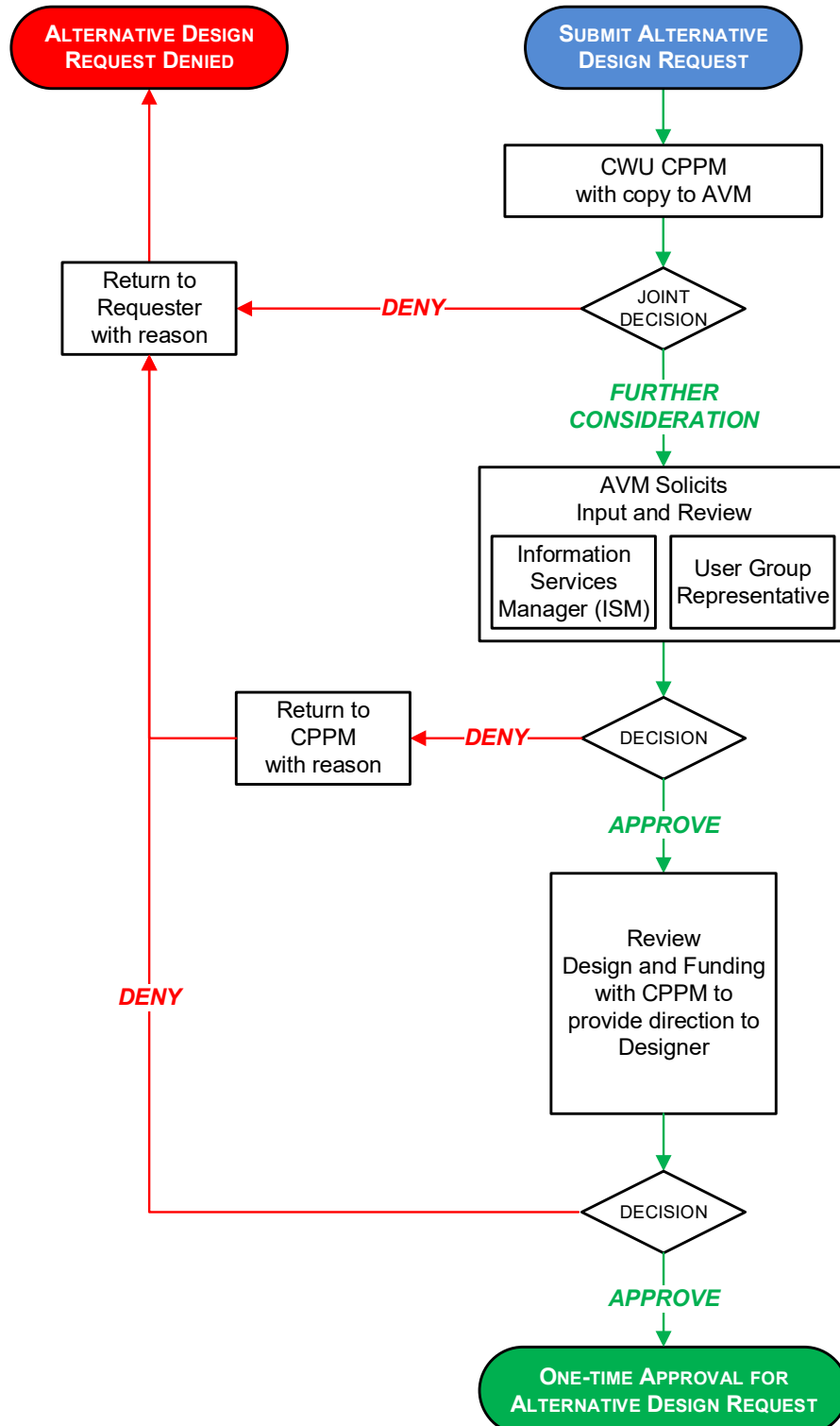
- A. It is not the intent of CWU to rigidly impose standards on every aspect of a design. Each design is unique and special requirements may lead to situations in which deviations from the standards are warranted.
- B. This document identifies specific design solutions that are intended to meet the technical requirements at most CWU facilities. Design issues that are not consistent with the requirements in this document shall require prior approval through the CWU Alternative Design Requests (ADR) process. Requests to deviate from industry standards or CWU design solutions will be considered on a case-by-case basis. Any request to deviate from applicable code requirements or to deviate from manufacturer's warranty requirements will not be approved.
- C. If the Designer feels that a solution that is different from a given standard is warranted, the Designer shall submit a written Alternative Design Request to CWU. The Designer may, upon written approval from CWU, incorporate the design deviation into the overall design. CWU approval is required on a project-by-project basis, and only for the designated instance(s) within that project. The Designer shall not assume that an approval for one project means that the practice is approved for use throughout that project or that it will necessarily be approved for a subsequent project.

The request shall include a complete description of the proposed alternative design identifying:

1. Background information;
  2. The approved design solution as described in this document or in applicable industry standards;
  3. The proposed alternative design;
  4. A list of the guidelines and standards referenced in this document with which the alternative design will not be in compliance, and the effect of non-compliance, both short and long term;
  5. The reason for wishing to use the alternative design;
- D. The Designer shall be responsible to determine that the ADR process is properly conducted. For projects where the Designer is not the prime consultant, the prime consultant shall also be responsible to determine that the ADR process is properly conducted, and shall participate in the process (review, acknowledge and address issues) to determine that CWU's requirements are met.



## Approval Process for Alternative Design Requests





## 2.5 Procedures Related to Project Phases

In addition to the requirements contained in the State of Washington *Conditions of the Agreement* and the *Instructions for Architects and Engineers*, Designers of audio/visual systems for CWU facilities have the following responsibilities during each project phase:

### 2.5.1 SCHEMATIC DESIGN AND FIELDWORK

- A. Some projects at CWU campuses may require the Designer to conduct preliminary fieldwork to document the existing equipment, cabling and applications into which new audio/visual systems will integrate. CWU believes that this information is vital to a successful project.

During the Schematic Design phase where field work is required, the Designer shall document the information gathered while onsite:

- Take digital photographs of existing pathways, spaces, equipment and cabling that affect or are affected by the new project work.
- B. The Designer shall also conduct a needs analysis (involving CWU personnel) to identify and describe the required features and functionality of the new audio/visual applications.
- C. The information gathered during the fieldwork, combined with the results of the needs analysis shall be the starting point for Schematic Design of the proposed new work.
- D. Upon completion of the Schematic Design documents, the standard Design Review Process shall be conducted prior to progressing to the Design Development phase.

### 2.5.2 DESIGN DEVELOPMENT

- A. The Designer shall modify the design documents to address the review comments received during the Schematic Design Phase.
- B. The Designer shall meet with the CWU AVM to review the audio/visual equipment and functionality described in this document and also specified in the AVCGS to identify any changes that may have occurred since the documents were published. The design shall reflect the decisions from these discussions.
- C. Upon completion of the Design Development documents, the standard Design Review Process shall be conducted prior to progressing to the Construction Document phase.



### 2.5.3 CONSTRUCTION DOCUMENTS

- A. The Designer shall modify the design documents to reflect the accepted review comments received during the Design Development Phase.
- B. It is expected that the Designer will expend considerable effort coordinating details between different disciplines during the design process. Non-coordinated pathway/raceway is not acceptable to CWU.
- C. During the Construction Documents phase, the Designer shall obtain the assistance of manufacturer product representatives to review the project specification (adapted by the Designer from the CWU Audio Visual Construction Guide Specification) to determine that the correct part numbers have been included for each product in the specification.
- D. Upon completion of the Construction Documents, the standard Design Review Process shall be conducted. The Designer shall then modify the documents to reflect the accepted review comments associated with the Construction Documents prior to the Bidding Phase.
- E. Upon completion of the Final Construction Documents, the standard Design Review Process shall be again conducted as described above. The Designer shall modify the documents to address the review comments associated with the Final Bid Documents prior to the bidding phase rather than “by addendum.”

### 2.5.4 BIDDING

- A. On projects where a pre-bid walkthrough is held, the Designer shall attend the walkthrough and shall discuss any materials and practice requirements that the bidders might find peculiar, or which might affect the bids if such requirements were overlooked. Noteworthy items would typically be requirements that are more restrictive than practices considered acceptable for other commercial projects. The Designer shall consider the following items for inclusion on such a list, as well as any other items applicable to the project:
  - The requirement that new AV applications shall operate similarly to other existing AV applications on campus so that instructors will not require re-training to use the systems.
  - The fact that most of the materials specified for use in CWU’s audio/visual applications are not designated as “or equal, according to the judgment of the contractor.” Any material substitutions must be approved in advance by the Designer in counsel with the CWU AVM.
  - The requirement that the audio/visual sub-contractor must be pre-approved, prior to the bid, and that bids from AV sub-contractors who have not been pre-approved will be considered to be non-responsive.





- The fact that CWU's audio/visual standards and specifications are more stringent than electrical installation requirements or the specifications on many other projects.
- B. Approximately ten days prior to the date that bids are due, the Designer shall issue an addendum reiterating the requirement for audio/visual sub-contractors to have been preapproved. The addendum should also list the name and contact information for any sub-contractors who have been preapproved. The objective is that the bidders should receive this finalized list of preapproved sub-contractors not less than one week before the bids are due.

### 2.5.5 CONSTRUCTION OBSERVATION

- A. The Designer shall review the Contractor's submittals that are required by the Construction Documents. When the Contractor's submittals include materials or methods that deviate from CWU standards, the Designer shall either:
- Reject the specific materials and methods that do not comply, when the Designer believes that they constitute undesirable solutions.
  - Pursue the ADR process to seek separate approval for each specific material and method that the Designer believes would constitute a better solution.
- B. The Designer shall visit the construction site frequently to observe the construction quality and status. The Designer shall confer with the CWU FP&CS Project Manager prior to proposing services for the project to determine an appropriate site-visit frequency for the project. The site visit frequency will likely change during the construction phase as the audio/visual related activity increases and decreases.
- C. During the site visits, the Designer shall take digital photographs of existing and new pathways, spaces and cabling, both intra-building and outside plant that are related to the project. In particular, the Designer shall photograph infrastructure that will later be concealed during the course of construction.
- D. It is the responsibility of the Designer to verify that the Contractor properly labels all cabling (both inside plant and outside plant) during construction. Inadequate or incomplete labeling is not acceptable.
- E. Accurate as-built drawings are considered critical for the efficient long-term operation of CWU facilities. During construction observation visits, the Designer shall observe and report on the Contractor's progress toward staying current with the as-built drawing notations.
- F. After each construction observation visit, the Designer shall submit a written report describing the observed construction progress. Observations shall be documented in the report with annotated digital photographs and a written



description of any problems, a description of the requirements in the Construction Documents and the resolution to the issues. For each item requiring corrective attention, the report shall describe the following:

- A description of the issue
  - Applicable requirements in the Construction Documents
  - Applicable CWU standards, industry standards and codes
  - Corrective options available to CWU
  - Designer's recommendation
- G. The Designer shall submit the construction observation reports via email to the CWU FP&CS PM and the CWU AVM as soon as possible following each site visit. The reports shall also be reviewed at the next construction meeting. A timely report submission will aid the Designer and CWU in identifying potential problems early in the construction process.
- H. The Designer shall work with the Owner and AV Integrator to coordinate the required training sessions. The Designer shall attend the training sessions for each AV application space help the attendees to get their questions answered.

### **2.5.6 POST-CONSTRUCTION**

- A. The Designer shall review the Operation and Maintenance information provided by the Contractor for the audio/visual distribution system. The Designer shall verify that information is included for each component in the audio/visual system. Upon approval of the content in the Operation and Maintenance information, the Designer shall submit the information to local CWU ITS Media Staff with written documentation indicating that the Designer has reviewed the information and that it appears to meet the requirements in the Construction Documents.
- B. The Designer shall provide record drawings and record documentation to CWU (based on as-built documents that have been "red-lined" by the Contractor). Record documents shall be provided in electronic CAD format where applicable, in addition to requirements put forth by the Designer's contract with CWU.
- C. The Designer shall verify that the audio/visual contractor provides the appropriate manufacturer warranty certification documentation to CWU.



## 3 AV Equipment

This section discusses the equipment that shall be used as components in Audio/Visual systems for CWU. The Designer shall design these into the various application spaces (meeting rooms, instructional spaces, etc.) in CWU facilities as described in Section 4 – Application Spaces. The Designer shall incorporate this content into the construction drawings and specifications.

CWU prefers to consistently use the same equipment from project to project wherever possible to optimize their spare parts management. When a component fails, it is very desirable to replace it with an identical make and model (or very similar 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 CWU 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 CWU AVM to select a replacement, preferably from the same manufacturer and product family as the listed equipment.
- Design the systems using this equipment or the CWU-approved equivalent.

### 3.1 General

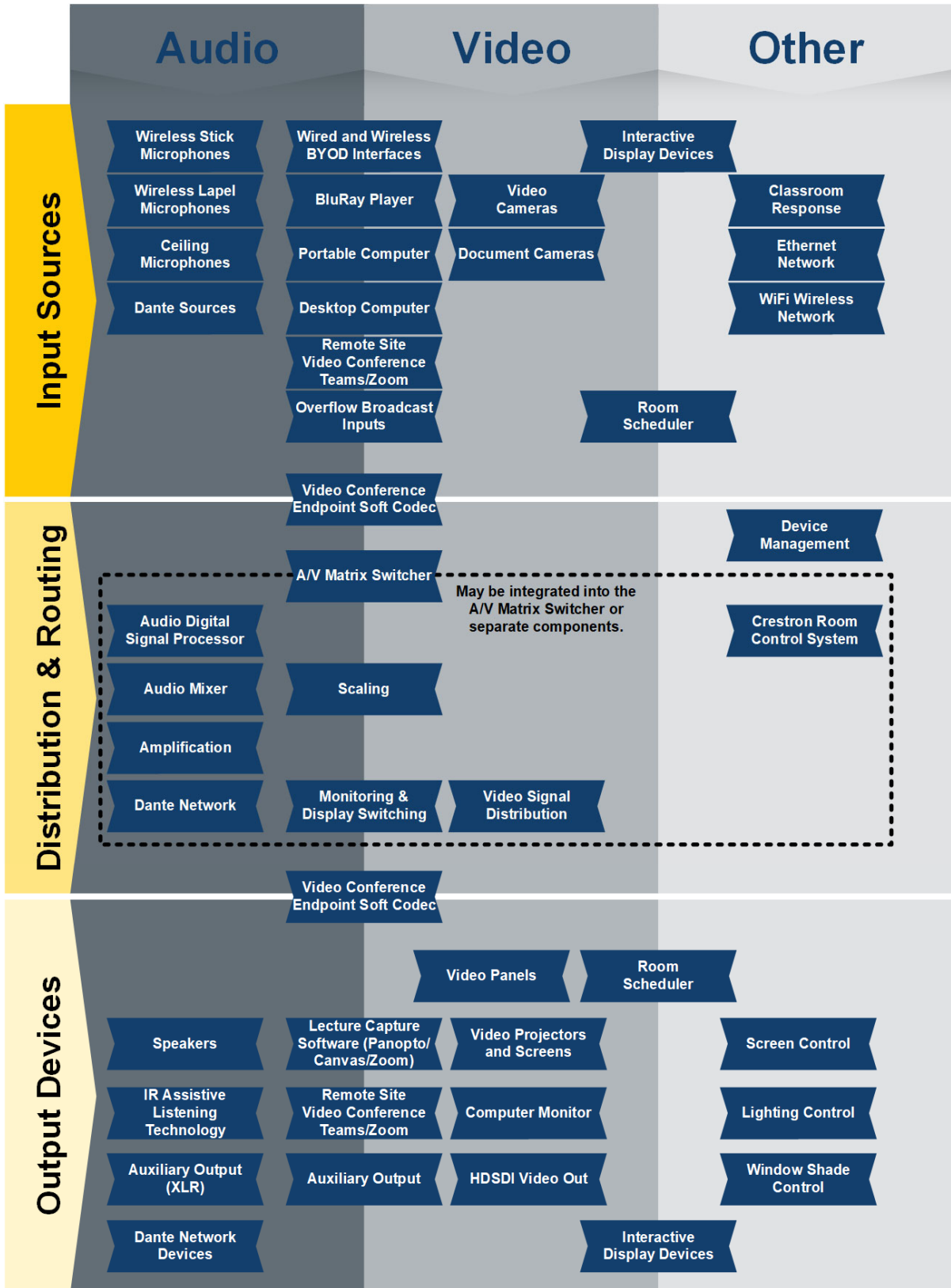
Generally speaking, audio/visual systems are comprised of devices and functions in three categories:

- Sourcing and Input
- Distribution and Routing
- Output

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

CWU has a strong preference for IP-based audio/visual connections that carry audio and video content via the campus network.

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





## 3.2 Sourcing and Input Devices

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

### 3.2.1 MICROPHONES

#### 3.2.1.1 CEILING

Ceiling microphones are intended to provide audio to **remote** video conferencing sites.

CWU prefers beam array-type microphones such as:

- Sennheiser TeamConnect Ceiling 2
- Audio Technica ATND1061
- Shure MX902

Pendant microphones shall only be used when approved by the AVM:

- Shure MX202
- Vaddio CeilingMIC

Ceiling microphones shall be supported using wire to building structure.

Microphones should be connected to the computer (provided by the AV Integrator) with a USB input so that it can be used with soft codec software (Microsoft Teams, Zoom, etc.). The Shure ANIUSB-Matrix can be used to convert Dante audio to USB.

#### 3.2.1.2 WIRELESS

Wireless microphones (lapel and hand-held stick) are intended to provide audio to **both local** public address and **remote** video conferencing sites. All wireless microphones shall operate in the DE2 frequency band (470.125 to 529.975 MHz), with the ability to self-determine available radio frequencies.

Wireless microphones shall be connected to both the computer via USB and to the audio/visual system.

Motu M2 3120 and Steinberg UR22C audio mixers have USB outputs and may be useful in some applications.

CWU currently uses:

- Audio Technica ATW-3212/C710 handheld microphones
- Audio Technica ATW-3211/831 lapel microphones
- Shure QLXD/ULXD1/SM58 handheld microphones
- Shure QLXD/ULXD1/WL185 lapel microphones



A microphone recharging cradle is required at each application space.

For larger spaces (lecture halls, auditoriums, etc.) solutions from RF Venue can be used to provide multiple ceiling antennas throughout the space.

### **3.2.2 CAMERAS**

#### **3.2.2.1 DOCUMENT CAMERAS**

Document cameras shall be 4K, with dual outputs:

- USB output to the computer
- HDMI output to the audio/visual system.

The document camera shall rest on the top of the instructor console.

Acceptable manufacturer:

- Elmo TT-12F

#### **3.2.2.2 VIDEO CONFERENCING CAMERAS**

CWU currently uses the Vaddio Roboshot camera with the Vaddio Onelink for video conferencing applications. The 30x zoom lens is preferred.

The camera shall be connected via USB to the computer. Do not connect to the audio/visual system.

Cameras requiring license fees shall not be used.

Presenter tracking system such as the Vaddio RoboTRAK use an infrared lanyard worn by the presenter. These systems are therefore incompatible with built-in assisted listening systems that use infrared. Instead, the assisted listening system would need to be RF-based or a T-coil solution.

### **3.2.3 BLU-RAY PLAYER**

CWU currently uses rack-mounted Blu-ray players, preferably from Denon.

### **3.2.4 COMPUTER**

In the past, computers to be integrated into AV systems were Owner-provided. However, this is no longer the case. Computers shall be provided by the AV integrator as part of the AV system. Computers shall comply with the current CPU standards, which are subject to change. The Designer shall work with the ISM and the AVM to insert CWU's current computer hardware standards into the bid specification.

Typically, the computers will be small form factor devices that sit in a bracket behind the desktop monitor or will be mid-size case that sits on the desktop with the monitor sitting on top of the computer.



### **3.2.5 PORTABLE DEVICES**

#### **3.2.5.1 NOTEBOOKS, TABLETS AND OTHER BYOD DEVICES**

Audio and video from portable notebook and tablet computers can be input to the system via wired or wireless methods where applicable.

CWU currently uses an Extron AAP or MAAP with modular connectors, including HDMI input and a 3.5mm audio output (for the assisted listening system). An Ethernet port is also included as one of the modular connectors.

Crestron AirMedia is used to wirelessly connect bring-your-own-devices (BYOD) such as smartphones, tablets and portable computers. AirMedia is integrated into the Crestron DMPS3-4K-350-C-AIRMEDIA. Standalone AirMedia AM-3200 devices shall be used wherever the DMPS3-4K-350-C-AIRMEDIA is not being used.

The Designer shall alert the AVM about the need for CWU to obtain AirMedia licenses for DMPS devices under CWU's account.

## **3.3 Distribution and Routing Equipment**

### **3.3.1 VIDEO SCALING EQUIPMENT**

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

### **3.3.2 AUDIO AND VIDEO ROUTING EQUIPMENT**

Audio and video routing is to be done with the digital media management system from Crestron as appropriate for the application.

In the past, the Crestron DMPS3-4K-350-C-AIRMEDIA and the Crestron DMPS3-4K-150-C were used extensively for campus A/V applications. However, the University has now standardized on the Creston HD-PS402 matrix with the Crestron MCP-3-302-B control panel in a tabletop enclosure for most classroom spaces.

The Crestron DMPS3-4K-350-C-AIRMEDIA and the Crestron DM-MD8X8-CPU3 8x8 DigitalMedia Switcher are the preferred solution choices for larger A/V applications that would exceed the capacity of the.

The Designer shall discuss the choice of routing equipment in advance with the AVM.

### **3.3.3 AMPLIFIERS**

While the DMPS3-4K-350-C includes an integrated audio amplifier, do not use it. All applications require a separate amplifier due to the limited power capacity of the integrated amplifier.



Audio systems shall be designed in such a manner as to provide a clearly intelligible monaural audio signal at every location within the classroom. 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 dBA at 48 inches above finished floor in the classroom seating area.

Amplifiers are normally a mixer/amplifier with an output of 60w RMS or more to a 70v speaker system. Amplifiers shall have 70v. line outputs intrinsic in their design and shall have inputs to accommodate the audio sources.

- The typical mixer/amplifier utilized by CWU is a TOA 906MK2 or larger with appropriate input modules for the sources to be mixed.
- For small applications, the Extron MPA 601-70V is appropriate.

### **3.3.4 CODEC**

CWU currently uses only soft-codec solutions, primarily Microsoft Teams and Zoom. If a hardware codec is necessary, approval from the AVM is required because these devices typically require ongoing licensing fees.

## **3.4 Output Devices**

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

### **3.4.1 SPEAKERS**

The speaker systems shall be designed in such a manner as to provide a clearly intelligible audio experience at every occupied location within the space.

#### **3.4.1.1 CEILING-MOUNTED**

CWU uses 70 Volt monaural 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. Audio enhancement shall provide a level of not less than 55 dBA at 48 inches above finished floor in the classroom seating area. Audio levels shall not vary by more than 2dB at any point within the occupied area.

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

Support ceiling-hung speakers using wires attached to the building structure.

CWU typically uses speakers from Bose Professional, JBL or Atlas-Soundolier.





### 3.4.1.2 SOUNDBARS

Soundbar speaker systems shall attach to the bottom of a video panel. CWU currently uses the Crestron Flex UC-SB1-Cam soundbar.

### 3.4.2 ASSISTED LISTENING SYSTEM

Large spaces, especially those where the public might attend, shall have built-in assisted listening system. CWU typically uses the Listen Tech LT-84 transmitter/radiator with the LR-42 IR Receiver.

For all other spaces where audio is output via speakers, provide an audio output (3.5mm) and portable kits consisting of the Listen Tech LT-800 FM transmitter and the LR-4200-FM receiver. The Williams FM ADA KIT 37 RCH is also an acceptable kit. Provide three portable kits per building.

If the RoboTRAK presenter tracking camera system is being used, the assisted listening system will need to be an RF-based system or a T-coil solution.

### 3.4.3 VIDEO OUTPUT DEVICES

#### 3.4.3.1 PROJECTORS

Video projectors shall have the following performance characteristics:

- Standard-throw projectors are almost always required.
- With the projectors that CWU is currently using, the following are key projector location measurements:
  - The distance from the projector's **lens** to the **screen** should fall within the range of 12' 2" to 18' 5".
  - The Designer should target 17' from the projection **wall** to the **mounting column** as a design starting point, which (as an odd number) has a higher chance of landing in the center of a ceiling tile and will result in a **lens-to-screen** distance of approximately 15' 8".
  - Verify that the ceiling at this location is free of obstructions, such as light fixtures, structural members, HVAC ductwork and plumbing.
- Short-throw projectors are only permitted with pre-approval by the AVM. Ultra-short throw projectors are not normally desirable.
- 1920x1080 native resolution with 16:10 or 16:9 aspect ratio
- Laser projection is required.
- Minimum of 5,000 ANSI lumens output
- No keystone adjustment shall be required with a properly installed system.
- Projectors shall support Crestron DM.



Acceptable manufacturers of projectors include:

- Standard-throw: Panasonic PT-VMZ50U, or better

Wiring to the projector shall consist of:

- One CAT6A Shielded (purple color preferred, blue is acceptable) between an outlet above the projector and the AV Junction Panel or floor box.

Projectors shall be ceiling-mounted and may be attached to structure or utilize a suspended ceiling adaptor approved by the mount manufacturer. Mounts will require manufacturer-approved and code-approved seismic bracing or security attachments to the structure. The ceiling-mounted projector shall be no lower than eight feet above finished floor with a clear and unobstructed path to the screen and positioned to achieve a non-keystone shape image without image manipulation settings. Any room lighting apparatus must be installed in such a manner as to not conflict with the projected image.

Acceptable manufacturers of ceiling-mounts for projectors include:

- Chief Manufacturing RPMA-U universal mount with threaded column, projector specific interface and trim.

#### **3.4.3.2 IDEAPAIN**

Some projects may wish to use a whole wall paint covering product such as IdeaPaint ([www.ideapaint.com](http://www.ideapaint.com)) or equivalent in lieu of liquid marker boards. IdeaPaint is intended to provide a whiteboard-like coating to cover the wall and serve as both as a projectable surface and a liquid marker writing surface.

CWU has had mixed results with these materials, and recommends that design decisions supporting the use of these materials be made after careful consideration of the pros and cons.

Wherever IdeaPaint (or its equivalent) is used, the painted area shall be surrounded with wood or metal framing to prevent overwriting or wiping ink residue onto the surrounding non-IdeaPaint surfaces.

#### **3.4.3.3 PROJECTION SCREENS**

The Designer shall work closely with the architect to incorporate projection screens into the design.

Projection screens shall be sized appropriately to the room size and in accordance with the AVIXA 202.01:2016 industry standard, which CWU endeavors to follow. This standard describes the required screen size associated with viewing distance, among other factors.

Screens shall be tensioned, have a 16:10 aspect ratio, and have a matte white surface. Draper's XT1000V with a 1.0 gain is almost always desired.

Screens shall be electrically operated and be low voltage controllable, both with a manual wall switch and via the audio/visual control system.

Projection screens shall be carefully coordinated with the following room parameters:



- For spaces with only one liquid marker board, don't locate the projection screen such that it will cover the liquid marker board.
- For rooms with ceiling heights lower than 14 feet, the projected image shall be as large as practical in the space, extending from 2" below the ceiling down to 40" above the finished floor. For spaces with higher ceilings, consider projection screen placement above liquid marker boards.
- For wider rooms, two projection screens may be required.
- Verify that audience sight lines are not obstructed.
- Coordinate with the lighting designer to ensure that pendant light fixtures do not shadow the projected image and also to zone the lighting such that the projection wall can be separately switched off to reduce light wash on the screen. It is important to note that the more ambient light falling on a projection screen, the higher the number of lumens (a brighter shine) is required from the projector (with a corresponding cost increase) to overcome the ambient light on the screen and produce a readable image.
- Coordinate with the electrical designer to ensure that fire alarm devices, light switches and the screen control switch are not located behind the projection screen.

The following table provides a general guideline using products from Draper for sizing projection screens under various ceiling heights. Equivalent products from Daylite are also acceptable. The ceiling heights listed for each screen size are the low and high limits that will be served by that particular screen model. Note that the part numbers will change with if non-default drop lengths are added.

Projection Screen Applications					Required Projection Screens			
Ceiling Height		Image Dimensions (inches)						Case
feet	inches	Height	Width	Diagonal		Diagonal	Model #	Length
8	11	65	104	122.6	Draper Premier	123"	101640L	122"
9	0	66	105.6	124.5	Draper Premier	137"	101641L	135"
9	6.5	72.5	116	136.8	Draper Premier	137"	101641L	135"
9	7	73	116.8	137.7	Draper Premier	165"	101642L	160"
10	9.5	87.3	139.8	164.8	Draper Premier	165"	101642L	160"
10	10	88	144	168.8	Draper Access V	189"	140089L	187"
11	10	100	160	188.7	Draper Access V	189"	140089L	187"
11	11	101	161.6	190.6	Draper Access V	198"	140042L	196"
12	3	105	168	198.1	Draper Access V	198"	140042L	196"
12	4	106	169.6	200.0	Draper Access V	226"	140043L	221"
13	6	120	192	226.4	Draper Access V	226"	140043L	221"

Projection screens are typically specified in section 115213 – Projection Screens (as opposed to section 274100 – Audio Video Systems) and should be prepared by the Designer. This is an important strategic point for two reasons:

- The projection screens need to be installed in cooperation with the ceiling system.



- The audio/visual system is frequently bid as an Add Alternate item, and it would be undesirable to have the projection screens not included in the base bid (disrupting the ceiling system) if the Add Alternate is not accepted.

Acceptable manufacturers of projection screens include:

- Draper
- Da-Lite

#### 3.4.3.4 VIDEO PANELS

Video panels shall be a minimum of 65 inches (measured diagonally). Larger rooms will require larger video panels.

Video panels in most Conference Rooms will need to be sized at 80" or larger in order to be viewable from the farthest seat in the room.

Video panels shall be commercial grade. Acceptable manufacturers include:

- Panasonic (preferred)
- Samsung (only with onsite support warranty)

Video panels shall be hung on tiltable wall-mounts which have panel security locking provisions or with structure-attached ceiling-mounts. The video panel shall be mounted with an in-wall mount wherever possible, acknowledging that some remodel circumstances and fire-rated wall assemblies may require a surface mount. Where video panels are intended to be diagonally corner mounted, a ceiling mount would be preferable.

Acceptable wall-mounts for video panels include:

- Recessed In-wall Box: Milestone/Chief PAC501B with in-wall swing arm mount PNRIWUB and video panel interface PSBUB.
- Surface Mount: Milestone/Chief PDRUB, with a (preferred) PAC525 small in-wall box.
- Surface Mount (low profile): Milestone/Chief MSTU Thinstall, with a (required) PAC525 small in-wall box.

Acceptable ceiling-mounts for video panels include:

- Milestone/Chief CMA450 or CMA440, with mounting column CMS0x0x, escutcheon ring CMA640W and video panel mounting interface LCM1U.

In-wall boxes support integrated single gang power and telecommunications outlets, as well as conduit knockouts for conduits routing audio/visual cabling to the video panel.

- The electrical power outlet shall typically be installed into the box knockout on the bottom of the in-wall box.
- The telecom conduit shall be installed into the box on the top of the in-wall box, providing the conduit a direct route with fewer conduit bends.
- The audio/visual conduits shall be installed into a conduit knockout on the top of the in-wall box, providing the conduit a direct route with fewer conduit bends.



Where an in-wall box is not being provided, carefully coordinate the location of the power outlet and low voltage outlet so that they do not conflict with the video panel wall mount.

## 3.5 Room Control Systems

### 3.5.1 CRESTRON

A Crestron room control system shall be used to operate the audio/visual system in each application space.

The University has standardized on the Crestron brand control system. The most commonly used solution at CWU is the Crestron HD-PS402 matrix with the Crestron MCP-3-302-B controller in a tabletop enclosure. The Designer shall discuss this selection in advance with the AVM.

All Crestron programming developed for a CWU project shall become the property of the University and shall become part of the project deliverables in the current standard Crestron uncompiled format.

The control system shall automate projector and screen functions, control room audio volume levels, control source selection for the projector, and provide for an orderly start-up and shutdown of the audio/visual devices.

The Crestron system shall provide control for the devices depicted on the diagram discussed in Section 3 – AV Equipment.

### 3.5.2 TOUCH PANEL

In the past, the Crestron TS-1070-B-S touch panel was widely used for A/V applications. CWU has recently changed its standard practice to use the Crestron MCP-3-302-B control panel in a tabletop enclosure. A POE+ network connection is required for each touch panel.

### 3.5.3 ROOM SCHEDULER

CWU uses three Crestron devices communicating with 25Live to function as its room scheduler solution.

- Touch panel with room availability light bar: Crestron TSS-1070-B-S-LB KIT
- Occupancy Sensor: Crestron CEN-ODT-C-POE
- Room Status Flag: Crestron SSW-102-EL



## 3.6 Equipment Racks and Cabinets

### 3.6.1 SMALL ROLL-OUT CABINETS

Small cabinets may be used inside custom millwork, casework or other furniture. See Section 4.1.1.5.3 - Credenza or Casework for more information.

CWU would likely use a Middle Atlantic Mobile Furniture Rack MFR-1227KM for this application. This is a 12U high cabinet on casters with knotty maple finish, which typically matches the interior design for CWU facilities. Other finishes are available.

### 3.6.2 MID-HEIGHT ROLLING CABINETS

A mid-height cabinet is used to host equipment in instructional spaces.

CWU typically uses a Middle Atlantic Mobile Furniture Rack MFR-2027KM for this application. This is a 20U high cabinet on casters with knotty maple finish, which typically matches the interior design for CWU facilities. Other finishes are available. Provide the following features.

### 3.6.3 TALL CABINETS

A tall cabinet would be used to host larger quantities of equipment in larger application spaces requiring more equipment.

This is rarely ever needed, but if so, CWU would use Middle-Atlantic WRK-44SA-32, along with the following features:

- Rear rail kit: Middle-Atlantic WRK-RR44
- Slotted-pattern vented top panel: Middle-Atlantic MW-VT
- 4" caster base: Middle-Atlantic CBS-WRK-32
- Two vertical power strips, inside the rear of the cabinet with 15 or more outlets each (Middle Atlantic PDT-2015C-NS)
- Front panel switched, rear outlet power distribution device (Middle Atlantic PD-915R)
- Two lacing strips: Middle-Atlantic LACE-44LP
- A two-rack unit height (2U) accessory drawer (no lock) (Middle Atlantic UD2).



## 4 Application Spaces

Audio/visual systems shall be designed for a variety of meeting spaces and instructional spaces. See Section 3 - AV Equipment for descriptions of the audio/visual equipment and furniture described in each application space below.

### 4.1 General Requirements

#### 4.1.1 ARCHITECTURAL

##### 4.1.1.1 WALL COLOR

Wall paint colors shall be neutral, such as beige, light gray or light blue. Flesh tone values should be avoided. High contrast such as white and black should be avoided. "Busy" patterns and very rough textures should be avoided because they distract from the foreground and can cause moiré patterns on video images.

##### 4.1.1.2 SOUND TRANSFER THROUGH WALLS

Where confidentiality is required for meeting rooms or where the potential of disruptive noise from adjacent spaces is anticipated, the walls shall be constructed in a manner that will attenuate sound transfer. In these circumstances, walls shall be six inches (6") deep and shall employ sound dampening material and construction strategies.

##### 4.1.1.3 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.

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. Carpeting is highly desirable.

##### 4.1.1.4 WINDOWS

If there are windows in the room, they must have blinds to control light spill. Presentation walls should not have windows.

##### 4.1.1.5 FURNITURE

###### 4.1.1.5.1 Instructor's Console

Instructor console systems shall be located in the front of the classroom, to the side of the presentation area of the front wall, away from the door. The console should be visible from



every seat in the space but should not obstruct the line of sight to the projection screen from any seat in the space.

The Instructor's console shall be a KI Genesis Electric adjustable table, 30x70 (or 30x60) with modesty panel.

- KI part number: GRSE3072 (or 3060) /S/74P/PUN/xx/xx/GROMM. (color choices shall specified by the Architect)
- No wireway
- Add casters
- Commercial 6-outlet power strip, all-metal with screw flanges. No power switch is required. Secured to the underside of the tabletop. (Tripp-lite UL24RA-15)
- 3" grommeted holes, one in each back corner (away from the instructor), 6-inches in from end, 3-inches back from edge with PVC sleeve.

The console should be powered via an outlet inside the AV Equipment Cabinet.

The AV Equipment Cabinet shall be located near the far end of the instructor console away from the door. In other words, there should be a clear walking path from the door, across the front of the classroom to the teaching position behind the instructor console before encountering the AV Equipment Cabinet.

#### 4.1.1.5.2 Conference Table

Conference tables shall be sized to fit the room. Chairs should be selected for comfort and for utility in a conference setting.

When selecting the conference table, consider how wiring for power and cables for wired network, power and other cabling would be routed from the floor box up through a table leg. It is recommended that tables be manufactured with integrated cable raceways to support cable routing and management.

The following cable access device shall be provided for each conference table:

- Crestron FlipTop FT2-700-MECH-PTL-AL with the following add-in modules:
  - Four electrical power receptacles
  - Two USB-C inputs (for content, not charging)
  - Two data jacks
  - Two HDMI inputs
- or another equivalent solution supplied by the conference table manufacturer.

#### 4.1.1.5.3 Credenza or Casework

Sometimes a space is desired that is a blend of meeting space features and instructional space features and may be referred to as a seminar room. These rooms may require audio/visual equipment that is similar to an instructional space, which would typically be installed in an AV Equipment Cabinet. However, it is not normally desirable to include an AV Equipment Cabinet in a meeting room space.

Two possible solutions include a credenza or built-in casework (preferred).



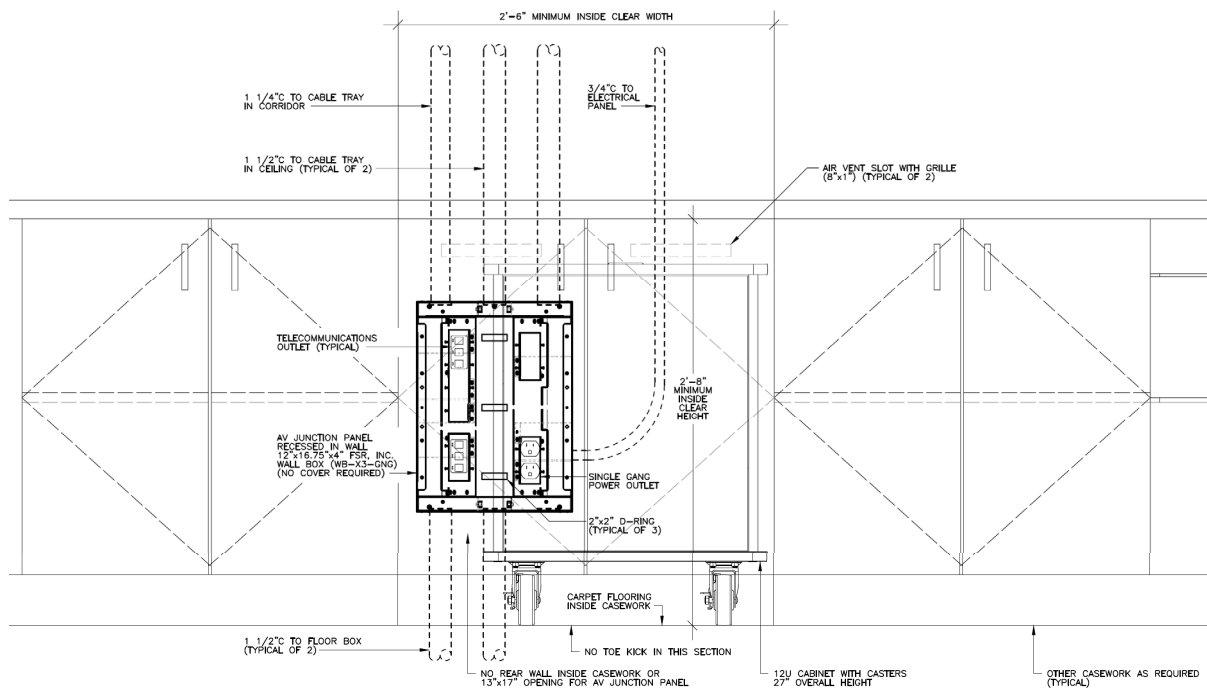


A credenza could be used to host A/V equipment in conference room spaces with more formal décor. CWU uses 2-bay credenzas (Middle Atlantic C5F2) and 3-bay credenzas (Middle Atlantic C5F3), with built-in slide-out racks. Provide Plexiglas doors (Middle Atlantic C5Kx-XXX-xx). The Designer shall inquire with the AVM whether a credenza might benefit from a Crestron FlipTop as discussed above, with half the number of connections required for a conference table.

CWU has a preference for built-in casework with a small rack (12U) on casters (see Section 3.6.1 - Small Roll-out Cabinets). A built-in casework solution with a roll-out rack is more flexible and maintainable than a credenza solution when it is designed with the following features:

- Two cabinet bays wide, with no center dividing wall.
- No drawers below the countertop. The 12U small rack is just less than 27" high including casters. The full inside clear height will be required.
- No cabinet floor. Instead, room carpeting should extend into the casework and cover the floor inside.
- No toe kick.
- No shelf.
- Air vents near the top of both doors. Air will flow into the casework below the doors where the floor and toe kick would have been.
- No cabinet back wall. The gypboard wall should be exposed inside the casework.
- An AV Junction Panel shall be provided in the stud wall inside the casework without a hinged door cover. Power, telecommunications and audio/visual cabling will terminate in the AV Junction Panel.

The diagram below depicts a built-in casework example:





#### 4.1.1.6 PROJECTION SCREENS

The architect shall work closely with the audio/visual Designer to incorporate projection screens into the design.

See Section 3.4.3.3 – Projection Screens for important architectural considerations.

#### 4.1.1.7 FURNITURE

### 4.1.2 MECHANICAL

The Mechanical Designer shall account for the heat load produced by the audio/visual equipment in each application space. The following numbers are a starting point for mechanical design; however, the Mechanical Designer shall be responsible to base their design on the actual heat load produced in each application space.

Breakout Room	1,200 BTU
Small Conference Room	1,750 BTU
Medium Conference Room	2,500 BTU
Large Conference Room	3,500 BTU
Small Lab / Classroom	5,000 BTU
Medium Lab / Classroom	6,800 BTU
Large Lab / Classroom	12,000 BTU
Lecture Halls, Auditoriums and Theaters	17,000 BTU
AV Equipment Rooms	5,000 BTU
Digital Signage	1,200 BTU
Video Walls Direct View LED	Higher than typically expected

The Mechanical Designer shall coordinate with the audio/visual Designer to cooperatively place air flow devices to minimize noise captured by ceiling microphones and minimize the movement of the projection screen.

#### 4.1.3 ELECTRICAL

##### 4.1.3.1 POWER REQUIREMENTS

Wherever possible the electrical power circuits supplying projectors, video panels, the AV Junction Panel and the AV Equipment Cabinet must be from the same breaker panel and use the same phase in the panel.

Conduits for electrical power shall be 3/4" trade size minimum.

The AV equipment located throughout the room that will require power includes:

- AV Junction Panel – duplex outlet, mounted inside the panel
- AV Equipment Cabinet – quad outlet, mounted inside the equipment cabinet near the bottom, fed with a shielded power cord-and-plug. The power cord shall route through



- the mesh cable umbilical from the AV Equipment Cabinet to the AV Junction Panel, where it will plug in.
- Video Panels – duplex outlet typically integrated into the in-wall box behind each video panel.
  - Projector – duplex outlet typically located in the projector mount or in the ceiling above the projector, preferably not visible.
  - Projection Screen – duplex outlet for the projection screen. A conduit and box are also required for the low-voltage control switch for the projector, which shall be installed near the instructor’s console in a location that is not behind the projection screen.

The Electrical Designer shall account for the electrical power required for the audio/visual equipment in each application space. The following numbers are a starting point for electrical design; however, the Electrical Designer shall be responsible to base their design on the actual power requirements for each application space.

Breakout Room	350 W
Small Conference Room	500 W
Medium Conference Room	750 W
Large Conference Room	1,000 W
Small Lab / Classroom	1,500 W
Medium Lab / Classroom	2,000 W
Large Lab / Classroom	3,500 W
Lecture Halls, Auditoriums and Theaters	5,000 W
AV Equipment Rooms	1,500 W
Digital Signage	350 W
Video Walls Direct View LED	Multiple 120VAC circuits

**4.1.3.2 LIGHTING REQUIREMENTS**

Pendant light fixtures shall be coordinated so that they do not obstruct the projected light path to the projection surface. The projector will typically be hung between six and twelve inches below the finished ceiling and approximately twice the screen width back from the front of the room.

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.

**4.1.4 LOW-VOLTAGE PATHWAYS AND BOXES**

Audio/visual systems have a life cycle in the 8-to-10-year range and will therefore be replaced many times in the life of the building. CWU’s objective is to provide strategically placed pathways to support AV equipment and cabling without requiring heavy construction (cutting and patching) at each upgrade or replacement cycle.



#### 4.1.4.1 WIRE BASKET CABLE TRAYS

Audio/visual cabling running through ceilings shall not lay on t-bar ceiling tiles. J-hooks and ring-type solutions are not acceptable.

In instructional spaces and conference rooms, provide wire basket cable trays in the accessible ceiling to route cabling from speakers, microphones, cameras and projectors to the headend location in each room. These trays can be small, sized in the range of 6" or 8" wide by 2" high, and shall connect to the main low-voltage distribution cable tray in the building.

Cable tray practices shall comply with CWU telecommunications design guidelines.

#### 4.1.4.2 CONDUITS, DEVICE BOXES AND FACEPLATES

Conduit sizing shall be as follows:

- Provide conduits (minimum 1" trade size) from the wire basket to in-wall, deep, double gang device boxes serving each wall-mounted audio/visual device.
- Separate conduits are needed for speaker and analog microphone wiring, however analog ceiling microphones are becoming increasingly rare in favor of Dante-based ceiling microphones.
- Conduits intended to pass large connectors shall be sized accordingly – typically 1" trade size or larger (depending on cable fill and the sizes of factory-terminated connectors).
- All other conduits – 1" trade size minimum

Box sizing shall be as follows:

- Typically, 4" square, 2 1/8" deep (minimum depth), with mud-ring/extension ring the overall internal depth shall be 2 1/2" minimum.
- Where thick/stiff cabling is terminated (having large bend radius requirements) such as CAT6A-Shielded for HDBaseT, device boxes shall be 5" square boxes. See RANDL Industries, Inc. [www.randl-inc.com](http://www.randl-inc.com)

Faceplates shall be as follows:

- Provide stainless steel faceplates with circular holes in the plates that are large enough for connectorized cables to pass through.
- Provide blank stainless-steel faceplates for future devices.

Conduits, device boxes and faceplates shall comply with CWU telecommunications design guidelines.

#### 4.1.4.3 AV JUNCTION PANELS

For instructional spaces, provide an AV Junction Panel recessed in the wall near the location where the AV Equipment Cabinet will sit.



CWU requires a lockable door and bottom hinge-flap allowing cables to exit through the closed door. CWU typically uses:

- 12" x 16.75" x 4" wall box from FSR Inc. (WB-X3-GNG)
- Flush-mounted cover (FSR WB-X3-CVR-XXX)

Provide the following conduits connected to each AV Junction Panel:

- Provide two 1 ½" conduits to the in-room wire basket for audio/visual cabling.
- Provide one 1 ¼" conduit to the cable tray in the corridor for telecommunications cabling.
- Provide two 1 ½" conduits to the floor box for audio/visual cabling.
- Provide a ¾" conduit for the power circuit. This conduit shall enter the sidewall of the AV junction Panel into the space for the receptacle, leaving the top conduit knockouts for low voltage conduits.

Provide a single gang power outlet inside the AV Junction Panel.

Provide CAT6A telecommunications cabling from the nearest telecommunications room terminated inside the AV Junction Panel. A minimum of 6 cables are required, however most applications will require 8 or more CAT6A cables. CAT6A cabling shall comply with CWU telecommunications design guidelines and be installed by a certified telecommunications contractor (not the AV integrator).

The cabling between the AV Junction Panel and the AV Equipment Cabinet shall be enclosed in a braided/mesh expandable sleeving such as Flexo PET, Techflex or Panduit. The cable shall enter the cabinet at the bottom rear and be securely anchored to the rack inside. The cabling between the AV Equipment Cabinet and the Instructor Console shall be similarly dressed in mesh sleeving.

#### 4.1.4.4 FLOOR BOXES

Floor boxes serving audio/visual functions must be sized to accommodate the quantity of audio/visual cables, data cables, and power outlets required by A/V systems. Some audio/visual cables have bend radius limits due to the size and stiffness of the cables.

Large floor boxes serving an instructor console shall have a cover that will incorporate a finish (carpet, tile, etc.) that matches the finish of the floor. Floor boxes shall have separate partitions for power wiring and low voltage cabling.

CWU's preferred floor box solution is from FSR, Inc. [www.fsrinc.com](http://www.fsrinc.com) (or a Hubbell equal when pre-approved):

- For all applications:
  - FL-500P-8 or FL-600P-8-B with 8" depth (also available in 10" depth).
  - Single gang for power

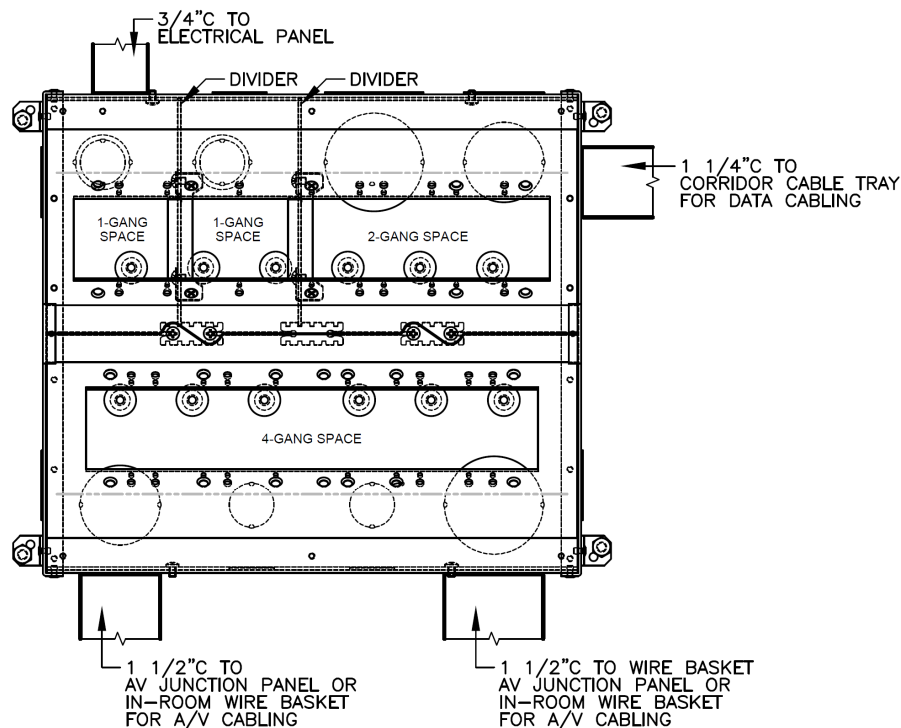


- Double gang for data
- Four-gang for A/V
- For slab-on-grade applications:
  - Use the FL-GRD2/4 pour pan with one of the above boxes.
- For fire-rated floor applications:
  - Use the FL-FRK-500P or FL-FRK-605P firestop box assembly with one of the above boxes.

Floor boxes shall have the following conduits:

- Electrical power –  $\frac{3}{4}$ " conduit.
- Audio/visual – two  $1\frac{1}{2}$ " conduits to the AV Junction Panel (or in-room wire basket if there is no AV Junction Panel in the room).
- Telecommunications –  $1\frac{1}{4}$ " conduit to the cable tray in the corridor.

The diagram below depicts the plan view of a floor box with the required conduits:



Some applications may require a high-capacity floor box, such as the FSR FL-600P-x. The Designer shall discuss with the AVM on a project-by-project basis about whether the larger floor box would be appropriate.



#### 4.1.5 TELECOMMUNICATIONS REQUIREMENTS

CAT6A telecommunications cabling from the nearest telecommunications room is required as follows:

- At least 6 cables terminated in the AV Junction Panel (or floor box) for the AV Equipment Cabinet and instructor console
- 1 cable near each projector
- At least 2 cables serving each video panel
- 1 cable serving each camera
- 1 cable serving each beam array microphone

CAT6A-**shielded** telecommunications cabling is required as follows:

- 1 cable between a projector and the AV Junction Panel (or floor box) for HDBaseT (Crestron DM) communications
- 1 cable between a video panel and the AV Junction Panel (or floor box) for HDBaseT (Crestron DM) communications

All telecommunications cabling, including the cabling described above serving the audio/visual applications, shall be designed and installed per CWU's telecommunications design guidelines by a certified telecommunications contractor. The AV Integrator shall not install this cabling.



## 4.2 Meeting Spaces

Meeting spaces shall be designed with the following features:

Features	Breakout Room	Conference Rooms		
		Small	Medium	Large
Seating	6 or fewer	6 or fewer	6 - 12	12 or more
CWU Computer	No	Yes	Yes	Yes
Soft Codec Video Conferencing	via User's BYOD Device	via CWU Computer	via CWU Computer	via CWU Computer
AirMedia AM-3200	Yes	Yes	Yes	Yes
Touch Panel (Wireless + GW)	No	No	Yes	Yes
Video Panel Qty	1	1	1 or Optional second	up to 4
Video Panel Size	55"	65" or 75"	75" or larger	75" or larger
Projector & Screen	No	No	No	Optional
Speakers	Crestron Flex Soundbar below video panel with integrated mic and camera	Crestron Flex Soundbar below video panel with integrated mic and camera	Ceiling speakers with amplifier	Ceiling speakers with amplifier
Microphone			beam array or pendant	beam array
Camera			PTZ camera	multiple PTZ cameras
Auxiliary Input Faceplate on Wall	HDMI input & USB to Soundbar	No	No	No
Auxiliary Input FlipTop in Conf Table	No	Yes	Yes	Yes
Controlled Lighting	No	No	No	Optional
Room Scheduling	No	Optional	Optional	Optional
Example Drawings	Breakout Room	Conference Rooms		
		Small	Medium	Large
Plan & Elevation Drawings	Tx.xx	Tx.xx	Tx.xx	Tx.xx
Schematic Diagram	Tx.xx	Tx.xx	Tx.xx	Tx.xx





## 4.3 Instructional Spaces

Instructional spaces shall be designed with the following features:

Features	Classrooms and Labs			Lecture Halls, Auditoriums & Theaters
	Small	Medium	Large	
Seating	50 or fewer	50 - 90	90 - 150	150 or more
CWU Computer	Yes	Yes	Yes	Yes
Soft Codec Video Conferencing	via CWU Computer	via CWU Computer	via CWU Computer	via CWU Computer
AV Matrix Switcher	HD-PS402	HD-PS402	HD-PS402 or DMPS-350	DMPS-350 or DM-MD8X8-CPU3 8x8
AirMedia	AM-3200 (component)	AM-3200 (component)	AM-3200 or DMPS integrated	integrated with DMPS-350 or AM-3200
Touch Panel (Wired POE+)	Yes	Yes	Yes	Yes + optional wireless Touch Panel
Projector & Screen	1 5,000 lm	1 or 2 7,000 lm	2 or more 10,000 lm	2 or more 15,000+ lm
Speakers	Ceiling speakers with amplifier	Ceiling speakers with amplifier	Ceiling speakers with amplifier	Ceiling speakers with Amp + DSP & subwoofer
Assisted Listening System	Kit with 3.5mm Audio	Kit with 3.5mm Audio Output	Built-in	Built-in
Lavalier and Stick Microphones	1 Lavalier	1 Lavalier	2 Lavalier + 2 Stick	2 or more Lavalier + multiple Stick
Ceiling Microphone	Minimum Logitech 930 camera with integrated mic	1 or 2 Beam Array	2 or 4 Beam Array	No
Camera		PTZ camera	PTZ camera	PTZ camera
Controlled Lighting	No	No	Yes	Yes
Controlled Window Shades	No	No	No	Yes
Room Scheduling	Yes, for all instructional spaces designated as "General Use" spaces			Yes
<b>Level 1 - Enhanced Conferencing</b>	<b>Classrooms and Labs</b>			<b>Lecture Halls, Auditoriums &amp; Theaters</b>
	<b>Small</b>	<b>Medium</b>	<b>Large</b>	
Video Panels	One 65" or 75"	1 or 2 65" or larger	1 or 2 65" or larger	Multiple 65" or larger
Ceiling Microphone	1 Beam Array	-	-	Multiple Beam Array
Camera	Optional PTZ Camera	1 additional PTZ camera	1 or 2 additional PTZ cameras	Multiple additional PTZ cameras



Level 2 - Enhanced Conferencing	Classrooms and Labs			Lecture Halls, Auditoriums & Theaters
	Small	Medium	Large	
Auto Tracking Camera System	-	Vaddio RoboTRAK Presenter Tracking System		
Example Drawings	Classrooms and Labs			Lecture Halls, Auditoriums & Theaters
Plan & Elevation Drawings	Tx.xx	Tx.xx	Tx.xx	Tx.xx
Schematic Diagram	Tx.xx	Tx.xx	Tx.xx	Tx.xx

### 4.3.1 SPECIAL CASES

#### 4.3.1.1 ENHANCED CONFERENCING

There are two levels of additional features that can be added to instructional spaces:

##### 4.3.1.1.1 Level 1

###### 4.3.1.1.1.1 Video Panels

Video panels can be added to the rear wall for the instructor to view the content on their computer screen and/or to view the camera image of students at a remote site.

One or more additional panels can be added to the front wall for students to see the other students at a remote site.

###### 4.3.1.1.1.2 Ceiling Microphones

For a Small classroom, a beam array microphone can be added.

For Lecture Halls, Auditoriums and Theaters, multiple beam array microphones can be added to cover the audience seating area.

###### 4.3.1.1.1.3 Cameras

For a Small classroom, a PTZ camera aimed at the presenter can be added, in lieu of the Logitech 930.

For the other spaces, one or more PTZ cameras can be added to provide a student view and to provide additional instructor views.

##### 4.3.1.1.2 Level 2

Level 2 includes all Level 1 enhancements. In addition, a Vaddio RoboTRAK Presenter Tracking System can be provided.

#### 4.3.1.2 COLLABORATIVE LEARNING ENVIRONMENTS

In Collaborative Learning Environment (CLE) classrooms, the instructor spends most of their time in the class period moving from table to table to support student groups as they



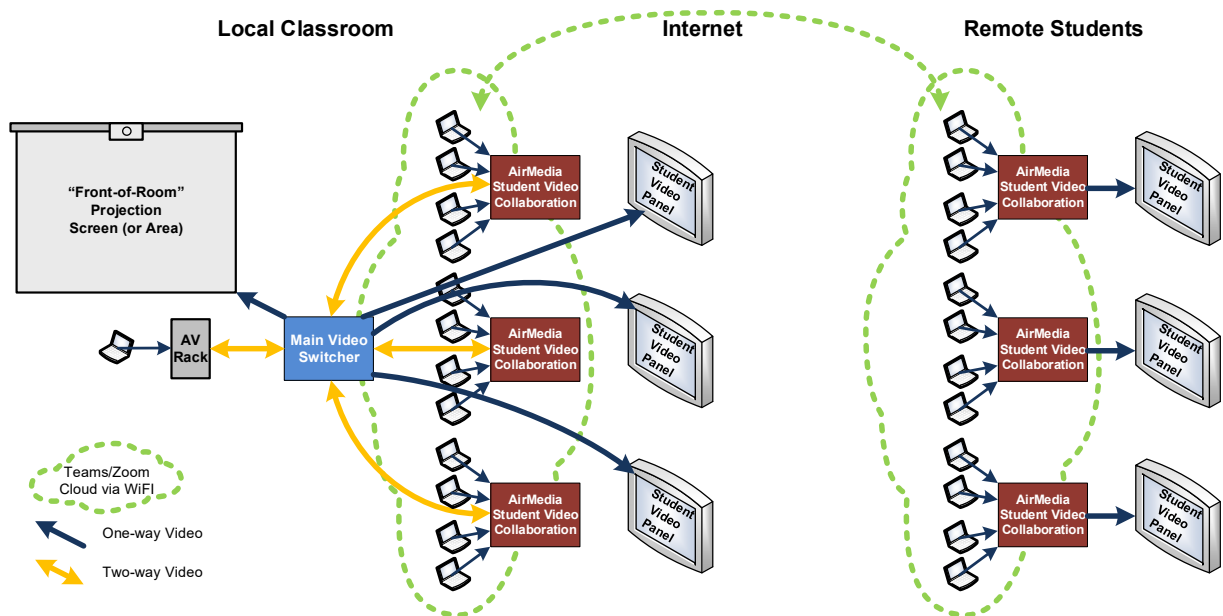
collaboratively apply what they studied outside of class to solve the challenges given them in class.

In CLE Classrooms, students sit in groups of up to 9 around each table. The tables are equipped with technology to support computers that are used by students during the class period. The wall near each table has a video panel mounted approximately 12 inches above the tabletop, where the students can view and interact collectively.

A Crestron Air Media device is required for each table and is capable of simultaneously connecting all of the students at the table, showing their screens in a grid pattern. In addition, when the students connect to the classroom's Teams or Zoom session, remote students can also see the screen associated with the student's table.

CLE Classrooms also have a "front-of-room" projection wall where the instructor might present a limited amount of material, however CLE Classrooms are not intended as lecture spaces. The front-of-room designation is a loosely meaningful 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 should 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.

In addition to all of the features of a Small Classroom, CLE Classrooms will also require AirMedia devices and video panels as shown in the diagram and discussed below:





## 4.4 Other Spaces and Applications

### 4.4.1 AUDIO/VISUAL EQUIPMENT ROOMS

An A/V Equipment Room shall be designed in each building to host audio/visual equipment serving large application spaces, digital signage, video walls, store assisted listening kits, and possibly other applications.

The A/V Equipment Room shall be designed similar to a telecommunications room, with plywood backboard on the walls, a 2-post equipment rack, 120VAC power, and plenty of pathway connectivity to each audio/visual application and the main telecommunications cable tray.

Telecommunications cabling from the nearest telecommunications room for A/V Equipment Rooms shall be primarily CAT6A, terminated on a rack-mounted patch panel.

Cooling for A/V Equipment Rooms is typically accomplished through positive pressure air exchange. However, mechanical cooling may be required for some heavy load applications. The Designer shall work with the mechanical designer to provide an appropriate solution for each A/V Equipment Room.

### 4.4.2 VIDEO WALLS

Direct-view LED shall be used for all video walls. CWU prefers to use solutions from Planar and is willing to consider other major name manufacturers. The Designer shall coordinate with the electrical designer and the mechanical designer to provide the multiple electrical power circuits required and to provide adequate cooling.

Video source equipment and video wall controller equipment should be deployed in a reasonable nearby location, including an AV Equipment Room, a telecommunications room or an AV Equipment Cabinet.

### 4.4.3 DIGITAL SIGNAGE

Video panels shall be sized for the application. At a minimum the panel shall be at least 65 inches (diagonally measured). Commercial grade video panels are required and should be selected with usage ratings that are appropriate for a 24/7/365 duty cycle.

Digital signage purposes include way finding, information and publicity, academic and program functions and retailing, and may use a touch screen or non-touch video panel.

Video panels may be oriented in either landscape or portrait mode. For portrait orientation, verify that the mounting solution will remain concealed behind the video panel, which may be narrower in portrait mode than the width of the mount.



Video panel mounting height shall be appropriate for the application. Compliance with ADA's 4" maximum distance limit from the wall is required. Using the Chief PAC501B in-wall box helps reduce the overall distance from the wall.

Each digital signage application requires a single-gang electrical power outlet and two CAT6A cables terminated in a telecom outlet, both integrated into the in-wall box.

Where the PAC501B in-wall box is used, there is space available in the box for a small form-factor computer provided by the AV Integrator. This is preferred as long as the video panel is mounted in an easily accessible location. Otherwise, it may be necessary to deploy the computer in the nearest telecommunications room and use a Crestron DM transmitter/receiver pair to send the video signal to the video panel.

See sheet **Tx.xx** for floor/ceiling plan details and wall elevation details and sheet **Tx.xx** for the schematic diagram for this application.

#### **4.4.4 ROOM SCHEDULER**

A room scheduler system should be provided for all meeting spaces and instructional spaces. A POE+ network connection is required for the touch panel and a POE network connection is required for the occupancy sensor. The room status flag communicates via USB to the touch panel. A variety of mounting solutions are available for mullion mounting and gypboard mounting.



## 5 Construction Document Content

This section of the AVDG describes the content requirements that the Designer shall include when creating the Construction Documents<sup>1</sup>. 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. 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:

### 5.1 Plans and Drawings

#### 5.1.1 GENERAL

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

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

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

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

---

<sup>1</sup> 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 "Construction 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.



### 5.1.2 SITE PLAN DRAWINGS

Outdoor audio/visual applications may include:

- Outdoor speakers
- Broadcast vehicle connections for sporting events
- Power and network for outdoor gathering spaces

### 5.1.3 FLOOR PLAN AND REFLECTED CEILING 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.
    - It is expected that the Designer will expend considerable coordination effort during the design process. Non-coordinated pathway/raceway is not acceptable to CWU.
  - Approximate locations of junction boxes and conduit bends.
  - The cable quantities and the raceway at any given point in the system.
- 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 CWU AVM 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.

### 5.1.4 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. CWU uses salvaged equipment as spare parts to support the existing equipment in other buildings.
- 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.



### 5.1.5 ELEVATION DIAGRAMS

- A. The Designer shall provide scaled wall elevation details for each meeting space and instructional space affected by the project.
- B. For remodel projects, the Designer shall take 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:
  - Video panels
  - Cameras
  - Projection screens and control switches
  - Assisted Listening radiators
  - Touch panel docks
- D. Elevation details shall be provided for each of the AV Equipment Cabinets in each instructional space. Rack elevation details shall show the cabinets and any components that are mounted in or near the racks.

## 5.2 Project Manual

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.

### 5.2.1 SPECIFICATIONS

#### 5.2.1.1 CWU AUDIO VISUAL CONSTRUCTION GUIDE SPECIFICATION

- A. The CWU 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 AV 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 CWU AVM 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 CWU 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.

#### 5.2.1.2 TYPICAL SPECIFICATION SECTIONS

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

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

- 098100 – Acoustic Insulation
- 098300 – Acoustic Finishes
- 098400 – Acoustic Room Components
- 092313 – Acoustical Gypsum Plastering

Sections typically provided by the Telecommunications Engineer, requiring audio/visual Designer input:

- 270500 – Common Work Results for Communications
- 270526 – Grounding and Bonding for Communications Systems
- 270529 – Hangers and Supports for Communications Systems
- 270533 – Conduits and Backboxes for Communications Systems
- 270536 – Cable Trays for Communications Systems
- 271100 – Communications Equipment Room Fittings
- 271300 – Communications Backbone Cabling
- 271500 – Communications Horizontal Cabling
- 271600 – Communications Connecting Cords, Devices, and Adapters

Sections typically provided by the Audio/Visual Designer:

- 115213 – Projection Screens
- 274100 – Audio-Video Systems



## 5.3 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*:

### 5.3.1 RECORD DRAWING CONTENT

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

### 5.3.2 RECORD DRAWING DELIVERABLES

- One 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.
- One CDROM containing the digital photographs taken by the Designer during the project shall be delivered to CWU Facilities Planning and Construction.