University of South Australia

Audio Visual System Design Standards

Guidelines and standards to follow when designing and installing Audiovisual systems at the University of South Australia

Table of Contents

1. Introduction

Welcome to the definitive guide to the Audio Visual (AV) standards for Adelaide University. This package consists of five essential documents, each addressing a key component of our AV framework. Understanding how these documents interrelate is vital for achieving a cohesive and effective AV environment across our university.

The below outline is present in each of the 5 documents and serves as a reminder and guide to the reader on the relationship between the volumes.

AV Capabilities	• Describes the audio visual capabilities and how they support the venue functionality
Architecture & Infrastructure Design	• Rules to be utilised when designing facilities with integrated audio visual technology
System Performance	• Target performance criteria to enable suitable selection of technology solutions
System Design	• Standardised System design documentation including required component characteristics
Device Selection	• A framework of selection criteria to choose devices with appropriate characteristics to meet system design

1.1. Document Overview:

1. **AV Capabilities**: This document outlines the overall capabilities and functionalities expected from our AV systems. It provides a link between the institution's desired pedagogical delivery methods, and the venue's technological facilities, setting the stage for all related specifications and design considerations.
2. **Architecture & Infrastructure Design**: Building upon the AV capabilities, this document details the technical and spatial requirements for the physical setup of AV systems. It includes guidelines for associated joinery placement, room acoustics, and infrastructure support, ensuring that our AV technology is integrated seamlessly into the university's physical spaces.

3. **System Performance**: This document focuses on the performance metrics and evaluation criteria for our AV systems. It establishes how the systems should perform in practice, including benchmarks for reliability, clarity, and efficiency. Along with the infrastructure standards outlined in the previous document, ensures the technology installation will meet the required performance standards, simultaneously providing a quantitative testing framework of measurement.
4. **System Design**: Detailing the technical design of our AV systems, this document bridges the gap between capabilities and practical implementation. It includes specifications for system configuration, integration, and customization, ensuring that all components work together effectively to meet the outlined performance standards.
5. **Device Selection**: The final document provides guidelines for choosing the right AV equipment and technology. It outlines criteria for evaluating and selecting devices that align with our capabilities, design specifications, and performance requirements, ensuring that each piece of equipment enhances the overall AV system.

1.2. Connecting the Documents:

These five documents work together to create a comprehensive AV implementation framework. **AV Capabilities** sets the overarching goals and expectations for our AV systems, which are then translated into practical guidelines for facilities design in **Architecture & Infrastructure Design**. The **System Performance** document ensures that these designs meet the required performance standards, while the **System Design** document provides the detailed technical specifications for implementation.

Finally, **Device Selection** ensures that the equipment chosen will support and enhance the capabilities, design, and performance criteria outlined in the preceding documents. By following this interconnected framework, we can ensure that our AV systems are consistent, fit-for-purpose, high-performing, and fully integrated into the university's environment.

1.3. Purpose and Architectural foundations

Audio Visual (AV) technology is fundamental to the provision of teaching and other academic activities. The process of building Audio Visual (AV) systems must consider many factors and so the systems themselves are multidimensional in nature. Standardising the way in which they are designed provides many benefits, in particular:

· User experience

· Time-to-delivery of system

· Cost-of-delivery of system

· Component lifecycle management, e.g. technology refresh, etc.

AV system designs are largely driven by business requirements that can be broadly categorised as:

· Activity type (with key archetypes of teaching and meeting)

· Functional requirements (which are typically more detailed breakdowns of the activity type, e.g. a teaching space that also enables small group discovery)

· Physical architecture constraints

· Location constraints

A specific combination of these factors for any given room (or space) will drive the AV design for that room by isolating the set of AV capabilities that need to be delivered to address the set of relevant factors. In turn, the set of capabilities for the design leads to identification of the technical characteristics required of the system componentry. Standardisation of designs enables system components to be assembled into building blocks that can deliver a set of design capabilities, while also enabling them to be combined with other assemblies to deliver more sophisticated sets of capabilities. In a similar fashion to way the Lego blocks can be assembled to form a structure and then extended with an additional Lego block assemblies to create more advanced structures.

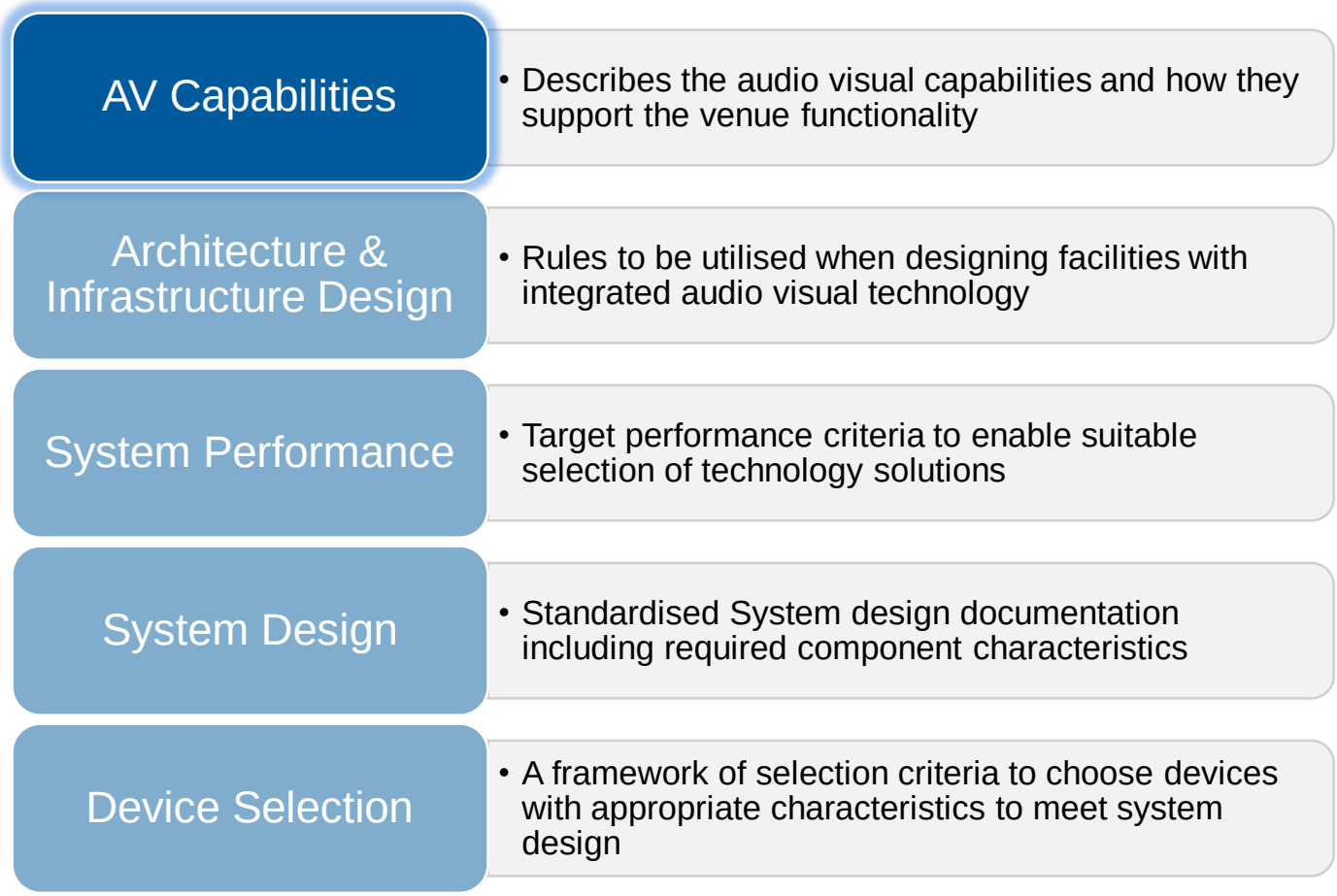
2. Audio Visual Capabilities

2.1. Introduction

Purpose

The purpose of this document is to outline a set of standard Audio-Visual Capabilities that are available at Adelaide University. Each Capability describes a set of functionalities that can delivered by an Audio-Visual system.

This document defines the available capabilities. To understand the full design architecture of audiovisual systems at Adelaide University, all documents in the Standards must be viewed and understood.



2.2. Capability Definitions

This section outlines the definitions of the Audio-Visual Capabilities.

2.2.1. Presentation Display

A presentation display is a large-format screen that allows for the effective presentation of various ***Presentation Sources***. The display ensures that all visual content is clearly visible to everyone in the space.

2.2.2. Presentation Source: Installed PC

A computer that is permanently integrated into the room's audio-visual system. It is configured to provide content for display on the ***Presentation Display(s),*** such as slides, documents, videos, or other digital media. This Installed PC is typically equipped with necessary software and connectivity options to facilitate presentation of materials during meetings, lectures, or collaborative sessions. It is designed to be readily accessible to users within the room, without requiring additional setup or configuration each time it is used. This installed PC will have the University's Standard Operating Environment bundled.

2.2.3. Presentation Source: HDMI

A connection point in the audio-visual system that uses HDMI (High-Definition Multimedia Interface) to transmit high-quality audio and video signals to the ***Presentation Display***. It allows for the connection of external devices, such as laptops, tablets, or other equipment, enabling them to send visual and audio content to be displayed on the screen.

2.2.4. Presentation Source: USB-C

A connection point in the audio-visual system that uses a USB-C interface to transmit high-definition video and audio signals from external devices to the presentation display. This interface supports video output, audio transmission, and data transfer through a single cable. In addition to connecting personal devices like laptops or tablets for presentations, USB-C also provides power to charge these devices. It integrates with room peripherals, enabling seamless online collaboration by connecting to microphones, cameras, and other conferencing equipment, thereby supporting a Bring Your Own Meeting (BYOM) approach.

2.2.5. Presentation Source: Document Camera

A device used in the audio-visual system to capture and project physical documents, objects, or written materials onto the presentation display. It allows users to display text, images, or other materials from books, notes, or other physical sources in real time. The document camera is equipped with a camera that can zoom in and focus on specific areas, providing a clear and detailed view of the material for all participants in the room.

2.2.6. Presentation Source: Wireless Presentation

A system or technology that allows users to share and display content from their personal devices—such as laptops, tablets, or smartphones—on the ***Presentation Display*** without the need for physical cables. This source supports the transmission of video, and audio enabling seamless and convenient integration of various devices into the room's AV system.

2.2.7. Presentation Source: Whiteboard Capture

A system or device that digitally captures and displays content from a physical whiteboard onto the ***Presentation Display***. It typically involves a camera that records the writing or drawing on the whiteboard and converts it into a digital format. This content is then projected onto the screen in real time, allowing all participants to view and interact with the whiteboard material during presentations, meetings, or collaborative sessions.

2.2.8. Presentation Source: Room Camera

A camera installed in the room that captures video of in-room activities or demonstrations. It is used to provide a live video feed, which can be shown on the ***Presentation Display***. The room camera enables visual engagement by all participants in the room.

2.2.9. Collaboration Display: Presentation Mode

A ***Collaboration Display*** is a screen used to enhance cooperative activities within a space. It is designed to facilitate group work and communication by allowing multiple participants to view and engage with content simultaneously.

Presentation Mode mirrors the content shown on the primary ***Presentation Display***. In this mode, the ***Collaboration Display*** replicates the visual output of the main screen, ensuring that all participants in the room can view the same content simultaneously. This mode is useful for reinforcing key information and making it accessible to everyone, regardless of their position in the room. It ensures consistency in what is being presented and supports effective group discussions and engagement.

2.2.10. Collaboration Display: Breakout Mode

A ***Collaboration Display*** is a screen used to enhance cooperative activities within a space. It is designed to facilitate group work and communication by allowing multiple participants to view and engage with content simultaneously.

Breakout Mode is used to show content from a local source, such as an HDMI connection, separate from the primary presentation display. In this mode, the ***Collaboration Display*** provides a dedicated space for group work or discussions by displaying different content or applications that facilitate interaction among smaller groups or teams. This mode is ideal for collaborative activities, allowing participants to work on different tasks or view supplementary information while still being connected to the broader presentation.

2.2.11. Collaboration Display: Spotlight Mode

A Collaboration Display is a screen used to enhance cooperative activities within a space. It is designed to facilitate group work and communication by allowing multiple participants to view and engage with content simultaneously.

Spotlight Mode shows content from a single group's ***Collaboration Display*** to all other ***Collaboration Displays*** in the room. In this mode, the selected participant's content is displayed on all screens, allowing their contributions or presentations to be shared widely with the group. Spotlight Mode is useful for drawing attention to specific information or discussions led by an individual or group, ensuring that all participants are focused on the same content simultaneously.

2.2.12. Feature: Amplified Wireless Microphones

A microphone that transmits audio wirelessly to an amplification system, enhancing the clarity and volume of the speaker's voice throughout the room. These microphones use wireless technology to connect to the audio system, eliminating the need for physical cables and allowing for greater mobility. The amplification feature ensures that the speaker's voice is heard clearly by all participants, making it suitable for large rooms, presentations, or environments with significant background noise.

2.2.13. Feature: Hearing Augmentation

A technology designed to support individuals with hearing impairments by enhancing audio accessibility and clarity in a room. This feature typically includes systems such as assistive listening devices, induction loop systems, or personal hearing aids that amplify or clarify sound for users. Hearing augmentation ensures that all participants, including those with hearing challenges, can fully engage with and benefit from the audio content being presented, promoting inclusivity and equal access to information.

2.2.14. Feature: Dual Source Presentation

Enables two different ***Presentation Sources*** to be displayed simultaneously on the ***Presentation Screens*** within a room. This feature enables the integration and comparison of different types of content, such as displaying a presentation alongside live video feed. ***Dual Source Presentation*** enhances flexibility and facilitates more dynamic and interactive presentations by allowing users to manage and view multiple sources of information at once.

2.2.15. Feature: Room Combining

Enables multiple adjacent or physically connected rooms to be merged into a single larger space for classes, events, or meetings. This feature facilitates the seamless integration of audio-visual equipment and control systems across the combined spaces, enabling a unified presentation and audio experience.

2.2.16. Feature: Room Scheduling Panel

An interface used to manage and display the booking status and schedule of a teaching space, meeting room, or event space. It typically features a digital screen or touch interface mounted outside or inside the room, showing real-time information about current and upcoming reservations, availability, and booking details. The room scheduling panel enables users to quickly check room availability, make or modify bookings, and see details about scheduled events, helping to streamline room management and improve the efficiency of space utilisation.

2.2.17. Synchronous Online Collaboration: Software via Installed PC

Enables the use of installed software on a dedicated computer within the room to facilitate real-time online collaboration and communication. This software allows participants to engage in synchronous activities such as video conferencing, online meetings, or live discussions using the room's audio-visual system. The installed PC integrates with the room's AV equipment to enable seamless interaction with remote participants and collaborative tools, supporting effective communication during live sessions.

2.2.18. Synchronous Online Collaboration: Software via Laptop/BYOD

Enables the use of personal laptops or devices (Bring Your Own Device) to access and use online collaboration software during real-time meetings or sessions. Participants connect their own devices to

the room's AV system—through a physical connection—to engage in activities such as video conferencing, live discussions, or collaborative work. This setup allows users to utilise their preferred software and tools, providing flexibility and convenience for remote collaboration while integrating with the room's technological resources.

2.2.19. Synchronous Online Collaboration: Zoom Rooms Appliance

A dedicated hardware device specifically designed to run Zoom Rooms software, facilitating seamless video conferencing and online collaboration. This appliance supports pre-scheduled meetings and integrates with the room's AV system, allowing users to manage and join Zoom sessions easily. It enables sharing of all the room's ***Presentation Sources*** and supports multiple cameras to capture different angles or participants. This setup ensures a comprehensive and effective online collaboration experience by providing high-quality audio, video, and content sharing capabilities.

2.2.20. Synchronous Online Collaboration: Room Microphones

An array of microphones installed within the room to capture and transmit the audio of in-room participants during real-time online meetings or video conferences. These microphones are integrated with the room's AV system to ensure clear and accurate audio capture from various locations within the space, enabling effective communication with remote participants. They are designed to pick up voices from all areas of the room, enhancing the overall collaboration experience by ensuring that all contributions are heard and transmitted clearly during synchronous online interactions.

2.2.21. Synchronous Online Collaboration: Wireless Microphones

Microphones that transmit audio wirelessly to the room's AV system, facilitating real-time online meetings or video conferences. These microphones provide flexibility and mobility for speakers and presenters by eliminating the need for physical cables, allowing them to move freely while speaking. The wireless system ensures clear and uninterrupted audio capture from various positions within the room, enhancing communication with remote participants and ensuring that all voices are heard clearly during synchronous online collaboration.

2.2.22. Asynchronous Online Delivery: Software via Installed PC

Enables the use of software installed on a dedicated computer within the room to record and capture teaching activities for asynchronous delivery. This setup allows for the recording of presentations, lectures, or other instructional content directly from the installed PC, which includes features to capture the screen, and audio. The recorded content is then made available for later viewing by students or other learners.

2.2.23. Asynchronous Online Delivery: Software via Laptop/BYOD

Enables the use of personal laptops or devices (Bring Your Own Device) to record and capture teaching activities for asynchronous delivery. This setup allows for the recording of presentations, lectures, or other instructional content directly from the user's device, which includes features to capture the screen, and audio. The recorded content is then made available for later viewing by students or other learners.

2.2.24. Asynchronous Online Delivery: Automated Recording Appliance

A dedicated recording appliance integrated with the room's AV system that automatically records teaching activities, usually based on a pre-set schedule, though ad-hoc recording can also be performed. The appliance captures selected presentation sources and room audio and can be controlled via the AV

Touch Panel. This system enables automated, scheduled recordings of lectures or presentations, providing a consistent and reliable way to deliver instructional content for later viewing.

2.2.25. Asynchronous Online Delivery: Room Microphones

An array of microphones installed within the room to capture and record audio from in-room participants during teaching activities. These microphones are integrated with the room's AV system to ensure clear and accurate audio capture from various locations within the space, specifically focusing on capturing audience questions. They are designed to pick up voices from all areas of the room, ensuring that questions and interactions are clearly included in the recorded content for later viewing, providing a comprehensive view of the instructional session for students reviewing the material later.

2.2.26. Asynchronous Online Delivery: Wireless Microphones

Wireless microphones used to capture audio from presenters during recorded teaching activities. These microphones transmit audio wirelessly to the recording system, allowing for greater mobility and ensuring that all spoken content is clearly captured and included in the recording for later viewing.

3. Architecture & Infrastructure Design standards

3.1. Purpose

The purpose of this document is to outline a set of standard design rules for audio visual systems at Adelaide University (AU or 'The University'). It describes the rules to be utilised when designing facilities with integrated audio-visual technology for new and upgraded AV spaces.

This document covers aspects such as lighting, acoustics and joinery requirements, ensuring architects and builders can design and build venues that support fit-for-purpose audio visual technology. It forms part of a package of audio-visual standards as described below.

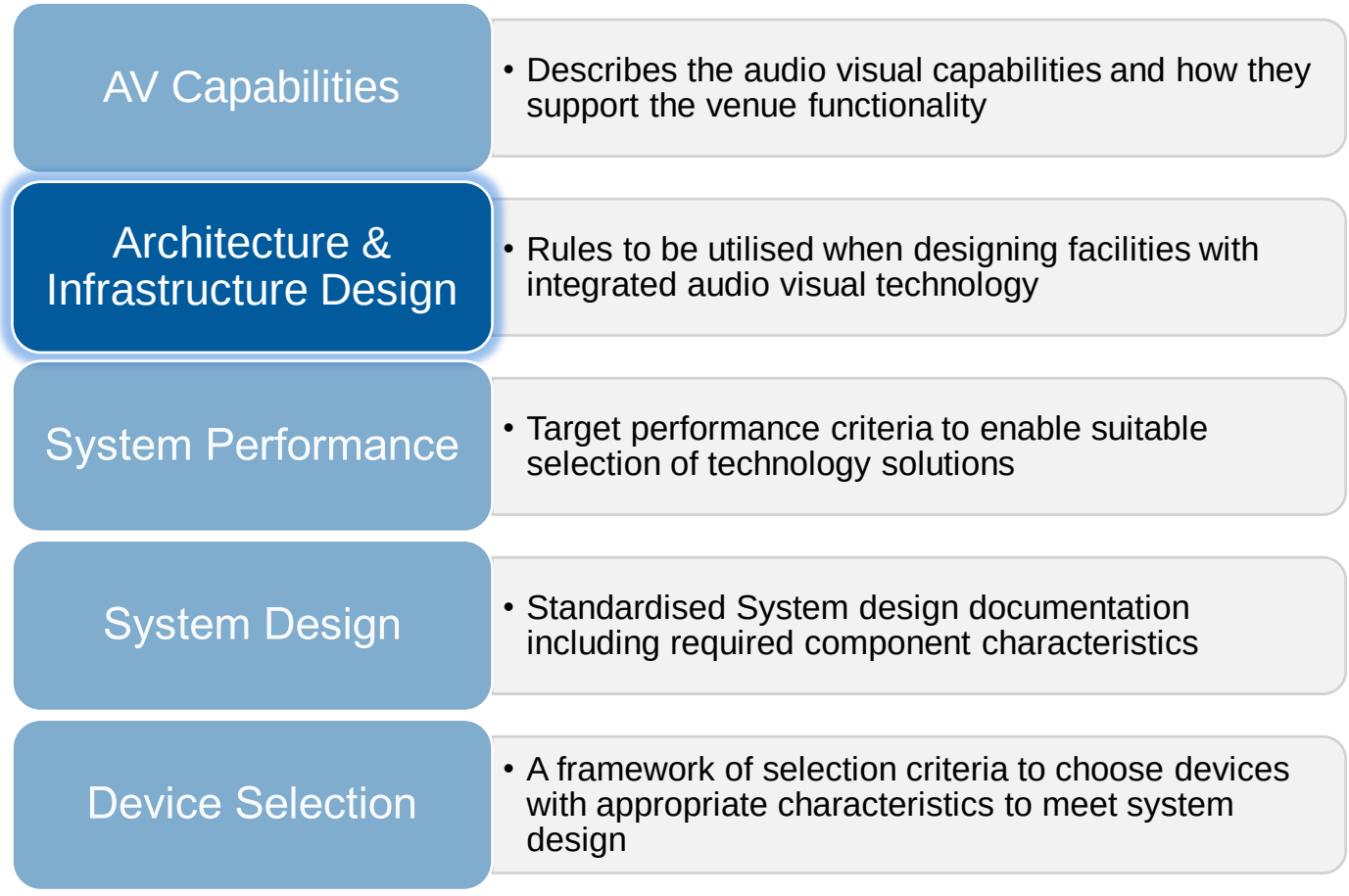


Figure 1. AU AV Standards Documentation Package.

3.2. Technical requirements

This section outlines the specific technical requirements for the Audio-Visual Architecture & Infrastructure Standards.

(Refer document "Audio Visual System Performance Standards" for audio visual design rules)

1. Acoustic design

1. Introduction

This section addresses acoustic design requirements pertinent to the suitability of spaces for teaching activities.

3.3. Summary of criteria

Two acoustic criteria are considered: internal noise level and reverberation time (RT). These quantities are both properties of the acoustics of a space and shall be assessed independently of any installed sound system.

If uncontrolled, both quantities can have a detrimental effect on speech intelligibility, making it difficult for listeners in a learning environment to concentrate, leading to poor learning outcomes.

Measure	Maximum Allowable
Internal Noise LAeq, dB(A)	45 dB(A)
RT (s) (500Hz, 1kHz, 2kHz avg.)	0.7 secs

Table 1 - Criteria internal noise level and reverberation time (RT)

3.4. Measurement guidelines

Detailed guidance regarding internal noise level and reverberation time is provided in Australian Standard 2107:2016, Acoustics - Recommended design sound levels and reverberation times for building interiors. Refer to AS2107:2016 and its references for complete descriptions of internal noise level, reverberation time and their measurement and application.

Measurement methods should comply with the AS2107:2016 Clause 6, which references other relevant Australian Standards regarding suitable methodology and instrumentation etc. General guidance regarding the intent of internal noise and reverberation time measurements is provided in the following sections.

3.5. Internal noise level

The internal noise level of a space describes the ambient noise that remains when all wanted sounds are absent, typically including contributions from:

- Building services e.g. Heating, Ventilation and Air-Conditioning (HVAC) systems, water and waste pipes, lifts etc.
- External noise sources e.g. road traffic
- Internal noise sources e.g. building occupants in adjacent spaces, printers, copiers etc.

Spaces for learning should aim to reduce internal noise levels such that wanted sounds are clearly audible above the ambient noise. If the internal noise levels are too high, listeners will have difficulty discerning speech sounds from unwanted noise.

3.5.1. Measurement locations

Noise measurements should be taken at the expected occupancy positions throughout the space, at approximate ear height for either seated or standing persons as appropriate for the space – i.e. 1200 or 1600mm AFFL respectively.

An indicative sample position can be chosen where there is little spatial variation in noise level. Where significant spatial variation exists (e.g. due to the operation of a particularly noisy piece of localised plant) the location should be chosen to reflect the maximum recorded level.

3.5.2. Reported noise level

The reported noise level should be the maximum found across the expected occupancy positions in the space.

3.5.3. Measurement conditions - inclusion of noise sources

Measurements should be made under the typically expected operating conditions of the space, i.e. with all heating, ventilation and air conditioning (HVAC) equipment operating, road traffic and building occupancy noise present.

Where a noise source is known to be out of the ordinary, (e.g. building construction works) it is acceptable to schedule the measurement for a time when it is not present.

3.5.4. Character of noise

Internal noise should not contain any distinctive characteristics such as prominent tones or significant temporal fluctuations. If such acoustic artefacts are present in any measured noise level, they should be assessed in accordance with Section 6.1.7 of AS 2107:2016, with a correction applied to the sound level as necessary.

3.5.5. Sound level measurements

Noise levels must be measured with an integrating sound level meter, capable of measuring the Equivalent Continuous A-weighted sound pressure level (LAeq), over a period that is appropriate for the dominant type of noise source being measured.

The measurement period used should be long enough to fully characterise any natural variation in the noise level, and as such, will vary depending on the nature of the dominant noise source. As a guide, the following is recommended at a minimum:

Dominant Noise Source	Minimum LAeq Period
HVAC	30s
Road Traffic	2m
Building Occupancy	5m

Table 2 - Minimum recommended noise source measurement

3.6. Reverberation time

When a sound source is placed inside a space, multiple reflections of sound from the internal surfaces combine, creating the acoustic ‘character’ of the space. This ‘character’ is often represented by the space’s reverberation time, which is a measure of how long it takes for sound within the space to die away (i.e. decrease in level by 60 dB) after the initial sound has ceased.

Spaces for learning should aim to control (i.e. shorten) the reverberation time, so that listeners primarily hear the sound directly from the source and hear little of the persistent sound caused by reflections from the room’s surfaces.

3.6.1. Measurement locations

Reverberation time measurements involve the placement of a stimulus source (e.g. loudspeaker or balloon) and a receiver (microphone). It is recommended that multiple combinations of source and receiver are used across several measurements, to calculate a spatial average.

A minimum of three distinct measurement positions is recommended, with the final reported result being the spatial average across all positions.

3.6.2. Frequency dependence

Reverberation time varies with frequency. The reverberation criteria presented is for an average of the 500Hz, 1kHz and 2kHz octave bands, with each octave band value being the spatial average across all measurement positions.

3.6.3. Measurement method

There are numerous available methods to measure reverberation time. The method employed is not critical, as the accuracy of results with most methods is sufficient for The University’s purposes. Example methods include:

- Impulsive noise (e.g. balloon burst)
- Interrupted noise (using a suitable loudspeaker and broadband noise source)
- Schroeder integration of Room Impulse Response (RIR)

3.7. Venue lighting

3.7.1. Standards compliance

All lighting must meet the requirements of the Australian and New Zealand Standards – AS/NZS 1680 for Lighting (as amended) and relevant building codes. The sections that venue lighting must adhere to are:

- Infrastructure standards 3.15 Lighting

3.7.2. Lighting arrangement in venues

All lighting sources (installed lighting, ambient light from windows etc.) in a venue shall be adjustable. AV Services must be engaged to assist with the design of lighting in venues. The aim is to control all

ambient (venue lighting, sunlight etc.) light to meet the required contrast ratio of the display, provide suitable note taking light, illuminate the presenter and any demonstration or presenter workspaces.

All lighting and environment are to be controlled through the venue audio visual control system, the electrical contractor must provide an interface at the audio-visual equipment rack location. AV Services are to be provided with a draft copy of CBUS/Lighting System programming configuration prior to hand over, to review and approve groups and channels. The lighting system interface with the Audio-Visual system is to be via Network/IP.

3.8. Audio visual equipment housing and cabling

3.8.1. Joinery provisions for equipment racks and equipment

In spaces that audio visual equipment is present, there must be lockable, ventilated and AV Services approved joinery. Provisions for power, data and audio-visual connection cables must be made within the joinery. Suitable clearance between the equipment rack and services connections must be maintained.

Lectern and workbench areas will be coordinated to allow for devices to be permanently fixed (where applicable) whilst maintaining a sizeable work area for teaching materials.

All joinery or housing containing audio visual equipment must be keyed to The University's Audio-Visual key set.

3.8.2. Maintenance access

Front and rear access for audio visual equipment racks or suitable cable length (as to allow an equipment rack on casters to be removed from joinery and manoeuvred to allow front or rear access) is required for all spaces. Enclosed equipment rack areas should have enough clearance for technicians to freely be able to remove equipment with the need of dismantling joinery, equipment rack or equipment.

There must be a clearance of any equipment rack access of at least 800mm.

3.8.3. Ventilation

All joinery containing audio visual equipment needs ventilation, there must be vents at the bottom of the joinery to bring cool air in and active exhaust towards the top of the joinery to allow warm air to be exhausted. Vent covers should be selected or manufactured to prevent intrusion of rodents.

The temperature of the equipment rack should not exceed 40 degrees, this can be managed by utilising active cooling equipment. Cooling equipment can be in either the form of low voltage fans or rack mounted fan arrays.

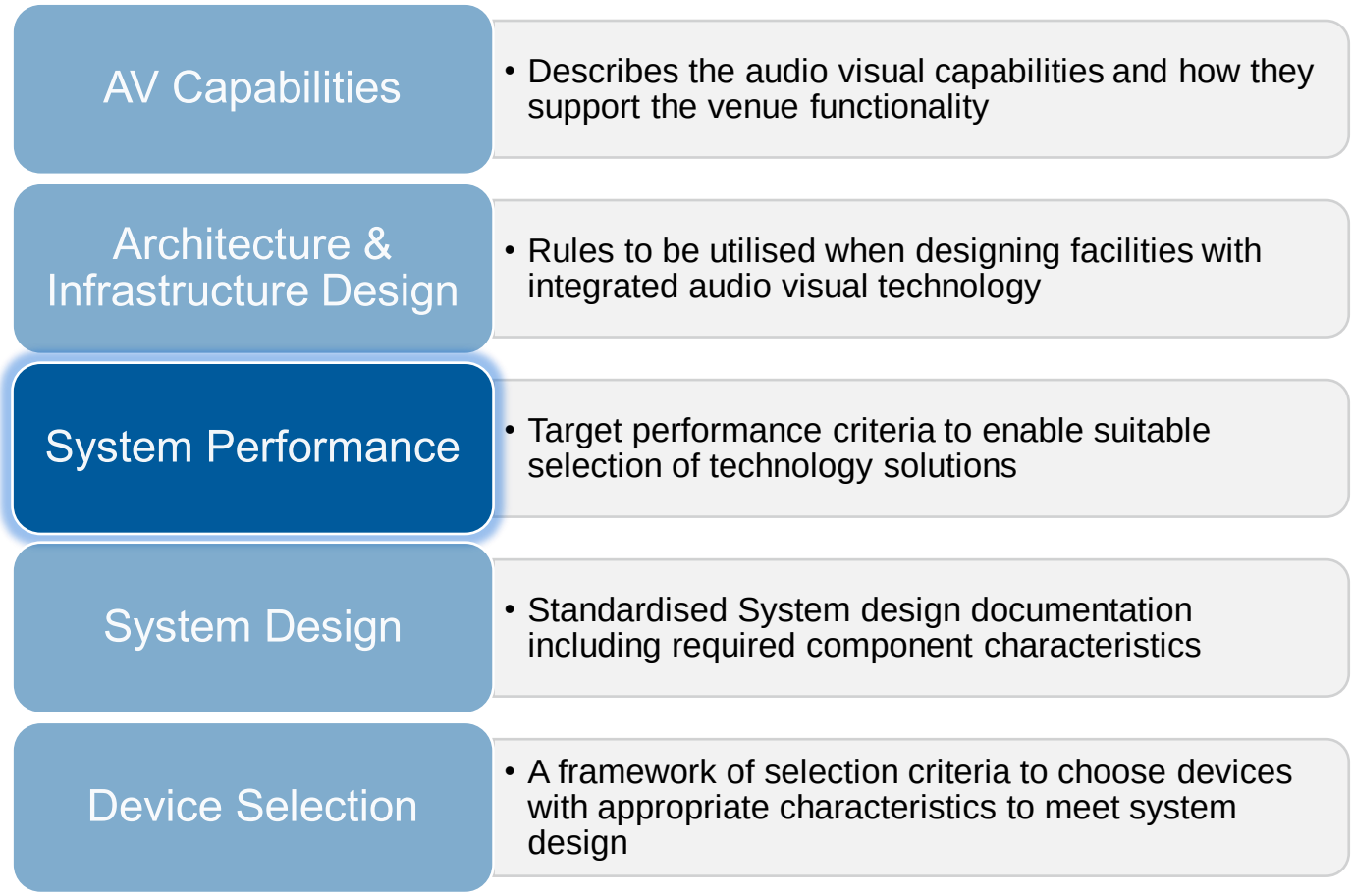
4. Audio Visual System Performance Standards

4.1. Purpose

The purpose of this document is to outline a set of standard design rules for audio visual systems at Adelaide University (AU or 'The University'). It describes the rules to be utilised when selecting technology solutions for new and upgraded AV spaces.

Design decisions shall follow documented rules; the rules shall be based on quantitative data thus ensuring uniformity of design, which in turn will ensure consistency of user experience.

Capabilities are the defining characteristics of a venue. Equipment selection shall be prescribed to achieve the defined capabilities based on the quantitative design rules laid out in this document. For example, a 'Meeting Room' delivers the same feature set irrespective of size. 'Small', 'Medium' or 'Large' shall not dictate a different standard, or a different set of quantitative design rules.



4.2. Design Rules

4.2.1. Displays

4.2.1.1. Type

Intent: Provide a high-quality, easily readable image that isn't dependant on control of ambient light levels or viewing angles.

Constraints:

- Size: max LCD size commonly available is typically 100"
- Mounting/Architectural; Requires suitable mounting surface

Rule: Shall be LCD wherever possible.

4.2.1.2. Size

Intent: 'Typical' content will be readable from all parts of the intended viewing area

Constraints:

- Must follow minimum bottom edge rule to maintain viewability
- Must fit in the venue

Rule: Maximum Intended Viewing Distance (**D**) = Display Height (**H**) * 6

Max Viewing Distance (m)	Display Height (cm)	Diagonal Size (In)
4.1	68	55"
4.9	81	65"
5.6	93	75"
6.4	106	85"
7.4	124	100"
9.0	150	120"
11.2	187	150"

Table 3 - Maximum Intended Viewing Distance Examples.

4.2.1.3. Brightness

Intent: Provide a minimum contrast ratio to enable content to be legible without needing to turn off lights or close blinds.

Ambient Light Level (Lux)	Projection Minimum Display Luminance (NITS)	LCD Minimum Display Luminance (NITS)
<300	300	350
300-1000	600	650
>1000	No	Seek engineering advice

Table 4 - Minimum Display Brightness Levels.

4.2.1.4. Elevation

Intent: To achieve an acceptable line of sight to the display and an acceptable user comfort level, the display must be no lower than the minimum height and no higher than the maximum height.

Constraints:

- Camera below display at eye level
- Flat floor vs tiered; impact on line of sight
- Ceiling height in room

	Minimum height of bottom edge of display	Maximum height of bottom edge of display
Direct line of sight to display	1050mm	1200mm
Obscured line of sight to display (i.e. there are people between you and the display)	1300mm	1500mm

Table 5 - Minimum and Maximum Bottom Edge Display Heights.

4.2.2. Speakers

Intent: Provide audio coverage to the intended coverage area within a uniform and comfortable volume level.

Constraints:

- Architectural limitations on speaker type and placement
- Noise floor

Rule: Speakers should be able to produce white noise at 75dBA SPL +/- 6dB across 90% of the intended coverage area. i.e. 90% of the intended coverage area should be within a 12dBA volume range.

Ensure noise floor is not above maximum detailed in document Architecture & Infrastructure Design Standards - Table 2 - Minimum recommended noise source measurement

4.2.3. Conferencing Camera Positioning

Intent: Where used primarily for conferencing, cameras should be installed as close as practicable to the eye level of occupants in the intended usage of the venue and should be installed at the display to maintain far-end perception of eye-contact.

Constraints:

- Display height
- Modesty (should not be able to see under desk, or be angled down from above)

	Minimum height of camera	**Maximum height of camera**
Seated	1000mm	1200mm
Standing	1250mm	2000mm

Table 6 - Conferencing Camera Mounting Heights.

4.2.4. Amplified Microphones

Intent: Provide amplified speech to extend coverage to the intended listening area.

Rule: 70dBA @ 1m -> 60dBA within 90% of intended coverage area AND min 12dB above room background noise floor (consider background noise floor with full occupancy). Wireless wherever possible.

Venue Capacity	Recommended Minimum
0-90	2 Lapel
91-300	2 Lapel, 2 Handheld
300+	4 Lapel, 4 Handheld

Table 7 - Wireless Microphone Channel Counts.

Quantities selected should consider room usage, i.e., where a room is used primarily for panel discussions, a larger than normal quantity of lapel transmitters may be appropriate or where it is an event space a wireless gooseneck microphone can be added.

4.2.5. Conferencing Microphones

Intent: To capture speech within the intended coverage area at a defined intelligibility level.

Constraints:

- If amplified for voice lift, consider gain before feedback when selecting type and placement

Rule: Speech measured at 70dBA @ 1m must be 9dBA above noise floor at microphone.

4.2.6. Hearing Augmentation

Intent: To provide equity for hearing impaired users.

Constraints:

- Loop – significant installation difficulties and architectural implications, can spill into adjacent spaces, not recommended
- Receiver-based – consider coverage and implications of windows (IR), receivers must be centrally accessible to users without AV support presence

Rule: Coverage of 90% of the audience area. Must follow all relevant legislation, including national legislation and national construction code[3].

4.3. List of References

1. Adelaide University. (2024). *Volume M. Part 1. Audio Visual Architecture & Infrastructure Standards Standard.*
2. *Disability Discrimination* (*DDA*) *Act 1992* (Cth). https://www.legislation.gov.au/C2004A04426/latest/text
3. Australian Building Codes Board. (2022). *National Construction Code 2022 volume one, part D4*. https://ncc.abcb.gov.au/editions/ncc-2022/adopted/volume-one/d-access-and-egress/part-d4-access-people-disability

5. System Design

5.1. Purpose

The purpose of this document set is to present a standard and consistent documentation pack for audio visual systems at Adelaide University (AU or 'The University'). The technical drawings represent the result of design following the set of standards, and the returnable schedule allows for clear and concise vendor responses.

Design decisions shall follow documented rules; the rules shall be based on quantitative data thus ensuring uniformity of design, which in turn will ensure consistency of user experience.

AV Capabilities	• Describes the audio visual capabilities and how they support the venue functionality
Architecture & Infrastructure Design	• Rules to be utilised when designing facilities with integrated audio visual technology
System Performance	• Target performance criteria to enable suitable selection of technology solutions
System Design	• Standardised System design documentation including required component characteristics
Device Selection	• A framework of selection criteria to choose devices with appropriate characteristics to meet system design

5.2. System Schematics

Standardised schematics available upon request. The UniSA Teaching Technologies team use Microsoft Visio for schematic development.

5.3. Returnable Schedule

Returnable schedules are developed on a per project basis, a template can be provided upon request.

6. Device Selection

6.1. Purpose

This document outlines key technology characteristics for capabilities and functions that can apply to Audio Visual components associated with the standard Audio-Visual system types within UniSA's environment. This document is intended to provide UniSA staff with guidance in selecting products with the appropriate technology characteristics that will fit with the standardised UniSA system designs.

This document should be read in conjunction with other relevant documents, outlined below:

AV Capabilities	• Describes the audio visual capabilities and how they support the venue functionality
Architecture & Infrastructure Design	• Rules to be utilised when designing facilities with integrated audio visual technology
System Performance	• Target performance criteria to enable suitable selection of technology solutions
System Design	• Standardised System design documentation including required component characteristics
Device Selection	• A framework of selection criteria to choose devices with appropriate characteristics to meet system design

For a device to be considered for inclusion, it must fulfill the chosen criteria at a minimum. Then, a comparison of successful devices is made, and the suitable candidate is added to the standard device selection.

NOTE: The function designations below follow the headings outlined in the CAUDIT Higher Education Reference Model (HERM). The Higher Education Reference Models (HERM) provide standardised business, data, application and technology architectures that communicate a generalised view of how higher education institutions are organised and the information they use. The HERM also includes a Business Model Canvas to support scenario-based planning and for exploring and communicating an institution's specific strategic drivers and goals.[i]

6.2. Technology Characteristics by Capability/ Function

6.2.1. CAUDIT designation 3.9.1.2.2 Enabling | Facilities and Estate Management | Facility Management | Facility Booking

Room Booking Display (aka Room Booking Panel)

Characteristic	Required Value(s)
Room Booking Systems Integration Compatibility	MS Exchange, Syllabus Plus
Physical Mounts	Portrait, Landscape or Glass
Power	PoE
Management System	Centrally managed

6.2.2. CAUDIT designation 4.5.2.1 IT Reference Model | Audio Visual Services | AV Collaboration | Image Capture

Camera – Installed Device (aka PTZ Camera)

Characteristic	Required Value(s)
AVOIP Output	Full NDI
Video Output	HDMI
Minimum Resolution Output	FHD
Power	PoE
User Controls	LAN-based; Web UI remote interface; VISCA preferred
Network Support	DHCP; preset in factory
Packaging	MAC Address displayed on unit and/or packaging

Camera – End User Device

Characteristic	Required Value(s)
Image Quality Contrast	Wide dynamic range; good low light performance
Minimum Output Resolution	FHD
Microphone	In-built array
USB Host	USB 2.0 backwards compatible
Physical Mounts	¼” thread

Camera – Document Capture (aka Document Camera)

Characteristic	Required Value(s)
Video Output	HDMI
Minimum Resolution Output	FHD
Lighting	Inbuilt
User Controls	Buttons built into unit
Physical Mounts	Desk mounts

6.2.3. CAUDIT designation IT Reference Model | Audio Visual Services | AV Collaboration | Audio Capture

Microphone – Ceiling Mounted (aka Ceiling Mounted Microphone)

Characteristic	Required Value(s)
AVOIP Outputs	Dante or audio-visual bridging (AVB)
Microphone	Beamforming
Power	PoE
Minimum Available Colours	Black; white

Microphone – Bar Integrated

Characteristic	Required Value(s)
Camera resolution	2160p, 4K UHD (3840 x 2160)
External I/O ports:	USB Type-C 5Gbps signalling rate
Speaker bandwidth	100 Hz to 20 kHz
Frequency response (microphone)	120 Hz to 16 kHz
Zoom/ Microsoft Teams Certified	
Physical Mounts	Wall mounting (included)
USB Device mode	

Microphone – Wireless

Characteristic	Required Value(s)
Signal Processing	Digital
Signal Security	Encrypted
Network Support	Wireless LAN
User Controls	API-based remote interface
Power	Rechargeable battery; desktop charging dock

Transmitter Type	Lapel, handheld, gooseneck or boundary

6.2.4. CAUDIT designation IT Reference Model | Audio Visual Services | AV Collaboration | AV Connection

Wired Connection

HDMI

Characteristic	Required Value(s)
Audio Input/Output	Embedded
Minimum Resolution Input/Output	FHD

USB-C

Characteristic	Required Value(s)
USB Role	USB Host
Minimum USB Version	2.0
Alt Mode	DisplayPort
Minimum Resolution Input/Output	FHD
Power	USB PD (60w)

NDI Encoder

Characteristic	Required Value(s)
Min supported video format	HD 1080p 60Hz
Video I/O Connectivity	HDMI 2.0
Video Codec support	NDI (Full bandwidth)
Network Connectivity	Ethernet RJ45 1000baseT w/integrated PoE
	Embedded Web configuration Panel
Power	PoE+ 802.3at

NDI Decoder

Characteristic	Required Value(s)
Min supported video format	HD 1080p 60Hz
Video I/O Connectivity	HDMI 2.0
Video Codec support	NDI (Full bandwidth)
Network Connectivity	Ethernet RJ45 1000baseT w/integrated PoE
	Embedded Web configuration Panel
Power	PoE+ 802.3at

Wireless Connection (aka Wireless Presentation)

Characteristic	Required Value(s)
Audio Input/Output	Embedded
Wireless Content Sharing Protocol	Miracast
OS Compatibility	Android, iOS, OSX, Windows
Access Controls	Single Sign on; Guest Login
User Controls	Cloud management portal remote interface
Network Support	Beacon frames

6.2.5. CAUDIT designation IT Reference Model | Audio Visual Services | AV Collaboration | AV Recording

Recording Capture Device (aka Lecture Capture Appliance)

Characteristic	Required Value(s)
Video Input	HDMI
Video Channel Inputs	Dual channel capable
Audio Input/Output	Embedded HDMI Audio or Balanced Analogue
User Controls	API-based remote interface
Uptime Rating	24/7 operation

6.2.6. CAUDIT designation IT Reference Model | Audio Visual Services | AV Presentation | Display Device

Projector – Installed Display Device (aka Projector)

Characteristic	Required Value(s)
Video Input	HDMI
Minimum Resolution Input	FHD
Light Source	Laser
Light Output	Size and luminosity matched to venue size and ambient lighting level
Native Aspect Ratio	16:9
Image Adjustment Functions	Lens shift; zoom; warp correction
Screen Adjustment Functions	Motorised screen with contact closure; operable via the remote interface
User Controls	LAN-based API; Web-based UI remote interface
Network Support	HDBaseT input
Minimum Service Life	20,000 hours

LCD – Wall Installed Display Device (aka LCD Display)

Characteristic	Required Value(s)
Video Input	HDMI
Minimum Video Input Ports	3
Minimum Brightness	600 NITS
Native Aspect Ratio	16:9
Minimum Native Resolution	FHD
User Controls	LAN-based API; Web-based UI remote interface
Physical Mounts	Portrait or VESA mountable
Uptime Rating	24/7 operation

6.2.7. CAUDIT designation IT Reference Model | Audio Visual Services | AV Presentation | Speaker Device

Installed Speaker Device

Ceiling Speaker

Characteristic	Required Value(s)
Frequency Response	60Hz – 20kHz ± 10dB
Amplification	100v or plenum-rated PoE
Enclosure Type	Back hat
Minimum Available Colours	Black; white
Physical Mounts	Secure mounting (i.e., not spring clips); tile bridge option

Point Source Speaker

Characteristic	Required Value(s)
Audio Input	Balanced audio
Frequency Response	60Hz – 20kHz ± 10dB
Amplification	Active; in-built
Minimum Available Colours	Black; white
Physical Mounts	Wall mounting

Bar Speaker (aka Sound Bar)

Characteristic	Required Value(s)
Audio Input	Balanced audio
Frequency Response	100Hz – 16kHz ± 10dB
Amplification	Active; in-built
Physical Mounts	Wall mounting (included)

6.2.8. Hearing Augmentation

Characteristic	Required Value(s)
Audio Input	Balanced audio
DDA Compliance	BCA Compliant

6.2.9. CAUDIT designation IT Reference Model | Audio Visual Services | AV Presentation | TV/ IP Video Streaming

IP Video Streaming Device (aka IPTV)

Characteristic	Required Value(s)
Streaming Format	Multicast
Channels	FTA TV Receive
User Controls	Receiver hardware; LAN-based API with remote interface

6.2.10. CAUDIT designation IT Reference Model | Audio Visual Services | AV Presentation | Controller Device

AV Touch Panel

Small Touch Panel

Characteristic	Required Value(s)
Display Size	3.5 inches
Display Type	Full colour touch screen
Speakers	Inbuilt
User Controls	Inbuilt control processor option
Power	PoE
Electrical Installation Compatibility	Standard electrical gang box
Physical Mounts	Wall mountable
Serviceability	Toolless removal from mount
Minimum Available Colours	Black; white

Large Touch Panel

Characteristic	Required Value(s)
Display Size	10 inches
Display Type	Full colour touch screen
Speakers	Inbuilt
User Controls	Inbuilt control processor option
Power	PoE
Physical Mounts	Wall mountable or tabletop

Serviceability	Toolless removal from mount
Minimum Available Colours	Black; white

AV Controller

Characteristic	Required Value(s)
Code Standard	Non-proprietary coding language
User Controls	WebUI-based remote interface; WYSIWYG programming interface option
Platform Compatibility	Centralised monitoring

Zoom Touch Panel

Characteristic	Required Value(s)
Screen Size	24”
Video Output	HDMI (preferred) or DisplayPort (acceptable)
Webcam	Inbuilt
Microphone	Inbuilt
USB Type	USB A
USB Ports	2
Minimum Videoconferencing Specs	Zoom Rooms hardware specifications
User Controls	Touch interface
Minimum Operating Systems	Windows 10
Network Support	Wired LAN
Physical Mounts	VESA mountable

1.1. [i] Higher Education Reference Models - https://www.caudit.edu.au/communities/caudit-higher-education-reference-models/