## SECTION 18: AUDIO VISUAL DESIGN STANDARDS 2019

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18.1 INTRODUCTION

This section provides details of minimum requirements for the design, installation and operation of audio-visual services. These design standards supersede 'The University of Melbourne Teaching Space Design Standards (2018) and shall be read in conjunction with other sections of 'The University of Melbourne Design Standards'.

Both project management and design standards apply to all learning spaces, professional spaces and digital signage. The critical role of learning spaces for the University and the specialised nature of learning space design means that particularly rigorous standards of design and construction are required which are reflected in the standards.

The Designer is expected to produce their own specification incorporating the elements of the following information and submit all designs to the University for review prior to any works commencing on site. This design standard sets out the University’s minimum requirements and shall be considered an adjunct to all relevant statutory regulations.

18.2 OBJECTIVES

Teaching spaces throughout the University are places of social and personal interaction, where learning takes place and where creative thinking is encouraged. The primary objective of this design standard is to provide a consistent arrangement of all audio visual systems on campus such that operation, maintenance and management are simplified.

This document aims to prescribe a list of recommendations and considerations that should be included in designing audio visual systems for teaching, learning and professional spaces. It is recommended that all spaces are specifically designed to meet the user group’s requirements and be coordinated by Collaboration Endpoints.

18.3 COLLABORATION ENDPOINTS

Collaboration Endpoints is the team responsible for maintaining the University's teaching, learning and professional space standards. Collaboration Endpoints sits within the Digital Workplace Team in Client Services. Collaboration Endpoints are responsible for inspecting new audio visual installations in these spaces prior to handover to ensure that works are completed satisfactorily and meet the standards herein.

The AV Consultant shall invite a representative of Collaboration Endpoints to meetings with the end users when issues relevant to audio visual equipment are discussed and shall coordinate with the Collaboration Endpoints representative prior to completion of the design.

Any variation from the selection of audio visual equipment currently being used must be authorised by the Collaboration Endpoints representative in writing.

Collaboration Endpoints contact details are:

The University of Melbourne – Collaboration Endpoints
Level 1, 11 Barry St Carlton, VIC
Email: dwt-collaborationendpoints@lists.unimelb.edu.au
18.4 PROJECT RESPONSIBILITIES

Each project team shall include a representative of the User Group to provide user input. However, the project team shall take account of the fact that some of the University’s learning spaces are common learning spaces and may be used by other departments.

It is the responsibility of the AV Consultant to ensure adherence to the standards herein, and to liaise with the User Group, Collaboration Endpoints staff and the University appointed Project Manager/ Project Services representative.

18.5 PROJECT PROCESS

AV Projects follow a similar format to standard construction project management processes and include the following phases:

- **Design**
  Workshops are conducted and AV system requirements are established, including specific functional and technical requirements. Preliminary design options are produced by AV Consultant with preliminary cost estimates for AV services. Options are presented with Collaboration Endpoints and stakeholders for consideration.

- **Contract documentation**
  Preferred design option is developed further. System design schematics, AV drawings and technical specification are produced for tender. All AV services are coordinated with architectural and engineering services. A detailed, pretender cost estimate is produced.

- **Tender**
  AV documentation is issued for tender to an endorsed list of specialist AV Contractors. Tender submissions are evaluated for their technical and commercial merit and tender recommendation is provided by AV Consultant. Project Manager engages AV Contractor for the project.

- **Construction**
  AV Contractor installs, programs and commissions AV systems as specified. AV Contractor coordinates works with the Head Contractor and other trades as necessary. Any issues, questions or clarifications are issued to Project Manager as an RFI. AV Consultant responds to RFIs formally as a Consultant’s Advice Notice (CAN).
Handover

Handover occurs once systems have been installed and tested. Complete written test results are submitted to AV Consultants. AV Consultant conducts an independent inspection of AV systems to verify AV test results. All defects identified are issued to AV Contractor as a CAN to rectify. Practical completion is awarded by Project Manager once all items noted in Section 20.36 have been addressed.

18.6 PROJECT STAKEHOLDERS

The following stakeholders will generally be involved in University projects:

Architect

External consultant engaged to design the overall teaching space and coordinate all services. On occasion acts as superintendent.

AV Consultant

External consultant engaged to design and coordinate the installation of the audio visual system. The AV Consultant shall liaise with all other stakeholders listed below. On projects where no external AV Consultant is present, the role of designer will be undertaken by a Collaboration Endpoints Engineer.

AV Contractor

External contractor engaged to perform audio visual works

Collaboration Endpoints

University representatives who are responsible for the maintenance of audio visual standards within the University.

Project Services

Typically assigned as Project Managers for projects.

Services Consultant

External consultant engaged to design and coordinate installation/modification of engineering services for teaching spaces.

Support Centre

Responsible for maintenance and management of audio-visual systems once installed

User Group

University representative selected to outline specific requirements for the teaching space.
### 18.7 RESPONSIBILITY MATRIX

The following table outlines the project team’s typical responsibilities.

<table>
<thead>
<tr>
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<th>Architect</th>
<th>AV Consultant</th>
<th>Collaboration Endpoints</th>
<th>Property Services PM</th>
<th>Services Consultant</th>
<th>User Group</th>
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### Task Matrix

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<th>Services Consultant</th>
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- **R** - Member of the project team who is responsible for documentation of the task
- **C** - Requires coordination with this member of the project team
- **I** - Must inform this member of the project team
- **N** - Not involved with the nominated task

### 18.8 AV CONSULTANT

The audio visual consultant will be engaged by Project Services and/or Collaboration Endpoints. In the case of minor works Collaboration Endpoints may perform the role of AV consultant. Otherwise, the AV consultant must be selected from the University’s approved AV Consultant panel.

The AV Consultant will be responsible for the design and the coordination of the delivery of all AV services. The Consultant must be strictly versed on the University design standards and must ensure that all systems strictly comply with University standards and best practice.

As a minimum AV Consultant must have the following qualifications:

<table>
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<tr>
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<td>AVIXA/Infocomm Certified Technology Specialist – Design (CTS-D)</td>
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<td>Extron XTP Systems Engineer Certification</td>
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<td>Minimum 4 years Industry Experience</td>
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As a minimum, the AV Consultant must be responsible for the following works:

- Attend design workshops and document AV services requirements as nominated by Stakeholders. All requirements must be captured formally as part of meeting minutes and/or Return Brief for formal acceptance.
- Produce AV systems designs to be issued for approval by Collaboration Endpoints. System design shall include:
  - Video system schematic
  - Audio system schematic
  - Control system schematic
  - Cable schedules
- AV equipment rack layout
- Produce AV drawings for coordination with Architect and Services Engineer. Drawings shall include:
  - Floor plan indicating locations of AV equipment
  - Elevations
  - Reflected ceiling plans
- Produce technical specification for tender. Technical specifications shall include:
  - AV scope of works
  - Functional and technical description of each system
  - Technical specifications
  - Installation requirements
  - Details of coordination with other trades
  - Specific access requirements and working conditions
  - Details of defects liability and warranty
- Project coordination during installation including:
  - Review shop drawings produced by AV Contractor
  - Respond to RFIs issued by AV Contractor
  - Provide design advice as requested by Project Manager
  - Coordinate integration with other services
  - Coordinate commissioning and testing of AV systems
- Conduct independent inspection of AV systems to ensure it meets Stakeholder requirements
- Review training material and coordinate training
- Review as-built documentation and operational manuals

### 18.9 AV CONTRACTOR

The audio-visual Contractor must be enlisted with Property and Campus Services and Collaboration Endpoints. The Contractor must be on the University approved AV Contractor panel as a specialist AV Contractor, in order to be appointed to undertake any AV works at the University of Melbourne. Organisations that are not on the University AV Contractor panel are not permitted to undertake any AV works for the University.

AV Contractors carrying out works must have appropriate experience and qualifications required of their trade. As a minimum AV Contractors must have the following certifications:

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### Qualification

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<tr>
<td>Biamp Audia, Nexia, Tesira Certification</td>
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The AV Contractor must appoint an installation manager who will act as a single point of contact throughout the delivery of the project and have enough experience to be able to ascertain if the works carried out are fit for purpose.

AV Contractors must undergo induction of the University site procedures prior to commencing work. AV Contractors must adhere to and observe all safety, security and administrative rules and regulations by the University as well as local, state and federal regulations.

### 18.10 VARIATION FROM THE DESIGN GUIDELINES AND CUSTOM DESIGNS

Variation and changes to the AV Design Guidelines may be considered for a project for a number of reasons, including unique user requirements, building environment, change in equipment supply etc.

Any variation may only be considered by way of a variation request form, submitted to Collaboration Endpoints for approval using the UoM Modification Request Form. Requests for variation must identify the scope of the change, the reason for the change and any impact or risk to the project and ongoing operations.

### 18.11 TEACHING SPACES

The following sections describes the various types of learning spaces at the University of Melbourne, their minimum audio-visual functional requirements and recommended equipment.

Each type of learning space, as outlined below, has differing design considerations according to their intended use. The design of each space shall be coordinated closely with architectural, faculty and services requirements.

### 18.12 COLLABORATIVE LEARNING SPACES

#### 18.12.1 Description

Collaborative learning spaces are unique teaching spaces designed to enhance and facilitate adaptable teaching, interaction and shared communications. A range of different models have been developed by the University to bring about the functionality required for these spaces. Some spaces are fitted out with several complex integrated AV and IT systems whilst others are provided with simplistic presentation systems.
The specific designs for each collaborative room shall be developed to meet the requirements of the User Group on a project by project basis. Typically, all collaborative spaces will allow for some of the following functionalities:

- Students to interact with the teacher via the installed computer
- Students to work in large or small individual groups
- Student groups to share content with other student groups
- Students to present to entire class
- Teacher to monitor each student computer
- Interactive capabilities via interactive flat panel display (FPD), interactive whiteboard, tablet PC or touch screen
- Capacity to connect laptop or other 3rd party device to share multimedia content with classroom.

18.12.2 AV Equipment

AV equipment nominated for collaborative classrooms will vary to suit specific teaching requirements. Equipment manufacturer and technology must be consistent with University standards and quality to ensure that it can be readily supported by Collaboration Endpoints staff.

18.13 MAJOR LECTURE THEATRE

18.13.1 Description

Major lecture theatres are generally single function spaces with fixed seating and writing furniture on a tiered or sloping floor surface with a seating capacity of 150 or more. Each seat should have a clear unobstructed view to the lecturer and to all boards and screens located on the presentation wall. These spaces are generally well equipped for audio visual equipment including projection system, dedicated sound reinforcement system; touch panel control system and playback equipment installed within a dedicated lectern. The AV system including theatre lighting must be operatable via an integrated touch panel control system.

18.13.2 AV System Functionality

As a minimum, major lecture theatres shall be provided with the following audio visual system functionality:

- Dual video/data projection to display the following sources:
  - University supplied computer
  - Laptop connection(s)
  - Document camera(s)
- Local preview of all sources on lectern monitor(s) (not required for iMacs)
- All source audio shall be via front of house speakers
- All microphone audio shall be reinforced via ceiling mounted speakers
- The hearing augmentation system shall provide 80% coverage of the entire space with low spill to adjacent spaces. The induction loop shall take a combined feed of source and microphone audio.
- Audio output plate on lectern or nominated location for recording/ media feed (mix of microphone and source audio)
- Dedicated audio output (XLR connection) from audio DSP for web-conferencing applications (Skype, Zoom etc.) Located at lectern.
- Provision to integrate Echo Systems
- The control system processor and touch panel, as a minimum, shall interface with the following equipment:
  - Video matrix switch
  - Digital Audio processor
  - Video/data projectors
  - Motorised screen(s) (as required)
  - Motorised projector lift (as required)
  - Motion sensor
  - Equipment rack power controller
  - Room lighting dimmers
  - Extron GVE network (via the LAN)
- A fixed lectern installed at the front of the theatre to house the following AV equipment:
  - University supplied computer
  - Laptop input connection plate (mounted above the lectern)
  - Touch panel
  - Boundary microphones
  - Document camera(s)
- All other AV equipment shall be securely installed in a dedicated full height AV equipment rack. AV equipment rack shall be securely locked in a dedicated cupboard locked with a University standard ‘TEC lock’.

18.13.3 AV Equipment
As a minimum, major lecture theatre shall be provided with the following audio visual equipment:
- 2 x Video/data projectors
- University supplied computer
- Laptop input connection plate(s)
- Document camera(s)
- Front of house speakers
- Ceiling mounted speakers
- Wired boundary microphones
- Wireless lapel microphone system and charging dock
- Wireless handheld microphone system and charging dock
- Hearing augmentation system
- Video matrix switch
- Digital audio processor
- Audio amplifiers and 100V line transformers
- Touch panel
- Control system processor
- Dedicated local AV network switch if required
- Echo 360 Systems
- Dedicated AV equipment rack
- Motorised projection screen (as required)
- Motorised projector lift (as required)
- Fixed lectern

18.14 LECTURE THEATRE

18.14.1 Description

Lecture theatres shall have a capacity of 60 to 150 and are designed for presentation of video/data via a single projector. The AV system, input devices and theatre lighting shall be controlled via a dedicated wired touch panel installed on the University standard lectern.

The lectern, as a minimum, shall house one University supplied computer, document camera, laptop connection plate, and touch panel. All audio visual switching and processing equipment shall be housed in a dedicated audio visual equipment rack located in a separate cupboard/joinery.

Voice reinforcement shall include wired and wireless microphones along with ceiling speakers and a hearing augmentation system.

Lecture theatres may be tiered or have a levelled floor.

Lighting shall generally be controlled using a self-standing lighting control system accessed by a wall panel offering a limited number of standard lighting scenes and the option of ramping audience and board lighting.

18.14.2 AV System Functionality

As a minimum, lecture theatres shall be provided with the following audio visual system functionality:

- Single video/data projection to display the following sources:
  - University supplied computer
  - Laptop connection(s)
  - Document camera
- Local preview of computer on lectern monitor(s) (not required for iMacs)
- All source audio shall be via front of house speakers
- All microphone audio shall be via ceiling mounted speakers
- The hearing augmentation system shall provide 80% coverage of the entire space with low spill to adjacent spaces. The induction loop shall take a combined feed of source and microphone audio.
- Audio output plate on lectern or nominated location for recording/ media feed (mix of microphone and source audio)
• Dedicated audio output (XLR connection) from audio DSP for web-conferencing applications (Skype, Zoom etc.) Located at lectern.

• The control system processor and touch panel, as a minimum, shall interface with the following equipment:
  ▪ AV media presentation switch
  ▪ Digital audio processor
  ▪ Video/data projector
  ▪ Motion sensor
  ▪ Equipment rack power controller
  ▪ Extron GVE network (via the LAN)

• A fixed lectern installed at the front of the theatre to house the following AV equipment:
  ▪ University supplied computer
  ▪ Laptop connection plate(s)
  ▪ Touch panel
  ▪ Document camera

• All other AV equipment shall be securely installed in a dedicated AV equipment rack. AV equipment rack shall be securely locked in a dedicated cupboard locked with a University standard ‘TEC lock’.

18.14.3 AV Equipment

As a minimum the lecture theatre shall be provided with the following audio visual equipment:

• Video/data projector
• University supplied computer
• Laptop connection plate
• Document camera
• Front of house speakers
• Ceiling mounted speakers
• Wired boundary microphones
• Wireless lapel microphone system and charging dock
• Wireless handheld microphone system and charging dock
• Hearing augmentation system
• AV media presentation switch
• Digital audio processor (if required)
• Audio amplifiers and 100V line transformers
• Touch panel
• Control system processor
• Dedicated local AV network switch if required
• Echo 360 Systems
▪ Dedicated AV equipment rack
▪ Fixed lectern

18.15 SEMINAR ROOMS

18.15.1 Description
Seminar rooms have a capacity of up to 56 people but typically have classes of 30 people. The use of different presentation media is restricted.

The AV system shall typically comprise of a projection system or large format FPD (depending on the size of the space), and front of house sound reinforcement. All systems shall be controlled via a dedicated push-button keypad or touch panel. Control system shall be interfaced with all AV equipment.

18.15.2 AV System Functionality
As a minimum, seminar rooms shall be provided with the following audio visual system functionality:
▪ Video/data projector or FPD to display the following sources:
  ▪ University supplied computer
  ▪ Laptop connection(s)
  ▪ Document camera
  ▪ All source audio shall be via front of house speakers
  ▪ The control system processor, as a minimum, shall interface with the following equipment:
    ▪ AV media presentation switch
    ▪ Digital audio processor
    ▪ Video/data projector / FPD
    ▪ Motion sensor
    ▪ Equipment rack power controller
    ▪ Extron GVE network (via the LAN)
  ▪ A teacher’s desk installed at the front of the room to house the following AV equipment:
    ▪ University supplied computer
    ▪ Laptop connection plate
    ▪ Push button keypad / touch panel
  ▪ All other AV equipment shall be securely installed in a dedicated AV equipment rack. AV equipment rack shall be securely locked in a dedicated cupboard/joinery locked with a University standard ‘TEC lock’.

18.15.3 AV Equipment
As a minimum the seminar rooms shall be provided with the following audio visual equipment:
▪ Video/data projector
▪ FPD (optional)
- University supplied computer
- Laptop connection plate(s)
- Document camera
- Front of house speakers
- AV media presentation switch
- Digital audio processor
- Wired boundary microphones (optional)
- Wireless lapel microphone system and charging dock (optional)
- Wireless handheld microphone system (optional)
- Hearing augmentation system
- Audio amplifier
- Push button keypad / touch panel
- Control system processor
- Dedicated local AV network switch if required
- Dedicated AV equipment rack
- Fixed teacher’s desk joinery

18.17 PROFESSIONAL SPACE

18.17.1 Description

Professional spaces are designed for staff, students and other users. Consult with Collaboration Endpoints for more detailed standards regarding staff meeting spaces in 2019.

Room types may include:
- Huddle Spaces up to 4-5 people
- Meeting rooms from 5 – 9 people
- Large Meeting Rooms from 10–12 people
- Boardrooms and Multipurpose spaces for 12 people and over
- Stand-up style meeting spaces
- Project Rooms, student presentation spaces

These rooms are basic in their design and layout with tables and chairs, one panel whiteboard as well as a flat panel display (or projector depending on the size of the space) and AV playback devices. AV system shall be controlled by a push-button keypad / touch panel.

18.17.2 AV System Functionality

As a minimum, Professional spaces shall be provided with the following audio visual system functionality:
- FPD / projector to display the following sources:
  - University supplied computer or Unified Communications Engine
  - Laptop connection(s)
▪ Wireless presentation system
▪ All source audio shall be via front of house speakers
▪ All staff meeting spaces should be enabled with the University's preferred soft-conferencing and collaboration platform. Consult with Collaboration Endpoints.
▪ Source equipment shall be directly connected to the FPD
▪ The control system processor and touch panel, as a minimum, shall interface with the following equipment:
  ▪ FPD / projector
  ▪ Motion sensor
  ▪ Equipment rack power controller if present
  ▪ Extron GVE network (via the LAN)

18.17.3 AV Equipment

As a minimum the Professional spaces shall be provided with the following audio visual equipment:
▪ Display: FPD / Projector / Interactive FPD
  ▪ Displays smaller than 80” may be interactive where practical
  ▪ Interactive FPD for all stand-up meeting spaces
▪ Front of house speakers if required (in-built flat panel display speakers can be used for smaller spaces)
▪ University supplied computer
▪ Laptop connection plate(s)
▪ Wireless presentation system
▪ Push-button keypad / touch panel
▪ Control system processor
▪ Skype & Zoom Compatible Cameras and microphones for web conferencing (not required for stand-up meeting spaces)

18.18 TECHNICAL REQUIREMENTS

The following sections detail the minimum technical requirements for audio visual equipment specified in The University of Melbourne’s teaching spaces.

The make and models of all audio visual equipment nominated for The University of Melbourne teaching spaces shall be verified by Collaboration Endpoints prior to installation. A list of AV equipment manufacturers currently supported by Collaboration Endpoints is included in Appendix B.

18.19 PROJECTION SYSTEM

Projection systems play a primary role at the University and are present in the majority of learning spaces across the campus. It is imperative that the projection system for these spaces meet the technical and functional requirements of the space.

Engineers shall confirm make, model and specifications of projector with a Collaboration Endpoints representative prior to finalising system configuration.
As a minimum, projection systems at the University of Melbourne shall comply with the following:

### 18.19.1 Projector Requirements

As a minimum, nominated video/data projectors shall adhere to the following standards:

- Minimum of 4000 ANSI lumens. The specific brightness of the projector shall depend on the application and the particular space.
- Minimum contrast ratio 2000:1. The specific contrast of the projector shall depend on the application and the particular space.
- Capacity to support 4:3 and 16:9 aspect ratios
- Native 1920 x 1080 resolution
- As a minimum, projectors shall include the following video inputs:
  - HDMI
  - HDBaseT
  - RS232 / Ethernet controllable
  - Ethernet interface (for management)
  - Lamp-less technology (e.g. laser)
  - Low noise
  - Ceiling mountable

### 18.19.2 Lines of Sight

Optical calculations shall be performed to determine suitable projection parameters for each space; however, the following standards shall be applied:

- Furthest Viewer – no student shall be further than 5.3 image height lengths from the projection surface
- Closest Viewer – no student shall be closer than two screen height lengths from the projection surface
- Horizontal Viewing Angle – audience shall be positioned within an arc of 45 degrees from either side of the centre line of projection
- Vertical Viewing Angle - audience shall be limited to 15 degrees maximum head tilt above horizontal, in relation to the centre of the projection image
- Image position – The base of the projected image should be at least 1200AFFL

Whilst the horizontal viewing angle and closest viewer rules are slightly flexible, the furthest viewer rule is not flexible at all.

The size and the height of the image shall take into account environmental considerations such as ceiling height, ceiling mounted equipment, furniture, audience seating position etc.

### 18.19.3 Projection Screen / Surface

The projection image shall be located in the centre of the front of house, or in the case of two images (which may include writing space) each shall be situated on either side of the centre. Where possible the projection system shall be able to be used simultaneously with writing boards.
Projection walls shall be a non reflective surface painted matte white. Projection shall be above or behind the writing board area, which may be lowered to expose the projection surface.

If required, fixed and motorised projection screens shall be provided. The projection screen shall be sized to suit the space and a 16:9 aspect ratio.

Motorised projection screens shall be quiet and robust and when recessed, shall be flush mounted within the ceiling cavity where possible. The screen must move from recessed position to presentation position within 25 seconds. Screens shall be individually controlled via the touch panel control system.

18.19.4 Projector Configuration

The projector must be configured for optimal image reproduction. The projector must be configured with the following settings:

- Colour matching – for side by side projectors
- Panel alignment – adjust if necessary, will fine tune colour and make image sharper
- Eco mode – switch off Auto Dim feature

18.19.5 Projector Installation

Video/data projectors shall be securely installed on either a ceiling bracket or within a dedicated bio-box depending on the requirements of space.

The following considerations shall be taken into account when positioning the video/data projector:

- Presentation position – The projector shall be installed such that the projected image is not obstructed by the lectern or the presenter. Consideration shall also be taken to ensure that the presenter is not affected by the glare from the projection angle.
- Projection image size – Each projector manufacturer recommends an optimal installation distance for a given projected image. Engineers shall ensure that a suitable lens is provided for the desired position.
- Ease of maintenance – Consideration shall be taken to ensure that the projector is accessible for maintenance purposes. It is preferred that projectors are not installed above stairs or un-sturdy surfaces where ladders cannot be placed.
- Other ceiling mounted services and equipment – Projection image should not be obstructed by other ceiling mounted services such as security cameras, light fitting, air-conditioning ducts etc.
- Security – Projector shall be installed in a location where it is not easily accessible and prone to damage or theft.

Projector shall be installed on fixed ceiling mount bracket or motorised projector lift.

18.19.6 Fixed Projector Mount

Each projector shall be fitted on a University approved mounting bracket/mounting plate with University standard security screws and high tensile steel padlocks. The mounting bracket shall be fitted to a compatible dropper which is then fixed directly to the ceiling slab. The projector shall be installed such that the projector aligns horizontally with the top of the projected image and electronic image correction or adjustment shall not be required.

Electronic image correction or keystone adjustments shall only be used if prior approval is provided in writing by Collaboration Endpoints.
University preferred mounting bracket is an ‘Ultralift Spyder (Uni-Melb) bracket’ make and model.

18.19.7 Motorised Projector Lift
Where possible, video projectors shall not be mounted higher than 2700AFFL. If projectors cannot be mounted within 2700AFFL on a fixed bracket, then a University approved custom built mechanical lift shall be fitted.

The projector shall be fitted within the lift cage with University approved security screws and high tensile steel padlocks. The cage shall be modified to suit the projector. The cage should allow for removal and servicing of projector lamps, filters and lenses without having to remove the projector from the cage (often the underside of the cage is cut out to allow access).

The lift shall be cabled back to the AV control system and controlled by the touch panel. Furthermore, IR bud and remote control shall be provided as a failsafe.

The projector lift shall be installed securely on ceiling slab and configured for single stage drop, for service only. When projector is retracted to home position, it must be in show mode. Service height shall be approximately 1500AFFL.

CAT6A cabling must be used for all audio, video and control signals. Cabling must be terminated on connection plate within the ceiling adjacent the lift with braided cable down to the receiver/projector.

Electronic image correction and keystone adjustments shall only be used if approved in writing by Collaboration Endpoints.

University preferred projector lift is an Ultralift Unilift 2, custom modified to suit specific projector.

18.19.8 Dual Projection
Dual projection systems shall have two images projected side-by-side ensuring that they do not overlap. Each projected image shall be of the same size, brightness and contrast. It is recommended the same projectors are used in dual projection rooms.

The AV control system shall be flexible enough to allow the user to select any input source, to be displayed on either or both of the projection systems concurrently. Echo 360 Systems shall be configured to capture left projections by default.

18.19.9 Triple Projection
Triple projection systems shall have three images projected side by side ensuring that they do not overlap. Each projected image shall be same brightness and contrast. It is recommended the same projectors are used in triple projection rooms.

The AV control system shall be flexible enough to allow the user to select any input source, to be displayed on any one, two or all of the projection systems concurrently. Echo 360 Systems shall be configured to capture the left and centre projections (selectable via the control system).

18.20 FLAT PANEL DISPLAY

Flat panel displays are used in smaller tutorial rooms and collaborative classrooms and professional spaces where video/data projectors are not suitable. The installation
requirements for flat panel displays are governed by the same rules as the projections system.

The University of Melbourne currently only deploy FPD within teaching spaces. The following table lists the recommend panel size for the furthest viewer.

<table>
<thead>
<tr>
<th>Flat panel display size (diagonal)</th>
<th>Recommended Furthest viewer</th>
<th>Recommended Closest viewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>32”</td>
<td>2.0m</td>
<td>0.8m</td>
</tr>
<tr>
<td>40”</td>
<td>3.0m</td>
<td>1.0m</td>
</tr>
<tr>
<td>46”</td>
<td>3.5m</td>
<td>1.0m</td>
</tr>
<tr>
<td>52”</td>
<td>4.0m</td>
<td>1.5m</td>
</tr>
<tr>
<td>55”</td>
<td>4.0m</td>
<td>1.5m</td>
</tr>
<tr>
<td>65”</td>
<td>5.0m</td>
<td>1.5m</td>
</tr>
<tr>
<td>70”</td>
<td>6.0m</td>
<td>1.5m</td>
</tr>
<tr>
<td>80”</td>
<td>7.0m</td>
<td>1.5m</td>
</tr>
<tr>
<td>84”</td>
<td>7.5m</td>
<td>1.5m</td>
</tr>
<tr>
<td>98”</td>
<td>8.5m</td>
<td>1.5m</td>
</tr>
</tbody>
</table>

### 18.21 FPD Requirements

As a minimum, the nominated FPD shall adhere to the following requirements:

- Minimum HD resolution 1920 x 1080
- Widescreen, 16:9 aspect ratio
- High brightness
- Minimum 800:1 contrast ratio
- Standard sizes (as nominated in the table above) to meet room requirements
- NTSC/PAL Colour system
- RS232 / Ethernet controllable
- VESA compliant, wall mountable
- As a minimum, the panel shall include the following inputs:
  - HDMI x 2
  - Optional input slots for twisted pair receivers, TV tuners, HDBaseT, cards readers etc.
- Optional speakers

### 18.22 Installation Requirements

FPDs shall be fitted with University approved mounting bracket with high tensile University padlocks and security mechanisms to prevent theft or malicious damage. The security mechanisms shall meet the University’s security requirements. Any modifications to the installation bracket or security mechanisms shall be approved by Collaboration Endpoints.
Final height of FPDs shall be coordinated with architectural drawings and optimal viewing angles. Ceiling mounted FPDs and panels mounted at high levels shall be angled down to ensure image integrity. Where FDPs have equipment installed behind or if panel is recessed, an articulated bracket must be installed to allow for servicing.

Interactive whiteboards or FPDs with touch overlays shall be installed so the top of the board is no higher than 2000AFFL.

**18.23 Panel Brackets**

The bracket shall be from a reputable manufacture (Vogel, Ulstralft, Atdec, etc.) and be approved by Collaboration Endpoints prior to installation.

**18.24 Panel Enclosure**

FPDs installed in public and unsecured areas shall be fitted within a custom built enclosure. As a minimum, the enclosure shall have the following:

- Fully sealed (glass front)
- Lockable with keys or security screws (locks to be provided by UoM)
- Suitable to all temperatures
- Integrated air movement
- Mounting options: Wall mount, ceiling mount, stand-alone pedestal etc.
- Accommodate LCD screen and speakers within the enclosure
- To suit nominated FPD
- VESA mounting compatible or equivalent
- IP54 rated – dust and splash proof design
- Screen shall be accessible for servicing and maintenance.

**18.21 INTERACTIVE FPD AND INTERACTIVE WHITEBOARDS**

Interactive FPD and Interactive Whiteboards shall be minimum 55” diagonal, 16:9 aspect ratio and from a reputable manufacturer approved by Collaboration Endpoints.

The University recommends the use of interactive FPDs where possible. Interactive whiteboards shall only be used if 80” diagonal image, or larger is required. Interactive whiteboards must be supplied with an approved short-throw projector mounted on a manufacturer recommended ‘snorkel type’ arm / bracket. Contractors must ensure that the projector is positioned to minimise glare into the user’s eyes.

Interactive whiteboards and FPDs must be installed on walls and shall be mounted such that the top of the board is no higher than 2000AFFL.

Interactive whiteboards shall be directly cabled to University supplied computers.
18.22 VIDEO SWITCHING

The University transmits and switches the following video signals:

<table>
<thead>
<tr>
<th>Type</th>
<th>Video Signal</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogue Video</td>
<td>XGA (1024x768) / WXGA (1280x768)</td>
<td>Legacy equipment</td>
</tr>
<tr>
<td>HD Video</td>
<td>HD1080 (1920 x 1080p)</td>
<td>Special requirements</td>
</tr>
<tr>
<td>Digital Video</td>
<td>HDMI / (EDID enabled)</td>
<td>Fixed computer, laptop input, document cameras, DVD, Blu-Ray, videoconferencing camera, videoconferencing codec etc.</td>
</tr>
</tbody>
</table>

All video signals shall be switched, scaled, transmitted and displayed in full HD resolution (1920x1080 pixels).

All new AV systems must be provided with provisions to support both digital video equipment (e.g. HDMI) as well as legacy analogue video equipment (Composite, VGA RGBHV etc.). All digital AV switching equipment must support EDID, CEC and HDCP protocols.

Video switching equipment must be provided with the ability to disable HDCP from any input, including HDMI computer sources, HDMI laptops and HDMI document cameras.

All source devices that provide HDCP content must also provide sufficient HDCP (KSV) keys to allow all display devices to display content.

18.23 SOUND REINFORCEMENT

Despite the growth in the use of visual and computer means of communication, verbal communication remains the single most important method of teaching and learning. Irrespective of the size of the space, maximum attention must be paid to optimising the acoustic properties of the space.

Amplification is required for all lecture theatres and should be considered for small presentation spaces of 35 seats or more.

Wherever amplification is installed, whether for presenter’s voice or for electronic sound, provision for hearing aid induction loops and Echo360 should be considered.

Auxiliary inputs for sound presentation (audio-cassette, CD, iPod and computer audio), is always required for language teaching, and is required for all lecture theatres.

Typically, source audio shall be reproduced via dedicated front of house speakers and microphone audio shall be via ceiling mounted speakers. The hearing augmentation system and Echo360 system shall have combination of both source and microphone audio inputs.

18.23.1 Microphones

Wired and wireless microphones shall be used as required. Wired microphones shall be condenser boundary type microphones with a low profile and semi-cardioid pattern.

Wireless microphones using digital modulation shall operate on Band A 520-558MHz frequency range. Commissioning of wireless microphone systems shall be coordinated
with the existing range of frequencies in use in nearby spaces to ensure there is no interference. Alternative configurations to wireless microphones require approval from Collaboration Endpoints staff. Appropriate amplification shall be installed when quality sound reinforcement system is required.

Wherever microphone systems are installed, heating augmentation systems must be installed.

18.25 HEARING AUGMENTATION SYSTEMS

The Contractor must provide Hearing Augmentation systems where there is an inbuilt amplification system, other than one used solely for emergency warnings, as per BCA requirements.

The type of Hearing Augmentation system must be determined with due consideration of the building environment, restrictions, interference and user requirements.

IR and RF hearing augmentation systems require approval from Collaboration Endpoints staff. Hearing induction loops are the preferred option for all projects.

A complete set of written test results must be provided with each system including a certificate of compliance as per AS1428.5-2010.

All hearing augmentation systems must be provided with a constant audio feed, that cannot be muted, from the AV system consisting of a mix of both source and microphone audio.

18.25.1 Hearing Induction Loop

The Contractor shall coordinate with the builder to install copper foil tape below the floor covering. Chasing of floor will not be feasible.

Hearing augmentation system shall provide 80% coverage of the space as per BCA, with low spill to outside areas unless otherwise specified.

As a minimum, the assistive hearing loop must meet the following minimum criteria:

- Field strength inside the area of use must be equal to 400mA/m plus/minus 3dB (tested with 125ms RMS measurement with 1kHz Sine wave)
- Total variation in signal across the frequency band 100Hz to 5kHz at 1kHz must be within 3dB anywhere in the loop area
- Background noise must be less than or equal to -32dB relative to 400mA/m.

Contractors shall specify an appropriate loop layout from the list below for rooms over 100m2.

- Counter Loop - Typically used for counters and benches where one-to-one interaction is required.
- Perimeter Loop - Typically used in spaces where there are no spill issues and minimal metal loss.
- Single Array Loop - Typically used in fixed seating arrangements where it is known that users will not pass through the "null" zones during use.
- Cancellation Loop - Typically used for rooms located back-to-back where loop spill is reduced in one direction.
- Low Loss Phased Array - Typically used in spaces where metal loss occurs and there is a requirement to reduce spill into adjacent rooms.
- Ultra-low Spill Phased Array - Typically used in spaces where metal loss occurs and there is a requirement to reduce spill for confidentiality purposes.

The installer must seek specialist design advice from the manufacturer regarding the specific design of the system.

The Contractor must coordinate on site to determine the presence of existing adjacent hearing loop systems within the building.

The Contractor must conduct a site survey to undertake field strength measurements prior to designing the new hearing loop, to determine whether background interference is greater than, or equal to, -32dB relative to 400mA/m. The field strength measurements must be taken whilst adjacent hearing loop systems are in operation.

If an interfering system is discovered, the Contractor must advise the Project Manager and the Consultant and then proceed with the design of the hearing loop system.

The Contractor must submit results of background field strength measurements included with a manufacturer endorsed hearing loop technical design proposal. The measurement results and loop design proposal must be submitted to the Project Manager for approval prior to installation.

Where the manufacturer endorsed design includes the installation of copper foil tape below floor coverings (where chasing of floor is not be feasible), detailed technical drawings must be submitted for approval by Project Manager prior to installation.

The Contractor must engage the manufacturer of the hearing augmentation system to provide specialist design advice, site testing, technical data and design documentation from the system manufacturer for each space.

The manufacturer of the loop system, or their approved Australian distributor, must undertake the final system testing and provide the manufacturer certificate of compliance.

18.26 Infra-Red System

Infra-Red Hearing Augmentation system must include IR transmitters, antennas, IR receivers and room entrance and in room signage.

As a minimum, the IR Hearing Augmentation system must meet the following criteria:

- IR Hearing Augmentation must provide 95% coverage of the room as per the BCA
- Multiple transmitters may be required to ensure correct operation for all room configurations
- Transmitters must not be installed outside or in direct sunlight
- The number of receivers must correspond to the number of people the space accommodates to meet BCA regulations
- Recharger and rechargeable batteries must be provided for each receiver supplied

Contractor must conduct a site survey and review line of sight restrictions and ambient light, prior to submitting a detailed design submission.

18.27 Radio Frequency (RF) System

Radio Frequency Modulated Hearing Augmentation system must include RF modulator, antennae, RF receivers and room entrance and in room signage.

As a minimum, the RF Hearing Augmentation system must meet the following criteria:

- RF Hearing Augmentation must provide 95% coverage of the room as per BCA
The number of RF receivers must correspond to the number of people the space accommodates to meet BCA regulations

- Recharger and rechargeable batteries must be provided for each receiver supplied
- System must include all relevant licenses and fees

The Contractor must ensure that all RF transmitters and receivers do not interfere with existing equipment's frequency bandwidth or commercial frequency spectrum.

### 18.27 CONTROL SYSTEM

All teaching spaces provided with an audio visual system shall include a dedicated Extron control system fully programmed to control all audio visual devices. As a minimum each room shall be provided with a dedicated control system processor (Extron IP Link Control Processor or Integrated IP Link Processor) and fixed control interface (touch panel or keypad).

#### 18.27.1 User interface

The University typically uses the following control interfaces:

<table>
<thead>
<tr>
<th>Device</th>
<th>Model</th>
<th>Typical application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wired Touch Panel</td>
<td>Extron TLP 1025</td>
<td>Lecture Theatres, Collaborative Spaces and some Seminar Rooms</td>
</tr>
<tr>
<td>Wireless touch panel</td>
<td>Requires approval from Collaboration Endpoints</td>
<td>Videoconferencing rooms and collaborative teaching spaces.</td>
</tr>
<tr>
<td>16 /8 button keypad</td>
<td>Extron MLC Plus Series</td>
<td>Seminar rooms and professional spaces</td>
</tr>
</tbody>
</table>

#### 18.27.2 Device Integration

Typically, the following audio visual equipment shall be interfaced with the control system processor as follows:

<table>
<thead>
<tr>
<th>Device</th>
<th>Control Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video switch</td>
<td>RS232 or Ethernet</td>
</tr>
<tr>
<td>Audio DSP / Digital audio processor</td>
<td>RS232 or Ethernet</td>
</tr>
<tr>
<td>Audio amplifier</td>
<td>No control required</td>
</tr>
<tr>
<td>Video/data projector / FPD</td>
<td>RS232 or Ethernet</td>
</tr>
<tr>
<td>Lighting dimmers</td>
<td>RS232 or RS485. Interfaces to be provided by lighting contractor</td>
</tr>
<tr>
<td>Playback equipment</td>
<td>RS232</td>
</tr>
<tr>
<td>Document camera</td>
<td>RS232 or Ethernet</td>
</tr>
<tr>
<td>Wireless microphone system</td>
<td>Ethernet</td>
</tr>
<tr>
<td>Motorised projection screens</td>
<td>I/O or Relays or Ethernet</td>
</tr>
</tbody>
</table>
Motorised projector lift | I/O or Relays

Alternative configurations shall be approved in writing by Collaboration Endpoints.

18.27.3 Programming

Programming of control systems shall be coordinated with Collaboration Endpoints. The Control System programming shall be consistent with that of other teaching and professional spaces at The University of Melbourne where possible.

The Contractor shall organise workshops and submit samples of the touch panel and keypad layout to a Collaboration Endpoints representative to verify the layouts are correct prior to commissioning. A range of configurations and automation shall be available from the touch panel. Selecting a function from the touch panel shall operate all required equipment to perform that function e.g. selecting play on the Blu-Ray will switch the projector on, switch the AV switch to select Blu-Ray input and play the Blu-Ray.

Typical touch panel and keypad layouts are attached in Appendix A. Final touch panel layouts shall be developed on a project by project basis in conjunction with Collaboration Endpoints and User Groups.

The Contractor shall supply the fully working control system source codes on USB memory stick to the University on completion of the project. Software provided by the Contractor shall be procured and transferred in full compliance with the publisher’s copyright, licensing and other requirements of ownership and use. License agreements shall be registered in the Principal’s name.

The University shall retain full rights to all custom software and programming developed by the Contractor as part of the Project. This shall include, but not be limited to the right to use, reproduce and modify the software as reasonably required to operate the systems and to support their ongoing maintenance and development.

All IPCP Pro Series controllers shall be programmed in Global Scripter. Any deviation will require formal approval from Collaboration Endpoints.

18.27.4 Shut Down / Motion Sensor

Ceiling mounted motion sensors shall be provided for all spaces equipped with a control system. The control system shall be configured to automatically turn off all equipment when the motion sensor has not detected any movement for 2 hours, and the control interface has not been active within this period.

Additionally the control system shall be programmed to check status of the motion sensor at 11pm every night. If no motion has been detected, the AV system shall shut down all equipment. If motion has been detected, the system will repeat check every 2 hours.

18.27.5 Remote Management

All devices attached to an Extron control system with feed-back control (RS232, RS422, RS485 and TCP-IP) shall be able to be monitored and managed via the University of Melbourne’s Remote Management platform, Extron GVE, via the University LAN. All AV control systems provided for the University must be enabled for remote management by Extron GVE. Contractors must coordinate with Collaboration Endpoints staff to integrate control systems for all spaces.

Existing spaces with AMX control systems must be upgraded to Extron control systems and integrated to the Extron GVE.
As a minimum the remote management platform shall allow for real-time monitoring and problem notifications.

Source usage shall have the following labels:
- Projector
- FPD
- Document Camera
- Laptop Input – VGA
- Laptop Input - HDMI
- Computer
- Set-top box
- Aux Video Input
- Wireless Microphone System(s) (monitor battery levels, frequency and name)
- Equipment/system status and hot list of equipment errors
- Flexible, intuitive interface that lets the user select how and what is monitored
- Professional help desk and monitoring

Capacity to create the following web-based and/or log data reports:
- Help requests
- Room usage
- Lamp hours
- Both lamps for dual projection
- Lamp fail message for all lamps
- Source usage
- System & device usage
- Monthly reports on all maintenance requirements

Consultants and Contractors shall confirm final requirements with Collaboration Endpoints on a project by project basis.

18.27.6 Remote Power Management

A networked power distribution unit (PDU) must be provided to all AV equipment racks to enable remote monitoring and management of devices. As a minimum the PDU must allow for the following functionality via a web-based RMS interface:
- Current metre per outlet
- Individual outlet power consumption
- Remote ON/OFF and reboot switching
- User defined group control (switched and un-switched devices)
- PDU must have minimum 8 ports, each rated at 10A at 240V AC.

18.27.8 IP Address & Asset Schedule

All devices connected to the network must be listed on the UOM Asset and IP Address Schedule and handed over to Collaboration Endpoints for ad hosting 2 weeks prior to commissioning AV system. The schedule will be shared by the Collaboration Endpoints.
team via SharePoint. MAC addresses must be provided by AV contractor prior to IP addresses being allocated. The information must strictly follow the format provided (see figure below) and include the following details:

- Building Number
- Level
- Room Name/Type
- Room Number
- Device
- Make
- Model
- VLAN
- IP Address
- Subnet
- Default Gateway
- Host Name
- Outlet/Patch Number
- Switch/Port Number
- Port Req
- Sys Dev/No/ID
- IP Set
- Mac Address
- Serial

Any decommissioned equipment needs to be documented and a spreadsheet sent to Collaboration Endpoints Team for instruction. Items will need to be delivered to either Collaboration Endpoints Team or the e-waste office.

18.28 CABLING

The Contractor shall ensure that all cabling is installed to avoid sources of electromagnetic interference. Cabling shall be run concealed in ceilings, floor ducts or in wall cavities, and shall be labelled to indicate source, destination and function. Surface ducts or conduits shall not be used.

Velcro ties are to be used for cable management. No plastic cable ties or “zip ties” shall be accepted.

The cables installed shall be as listed below:
### Cable Type
### Cable Description
### Approved Manufacture

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Cable Description</th>
<th>Approved Manufacture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Projector Control</td>
<td>Low capacitance, 72 pF/m. 4 x stranded inner pairs with overall foil and drain screening only. Pair colours as per CAT5</td>
<td>Belden / Turnbull</td>
</tr>
<tr>
<td>Video Coaxial Cable</td>
<td>Coax, 1 coax, 20 AWG, stranded (26x34) TC - tinned copper conductors, EPDM - ethylene propylene diene monomer rubber insulation, conductive textile wrap, tinned copper Spiral Serve Shield, 72% shield coverage, neoprene jacket</td>
<td>Belden / Turnbull</td>
</tr>
<tr>
<td>Computer Video Cable</td>
<td>Digital video coax 5-way snake, miniature RG59/U, 23AWG, solid, soft PVC, 95% braiding, black</td>
<td>Belden / Turnbull</td>
</tr>
<tr>
<td>Digital Video Cable</td>
<td>HDMI cable, CTS category 2 version 1.3b compliant, verified for 1080p. 4 pair, 25 AWG stranded with drain wire, FR-PVC jacket. For continuous runs for no longer than 10m</td>
<td>Extron Ultra Series</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extron Micro Series</td>
</tr>
<tr>
<td>Audio Cable</td>
<td>1 pair, 22 AWG (7/0.32) tinned copper, polyethylene insulation, twisted beldfoil shielded pair, 22 AWG stranded tinned copper drain wire, PVC jacket.</td>
<td>Belden / Turnbull</td>
</tr>
<tr>
<td>Speaker Cable</td>
<td>2 core speaker cable 14 AWG, stranded, 75 degree insulated, PVC jacket</td>
<td>Belden / Turnbull</td>
</tr>
<tr>
<td>Twisted pair</td>
<td>Category 6A shielded twisted pair. Data twist / media twist. Purple colour PVC jacket for AV services.</td>
<td>Siemon</td>
</tr>
<tr>
<td>Fibre</td>
<td>50/125 µm multi-mode fiber, OM3</td>
<td>Extron</td>
</tr>
</tbody>
</table>

Shielded twisted pair cabling installed for AV services must be fitted off on RJ45 block within lectern and RJ45 connection plates at the device location. Each location must be clearly labelled. Braided CAT6 leads must be used between connection plate/block and equipment.

Cabling that is to be routed within a motorised projector lift must be fitted off to a connection plate within the ceiling space at the mounting location. Shielded twisted pair cabling installed within a motorised projector lift must be a pre-terminated Alogic purple shielded Cat6a patch cable.

All other CAT6 leads must be terminated on R&M RJ45, IP67, FM45, rated jacks suited for industrial environments. Alternatives will not be accepted.

Shielded Cat6a cabling must be installed with a minimum bend radius of 50mm.
18.29 CONNECTION PLATES AND FLY-LEADS

Cabling points and engraved connection plates shall be installed as nominated on drawings. All connection plates shall be engraved to indicate the function for each nominated outlet. The style and finish of all connection plates shall be consistent and match the décor of the space.

Typically, all audio visual connections shall be terminated on Clipsal 2000 series connection plates. The following table details University standard connections:

<table>
<thead>
<tr>
<th>Type</th>
<th>Video</th>
<th>Audio</th>
<th>Typical Installation location</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>University supplied computer input</td>
<td>HDMI and appropriate adapter</td>
<td>3.5mm mini stereo jack for audio</td>
<td>Installed below lectern in dedicated shelf for computer</td>
<td>COMPUTER</td>
</tr>
<tr>
<td>Laptop input</td>
<td>HDMI</td>
<td></td>
<td>Installed above lectern</td>
<td>LAPTOP</td>
</tr>
<tr>
<td>Document Camera input</td>
<td>HDMI</td>
<td></td>
<td>Installed above lectern</td>
<td>DOC CAM</td>
</tr>
<tr>
<td>Lecture Capture System / Echo 360</td>
<td>HDMI</td>
<td>Phoenix connector for audio (combined microphone and source outputs from digital audio processor)</td>
<td>Installed in AV equipment rack</td>
<td>ECHO SYSTEM</td>
</tr>
<tr>
<td>Microphone</td>
<td></td>
<td>3-pin XLR Female</td>
<td>Installed on lecterns, media link, bio-boxes and floor boxes</td>
<td>MICROPHONE #</td>
</tr>
</tbody>
</table>

# - denotes the number

Contractors shall submit connection plate samples for approval by Collaboration Endpoints.

Video adapters (mini DP, DP, USB–C etc.) must be approved by Collaboration Endpoints for suitability. Video adapters must be from the Liberty DigitaLinx range and securely tethered to AV fly-leads using a Liberty DL-CL adapter ring clamp.

Contractors must provide all necessary fly-leads for all devices. Laptop fly-leads (HDMI) must comply with the following. Alternatives will not be accepted:
Wall mounted connection plates must be provided with suitably sized fly-leads. Leads must be neatly coiled within joinery or on hooks where joinery is not available. Contractor must ensure that fly-leads and cables do not pose any OH&S risk.

### 18.30 POWER AND DATA REQUIREMENTS

The following table details the typical electrical and data requirements to support AV systems. The final requirements shall be coordinated on a project by project basis with Services Engineer to match the system design.

<table>
<thead>
<tr>
<th>Location</th>
<th>Electrical Requirements</th>
<th>Data Requirements</th>
<th>Typical AV Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV equipment racks</td>
<td>1 x 15 Amp captive outlet on dedicated circuit</td>
<td>4 x Data outlets</td>
<td>AV switching/processing equipment, Echo360, videoconferencing codec, AV control system.</td>
</tr>
<tr>
<td></td>
<td>1 x DGPO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectern</td>
<td>4 x DGPO within joinery</td>
<td>3 x Data outlets within joinery</td>
<td>Teacher’s computer and monitor, local AV switch, AV touch panel, Blu-Ray player, document camera, laptop etc.</td>
</tr>
<tr>
<td></td>
<td>1 x DGPO above joinery</td>
<td>1 x Telephone outlet</td>
<td></td>
</tr>
<tr>
<td>Teacher’s desk</td>
<td>4 x DGPO within joinery</td>
<td>4 x Data outlets within joinery</td>
<td>Teacher’s computer and monitor, local AV switch / distribution amplifier, AV touch panel, Blu-Ray player, document camera, laptop etc.</td>
</tr>
<tr>
<td></td>
<td>1 x DGPO above joinery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FPD, video/data projector location</td>
<td>1 x DGPO</td>
<td>2 x Data</td>
<td>Projector/ FPD, future AV receiver etc.</td>
</tr>
<tr>
<td>(standard installation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FPD, video/data projector location</td>
<td>2 x DGPO</td>
<td>2 x Data</td>
<td>Motorised lift, projector/ FPD, future AV receiver etc.</td>
</tr>
<tr>
<td>(motorised lift/mount)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorised projection screen</td>
<td>1 x GPO</td>
<td>1 x data</td>
<td>Motorised projection screen</td>
</tr>
</tbody>
</table>
The requirement or use of a dedicated AV Network Switch in any project shall be discussed and approved with the Collaborations Endpoints Team prior to inclusion and where required the University’s Network Operations Team. Where a dedicated switch is used, a single UoM LAN point must not have any more than 9 MAC addresses associated.

There are four key UoM Network configuration classifications for AV Projects at the University that are used/referenced in a given AV project.

- LS VLAN/1300 – Dedicated AV VLAN Network (most if not all AV equipment)
- MiTS/1400 – Digital Signage and devices requiring UoM User authentication
- Staff Mobility/1100 – Fixed IT Computing
- VoIP – In-Room Resource Phone

*ports are configured for PoE (802.3)

18.31 LECTERN / TEACHER’S DESK JOINERY

University standard lecterns shall be used in all lecture theatres and large teaching spaces. Smaller classrooms and seminar rooms may use standard mini-lectern or teacher’s desk, depending on the amount of AV equipment.

The standard lecterns provide an area on top of the bench for presenter’s notes/laptop, microphone(s), touch panel, PC monitor, document camera(s), wireless microphone charger(s) and input connections. It also includes sufficient space below the bench for University PC, and other AV switching equipment.

The standard lectern design can be modified to match the aesthetics to a limited extent. However changes to the design must not change the structural frame of the lectern and must be approved by Collaboration Endpoints staff prior to installation.

A floor duct or trench is required to carry electrical and AV wiring to the lectern. The duct must be compartmented to provide separation between services. Services must be terminated in floor boxes for mobile lecterns.

All AV equipment must be securely installed in an equipment rack within the lectern. Ventilation provided within the lectern must not be obstructed or covered. The lectern doors and access panels shall be secured with University standard TEC keys. Contractor must ensure that lecterns can be raised and lowered unimpaired.

A telephone shall be fixed securely in a position on the lectern where easily seen and usable without bending and where it does not interfere with the main flat surface of the lectern. Microphones must be fixed to lectern with tamperproof screws. Design and construction of the unit shall provide a well damped, rigid structure without excessive resonance.

Final joinery details shall be coordinated and approved by Collaboration Endpoints. UOM standard lectern designs are included in Appendix D.

18.32 AUDIO VISUAL EQUIPMENT STORAGE

The following AV equipment storage is required:

- AV equipment cupboard for ready access by presenters using the "LEC key", recessed completely into a wall at the front of the theatre, and utilising the international 19" rack mounting standard and readily accessible to service staff.
- AV systems and AV equipment racks shall be separately keyed under the "TEC key" for access by maintenance and technical staff.
- A dimmer cupboard usually adjacent to the switchboard outside the theatre, and never physically adjacent to the AV systems rack.

18.32.1 Ventilation

Ventilation shall be provided to maintain the temperature of all AV equipment within the manufacturer’s specifications. Ventilation requirements shall be determined by the Services consultant. Ventilation methods may include:
- Air inlets at low level and air outlets at high level must be provided to provide airflow through the rack, lectern, joinery or other relevant enclosure requiring ventilation.
- Ventilation slots or grilles shall be selected following consultation with the Architect.
- Natural convection or fan driven ventilation shall be provided to accommodate the heat load of the AV equipment requiring ventilation.
- Lighting dimmer cupboards will also require ventilation to maintain temperatures within the range of the dimmer manufacturer’s specification.

18.32.2 Power Supply

240V mains power on dedicated AV circuits are required for AV equipment, generally as follows:
- 15 Amp captive outlets for AV racks fitted with internal power rails.
- 10 Amp single or double GPOs for AV equipment

Specific requirements for each project are to be determined by the Services Consultant.

18.32.3 Dimensions of Equipment Cupboards

The internal cupboard enclosure usually provides a mounting surface for audio visual cable looms and ducts, power distribution conduits etc.

Adequate clearance must be provided for these services plus the actual metal rack frame. At least 150mm clear space is required behind the equipment rack frame, inside the cupboard.

Minimum internal dimensions for an equipment rack cupboard are 750mm x 650mm (depth x width).

Cupboard height varies with the size of the rack installation; however two common formats do occur:
- Typically the height is around 2100mm, allowing for installation of a full height (45RU) equipment rack.
- In the second case, the cupboard is much lower, usually no more than one metre high, often built with a bench top for use by presenters. In these cases the cupboard needs to be twice as wide, to allow for installation of two half height rack frames.

18.32.4 Access to Equipment

The rack shall be mounted on wheels to allow rack removal for service and the lecture theatre floor and the rack cupboard floor must be continuous. If the equipment is housed in two racks, there must be sufficient length of cable connection between the two racks to allow one of the two racks to be brought out alone.

All rack cupboard doors are fitted with the TEC key lock for technician access to remove/repair equipment and LEC key lock for user access to operate equipment.
18.32.5 **Cantilevered Cupboards and Bio-Boxes**

Projector cabinets and such shall not be cantilevered out from walls. This creates a safety hazard in terms of people knocking their heads, and in terms of people hanging on them. All cabinet work shall be taken down to the floor, not supported from walls.

18.32.6 **Lighting Inside Cupboards**

Light sources shall be located in a shielded position inside the projector cabinets or cupboards which activates when the access door is opened.

Rear projection rooms require adequate shielded lighting for operators.

All equipment racks require adequate internal lighting for technical staff.

18.32.7 **Dimensions and Location of Projection Room**

Sufficient height is required to clear audience heads and sufficient room is required for a bench for video/data projectors.

18.32.8 **Acoustic Isolation**

The Dimmer cupboard and rear projection room must be acoustically insulated to prevent dimmer or projector noise from disturbing lectures.

18.32.9 **Doors**

The front door of a recessed cupboard has conventional hinges and with the door closed, the cupboard door face is flush with the wall.

18.32.10 **AV Equipment Rack**

The AV Equipment Rack shall house all AV switching and processing equipment and thus be appropriately sized. The 19" AV equipment racks shall meet the following specifications:

- 540mm wide x 540mm deep
- Sized to accommodate equipment plus 20% spare capacity in AV cupboards
- Complete with 19" patch panels for termination of AV cabling
- Vertical and horizontal patch-lead management
- 1 x 8 way vertical power strip fitted with captive plug tops
- 1 x 8 way vertical power strip for switched power, connected to output of the power controller
- Power surge protection
- 2 x 100mm cable trays fitted to the inside of the equipment rack
- Fix the power controller to one of the cable trays
- Install manual reset button to be configured with power controller
- Allow for security panels as shown on the drawings
- Lockable doors and side panels
- Heavy duty castors to allow rack to be pulled out of cupboard for servicing.
- Shall be of reputable local manufacture

The colour finish and labelling of the cabinets shall be approved by Collaboration Endpoints.
Seminar rooms, Professional spaces and other small teaching spaces shall be provided with 19” rack strips installed within teacher’s desk, in place of dedicated equipment racks. The size of rack strips shall be selected to accommodate equipment.

Detailed shop drawings shall be submitted for approval prior to manufacture, indicating the layout and labelling of the patch panels.

18.33 LECTURE CAPTURE

The University of Melbourne Lecture Capture System is a central recording system that records and distributes audio and visual content from lecture theatres and other teaching spaces. The audio visual content is captured, encoded, stored on a central server and delivered over the University network via dedicated portal and a network connection to a dedicated VLAN.

The Lecture Capture System requires a dedicated video input from the theatre video switch and a dedicated audio feed from the theatre digital audio processor connected to the balanced audio inputs.

The audio feed shall be a combined mix of both microphone and source audio inputs terminated into the stereo phoenix connectors. PA / program audio touch panel controls shall not affect the level to the capture appliance. It will have a constant audio feed.

The video input to the Lecture Capture is HDMI and is split from the primary display (left projector in a dual projection room), however in some spaces a HDMI video output is also provided from a camera installed within the theatre. Video feed must be 720p or 1080p.

The touch panel control system installed within the theatre shall include a dedicated page for Lecture Capture Systems to monitor, pause and stop recordings (see appendix A). Control system must post-fade/mute audio feed when recording is paused or stopped. System shall have remote powering on/off capabilities for new devices.

The Echo 360 System must be installed securely within the AV equipment rack.

18.34 DIGITAL SIGNAGE

Digital signage systems provided within the University shall be network enabled and be integrated with the centrally managed Samsung digital signage platform.

Each project will be required to determine the following:

- Number and type of displays and player hardware
- Number of content administrators / authors
- Content management policy
- Network storage

Design and deployment of all digital signage systems must be coordinated with Collaboration Endpoints.

Digital Signage commissioning sheet to be sent to Collaboration Endpoints once screen is installed.

18.35 OVERFLOW

Selected theatres shall be provided with over flow displays (FPDs / projection systems) in the foyer area outside. Overflow displays are used in special circumstances when the theatre does not have enough seating capacity within the venue.
Nominated theatres must be provided with PTZ camera(s) within the theatre that can capture and display the presenter to the overflow display. Additionally, a dedicated feed from the video matrix switch must also be provided so that the overflow display can replicate the same content shown on the primary projection system within the theatre.

The size of the overflow display and installation locations shall be confirmed with Collaboration Endpoints.

### 18.36 MEDIALINKS

Selected theatres shall be provided with media outlets to allow external parties, such as news services, to connect for recording purposes. Additionally, audio visual links shall also be provided to adjacent theatres to allow media and other external parties to view lectures.

The specific number of connections and the number of links required shall be confirmed with Collaboration Endpoints.

### 18.37 AV Links

The following links, if available, must be transmitted to adjacent theatres:

- HDMI video content from primary projector
- Video from PTZ camera
- Combined audio from digital audio processor. Audio shall be a mix of source and microphone.

### 18.38 Media Connection

As a minimum, media outlet shall consist of the following connections:

- 4 x Male XLR connections for microphones
- Female XLR connections for microphones
- BNC connections for video if required

### 18.37 LIGHTING

#### 18.37.1 Lighting Levels

Lighting levels within teachings spaces must comply with the minimum requirements as nominated in the Property Services standards.

#### 18.37.2 Integration

AV Contractor shall coordinate with electrical contractors to integrate lighting systems with the AV control system. The electrical contractor shall be responsible for providing and installing lighting dimmers along with an RS232/RS485 interface.

As a minimum the AV contractor shall provide the following lighting pre-sets:

<table>
<thead>
<tr>
<th>Pre-set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>All lights turned off (excluding lectern light, emergency lights and aisle lighting)</td>
</tr>
<tr>
<td>ON</td>
<td>All lights on</td>
</tr>
</tbody>
</table>
### Videoconferencing System

The University currently deploys videoconferencing systems to selected teaching and professional spaces. Each teaching space shall be designed in consultation with Collaboration Endpoints to meet the User Groups requirements. The AV Consultant shall consider and coordinate the following aspects of the room:

- Lighting
- Lighting control
- Furniture selection
- Interior design (wall colour, carpets, curtains etc.)
- Acoustics
- Wireless network coverage
- Wired network bandwidth and capacity (to be coordinated with Information Technology Services)

#### Codec Based Systems

Codec based systems are no longer deployed. Liaise with Collaboration Endpoints staff to confirm requirements.

#### Web-conferencing

Small meeting rooms, huddle spaces and selected teaching spaces may be provided with a web-conferencing system that is configured to operate via software pre-loaded onto a resident PC. Web-conferencing systems provided to the University must comply with the following:

- Web-conferencing software must be Zoom or Skype for Business/ MS Teams cloud based application linked to the University’s existing account/subscription.
- IP enabled and configured to operate over the University LAN
- H.323/SIP compliant with provision to connect to multiple endpoints
- Support H.264, H.239, H.235, and G.722 protocols
- Capacity to support content collaboration for concurrent video and content streams.
- Full control via GUI software
- USB camera and microphone(s)
- Huddle and Meeting spaces up to 12 people will require cameras that are Zoom / Skype for Business / MS Teams compatible, controlled via software.

<table>
<thead>
<tr>
<th>AV</th>
<th>Stage lighting directed at the front of the theatre is turned off to reduce any glare on the projection surface. Theatre lighting reduced to 40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
<td>Stage light turned on. Theatre lights reduced to 40%</td>
</tr>
</tbody>
</table>
Practical completion will be granted when the following minimum requirements have been fulfilled by the AV Contractor:

- Completed IP Data Sheet has been submitted to Collaboration Endpoints
- System has been tested and commissioned
- System has been inspected by Collaboration Endpoints and the AV Consultant and has been deemed to be operational and practically complete
- Serial numbers of all new equipment has been submitted to Collaboration Endpoints
- All documentation has been approved by the AV Consultant and submitted to Collaboration Endpoints
- All control system source codes have been handed over to Collaboration Endpoints and become the intellectual property of the University
- Interface testing to the Extron GVE system has been successfully completed
- All training has been completed
- All accessories, software, fly-leads and remote controls have been handed over to Collaboration Endpoints. All packages of information handed over to Collaboration Endpoints shall be scheduled in a transmittal, copied to the Project Services project manager and AV Consultant
- Notice of Practical Completion issued by AV Consultant

The issuance of a Notice of Practical Completion by the AV Consultant is contingent upon the rectification of any installation defects by the AV Contractor. Installation defects are classified as follows:

<table>
<thead>
<tr>
<th>Severity</th>
<th>Characteristics</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical</td>
<td>Space is unable to be used, no workaround exists</td>
<td>Network not active for computers Displays not working User interface not working OHS related issues</td>
</tr>
<tr>
<td>Major</td>
<td>Functionality is limited or contains significant performance issues. A workaround can be temporarily implemented to allow use of space.</td>
<td>Some sources not working Lighting pre-sets not finalized No source audio present Some components not supplied Performance issue may include poor audio quality, distorted video signal</td>
</tr>
</tbody>
</table>
The priority of these installation defects are further categorised as follows:

<table>
<thead>
<tr>
<th>Priority</th>
<th>Characteristics</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Immediate | Defect to be resolved asap to be able to proceed with delivery of space | OHS Issues  
Critical Defects |
| Urgent    | Defects to be resolved prior to high, normal and low defects | Major Defects                       |
| High      | Should be fixed as soon as possible                  | Major and Minor Defects              |
| Normal    | To be resolved once higher priority defects have been attended to | Minor Defects                       |
| Low       | Fixing may be deferred until a later period          | Trivial Defects                     |

**18.40 DOCUMENTATION AND SUBMISSIONS**

As a minimum the following documentation shall be submitted to Collaboration Endpoints:

- Installation manuals with full description of the installed system including maintenance requirements
- Operational manual with clear and concise description on how to operate the AV system
- Quick reference guide. A one-page summary, briefly describing the basic operation of the AV system for each room using a UoM provided template.
- Equipment manuals of all equipment installed
- Details of equipment manufacturers and distributors
- As-built drawings including the following:
  - Audio schematic
  - Video schematic
  - Control system schematic
  - Floor plans, elevations and sections of teaching space indicating equipment locations, mounting heights and installation detail, including hearing loop layout if present.
  - Cabling schedule
- Serial numbers and MAC addresses of all equipment provided
- Commissioning test results (See Appendix C for template)

Contractors must provide an electronic copy of all documentation in PDF format via email or shared via cloud based platform.

18.41 TRAINING

Contractors shall allow for a minimum of 2 training sessions for each teaching space. An operator training course and a technical training course shall be provided.

The operator training course shall include but not be limited to training of the following systems:
- Basic operator principles of the system
- Operating principles of video, audio and control system equipment and functions
- Practical training in the operation of each function of the control system
- Equipment locations and operation

The technical training course shall include, but not be limited to, training of the following systems:
- Overall principles of operation of the AV System with specific emphasis on the installed system
- Basic operator principles of the system
- Operating principles of video, audio and control system equipment
- Practical training in the operation of each function of the control system
- Equipment locations and operation
- Maintenance and fault finding procedures
- Fault simulation for practical training in fault finding procedures

Training is to be formally structured. A training program, syllabus and personnel assessment format shall be provided prior to commissioning for approval. Training shall be provided prior to the issue of final certificate of the works.

Additional training courses may be requested by Collaboration Endpoints or the User Group.
APPENDIX A  STANDARD TOUCH PANEL AND KEYPAD LAYOUTS

Start Up

Touch Here
To Activate Equipment

System Waiting

System is not ready.
Please wait.
Document Camera

Lecture Recording
Lecture Recording stop

System Shutdown
Password for technical page access

### Displays

<table>
<thead>
<tr>
<th>CWE Name</th>
<th>Connection</th>
<th>Hours</th>
<th>T-takt</th>
<th>Lift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CWE Name</th>
<th>Connection</th>
<th>Hours</th>
<th>T-takt</th>
<th>Lift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Other Devices

<table>
<thead>
<tr>
<th>CWE Name</th>
<th>Connection</th>
</tr>
</thead>
</table>

#### Technical Page

- **Radio Mics**
  - CWE/TS Name: 
  - Connection: 
  - Battery: 
  - Frequency: 
  - Squelch: 

- **Motion Detectors**
  - Time Period: 800 minutes
  - Status: 

---

Design Standards
Section 20: AV – March 2019
*Button labels will differ on a project by project basis. Contractors must confirm labels with Consultant prior to commissioning.
## APPENDIX B  
APPROVED AV EQUIPMENT MANUFACTURERS

<table>
<thead>
<tr>
<th>EQUIPMENT / DEVICE</th>
<th>MANUFACTURER</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projector</td>
<td>Sony</td>
<td>VPLFHZ58 or to meet project requirements</td>
</tr>
<tr>
<td>Large Venue Projector</td>
<td>Sony</td>
<td>VPLFHZ700</td>
</tr>
<tr>
<td></td>
<td>Panasonic</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td>Interactive Short Throw Projector</td>
<td></td>
<td>Consult with Collaboration Endpoints</td>
</tr>
<tr>
<td>Interactive Flat Panel Display</td>
<td>NEC</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td></td>
<td>Hitachi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Samsung Flip</td>
<td></td>
</tr>
<tr>
<td>Flat Panel Displays</td>
<td>NEC</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td></td>
<td>Panasonic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Samsung</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sony</td>
<td></td>
</tr>
<tr>
<td>FOH Speaker</td>
<td>Bose</td>
<td>Panaray 402</td>
</tr>
<tr>
<td></td>
<td>JBL</td>
<td>Control 23, Control 25, Control 28</td>
</tr>
<tr>
<td>Ceiling Speaker</td>
<td>JBL</td>
<td>Control 24CT, Control 26CT</td>
</tr>
<tr>
<td>Pendant Speaker</td>
<td>JBL</td>
<td>Control 60, Control 67, Control 65</td>
</tr>
<tr>
<td>PTZ Camera</td>
<td>Sony</td>
<td>SRG300, SRG120DU</td>
</tr>
<tr>
<td>Document Camera</td>
<td>Wolf Vision</td>
<td>WOLVZ8L4, WOLVZ3</td>
</tr>
<tr>
<td>Wireless Presentation System</td>
<td></td>
<td>Consult with Collaboration Endpoints</td>
</tr>
<tr>
<td>Boundary Microphone</td>
<td>Beyerdynamic</td>
<td>PMC65VC</td>
</tr>
<tr>
<td>Wireless Handheld Microphone</td>
<td>Sennheiser</td>
<td>SL Handheld Set DW-3-AU R</td>
</tr>
<tr>
<td>Wireless Lapel Microphone</td>
<td>Sennheiser</td>
<td>SL Lavalier Set DW-3-AU R</td>
</tr>
<tr>
<td>Wireless Microphone Charging Bay</td>
<td>Sennheiser</td>
<td>CHG 2 or CHG 4N</td>
</tr>
<tr>
<td>Ceiling Microphone</td>
<td>Shure</td>
<td>MXA910</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MX202</td>
</tr>
<tr>
<td>AV Switch</td>
<td>Extron</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td>Twisted Pair Extenders</td>
<td>Extron</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td>EQUIPMENT / DEVICE</td>
<td>MANUFACTURER</td>
<td>MODEL</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>AV Control System Processor</td>
<td>Extron</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td>Touch Panel</td>
<td>Extron</td>
<td>TLP Pro series – 10”</td>
</tr>
<tr>
<td>Wireless Touch Panel</td>
<td>Consult with Collaboration Endpoints</td>
<td></td>
</tr>
<tr>
<td>Keypad</td>
<td>Extron</td>
<td>MLC Plus Series</td>
</tr>
<tr>
<td>Digital Audio Processing</td>
<td>Biamp</td>
<td>Nexia, AudiaFlex, Tesira</td>
</tr>
<tr>
<td></td>
<td>Extron</td>
<td>DMP Series</td>
</tr>
<tr>
<td></td>
<td>Shure</td>
<td>P300, ANIUSB when using MXA910</td>
</tr>
<tr>
<td>VC Codec</td>
<td>-</td>
<td>(confirm with LSS)</td>
</tr>
<tr>
<td>Audio Amplifier</td>
<td>Yamaha</td>
<td>P2500</td>
</tr>
<tr>
<td></td>
<td>Extron</td>
<td>MPA152, XPA1002, XPA2001, XPA2002</td>
</tr>
<tr>
<td></td>
<td>Crown</td>
<td>XLI series, XLS series</td>
</tr>
<tr>
<td>Hearing Induction Loop</td>
<td>Ampetronics</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td>IR Hearing Systems</td>
<td>Sennheiser</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td>Digital Signage</td>
<td>Samsung</td>
<td>Magic Info (Consult with Collaboration Endpoints)</td>
</tr>
<tr>
<td>AV Network Switch</td>
<td>Netgear</td>
<td>GS108* (Consult with Collaboration Endpoints)</td>
</tr>
<tr>
<td>Projector Mounts</td>
<td>Ultralift</td>
<td>Spyder UOM Custom</td>
</tr>
<tr>
<td>LCD Mounts</td>
<td>Ultralift</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td></td>
<td>Vogel</td>
<td></td>
</tr>
<tr>
<td>Projector Lift</td>
<td>Ultralift</td>
<td>UOM Custom Unilift 2 (to meet project requirements)</td>
</tr>
<tr>
<td>Projection Screen</td>
<td>Screen Technics</td>
<td>(to meet project requirements)</td>
</tr>
<tr>
<td>Racks (Frame)</td>
<td>Elgee</td>
<td>ZipRacks</td>
</tr>
<tr>
<td>Racks (Cabinet)</td>
<td>MFB</td>
<td>2005 Series</td>
</tr>
<tr>
<td>USB Cameras</td>
<td>Logitech</td>
<td>HD Pro Webcam C930, MeetUp, Pro PTZ 2</td>
</tr>
<tr>
<td>USB Microphone</td>
<td>ClearOne</td>
<td>Chat 150 / Chat Attach</td>
</tr>
<tr>
<td>USB Scaling Bridge</td>
<td>Extron</td>
<td>MediaPort 200</td>
</tr>
<tr>
<td>Lectern</td>
<td>Lectern Hub</td>
<td>UOM Custom</td>
</tr>
<tr>
<td>Room Booking Panel</td>
<td>(Consult with Collaboration Endpoints)</td>
<td></td>
</tr>
</tbody>
</table>
## Project Details

**UOM Project BR Reference:**

- **Project Name:**
- **Building Address:**
- **Room No./Space:**
- **AV Contractor**
  - **AV Contractor's Project Manager:**
  - **AV Contractor's Commissioning Manager:**
- **Date of Commissioning:**

**Notes:**

---

## Input Devices

<table>
<thead>
<tr>
<th>Item</th>
<th>Tested</th>
<th>Comments / Notes</th>
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</thead>
<tbody>
<tr>
<td>Installed PC / iMac</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>Video</td>
<td>□</td>
</tr>
<tr>
<td>Laptop Plate Connection</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>Video</td>
<td>□</td>
</tr>
<tr>
<td>DVD/ Blu-Ray Player</td>
<td>Audio</td>
<td>□</td>
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<tr>
<td></td>
<td>Video</td>
<td>□</td>
</tr>
<tr>
<td>Document Camera</td>
<td>Video</td>
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### Video Conferencing System

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<tr>
<td>Video</td>
<td>Video</td>
<td>□</td>
</tr>
<tr>
<td>Audio</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>AEC</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Boundary Microphone</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td>Wireless handheld Mic</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td>Wireless Lapel Mic</td>
<td>Audio</td>
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### Output Devices

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<tr>
<th>Item</th>
<th>Tested</th>
<th>Comments / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video/Data Projector</td>
<td>Video</td>
<td>□</td>
</tr>
<tr>
<td>LCD Panel</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>Video</td>
<td>□</td>
</tr>
<tr>
<td>Echo System</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>Video</td>
<td>□</td>
</tr>
<tr>
<td>Front of House Speaker</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td>Ceiling Speakers</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td>Hearing Augmentation Sys.</td>
<td>Audio</td>
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</table>

Hearing induction loop system compliance certificate provided as per AS1428.5-2010  Yes/No

### Control System

<table>
<thead>
<tr>
<th>Item</th>
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<th>Comments / Notes</th>
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<tbody>
<tr>
<td>AV Switching</td>
<td>Audio</td>
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<tr>
<td></td>
<td>Video</td>
<td>□</td>
</tr>
<tr>
<td>Audio DSP</td>
<td>Levels</td>
<td>□</td>
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<tr>
<td></td>
<td>Quality</td>
<td>□</td>
</tr>
<tr>
<td>DVD/Blu-Ray Player</td>
<td>Audio</td>
<td>□</td>
</tr>
<tr>
<td>Item</td>
<td>Tested</td>
<td>Comments / Notes</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------</td>
<td>------------------</td>
</tr>
<tr>
<td>Video</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Play</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Stop</td>
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<td></td>
</tr>
<tr>
<td>Fwd/Rev</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Next/Prev</td>
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<td></td>
</tr>
<tr>
<td>Menu</td>
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<td></td>
</tr>
<tr>
<td>Navigation</td>
<td>□</td>
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</tr>
<tr>
<td>Enter</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Vol +/-</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td><strong>Projector Lift</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up/Down</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>OFF</td>
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<td>AV</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>Pres</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td><strong>Control System</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shutdown</td>
<td>□</td>
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</tr>
<tr>
<td>Reset</td>
<td>□</td>
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</tr>
<tr>
<td>Helpdesk</td>
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<td></td>
</tr>
<tr>
<td>RMS</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td><strong>Touch Panel</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Layout</td>
<td>□</td>
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<tr>
<td>Icons</td>
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<td></td>
</tr>
<tr>
<td>Labels</td>
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</table>

**Other**

<table>
<thead>
<tr>
<th>Item</th>
<th>Tested</th>
<th>Comments / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Contractor to specify)</td>
<td>□</td>
<td></td>
</tr>
<tr>
<td>(Contractor to specify)</td>
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<td></td>
</tr>
<tr>
<td>(Contractor to specify)</td>
<td>□</td>
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<tr>
<td>Building Number</td>
<td>Building Name</td>
<td>Room Name/Type</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UNIVERSITY OF MELBOURNE SIGNAGE

REMOVABLE LOGO PANEL TO PROVIDE ACCESS TO RACKING FROM FRONT
950.87 TO ACTUATOR BUTTONS (CENTRED)

160.00 (3.3RU)

PENCIL DRAWER
A(1:1)

LOGO PANEL TO BE ATTACHED ON BOLTS
### APPENDIX F  DIGITAL SIGNAGE COMMISSIONING SHEET

**UNIVERSITY OF MELBOURNE**  
SAMSUNG MAGIC INFOR - DIGITAL SIGNAGE SETUP

**Job Name:**

**Date:** ______________________________________________________________________

**Completed By:** ______________________________________________________________________

Connect LCD to the LAN port on the wall.  
**NOTE THE LAN PORT NUMBER HERE:** ______________________________________________________________________

<table>
<thead>
<tr>
<th>WIRED CONNECTION</th>
<th>Confirmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Press the <strong>MENU</strong> button on the remote control.</td>
<td></td>
</tr>
<tr>
<td>2 Select <strong>Network</strong> - Open Network Settings.</td>
<td></td>
</tr>
<tr>
<td>3 Select <strong>Wired</strong>, – The network test screen appears and then the verification process starts.</td>
<td></td>
</tr>
<tr>
<td>4 When the connection has been verified, select <strong>OK</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NETWORK STANDBY</th>
<th>Confirmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Press the <strong>MENU</strong> button on the remote control.</td>
<td></td>
</tr>
<tr>
<td>2 Select <strong>System</strong> - Open <strong>System Settings</strong>.</td>
<td></td>
</tr>
<tr>
<td>3 Select <strong>Power Control</strong></td>
<td></td>
</tr>
<tr>
<td>3 Select <strong>Network Standby</strong> – ensure this is <strong>ON</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONNECT TO SERVER</th>
<th>Confirmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Press the <strong>MENU</strong> button on the remote control.</td>
<td></td>
</tr>
<tr>
<td>2 Select <strong>Network</strong> - Open Network Settings.</td>
<td></td>
</tr>
<tr>
<td>3 Select <strong>Server Network Settings</strong></td>
<td></td>
</tr>
</tbody>
</table>
| 3 Select **Connect to Server**  
Enter :::: 172.24.80.81 | | |

<table>
<thead>
<tr>
<th>LCD INFO</th>
<th>Confirmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Press the <strong>MENU</strong> button on the remote control.</td>
<td></td>
</tr>
<tr>
<td>2 Select <strong>Support</strong></td>
<td></td>
</tr>
<tr>
<td>3 Select <strong>Contact Samsung</strong></td>
<td></td>
</tr>
<tr>
<td>Advise all the Relevant Data:</td>
<td></td>
</tr>
<tr>
<td>Serial Number: ______________________________</td>
<td></td>
</tr>
<tr>
<td>WIRED MAC Address (not wireless): _____________________________</td>
<td></td>
</tr>
</tbody>
</table>