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Document Objectives

- To establish a set of standards when used in a coherent structured way provides a parity of delivery across all campuses of pedagogically sound teaching and learning environments. AV infrastructure must be reliable, consistent and intuitive for users to access room functionality via a “touch panel”.
- It is expected that all audio visual provisioning at Massey University will consider these guidelines, and if they are inappropriate, any exceptions and support arrangements will be agreed to and documented.

Document Review

- This document will continue to be updated and resubmitted to GTRAG to reflect any changes in pedagogy and/or technology.
- The latest version of these Audio Visual Guidelines and related documents are published on the Massey University ITS Audio Visual web page or may be obtained through your GTRAG representative or the ITS Help Desk.

Related Documents

- General Teaching Rooms Technology Levels approved by GTRAG 20120518.docx
- Massey University Brief to External AV Contractors approved by GTRAG 20120518.docx
Audio Visual Guidelines

Rich Media Access Points

• Rich Media Access Points (RAPs) can be added to a GTRAG Level THREE, FOUR or FIVE general teaching room, but not to level two or below, based on the specifications below.

Video Linked Teaching

• Video Linked Teaching Capability can be added to a GTRAG Level FOUR or Level FIVE general teaching room, but not to level three or below, based on the video conferencing specifications below.

Video Conferencing

• Video conferencing codec:
  o Far-end camera remote control
  o TCP/IP connectivity
  o H.323 and SIP calling support
  o H.264 and H.239 protocol support for video and presentation data.
  o Interoperability with Massey University’s default bridging service, currently the REANnz Video Conferencing Service (commonly known as the KAREN Bridge)
  o Multisite bridge capability (minimum 4-way).
  o Individual transcoding to each participant.
  o Configurable video compositing features.
  o Individual video compositors for each output and each encoder.
  o Multiple display (minimum 2) output capability.
  o Minimum 1080p 60Hz resolution.
  o Dual channel (H.239) data presentation capability.
  o Minimum 2 simultaneously active camera inputs.
  o Minimum 2 echo-cancelling microphone inputs.
  o Audio input from other room devices.
  o Presence information and video conferencing available through Microsoft Lync Unified Communications service.
  o RS-232 bidirectional control of Codec by AV controller.
  o Audience microphone to fit the purpose and size of the room

• Camera 1 - Presenter:
  o Minimum 1080p 60Hz resolution
  o Pan-Tilt-Zoom (PTZ) controls remotely operable by the presenter and/or facilitator (if present)
  o Camera positioned to allow for closely cropped image of presenter.
  o Ability to show a wide angle view of all participants in the room at once.

• Camera 2 – Audience:
  o Minimum 1080p 60Hz resolution.
Pan-Tilt-Zoom (PTZ) controls operable by the presenter and/or facilitator (if present)
Camera positioned to allow for closely cropped image of each group of participants
    (capability to zoom in on a table)
Camera positioned to allow for closely cropped image of each group of participants
    (capability to zoom in on a table)
Capability to zoom in on an individual on any table
Ability to show a wide angle view of all participants in the room at once

- Presenter’s monitor
  - A presenter is able to view a screen, or projected image showing their transmitted
    image.
- Integration into touch panel control allowing preset camera positions, address book and
  codec functions to be selected.
- The following devices may be connected as inputs to the video conferencing codec:
  - Document camera
  - Digital media player (e.g. Blu-ray/DVD player)
  - Resident computer (video and audio)
  - Laptop computer (video and audio)
- Themed (Zoned) lighting, with scenarios optimized for presentation mode and interactive
  mode video linked teaching.

**Document Camera/Visual Presenter**
- Camera Resolution native Minimum 1024 x 768 CCD pixels.
- Power zoom lens x 6 Minimum.
- Minimum 12.7mm (½") 1.5mega pixel progressive scan CCD imaging device.
- 15 frames per second frame scanning rate min.
- RS-232 bidirectional control.
- Located on the lectern.
- Preview of the viewed image available on the Touch Panel – if > 254mm (10”).
- Secured by a Kensington slot lock, padlock and cable system or similar especially for the
  Lumens model DC-265.
- HDMI output.
- Adjustable lights and image head.
- Visual presenter to have control over upper and lower lights.
- Full control from Touch Panel of all on-board visual presenter “user” controls.

**Note:** If higher levels of colourimetry are required, a Samsung visual presenter should be considered

**Blu-ray/DVD/CD Player**
- Shall play CD and DVD media:
  - Multi zone.
  - Multi standard – i.e. PAL, NTSC & SEACAM.
  - RS-232 bidirectional control.
  - 19” rack mountable.
  - Y Pb/Cb Pr/Cr Component output.
  - Composite video output for touch panel “preview function”.
  - HDMI output – preferred.
- Blu-ray:
  - RS-232 bidirectional control.
  - 19” rack mountable.
  - HDMI output, HDCP compliant.
  - Composite video output for touch panel “preview function”.
**Over Head Projector - OHP**

- OHPs are now obsolete technology with service components harder to source and new units unable to be purchased.
- Equipment will be maintained as long as possible but will need to be decommissioned at a date to be specified depending on manufacturer stock levels.
- Accordingly, OHP devices need to be phased out and replaced with current technology with equivalent functionality.
- Users should aim to get their transparencies transferred to digital media.

  It is understood that OHPs are also used for other purposes such as to provide dual or additional projection, and trials using a document camera with a dedicated display surface have been successfully initiated.

**35mm Slide projector**

- No longer manufactured.
- Equipment will be maintained where possible until decommissioned at a date to be specified depending on manufacturer stock levels.
- Service components generally unavailable.
- Users should have any 35mm slides transferred to digital media.

**S-VHS & VHS Players**

- No longer manufactured.
- Equipment will be maintained where possible until decommissioned at a date to be specified depending on manufacturer stock levels.
- Users should transfer material on S-VHS, VHS-C or VHS media to digital media.

**Projector**

- Mid-range “installation” grade 3 chip LCD panel projectors with optional lenses to suit throw distance and display screen size requirements.
- Mounted in a projection booth or if no suitable booth then be ceiling mounted (easy & safe access for servicing is mandatory).
- 24/7 security – see Campus Security Section, Facilities Management.
- 4,000 ANSI lumen output min.
- RS-232 bi-directional control.
- Min contrast ratio 500:1.
- Min 2,000 hour lamp life.
- Comprehensive remote monitoring i.e. over temp, lamp hours, filter hours, lamp failure input select.
- Vertical and horizontal lens shift.
- Projector must be physically mounted at right angles to the display screen and align with the top of the screen image.
- Native resolution - no less than 1280 x 800 pixels 16 x 10 aspect ratio. Note those projectors with a native 1024 x 768 pixel 4:3 aspect ratio, may have limited support available.
- Low noise rating, less than 42dBA.
- Projector will be located so that the required image size is produced with the zoom lens in its mid-zoom position.
- HDMI input to be a min version 1.3A or later. HDCP compliant – to be enabled or dis-abled depending on the input signal.
- To be optimised for computer generated images – i.e. must have the ability to feed a resolution at the projectors native resolution via a digital input.
• Have the ability to feed a HDMI feed directly to the projectors native resolution without scaling.
• Easy lamp replacement and air filter cleaning without removing projector from its mount.
• Mains power to power projector to be “star fed” from the lectern.
• Mains switched outlet to be mounted below the ceiling tile.

Interactive White Board c/w projector

• Minimum 1280 x 800 image resolution (16:10 aspect ratio).
• Computer or network interface allowing collaborative interaction with at least one other interactive board.

Interactive DisplayPanel

• To be evaluated for use in a collaborative space

Programme Sound Amplifier and Speakers

• Left and right front-of-house (FOH) speakers located either side of display screen.
• Amplifier will accept the following Stereo sources:
  o DVD or Blu-ray.
  o VCR – if fitted.
  o Resident PC.
  o Laptop computer – including HDMI, Display Port ++ or Display Port with digital sound embedded, or analogue sound breakout via L/R RCA input sockets.
• Composite Video AUX panel input.
• Amplifier to be 19” rack mounted.
• Consider heat emitted from amplifier at standby and operational output levels.
• Ensure all active level controls and I/O is labelled.
• Use balanced inputs – XLR connector wired with pin 2 hot, or the in phase signal.
• Wattage dependant on room coverage requirement and noise floor SPL.
• 8 Ohm speaker input impedance.
• High quality sound reproduction.
• Speakers to be mounted at either end of motorised projection screen at a 30 degree tilt down from the horizontal.
• Frequency response 30Hz to 20kHz +/- 3dB.
• Amplifier must be able to provide a Sound Pressure Level (SPL) of 85dBA in the room centre without any hum, distortion or audible noise.
• 0 dBu = 0.775 Vrms, 0 dBV = 1 Vrms, 0 dBV ≈ 2 dBu.
• There is no general standard for music, but for movies, an average level of 85 dB SPL with 20 dB of headroom is considered “best practice”. The programme sound amplifier and speaker systems should be designed and calibrated to this reference.

Speech Reinforcement Amplifier and Speakers

• Amplify the following sources:
  o White board surface barrier microphone (SMB) AKG.
  o Lectern gooseneck microphone – AKG.
  o Radio microphone – lapel – TOA or MiPro.
  o Radio Microphone – handheld – optional – TOA or MiPro.
• 100v line output – amplifier power RMS rating depends on No. of ceiling mount speakers, and their wattage setting. Speaker wattage setting to be available when in their mounted configuration.
• 19” rack mounted.
• Consider heat emitted from amplifier at standby and at operational output levels.
• Ensure all active level controls and I/O ports are labelled.
• Must be able to provide a SPL (Sound Pressure Level) of 72dBu in the room centre without any hum, distortion or audible noise. A 0dBu source shall produce a room level of 72dBu +/- 3dB.
• Use balanced inputs – XLR connector wired with pin 2 being the “hot” or “in phase” signal.
• Speakers to be ceiling mounted and be a min of 8” in diameter.
• Feature a multi power (watts) selection that is accessible from below ceiling.
• Sound coverage over the area where students are seated should be within 6dB six octave bands 250Hz to 8Khz.
• Frequency response 90Hz to 9kHz +/- 3dB.
• 0 dBu = 0.775 Vrms, 0 dBV = 1 Vrms, 0 dBV ≈ 2 dBu.

For further reading please access the following document: ANSI/INFOCOMM 1M-2009.

Notes:
• **Sound pressure level** (SPL) is a logarithmic measure of the effective sound pressure of a sound relative to a reference value. It is measured in decibels (dB) above a standard reference level. The commonly used “zero” reference sound pressure in air is 20 µPa RMS, which is usually considered the threshold of human hearing (at 1 kHz).
• **Speech Transmission Index** (STI) is a measure overall acoustic performance in teaching and learning space. A STI of .7 is considered a minimum, the higher the better – 1 being excellent.

**Digital Sound Processor (DSP)**
• Microphone and Line input levels and phantom power options.
• All I/O ports balanced.
• DriveRack, BiAmp or ClearOne are the preferred options.
• RS-232 bi-directional control port.
• Provide feedback control.

**Lighting – General**
• Generally there are several possible lighting configurations in most teaching and learning environments:
  o Main environment lighting – no less than 500 lux as measured vertically on the top of the student’s desk.
  o White board area – no less than 500 lux – must have an even “wash” of light over the entire whiteboard surface.
  o Speaker area.
  o Lectern area.
  o Full control over lighting levels by user.

  **Note:**
• **LUX**: A unit of illumination equal to 1 lumen per square meter equals 0.0929 foot candle.

**Lighting – LED and DALI**
• Standards to be available soon.
Resident Computer
- Currently a HP Small Form Factor (SFF) PC. The image is managed by the Image Team, part of Customer Services Section, ITS.
- Windows 7 is the operating system, or current version.
- Audio output is a 3.5mm stereo female connector with the internal speaker disabled.
- Video Display Port++ format (DP) and also an analogue feed is available on a DB15 connector, both are available concurrently.
- One 10/100 network connection is required.
- Computer to be set to output either 1024 x 768 for 4:3 aspect ratio or 1280 x 800 for a 16:10 aspect ratio (wide screen) depending on environment projector display device.

Rich Media Access Points
- Rich Media Access Point (RAPS) have been installed and used for the Mediasite trial in pilot production and revised for the Rich Media Learning project which started in late 2013.
The RAPs enable easy, robust “plug and play” audio and video connections for multi media recording by portable Mediasite units and other multi media technology.

Assistive Listening
- “Anti-spill” design - -40dBA at 3 to 4 x width.
- Provide an acceptable coverage for users.
- Low background “noise floor” as per AS60118-4 -32dBA or better.
- Noise should not affect intelligibility.
- Flat frequency response.
- Good signage.
- Field strength 400mA/m sine wave @ 1kHz.

For further reading please access the following document: AS60118.4-2007 and AS/NZS2107-2000.

Door ON/OFF Push Button Assembly
- A non-latching dual RED push buttons mounted on a signal PDL flash plate. The top button is labelled ON; the bottom is labelled “ROOM OFF”. Both buttons are illuminated by a LED lamp, 24v DC supply.

Room Movement Sensor
- A suitable motion detector(s) shall be installed into every automated space. The motion detector should be able to reliably detect the smallest amount of human movement in any part of the room, for example the amount of movement caused by a few people sitting still watching a movie. Multiple detectors can be used if this is not achievable with a single detector.
- After no detected movement for 55mins the AV system will be commanded to carry out a “room reset” and switch the room to the OFF state. Note: the resident PC, Mediasite recorder and the Crestron AV controller are NOT turned off.
- Note: the room movement sensor may also be used to trigger the building maintenance system (BMS) and room air conditioning system.
- 360 degree coverage dual element technology sensors, IR & microwave. Suggest the microwave sensor operates at approx. 10.525GHz.
- Operating voltage 24vDC – from the Crestron “CresNet” supply.
- To be configured for less than 5secs “gating” time.

Uninterruptible Power Supply - UPS
• APC UPS devices are used to ensure “clean” power to feed the electronics located in both the lectern and electronics cabinet, if one is deployed.
• 19” rack mount (if this is an option) otherwise tower configuration.
• IP connectivity – required for remote monitoring by ITS and via RoomView monitoring application.
• VA rating as required.
• Current preferred make is the APC Smart-UPS, SMT-xxxx model series.

Projection Screen Size and Viewer Location

• The size and position of projection screens in a teaching and learning environment is determined by the room parameters. Other factors that will affect the screen size and location include:
  o The ceiling height.
  o Desired aspect ratio.
  o Furthest viewers should be positioned LESS than five screen height multiples from the projection screen.
  o Closest viewers should be positioned FURTHER than two screen height multiples to the projection screen.
  o Horizontal Viewing Angle - viewers should be positioned within an arc of 45 degrees off the centre line of projection.
  o Vertical Viewing Angle viewers should be limited to 15 degrees maximum head tilt excursion above horizontal, when looking at the centre of the projection screen.

Projection Screen Electrical

• 230v AC 50Hz reversible “tube” type motor.
• Connect via 4 (HPM) pin plug on a flexible 4 core cable and socket fixed near screen motor and the plug to be easily un-plugged. Note: Do not locate the pin power socket in the ceiling void.
• Screen UP/DWN Motor controlled by relays mounted in the distribution board, one relay for each direction. Normally driven by a Crestron STI-IO card 24v DC feed to screen UP/DWN latching relays.

Projection Screen Aspect Ratio

• Aspect Ratio is the ratio of a picture's width to its height.
• Where possible the preferred aspect ratio is 16:10, or expressed as 1.60:1.
• Composite video and analogue TV images are native 4:3 aspect ratio, or expressed as 1.33:1.
• HDTV and SDTV images are in a 16:9 aspect ratio:
  o Movie theaters typically use an aspect ratio of either 1.85:1, or 2.35:1.
  o Letterboxing is displaying the full picture in the center of the screen, with black bars above and below it.
  o When displaying a 4:3 image on a 16:10 screen there will be vertical bars on both sides, these are called “pillar-box”.
  o When scaling a 16:10 image to fit on a 4:3 screen there will be rectangular areas at the top and bottom of the image which are known as the “letter box”.

Projection Screen Surface and Performance

• Control of ambient/spilled light:
  o Visibility of the projected image depends on relative brightness of the image versus ambient light spilling onto the screen projection surface.
Aim is to minimise light falling on the screen, while providing sufficient light to allow students to take notes. This can be achieved with careful selection, arrangement and control of light fittings, max 30 Lux.

- Black border – increases the perceived “contrast ratio”.
- Matt white fibreglass screen material with gain of about 1.0 – anymore gain and the angle of viewing is compromised.
- Adjust screen “stop” from the bottom of the screen image area of the screen to approx. 1.35m above floor level.
- It may be necessary to mount the screen above the ceiling tiles to allow for correct screen size for furthest viewer.
- 50mm side & bottom black borders.
- 300mm adjustable top black leader.

Help Phone
- A HELP Phone must be provisioned in all ITS supported teaching and learning spaces.
  - A label, attached to the top of the lectern in a clearly visible position with the numbers for assistance with AV and IT equipment in the teaching and learning spaces:
    - For regular assistance to the ITS Help Desk call 82111.
    - For urgent assistance call the Region specific hotline number listed on the label which will call the dedicated HOTLINE phone located at the ITS Help Desk
  - Uses VoIP connectivity back to the main telephony machine room.
  - Phone to be fixed near or on the lectern and be easily accessible and usable to all, including wheelchair staff/students.

Touch Panel
- Touch Panel design goals:
  - Provide technology that enables a more effective way to communicate with students by ensuring the design of a Touch Panel makes the process of controlling the room Audio Visual infrastructure an easy, and initiative flow process in line with current pedagogy best practice.
  - Provide a good user experience from “day one”.
  - Avoid the temptation for technology to drive the solution – the “users” drive the solution – the only proviso is that their requirements are technically feasible and can be provisioned within budget.
  - Provision the solution around what the user wants – focus on the user’s regular requirements, not on the one-off specials. Remember the 80/20 rule where 80% of the time only 20% of the functionality is utilised so the design goal should be to focus on the 20% and get it 100% rock solid and reliable
  - Aim for visual form to follow a function/style design concept
  - Consistency in colours, shapes, styles, sizes, fonts, labels, to be maintained across all Campus locations, this breeds familiarity which is a very important factor for user’s comfort level while minimizing the learning curve and the formal training requirement. Colour combinations must complement i.e. aesthetically pleasing to provide an easy-to-read interface. Keep the number of overall colours used low, make the fonts large (to assist users as their sight declines overtime) – keep the saturation low but ensure good contrast between elements. Ensure the angle of the touch panel to the “users” eyes is approx. 45 degrees.
• Affordance – provide the user with the visual cues to perform an action. The user should intuitively understand how to interact with the touch panel i.e. what can be pressed and what areas provide feedback, i.e. an illuminated (flashing) border, all in real time etc.
• Keep the fancy gimmicks to a minimum, aim for an uncluttered panel appearance. All buttons to be “single function” i.e. like a TV remote control. Clearly indicate when a button has been enabled i.e. an illuminated border but still see what that button purpose is and has changed state. Only the required characters should appear on the touch panel.
• The level of automation should be kept in check – there are limits – too much automation can intimidate users. Very important that the panel “guides” the user, hence the importance of the layout being intuitive and predicatable.
• Have a “room reset” button for the user on the touch panel, if “user” control becomes unstable or connectivity appears lost. Note: A ‘room reset” takes 2 to 3 minutes before the room is available for use again.
• Touch panel to be enabled while the room is an “active state”.
• Parity of layout and functionality across all Campus teaching and learning spaces – touch panel size dependant consistent with cost and real-estate available.
• Aim for a max of 3 page layers to reach your desired page/functionality.

Lectern and Controls
• In general a lectern design should following these “general principals”
  o The lectern should not dominate the room
  o The lectern is expected to remain in the corner for interactive, flexible classes
  o A mobile AV control panel is expected to be the preferred method of managing the equipment in the room
  o The lectern if possible will be mobile with cabling will be connected via an short umbilical cord
  o The lectern will need to house equipment such as Blu-ray player and a resident computer as in any teaching room
  o The lectern will house a touch monitor as well as a keyboard and mouse as per the Hokowhitu pilot and the VLT Technical Design document.
  o The lectern will be attractive and include Massey University branding.
  o A mobile lectern will be supplied by the University for fit-out and installation by the Contractor. This will be sized to fit rack mounted equipment behind front and rear lockable doors.
  o Up to 4m umbilical cable, sheathed in nylon tech-flex. Strain relief wire, power and network cables in umbilical.
  o Strain relief wire and fittings to be of suitable strength to prevent umbilical damage.
  o Provide internal 19” rack frame for equipment.
  o University supplied PC on rack shelf.
  o DVD player fixed to rack shelf above PC.
  o If the lectern is to be movable - 4m laptop umbilical cable containing VGA, audio and network.
  o Allow for umbilical to originate from floor box or wall (TBC).
  o Document camera, PC monitor and control touch panel mounted to lectern top.
  o Laptop and auxiliary connection panels and power outlet on the lectern top.
  o Telephone hotline connection to the Help Desk, but not necessarily on the lectern.
  o See the following section for Auxiliary connection panel details.
AUX Panel – Ancillary Panel

- An AUX panel is provisioned on the lectern. It contains the following I/O functionality:
  - Composite Video RCA input with stereo sound.
  - Digital input HDMI and DisplayPort++ and Display Port – with digital embedded or analogue sound breakout.
  - XGA DB15 laptop input with RCA stereo sound.
  - Resident computer USB input.
  - 10/100 base-t Network outlet RJ45 x 2 (normally only one outlet is patched).
  - Illuminated flashing red LED lamp/button to indicate the Examination ON mode is enabled, i.e. no sound programme or sound reinforcement, lights stay on FULL and the screen/s do not deploy.

LCD Panels

- LCD panels offer some very sufficient efficiency and cost of ownership benefits.
  - LCD panels/monitors can be used in smaller rooms in place of projectors, or in addition to projectors to cover “blind” viewing areas.
  - For displaying HDTV images the screen height should be 0.125 times the distance to the furthest viewer. Or display width should be 0.22 times the distance to the furthest viewer.
  - The maximum size of monitors increasing over time; currently is around 165mm (65”).
  - RS-232 control.
  - 1920 x 1080 resolution (16:9) Full HD.
  - Mounted in landscape orientation.
  - Min height of bottom of the image from the floor should be more than 1.120mm.

Reflectance Values

- The Engineering Society of North America recommends the following reflectance Values for finish materials:
  - Ceilings - 80% or higher.
  - Walls between 50% and 70%.
  - Floors between 20% and 40%.
  - Desktops between 24% and 45%.

Acoustical Considerations

- Entry and exit doors should be made of solid wood. Rubber door sweeps should be installed.
- Doors & wall partitions into the teaching and learning environment should have a minimum STC (Sound Transmission Class) rating of 45 to 55.
- Use acoustical ceiling tiles, these can aid in absorbing and diffusing the sound energy at this critical reflecting plane in the room.
- Floors should be carpeted to absorb and dissipate sound energy.
- As a rule of thumb approximately 50 percent of the wall space in the room should be covered with acoustical treatment. Heavy, acoustically absorptive drapery can substantially reduce the reflections from large windows.
- Generally, the audience provides much of the acoustical absorption. Well-upholstered seats and carpet help to level out the variation resulting from fluctuating audience size.
- For good speech intelligibility, the middle frequency reverberation time (RT60) of the space should be .8 second or less. But the actual RT value is subject to room size. Reverberation time (RT) is the time it takes for a sound in a room to decay to inaudibility. Most commonly used term is RT-60, meaning the time it takes for a direct sound to decay by 60 db.
• Speech Intelligibility, the ability of a listener to hear and correctly interpret verbal messages. In a teaching and learning environment with high ceilings and hard parallel surfaces such as glass and tile, speech intelligibility is a particular problem. Sound bounces off walls, ceilings and floors, distorting the lecturer’s instructions and compromising the students’ ability to comprehend.

• Mechanical devices such as heat exchangers and ventilation units should not be located in the ceiling above the immediate space or the surrounding areas. These devices will transfer mechanical vibrations into the space, adding to the overall noise floor.

• HVAC diffusers, returns, and associated ducts should be designed to allow air to flow through them at minimal velocities and with minimal disruption of the airflow.

• Aim for HVAC (NC 25-30 throughout room) SPL 35dbA or better – at 1 kHz band centre.

For further reading please access the following document: AS/NZS2107:2000.

Thermal Management

• Keeping electronic equipment cool is an important consideration given long term reliability is a key performance factor.
  o Carry out a full audit of all equipment in both the lectern and electronics cabinet.
  o One watt of power produces 3.4 Btu/h of heat.
  o One amp of current at 230v produces 784 Btu/h of heat.
  o 20°C is considered the maximum recommended operating temperature, as measured externally on the equipment case.
  o If passive cooling will not suffice a fan should be considered to maintain the recommended temperature. Note: passive cooling only is effective when the ambient air temperature is lower than the amount of heat produced.

General

• Wireless network with sufficient capacity for student use.

• Data outlets:
  o Min four RJ45 outlets located inside of the lectern
    ▪ UPS device
    ▪ AV Controller device
    ▪ Visiting Laptop
    ▪ Resident computer
    ▪ Help phone
  o Two RJ45 outlets on the lectern AUX panel, note only one to be operational, the other outlet to be blanked off, for future use.
  o If no lectern is to be provisioned then one dual RJ45 network outlet is desired to be ceiling mounted by each projector.

• Power outlets:
  o NOTE: All power feeds to be “starred out” from the lectern by a clean feed from the distribution board
  o Twelve General Purpose Outlet (GPO) outlets mounted inside lectern by using a rack mounted Jackson RAC1200 power board c/w surge protection
  o One dual switched dual outlet on the AUX panel
  o One single switched outlet in the distribution board for a 24V DC regulated power adaptor for powering the room movement sensor/s, door/s ON/OFF switch and Crestron STI I/O device to drive relays for screen UP/DWN and lighting rows. Note this requirement can be removed if a DIN 230vAC transformer 24v DC power supply is provisioned.
  o A dual GPO mounted on the ceiling near the projector.
• All equipment to be tested and tagged before installation as per current version of the AS/NZ 3760 standard.
• Cables – preferred cable manufacturer is Belden:
  o All Cat 5/6 cabling to have a Yellow outer sheath and use stranded wire.
  o Speaker 8 Ohm & 100/70v – Belden 8477
  o Speaker 70/100v – Belden 8471
  o RS-232 – Belden 9503 or 9536
  o Microphone & line level – Belden 8761 or 8723
• All cables must be run from source to destination without any intermediate joints, or connection points.
• All cables to be cabled tied every 600mm. Cable separation – it is very important to keep physical separation of low level signal cables i.e. microphone and line level audio and RS-232 and CresNet control cables from mains level electrical cables. It is recommended that at least 800mm distance between each group of cables. If this is not achievable then pass low level cables at 90 degree angle to any mains level cables to assist in electromagnetic (EM) field cancellation.
• All data patching cables on the network switch are to be RED.
• No unmanaged network devices are permissible. All network devices must be registered and conform the standards as defined by the Infrastructure Support Section, ITS.
• AV System Control Software Ownership
  o Where any Crestron programming is undertaken by a contractor is owned by the University and ALL intellectual property rights shall be transferred to the University at handover.
  o Unless otherwise agreed any “modular” programming is acceptable only to the extent that the source code and intellectual property are transferred to the University.
  o The contractor will supply to the University at handover ALL code used in the project in a hard copy and electronic format both compiled and non-compiled versions of the code. In each format a qualified Crestron programmer will be able to modify the code without any pass words and/or other security and/or copying restrictions or be MAC specific. Any code used by the contractor/programmer must not infringe any existing copyright; if a copyright infringement case is brought against the University the contractor will fully indemnify the University.

Remote monitoring
• Currently Crestron RoomView Express version 6 is used.
• It is anticipated that we will move to the server/web based Fusion RV application in the near future. An evaluation is currently underway with the Crestron Fusion RoomView web and server based application.

Legal Requirements
• All electrical and radio products must comply with the following legal requirements:
• Electrical, electronic and radio products on sale or in use in New Zealand must comply with Electromagnetic Compatibility (EMC) standards, current version of AS/NZS CISPR 14-1 EN55013 to minimise the risk of interference to the radio spectrum

Electrical compliance/certification requirements
All supplied audio, video, and similar electronic equipment supplied to the University must comply with the current version of AS/NZS 600065:2003. Apparatus and its amendments
  o All equipment to be “C-Tick” approved.
RoHS compliance.
- CE marked, and ideally to be UL listed.
- All electrical equipment MUST be tagged as per the requirements outlined in AS/NZS3760 and its amendments, note this includes “new” equipment which must be tested and tagged before installing. This is the Standard that specifies safety inspection testing and tagging protocols for compliance with The Electricity Act 1992, The NZ Health & Safety in Employment Act 1992 and OSH regulations.

Service support personal
Electrical Regulation AS3000 states all personnel working in areas where 70.7VAC peak (50VAC RMS) or 120v DC is present, or higher, must have a current Electrical Workers certification working within the appropriate limits of work as specified.

Cable identification and Labelling
To match “as built” documentation. When equipment is removed inter-connecting cables must be labelled at BOTH ends in a way that re-connection must be seamless and without ambiguity.
Label to have as a min requirement the cable FUNCTION, SOURCE and DESTINATION clearly marked in non-removable black Ink, or similar. Cable ID labels to be electronically produced, handwriting is discouraged.

HDMI
There are five types of HDMI cables available in the market today. Prior to the HDMI Specification Version 1.4, there were two cable types: Standard (category 1) and High Speed (category 2).

Currently the following HDMI cable types include:

- **HDMI Standard Cable**: Video resolutions up to 1080i at 60 frames per second (fps) are supported. 75 MHz bandwidth. Category One cable. 2.23gbps data through put.
- **HDMI Standard Cable with Ethernet**: Resolutions up to 1080i/60 as above plus the optional HDMI Ethernet Channel feature are supported.
- **HDMI High Speed Cable**: 2D video resolutions up to 1080p/60 with 16 bit colour, as well as all HDMI 1.4a 3D TV and 4KTV formats are supported. 340 MHz bandwidth and 10.2gbps data through put. Category Two cable.
- **HDMI High Speed Cable with Ethernet**: This cable supports the same feature set as HDMI high speed cables, plus the optional HDMI Ethernet Channel.
- **HDMI Standard Automotive Cable**: This cable and the Type E connector support the enhanced environmental requirements of the HDMI Automotive Connection System. Source HDMI Web site [www.hdmi.org](http://www.hdmi.org)

**Important Note:**
It is NOT mandatory for equipment or cable manufacturers to include all of the HDMI specifications – i.e. even though a cable/product may be advertised as a HDMI version 1.4 it may not for an example be 3D capable or have the network interconnectivity Consumer Electronic Control (CEC) functionality.
Common Makes and Models Fully Supported by the Massey University ITS Service Desk - think consumble stocks and operational spares

- **AV Controllers:**
  - Small installations Crestron MP2e
  - Larger installations Crestron AV2

- **Switchers & Scalars etc.**
  - Kramer VP-728
  - Crestron HD-MD8x2

- **Screens:**
  - Screen Technics
  - Grand View
  - Cyber

- **Projectors:**
  - Panasonic

- **Interactive Whiteboard**

- **Blu-ray Players**
  - Denon
  - Oppo

- **LCD Panels:**
  - Sharpe

- **Audio Amplifiers:**
  - TOA & Mackie

- **Speakers:**
  - Toa and Mackie

- **Touch Panels:**
  - Crestron TPS series for installations requiring a large amount of panel real-estate and TPS4 series for smaller installations.

- **All Digital environments:**
  - Crestron Digital Media (DM) range of hardware including matrix switchers for larger environments and Kramer products for the smaller environments.

- **Radio Microphones:**
  - Toa and MiPro

- **Resident PC:**
  - HP SFF

- **Lectern Microphone:**
  - AKG gooseneck with shock mount
  - AKG SBM

- **RAP – RichMedia Access Point:**
  - Digitools
  - MediaSite Recorders

**Minimum digital standards**

- HDMI version 1.3b – version 1.4 is being considered for suitability.
- Display Port++ version 1.1
- HDCP version 2.1, or greater
- DVI version 1.1
- EDID version 1.3, or greater

**Other standards to be developed over time**
• Source selection switching delay time - low-latency digital video and audio – to be less than 3 seconds switching time between any HDCP compliant, or non HDCP compliant source – image must be stable within three seconds of the touch panel switching of a source.

• All signal paths to be HDCP compliant, but also have the ability to transport un-protected content without being encrypted.

• Minimum number of HDCP “keys” available, discussions still to be undertaken, initial thoughts would suggest a min of 5 keys per device?
Expected Life of Equipment

- Blu-ray player –
- Computers - 3 years
- VCR's - 6 years
- Video/Data Projectors - 6 years
- (obsolete)
- TV's & Visual Display Units - 6 years
- Video Conference codecs – 6-years
- (obsolete)
- Ladybird document camera – 10 years
- Microphones – 10 years
- Screens - 6 years
- AV Level 5 Electronics - 10 years
- AV controllers – 6 years
- Consumables:
  - Replacement LCD Data Projector Lamps - Annual
  - Replacement OHP Lamps - Annual

Glossary

- HDMI
- EDID
- HDCP
- DVI
- To be completed