Imperial College
London

Information & Communications Technology
Network Infrastructure Group

Network Infrastructure Standards
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Appendix J – AV Standards

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Appendix J – AV Standards

These standards have been written by the AV Manager Caroline Carter and any queries should be addressed to her.

Caroline Carter

E-mail: caroline.carter@imperial.ac.uk
Phone: +44 (0)20 7594 3484

SPECIFICATION OF REQUIREMENTS

SPECIFICATION: AUDIO VISUAL FACILTIES REFURBISHMENT

The following describes the level of provision expected within a College standard lecture theatre.

Design Intent

The College wishes to implement a standard design across all lecture theatres. The aim is that the systems will contain the same core components and be largely the same. Occasionally there will be the need for additional facilities (see later), however these will be additional to the core design and treated as an additional item at the time of installation.

A Functional diagram of the required system is shown below:

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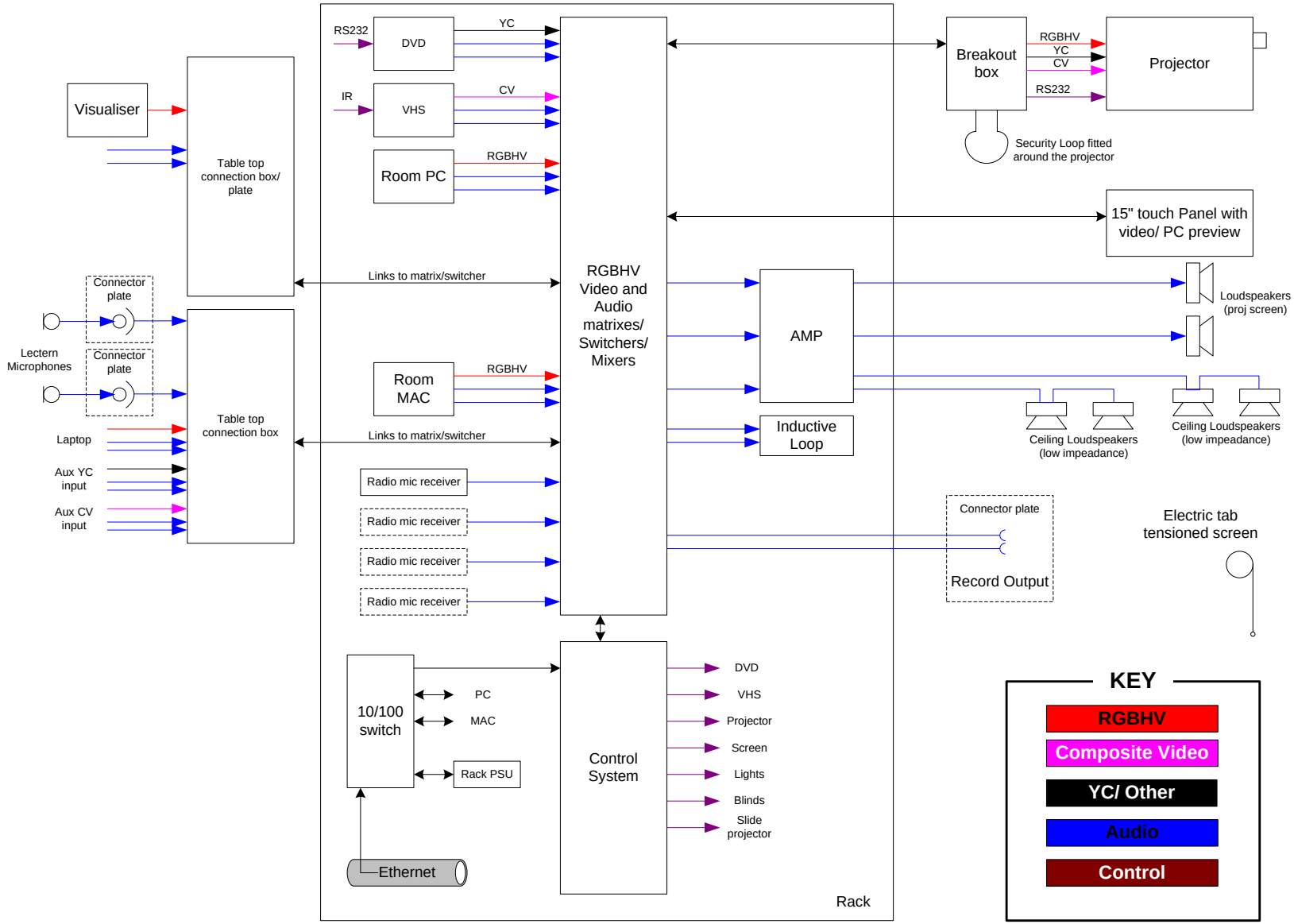
RS232
DVD
YC
IR
VHS
CV
RGBHV
Room PC
Visualiser
Table top connection box/ plate
Connector plate
Lectern Microphones
Connector plate
Laptop
Aux YC input
Aux CV input
Table top connection box
Links to matrix/switcher
Room MAC
RGBHV
Links to matrix/switcher
Radio mic receiver
Radio mic receiver
Radio mic receiver
Radio mic receiver
RGBHV Video and Audio matrixes/ Switchers/ Mixers
AMP
Inductive Loop
10/100 switch
PC
MAC
Rack PSU
Ethernet
Control System
DVD
VHS
Projector
Screen
Lights
Blinds
Slide projector
Rack
Breakout box
RGBHV
YC
CV
RS232
Projector
Security Loop fitted around the projector
15" touch Panel with video/ PC preview
Loudspeakers (proj screen)
Ceiling Loudspeakers (low impeadance)
Ceiling Loudspeakers (low impeadance)
Connector plate
Record Output
Electric tab tensioned screen
KEY
RGBHV
Composite Video
YC/ Other
Audio
Control

Figure 1 AV Functional Diagram

Lecterns

The Lectern shall house all of the Audio Visual equipment (except the projector) and be designed with optimum layout to make the AV system easy for lecturers to use.

- As a minimum the lectern should be capable of housing:
  - All the necessary AV equipment
  - IT equipment – at least one computer and an optional Mac.
  - Visitors equipment e.g. Laptop.
  - Various connection panels.

The functional diagram for the Lectern is shown below:

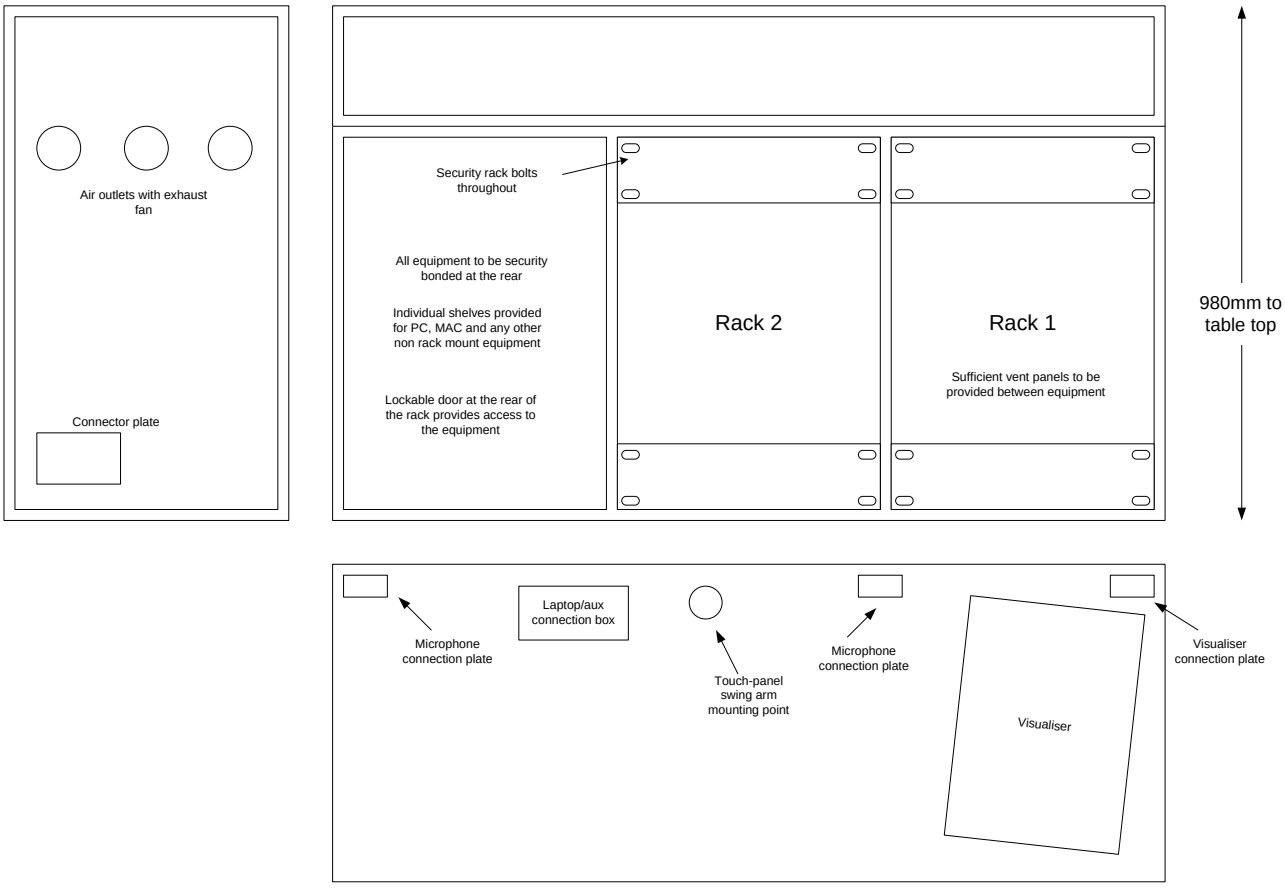

Figure 2 AV Lectern layout

The Lectern should be designed to the following specification:

- Practical layout to make it simple to use.
- House two equipment racks securely fixed to the lectern.
- Have two microphone connection panels with fixed microphones.
- Have a dimmable lectern light
- Provide a connection box for laptop and auxiliary connections. This should also provide a network connection for the laptop.
- Secure mounting of the touch panel on a swing style arm.

- Access to the rear of the racks shall be provided via a secure lockable door(s).
- A connector plate to facilitate easy recording of audio and video output shall be provided on the side of the rack.
- Provide a connection plate for the visualiser.
- Have adequate ventilation with low noise extractor fans if necessary
- The height from the floor to the top surface of the desk shall be 980mm
- Provide ready yet secure access for repair/replacement

Video

The primary display device in each lecture theatre shall be a ceiling mounted projector. The flexible routing of signals shall be provided by using a matrix, video switcher or other device so that all video signals can be previewed on the touch panel before being routed to the projector.

The various video inputs signals required are:

- DVD (using YC or better)
- VHS (Composite Video)
- Room PC (RGBHV)
- Room MAC (RGBHV)
- Laptop Connection point (RGBHV)
- Visualiser (RGBHV. This also doubles as a second laptop connector)
- Auxiliary YC input (provided in the laptop connection box)
- Auxiliary Composite video input (provided in the laptop connection box))

The output signals required are:

- RGBHV to the projector
- YC to the projector
- Composite Video (CV) to the projector
- RGBHV to touch panel preview
- YC to touch panel preview
- Composite Video to touch panel preview

Some lecture theatres will require dual projectors.

Projector

The projector shall be ceiling mounted on a pole and secured inside a security box housing. In some lecture theatres there is a projection room located at the back of the room. When this is the case the projector shall be mounted in the projection room with the correct lens fitted for the room to screen throw distance. Wherever possible the projector should be mounted such that people can not walk in front of it or block it. Some lecture theatres will require dual projectors.

A mid range "installation" projector is required of the following specification:

- Native resolution of the 1400 x 1050).
- Contrast ratio of at least 500:1
- Typical light output of a minimum of 3500 ansi lumens.
- Switchable lower light mode for smaller lecture theatres

- A range of lenses available
- Noise rating of no more than 42dB
- Quick start up from cold
- Vertical lens shift
- Horizontal and vertical keystone correction
- At least 2000 hour lamp life

The projector will be controlled and monitored by the control system, therefore the serial or TCP/IP control API shall provide the following:

- Standard switching functions with feedback
- Lamp life hours
- Over-heat error
- Fan error
- Lamp error

Visualiser

A high resolution visualiser shall be provided with the following specification:

- Resolutions: 1280x1024, 1024x768, 800x600.
- 12x powered zoom lens
- ½" 1,500,000 pixel progressive scan CCD
- Minimum 15 frames per second frame rate.

The visualiser will be permanently placed on the Lectern. A connection panel for the VGA video signal shall be located behind the visualiser towards the back of the desk. Although the visualiser does not have sound, audio connectors shall be provided so that the connections can be used for a second laptop if required.

DVD

A professional DVD shall be provided. This should connect to the control system using a serial data connection with full bidirectional feedback.

Audio from the DVD shall be stereo for the program sound system. Surround sound is not required.

As well as DVDs the DVD player shall also play audio Compact Discs.

VHS

A semi-professional VHS shall be provided. This should be a multi-standard model capable of playing all popular video standards.

Control shall use Infra-red and the connection to the system shall be composite video.

Computers

The system shall be able to handle a minimum of three computer signals (not including the visualiser). A permanent room PC shall be securely fixed on a shelf in the equipment rack. Keyboard and mouse shall be placed on top of the desk.
In some rooms a MAC computer may be required.

To make it easy for lecturers to connect laptop computers to the system a suitable "flip top" type box shall be installed at the rear of the Lectern. This shall also accommodate a connection to the College network as well as composte, YC auxiliary video connections and provide a standard 13 Amp power socket.

The PC, MAC, laptop and two video connections all require associated audio.

The current College standard for PCs is HP. PCs normally run Microsoft windows, but can be dual booted into Linux if required.

Audio

A comprehensive audio system comprising program sound and voice reinforcement shall be provided.

Program Sound

The program sound system shall comprise of the following signals:

VHS sound
DVD sound (stereo)
PC (and MAC) Sound
Laptop Sound
Visualiser input plate (to double as a second laptop input)
YC auxiliary input sound
Composite auxiliary input sound.

Any of the above signals shall be able to be switched to the program sound loudspeakers with a suitable mix also being provided for the inductive loop. The signals should be provided through a secondary outlet.

A suitable overall program volume control shall be provided on the touch panel.

The individual signal levels of each of the components and auxiliary inputs shall be matched during commissioning so that they are all at the same level.

Voice Reinforcement

A voice reinforcement system shall be provided in each lecture theatre comprising of the following:

- Two lectern microphones. These shall be of hypercardioid pattern.

- Lectern microphones shall be mounted on a suitable plate with a shock mounted connector, and placed in the locations indicated on the Lectern diagram.
- Lectern microphones shall be RF shielded to minimise interference from mobile phones and other mobile communication devices.
- A single tie-clip and pocket pack radio microphone shall be provided.

Each lecture theatre should be equipped with 6/8 ceiling loudspeakers The actual speakers provided and quantity will vary from theatre to theatre.

Ceiling loudspeakers shall be of a good quality and be provided with full back-box and all necessary baffling. Ceiling loudspeakers shall not be placed behind the lectern. Ceiling loudspeakers shall be connected low impedance and not 100 volt line. A suitable multi-channel amplifier shall be provided to power the loudspeakers in pairs (assuming a quantity of 6/8) although only a single signal is required to drive the amplifier input.

Microphones must be able to be used when the system is on without the need to select a source.

A record output shall be provided using XLR connectors mounted on a suitable connection plate. The record output shall provide the voice signal with a mix of the program sound at a lower level.

A suitable overall volume control for the voice reinforcement shall be provided on the touch panel. This should also allow for lectures to mute the microphones if required.

Radio Microphones

Each system requires a single radio microphone to be provided. To allow more radio microphones to be added in the future or for the conference office to install temporary radio microphones, the following specification shall be implemented:

UHF Diversity system
Modular received system.
1 U rack mount chassis with the ability to house up to 6 receiver modules.
Two active antennas to be mounted in a suitable location on the lecture theatre wall.
4 channels of the receiver shall be connected and programmed into the system.

A tie clip microphone with pocket transmitter and singe receiver shall be provided fitted into the chassis system described above.

Hearing loop

Provision shall be made for a hearing loop to be provided in all of the lecture theatres.

The hearing loop shall be of dual “phase shift” design to provide optimal results. The services of a professional company should be used to provide an optimal design for each individual lecture theatre.

This hearing loop shall provide the voice signal with a mix of the program sound at a lower level.

The finished and commissioned hearing loop system shall comply with all current legislation.

Control System

The control system will control all of the audio visual equipment within the room.

A 17" touch panel shall be provided. The touch panel shall double as a preview monitor for all video, and VGA sources. The touch panel shall be fitted to a swing arm securely fixed to the Lectern.

The key functions of the control system programming shall be:

- A consistent touch panel design across all lecture theatres, providing easy selection of all the equipment i.e. projector, visulaliser, audio, curtains.
- The touch panel design shall be designed using Graphical User Interface (GUI) best practice.
- The touch panel design has to be submitted for approval before implementation and the College reserves the right to undertake user suitability testing with full modification if required.
- A full set of help instructions built into the touch panel.
- The touch panel shall double as a preview monitor. The lecturer shall have the ability to preview sources before they are sent to the projector.
- The touch panel shall have the ability to preview DVD or VCR when a source is already being shown.
- Automatic shutdown of the system if the system has not been used for a programmable period of time. This will only occur if no buttons have been pressed and there are no active video signals in use.
- Automatic shutdown at a programmable, pre-set time.
- Easy to change to add new facilities

All programming code written will be the property of Imperial College. At the end of commissioning the finished code complete with any external modules and drivers shall be submitted to the College together with a written list of all the program components and modules with name and date of compiling.

In the event of any subsequent modification, a full set of program components with incremented version number shall be submitted to the College.

Diagnostics and Central Monitoring

The key requirements include but are not limited to:

Proactive monitoring of the projector lamp life and status.
Polling and status of all items of equipment that are connected using serial control
Proactive fault reporting if any item develops a fault or stops reporting its status.
Current status of the over all system – e.g. power on, projector off, system in use (button pushes being detected) etc.

Current status of all video signals – e.g. sync detected.
A TCP/IP controlled power distribution unit with the ability to cycle the power on any individual socket shall be built into the system. In the event of a problem on an individual item of equipment, the technician shall be able to re-boot remotely from the central monitoring tool.

All lecture theatre systems shall report into a central monitoring tool which will collate all of the information from all of the systems in real time. The remote monitoring software provided should be on an open platform basis to allow the monitoring of different control systems through the same system.

Lighting Control

Some lecture theatres have dimmable lights. In these dimming controls (with presets) shall be made available on the touch panel.

Remote control

All buttons and controls that are available on the touch screen shall be available via a remote web page with appropriate password security.

Security

The control system will be used for some security monitoring.

The key requirements include but are not limited to:

- A wire loop shall be fitted around the projector. If this is cut it should instantly send a message back to the central monitoring station, and high intensity audible alarm shall sound.
- All individual items of equipment that are connected using bi-directional serial data should be polled for status and if an item stops responding a message shall be instantly sent to the central monitoring station.

Equipment Racks

Two equipment racks shall be fitted within the Lectern. The rack shall have standard rack fixings at the front and back.

All deep items of equipment (over 400mm) shall be supported by rack rails secured to both the back and front fixings.

All cables shall be secured to cross rails at the back or the rack.

A rack light shall be fitted into the back of the Lectern to aid easy maintenance.

The racks shall have:

- Adequate service clearances
- Adequate cable lengths
- Removable back and front panels for ease of maintenance

Network

As there are various system components and PCs in the system, connection to the College data network shall be provided. The network should come directly from network ports which will be connected to an agreed ICT CWC,
There will be a minimum of 4 sockets per lectern and 2 per projection devices such as projectors and LCD/Plasma screens or others.

Power

Power distribution shall be centralised in the rack with a power distribution unit feeding individual items of equipment.

IEC connectors shall be used to connect to the distribution unit and there shall be no standard 13 Amp sockets used. There shall be not more than one key item of equipment connected to an individual channel of the power distribution unit.

The power distribution unit shall be a TCP/IP controlled unit with the ability to cycle the power (and switch on and switch off) on any individual socket. The unit shall be under the control of the control system.

The use of transformer "Wall Warts" is not allowable. A quality switch mode PSU shall be used as a replacement.

Security

All the systems shall be security fastened or locked away such that theft is made as difficult as practicable.

All items of equipment shall be secured into the rack using high security style bolts.

Any items of equipment that are not rack mounting shall be securely fixed to a rack shelf which in turn shall be secured using high security style bolts.

Each item of equipment shall be further secured with a "Kensington" lock at the rear.

The doors at the back of the rack shall be of sturdy construction with large hinges and concealed hinge screws. The door lock shall be a quality internal or mortice style with multiple levers.

If the projector is not located in a secure locked projection room, it should be secured in a cage with an alarm and detection wire as detailed in the section on the control system.

Alternative or additional suggestions to this security solution are welcomed.

Technical Diagrams

A full set of schematic diagrams should be provided detailing interconnection between all the components.

Within 5 days of the completion of each lecture theatre, the contractor shall submit a full "as built" schematic diagram to the College. This diagram shall include accurate cable numbers. A full commissioning schedule shall also be submitted.

Full operating instructions for all components must be provided.

Wiring

All new wiring shall be used. Comply with the wiring standards detailed elsewhere in the tender document.

AV Operating Instructions for AV Technicians

A full set of easy to use operating instructions should be made available for AV support specialists. These shall also describe all the cable connections and any necessary set-up required to connect speakers' external equipment.

Operating Instructions for speakers

'Crib Sheets' for quick reference shall be made available for speakers.

Projector Screens

Most theatres already have suitable screens of the correct size, which can be remotely controlled. These need to be checked for renewal due to their age and wear; they may need some modification to their controls to interface more readily with the replacement Audio Visual control system.

The following specification shall be adhered to:

- Height of the screen to be at least to the maximum viewing distance divided by six.

Blinds/Curtains

Many theatres are already fitted with motorised blinds/curtains. They should be retained and checked for renewal or if necessary serviced. Given the light output of the suggested projectors the blinds would only be required in rooms where there is direct sunlight to the screen or the sunlight / daylight is a distraction.

All electric blinds/curtains shall be interfaced to the control system with control buttons on the touch panel.

Supplementary Requirements

Within each lecture theatre, there may be a requirement for additional audio visual facilities, over and above that considered to be part of the standard specification. These requirements are primarily at the request of the Conference Services and if required, will be allocated to a different fund within the College. Make sure that the provision of such supplementary requirements can be easily provided in the systems proposed.

The additional requirements may include, but not be limited to:

Additional control system

Additional touch panel
A tie clip microphone
Additional UHF pocket transmitter(s)
Additional screen
Additional projector
Ability to control the system via laptop or other means
Ability to capture video and sound for live transmission or recording
An audience microphone system
Ability to add an XLR mixer

Tenderers shall confirm that they will honour the original tender prices for any additional equipment required at the time of installation.

----- End -----