

TENDER DOCUMENT

FOR

**SUPPLY AND INSTALLATION OF AV EQUIPMENT &
CONTROL SYSTEM AT INTERNATIONAL WATER
MANAGEMENT INSTITUTE**

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1. Auditorium System Overview

IWMI wish to procure an AV conference system for a multi-purpose auditorium with different seating arrangement layouts.

The system should support hybrid meetings, represent the latest state of digital technology and provides digital signal processing and transmission of all audio and video signals. It should not be susceptible to interference from mobile phones, walkie-talkies and any other kind of electronic equipment. It should provide versatility, high audio and video quality, data transmission security and simplicity of operation and installation. It should be possible to control the system via a user-friendly software interface.

Microphones for picking up speech from anywhere inside the auditorium should be of ceiling array technology providing high audio quality, suppression of noise from HVAC and sending information of location of speaker for automatic camera tracking.

Loudspeakers for far-end, presentations and voice lift should be ceiling speakers. Zoning should be implemented with a digital audio mixer or DSP (Digital Signal Processing) so that an individual loudspeaker does not play audio from nearby ceiling microphone(s) thereby avoiding acoustical feedback.

Pan-Tilt-Zoom (PTZ) cameras covering all seats in a number of seating arrangements and of minimum full HD (1080p60) and preferably 4K resolution (2160p60) and have optical zoom range necessary for reasonable close-ups of speakers without having to use digital zoom.

A control system software interface should available in the control room and inside the room and be easy to use and provide functions for storing and recalling microphone, DSP, camera presets for 10 different seating arrangements and monitoring the inside of the auditorium via the camera system.

Hybrid meetings should be possible using various codecs such as Microsoft Teams, Zoom, Webex and other future PC based solutions with proper automatic echo cancellation (AEC) applied.

A full UHD 4K display system based on a main projector and supporting displays along the side walls should be designed to display all video sources so that displayed documents can be read from all seats in the auditorium.

Equipment for simultaneous interpretation and language distribution is expected to be needed rarely and is therefore to be offered as an option.

AV systems for two smaller meeting rooms with 9 and 13 seats.

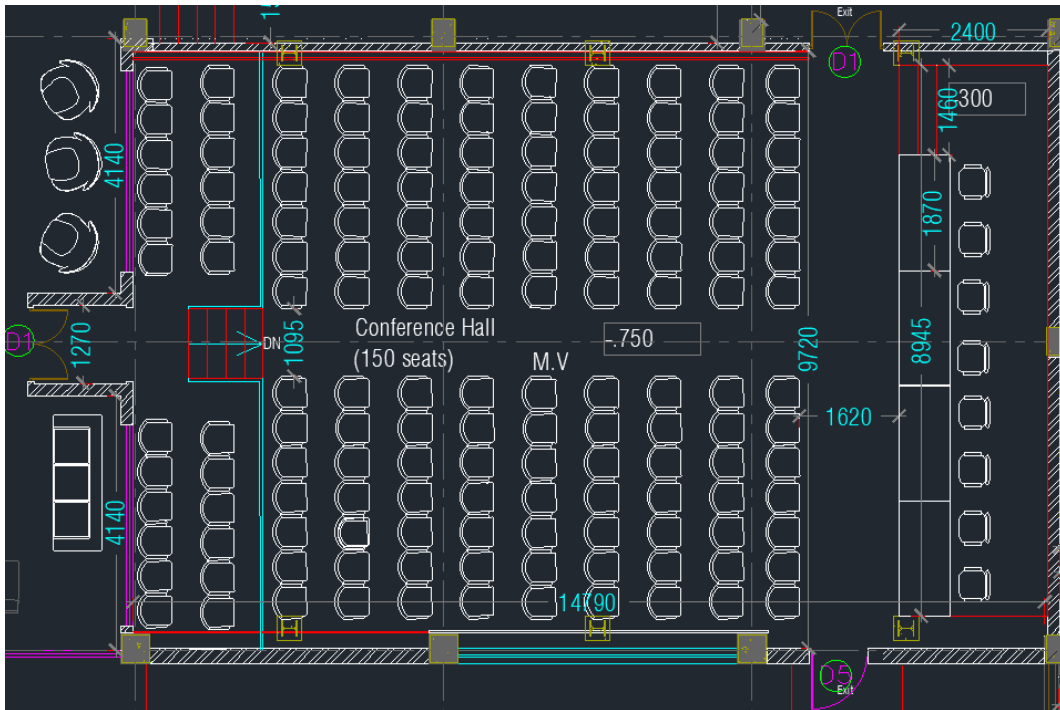
2. Functional Requirements

The following sections describe functional requirements in details and numbered for reference.

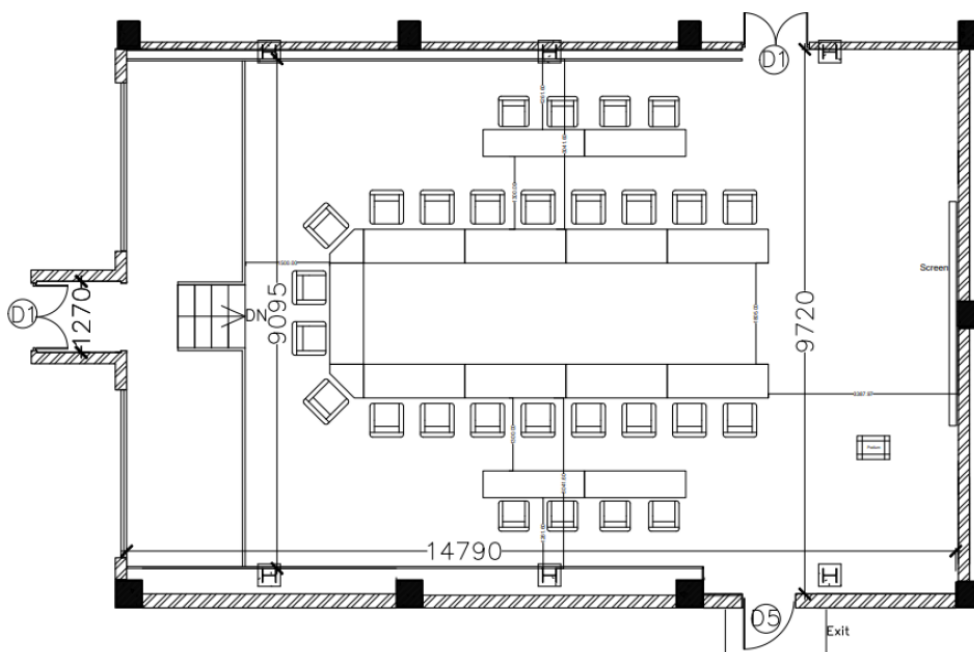
2.1. Auditorium Seating Arrangement layouts

Examples of seating arrangements are described for the bidder to be able to design a ceiling microphone system with automatic camera tracking and propose number of microphones and cameras for coverage of all seats and layouts.

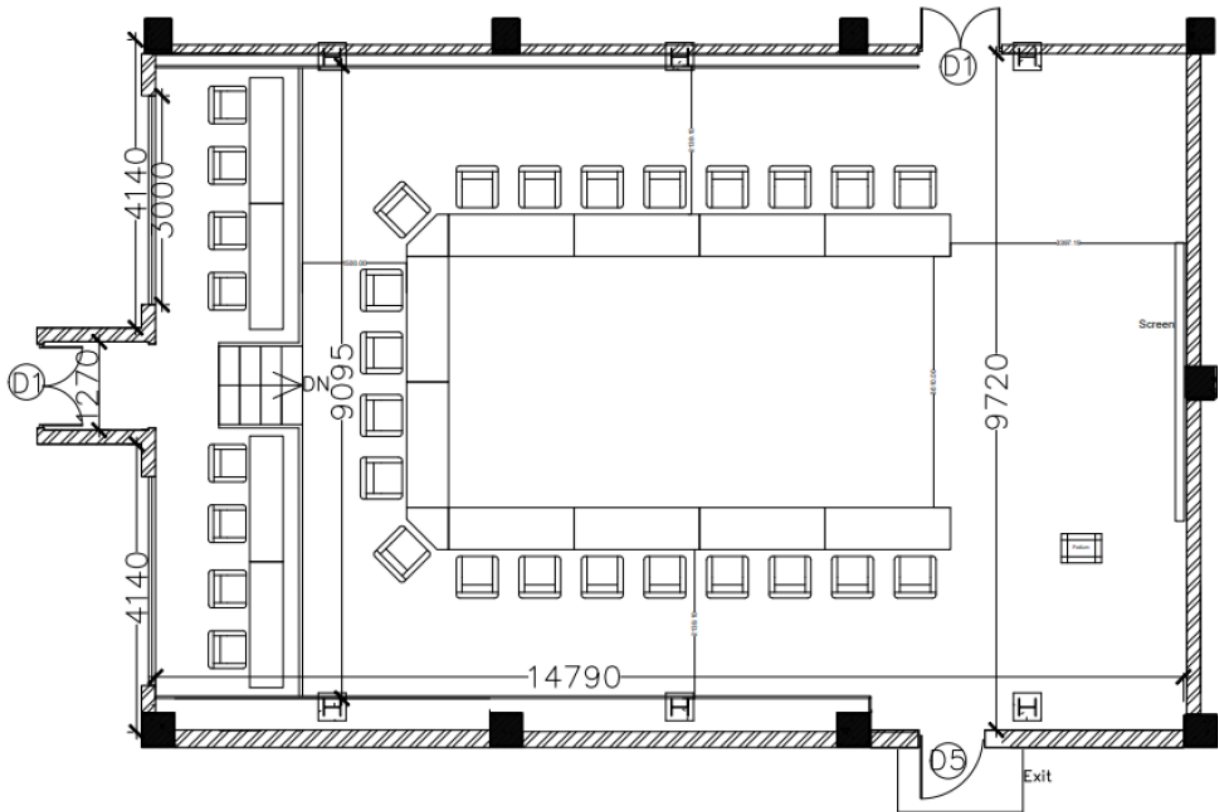
The most often used seating arrangement will be the classroom style layout:



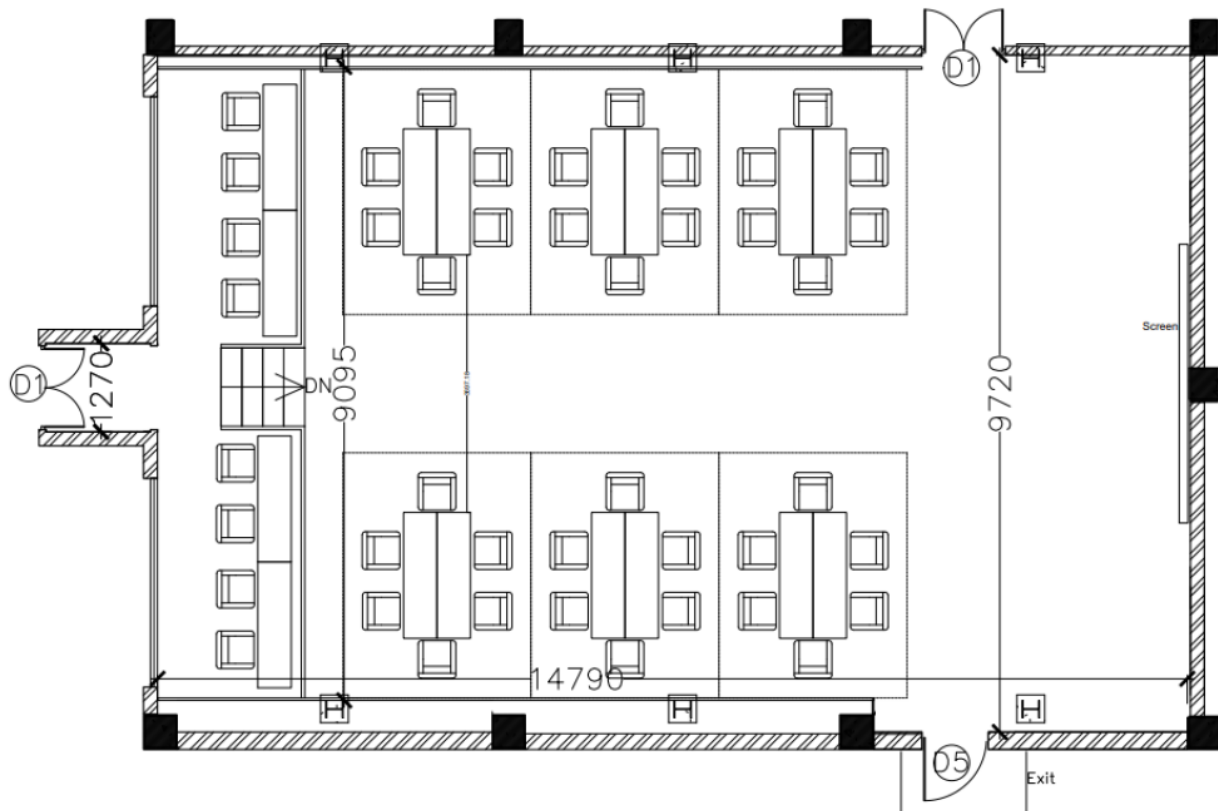
Small U-shape layout:



Larger U-shape layout:



Round table layout:



2.2. Ceiling Microphones

The auditorium is approximately 15 x 10 meter. The ceiling will be made of 60x60cm acoustic drop ceiling tiles and the height is approximately 3.2 meter. The floor is to be fitted with a sound absorbing carpet.

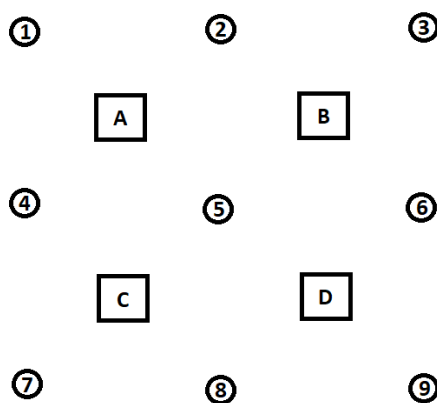
1. Audio quality should be high for all standing or seated talkers and the bidder is to propose quantity and locations of microphones for coverage of the the entire room according to the four IWMI seating arrangement examples given above
2. It should be possible for IWMI to add new seating arrangements in the future
3. If microphone configuration parameters have to be adjusted when changing between layouts then it should be easy for an operator to store and recall up to 10 different sets of parameters
4. Noise from HVAC diffusers in the ceiling, projector and windows should be suppressed
5. The microphones should provide realtime location of the talker via the network for an intelligent software based automatic camera tracking system to be able to call a camera preset that covers the area where the talker is located and switch between video from cameras

2.3. Ceiling Loudspeakers

A system of ceiling loudspeakers should be designed together with the ceiling microphones meeting the following requirements:

1. The ceiling speakers should be full range speakers for both speech and presentation sound
2. The number of ceiling speakers and locations should be so that an even level of voice lift is achieved in the entire room without causing acoustic feedback or Larsen effect
3. Intelligent zoning of the ceiling speakers should be implemented so that ceiling speakers near or over a microphone pickup area are muted for audio from that specific microphone or pickup area. See example explaining this below.

Theoretical principle showing zoning of ceiling speakers which can be achieved by a digital audio mixer or DSP (Digital Signal Processing):



Audio from microphone or "pickup area"	Is played in ceiling speakers	Is muted in ceiling speakers
A	3, 6, 7, 8 and 9	1, 2, 4 and 5
B	1, 4, 7, 8 and 9	2, 3, 5 and 6
C	1, 2, 3, 6 and 9	4, 5, 7 and 8
D	1, 2, 3, 4 and 7	5, 6, 8 and 9
Far-end sound and presentation audio	1, 2, 3, 4, 5, 6, 7, 8 and 9	

2.4. Digital Audio Mixer or DSP

A digital audio mixer or DSP is required to mix audio from different sources, to achieve voice lift as described above and provide Acoustic Echo Cancellation (AEC) in hybrid meeting mode.

1. The DSP must have enough digital audio inputs and outputs to handle the many ceiling microphones and ceiling speakers together with other audio sources and outputs
2. Automatic Echo Cancellation (AEC) must be applied to microphone inputs in hybrid meeting mode including four wireless microphone channels described below
3. If changes in seating arrangements require changes in DSP setup then the DSP must support store/recall of up to 10 different room layouts via the control system

2.5. Wireless Microphone System

A wireless microphone system must be provided to be mixed with audio from the ceiling microphones.

1. The wireless microphone system should be digital UHF system complying with Sri Lanka regulations
2. The system should have four channels
3. Two handheld transmitters with microphone capsules
4. Two bodypack transmitters with lavalier microphones
5. Rechargeable batteries and charging stations for charging transmitters without removing the batteries
6. The four audio channels should be routed to mixer / DSP inputs

2.6. Camera System

A number of PTZ cameras (Pan-Tilt-Zoom) should be installed in permanent locations under the ceiling or on the walls so that all seats in the seating arrangement layouts are covered in such a way that people can be captured from at least one camera providing a reasonable camera shot from the front in an angle that allows viewing of facial expression and gesturing.

1. Pan, tilt and zoom control via network for automatic and manual camera tracking
2. Automatic focus control
3. 20x optical zoom, distance to be covered by the camera may range from approximately 2 to 15 meter
4. Video format should be minimum 1920x1080 resolution, progressive scan and minimum frame rate 60
5. Joystick controller for manual operation of cameras
6. Horizontal flip option so cameras can be installed under the ceiling if necessary
7. Live video from the camera system should not be delayed more than maximum 3-4 frames or less than 130ms when displayed inside the room

2.7. Automatic Camera Tracking

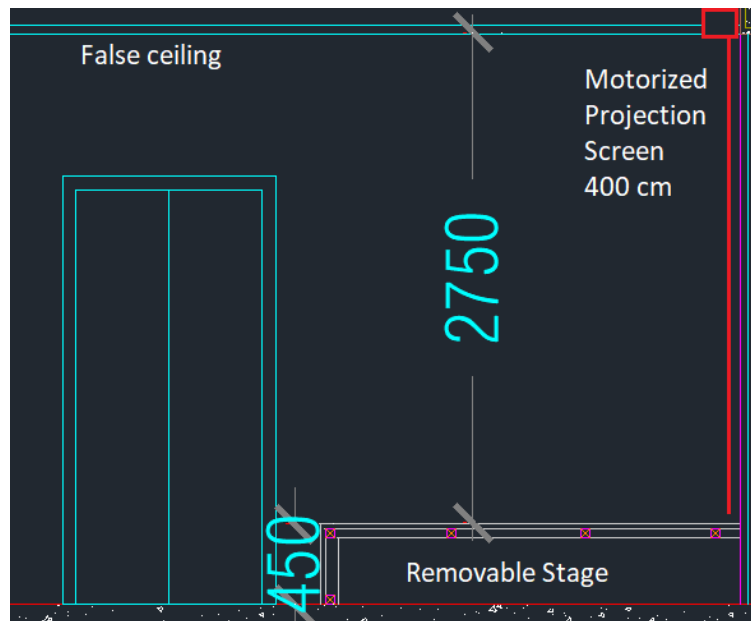
Video of talkers should be captured by an automatic camera tracking system based on location/audio data from the ceiling microphones.

1. Camera shots can be configured to cover groups or areas covering several seats
2. Once a camera shot is fixed it should not jump because someone is coughing or making a sudden noise.
3. Seats should be covered by two cameras as much as possible to avoid seeing camera movement on the video when cameras are moved into position
4. The system should go to an overview shot of the room with a few seconds delay when no one is talking
5. The operator should be able to adjust camera shots with a joystick

6. The operator should be able to disable automatic camera tracking and operate cameras manually with the joystick and to switch manually between cameras
7. It should be possible to create, adjust, store and recall configuration for 10 different room layouts

2.8. Projector and Projection screen

A motorized projection screen is to be installed on the wall behind the removable stage/podium with a ceiling mounted projector as close to the screen as convenient.



The bidder is to provide and install a projector and a motorized projection screen

1. The projector should have minimum 1000 lumens per square meter of projected image
2. The lens should have a shift range that allows installing the projector perpendicular to the projection screen and upside down right under the ceiling without having to use “keystone correction”
3. The lens should have motorized zoom and focus so that the control system can change its zoom and focus between two picture sizes, a smaller picture in seating arrangement layouts where people are seated on the podium and a larger picture in layouts where the stage and podium seats are removed
4. The lens throw should be as short as convenient to allow installing the projector as close to the projection screen as possible so that the light from the projector does not blind people seated at the podium
5. The mounting bracket should attach to the concrete ceiling slab which is 50cm above the false ceiling
6. The projection screen should be motorized and of the type that can be installed in a false ceiling
7. The width of the screen should be around 400 cm

The bidder should propose a complete display solution with a projector, wall displays and a confidence screen of sizes so that all people in the room can read document presentations.

2.9. Wall Displays

Two displays are to be installed on the side walls for people sitting too far away from the projection screen to be able to read it.

1. The size of the wall displays should be minimum 80” for people to be able to read document presentations from all back row seats in the auditorium
2. The displays should have a network based API for input selection and power on/off

3. Resolution should be 4K
4. The mount should be a heavy-duty swivel bracket so the screen can be swiveled out to a minimum angle of 45 degrees and tilted down to a minimum angle of 15 degrees
5. Swiveling and tilting should be possible without using tools
6. Option: Four wall displays instead of two

The two extra wall displays are to be priced separately as an option.

2.10. Confidence Screen

A moveable confidence screen should be available for people seated on the podium who have their back to the projection screen and cannot read the wall displays in the back

1. The confidence screen should be moveable on wheels
2. The screen should be installed in the dolly or moveable stand at an angle for better viewing from the raised podium
3. Connection point for the confidence screen should be provided in a floor box
4. Resolution should be 4K
5. Size of the screen should be minimum 60"

2.11. Interpretation Booth Displays - Option

The interpretation booths do not have windows towards the auditorium so interpreters need video displays to follow the meeting. Connectivity is to be provided for a table top video screen in each of the five interpretation booths next to the control room. Cable ways will be made alongside the wall under the desks.

1. One 4K table top monitor in each of the five interpretation booths
2. Live video from the camera system should not be delayed more than 3-4 frames or 120-160ms
3. Cabling between video distribution system in the rack and to the interpretation booths to be passed via cable ways provided by IWMI from the control room along the wall under the interpretation booth desks through the walls via tubes of minimum 5 cm diameter with acoustical dampening material

Displays, cabling and video distribution for this purpose is to be priced separately as an option.

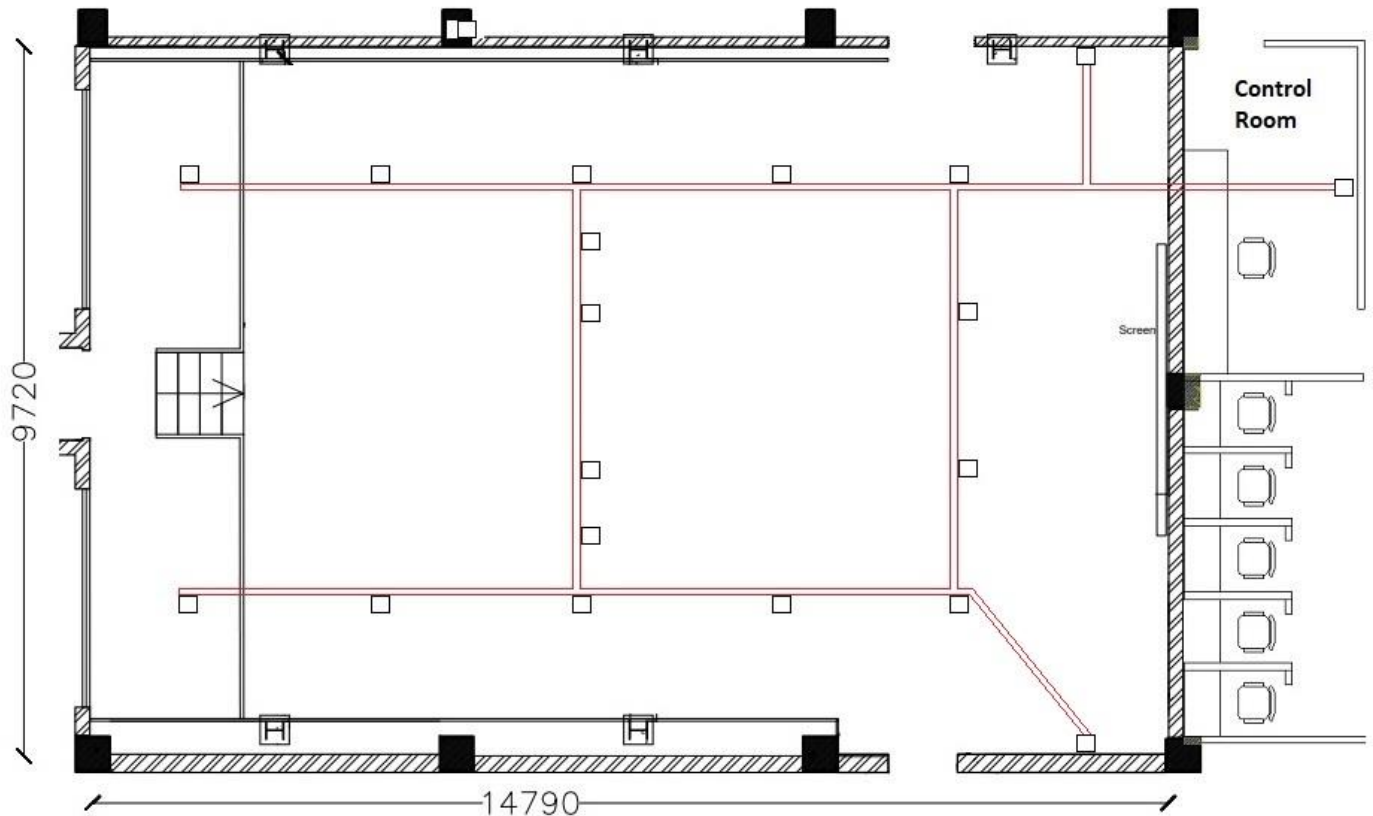
2.12. Presentation Input

HDMI connectivity should be provided inside the auditorium for video and audio presentations via laptop or PC.

1. The HDMI interface inside the room should be connected to the receiving equipment in the control room rack via a cable
2. The interface should accept up to 4K resolution and scale different laptop video output resolutions to the format used by the video system
3. The interface inside the room should be powered by the cable connecting it to the receiving equipment in the operator room rack
4. Connectivity for the presentation interface should be provided in minimum three floor boxes

2.13. Floor boxes and Cable Ways in the Floor

A number of floor boxes will be installed by the civil works contractor and IWMI's electrical contractor. The following drawing is not a final design. Number of floor boxes and locations are to be decided during the engineering phase.



All floor boxes will be adjacent to cable ways in the floor going to the control room where the equipment rack is to be located.

1. To calculate cost of labor, cable and materials, the bidder can assume that 18 floor boxes will be installed
2. Connectivity for "Confidence screen" for program video view from the podium/stage
3. Connectivity for computer connection for running MS Teams/Zoom/Webex/etc codecs from inside the room
4. Connectivity for wired presentation interface – three locations to be determined during the engineering phase and patching of receiver equipment in the rack
5. Control system interface – three locations to be determined during the engineering phase
6. The bidder is to provide and install minimum one Cat6a or better shielded twisted pair cable terminated in shielded RJ45 connectors in each of the 18 floor boxes going to a patch panel in the equipment rack
7. The female RJ45 connectors should be installed in termination boxes and patch panels isolated from any floor box / cable way metal and the metal of the rack. Plastic termination boxes and patch panels with plastic inserts can be used

The floor boxes will be either of the standard box type with lid or a type of spring loaded, angled lid where the face plate pops up in an angle. Choice of floor box type depends on depth available in the concrete floor which will be known when the civil works contractor starts cutting the floor to make cable ways.

2.14. AV Control System

Control of the installation should be available via graphical User Interface(s) (GUI). They should be intuitive and easy to use. The operator room has no window towards the auditorium so the system should allow the operator to monitor the auditorium. The minimum functionality required from inside the control room is:

1. Installation on/off
2. Video monitoring and selecting inputs to be displayed inside the auditorium (program video)
3. Audio monitoring
4. Enable/disable automatic camera tracking
5. Create/edit/store/recall of 10 seating arrangement layouts, microphone configuration and camera presets
6. Hybrid meeting setup
7. Motorized projection screen up/down
8. Control of projector zoom and focus for two picture sizes
9. Buttons for calling presets in the light dimming system provided by the electrical contractor, interface will be contact closure, IP or RS232/422/485
10. separate screen on the operator desk or mounted on the wall should display program video and all video input sources

The minimum control functionality required from inside the auditorium is:

11. Selecting inputs to be displayed inside the room (program video)
12. Enable/disable automatic camera tracking
13. Buttons for calling presets in the light dimming system
14. Hybrid meeting setup

2.15. Simultaneous Interpretation System – Option

Interpretation stations for five languages are required for the five interpretation booths next to the control room.

1. Selectable A and B outgoing languages
2. Selectable Floor and language presets
3. Connectivity for microphone gooseneck, headphone and headsets
4. Volume, bass and treble controls
5. Floor sound from the AV system should be a mix of all audio sources including far-end from hybrid meetings

Equipment and cabling for this purpose is to be priced separately as an option.

2.16. Language Distribution – Option

Language distribution is required for all participants in the auditorium carrying floor sound and all languages.

1. 150 receivers with minimum six selectable channels, floor sound and five language channels, power on button and volume control
2. 150 headphones
3. Coverage of all seat arrangement layouts inside the auditorium
4. Connectivity with optional simultaneous interpretation system
5. Connectivity with optional PC based system for remote interpretation via the internet

Equipment and cabling for this purpose is to be priced separately as an option.

2.17. Connectivity for PC based System for Remote Interpretation – Option

Connectivity for software based systems for remote interpretation via the internet is to be proposed as an alternative to having local interpreters using interpretation stations.

1. Floor sound output to minimum five PCs with software. The floor sound from the AV system should be a mix of all audio sources including far-end from hybrid meetings
2. Audio inputs for five PCs providing channels with simultaneous interpretation sound
3. Connectivity is to be located in the control room

Equipment and cabling for this purpose is to be priced separately as an option.

3. Meeting Rooms

AV systems are to be installed in two smaller meeting rooms with 9 and 13 seats.



1. Connectivity for hybrid meetings via MS Teams, Zoon, Webex, etc
2. Audio and video connectivity for laptop presentations
3. Screen mounted on the wall for viewing laptop presentations and far-end when in a call
4. Loudspeaker system for playing presentation and far-end audio
5. Good quality microphone for picking up audio from all seats

6. One camera covering all seats
7. Acoustic Echo Cancellation (AEC)

Voice lift is not required.

4. Installation

A high performance digital audio and video installation depend on using quality cables and observing recommendations from cable and equipment manufacturers.

4.1. Cables and Connectors

1. Data sheets should be available for bulk cables
2. Data sheets should be available for connectors to be used for terminating bulk cables
3. Manufacturers recommendations for pulling, installing and terminating cables should be followed. Bending radius, termination method, use of cable ties/velcro without cable deformation/performance degradation
4. Shielding of twisted pair cabling must be isolated from metal in rack and floor boxes/cable ways

4.2. Cable Test Reports

All installed twisted pair cables should be tested using a good quality cable tester – Fluke or similar – which can test cable performance and not just simple wire mapping.

1. Performance test reports for all installed and numbered twisted pair cables on pdf form

4.3. Equipment Rack

The equipment rack is to be installed inside the control room

1. The equipment rack should be a full size 19" equipment rack minimum 600mm wide and 800mm deep with a glass front door and a back door which both can be opened/closed for easy access to front and back of equipment
2. Top mounted ventilators should draw out hot air and should be silent considering that the rack is located inside the control room near the desk where operators will be monitoring audio from the room
3. 230V power rails should be with IEC connectors
4. Main switch for switching off power to all power rails
5. Vertical cable ways should be available on the inside for cable management
6. The rack should be placed so that front and back doors can be opened without moving the rack. Exact location and orientation to be determined during engineering phase

UPS backed power will be provided by IWMI at the location of the rack.

Other UPS backed sockets to be determined during the engineering phase.

5. Documentation

The following sections describe the documentation for implementation and commissioning of the installation.

5.1. Drawings and Documentation for Execution

The bidder is asked to submit the following documentation for IWMI's approval during the engineering phase.

1. Detailed schematic showing all equipment and cabling
2. Drawing showing equipment location inside the auditorium
3. Equipment list
4. Cable list
5. Rack layout, front and back
6. Layout of equipment to be installed on the operator desk in the control room
7. Data sheets for all bulk cables to be pulled between the control room and the auditorium

IWMI will need five working days for approval.

5.2. Cable Numbers and Cable List

All cables should be numbered at both ends using proper cable numbering systems that will remain on cable throughout the installation's life time. The cable numbers should show on schematics and be listed on a separate list identifying cable type, to/from equipment/location and length.

1. Bulk cables terminated on site should be numbered using the plastic ring type cable numbers that are fitted at both cable ends before cables are terminated
2. Preterminated cables should be numbered using a cable numbering system that provide long lasting identification. Simple self-adhesive labels wrapped around the cable are not acceptable

5.3. As-Built Drawings and Documentation

The bidder is to provide as-built documentation to IWMI and present it at commissioning. It is mostly a matter of updating the documentation for execution to reflect the physical installation:

1. Detailed schematic showing all equipment and cabling
2. Drawing showing equipment location inside the auditorium
3. Updated equipment list
4. Updated cable list
5. Updated rack layout, front and back
6. Updated layout of equipment to be installed on the operator desk in the control room
7. User manuals for all equipment in pdf format
8. Software and equipment licenses
9. System configuration/parameters for all equipment which requires configuration. Examples of such equipment are ceiling microphones, DSP, AEC, video mixer/switcher, projector

6. Training

The bidder is required to provide training after successful commissioning including handover of as-built documentation.

1. Training in operation, room configuration and trouble shooting

7. Time Schedule

IWMI wish to be able to use the installation from 1st September 2024. The bidder is to liaise with the civil works contractor and the electrical contractor concerning interfaces such as 230V power sockets, floor boxes, cable ways, drop ceiling, walls, rack location and operator desk in the control room.

IWMI propose the following overall time schedule:

1. Engineering phase completed before end of June
2. All equipment and materials available at IWMI end of July
3. Rooms ready for installation from beginning of August
4. Commissioning by end of August
5. Training immediately after handover