

AUDIO-VIDEO COMMUNICATIONS AND INSTRUCTIONAL MEDIA

Priority: The University of Illinois at Urbana-Champaign is committed to implementing the very latest in Audio Video communication capabilities, and supporting their use. Therefore, facility design criteria should support the latest and most appropriate in Audio Video communication. Audio Video applications should be considered in the very beginning of the planning process during the pre-design phases.

AV Defined

27 40 00 Audio-Video Communications:

Stand alone and integrated audio-video systems and equipment that generally support a single room or space in a facility with many components that function as one system.

- In the case of CATV, the integrated audio-video system connects to a cable distribution system.
- source and production equipment, switches, amplifiers, control interfaces, microphones, and presentation devices.
- broadcast studio audio-video equipment.

Includes, but is not limited to:

27 42 00 Electronic Digital Systems:

Hardware, software, and equipment for digital signage systems.

27 51 00 Distributed Audio-Video Communications Systems:

Paging, public address, sound masking, and intercommunications systems that service all or part of a facility.

Given For Clarification:

Instructional Media: Those AV systems and equipment in classrooms, lecture halls and departmental instructional spaces. This includes such items as lecture capture, video streaming, and specialized software, all of which may be used to differentiate these instructional systems from AV usage in administrative communication and recreational applications.

Closed Circuit Television: Closed circuit television (CCTV) equipment and systems including cameras, recording equipment for educational / research / distributed

presentation purposes is considered part of 27 40 00 Audio-Video Communications.

Reference: See 28 23 00 *Electronic Surveillance for video surveillance equipment and systems.*

For further considerations relating to Audio Video equipment and systems, consult with Campus Information Technologies and Educational Services (CITES), specifically: Classroom and Conferencing Media Engineering (CCME).

Classrooms, Lecture Halls and Departmental Instructional Spaces

Note: See “Classroom and Lecture Halls” in the General Guidelines of these *University of Illinois at Urbana-Champaign Facility Standards*

AV Designer Requirements

New construction and major remodeling or renovation projects with audio-visual scope will require the services of an audio-visual consultant/designer.

Minimum qualifications for the AV consultant are:

1. InfoComm CTS-D certification
2. 6 years working experience in the audio-visual industry.
3. Documented and verified design and project experience with like projects and technologies as the University project being contracted.
4. Ability to develop and author detailed specifications, and other project documents described in these facility standards related to AV.
5. Ability to prepare detailed construction drawings.
6. Ability to inspect, evaluate, and report on various project deliverables both in the field and written submittals.
7. Experience in a campus environment.

CITES-CCME must review and approve any variance requests of these designer qualification requirements.

Quality Assurance Deliverables

The AV System Commissioning process, or “Quality Control,” is started back during the Needs Assessment phase by the University’s Technical Representative (CITES-CCME) with the technical needs write-up. This will be the beginning of the Owner’s Project Requirements (OPR).

Basis Of Design [BOD]: *(the work document):* The process of continually refining the AV requirements will be the work of the Architect and AV Consultant with the development of their BOD (Basis of Design) document for the physical space(s) and AV system(s). The BOD shall give the reasoning, assumptions, and formulas used to determine layouts, equipment chosen, and the expected levels/results in an objective manner throughout the AV system ending with the end-user’s experience--in other words, the combination of technology and environment for total human experience.

The very first program statement from the design team should include an *AV System Performance Specification* information sheet that will be included for each space and/or type of space in the project. Please see *Exhibit 27 40 00-1 AV System Performance Criteria*

Design Phases and Contract Documents: The BOD shall be updated and submitted for review and approval by the University’s Technical Representative (CITES-CCME) with each of the design phases’ deliverables.

The bid document should show the final product of all work in narrative and drawings in a clear, concise, and measureable manner. Tests and testing procedures shall be a part of these bid documents. Any bid addendums that are issued may cause an elimination, addition, or modification to the individual test items required and/or testing procedures (see Testing and Testing Procedures below).

After Awarding: Once the AV portion is awarded, engineering work of the Integrator will be requested showing the reasoning, assumptions, and calculations used for the Integrator’s full project submittal, bill of materials, and installation plan. Any project-change orders or approved substitutions, modifications, or installation variances that are issued may cause a modification to the

tests required and/or testing procedures. Please refer to the section on Testing and Testing Procedures below.

Testing and Testing Procedures: All information from OPR through construction, and up to System Acceptance Testing, will be tracked and used where applicable by the consultant to develop a final set of current and relative tests and testing procedures that will be carried out by the Integrator at the proper times. Any changes to these tests and testing procedures will be developed in a cooperative manner with input from the AV Integrator and will be updated to reflect system changes or changes with the project as a whole. These tests and testing procedures will be submitted to the University’s Technical Representative (CITES-CCME) for final approval before any testing.

Milestones: The main AV milestones for verification will start with conceptualization / schematic design, depending on the first AE deliverable, and will end with completion of warranty. The documents being used for quality assurance, along with when and what for are:

Designer Verification and Deliverables

- *Exhibit 00 01 00-1, AE Minimum List of Deliverables (for Fee Negotiations); is a reference throughout contract for timing of general AV and other deliverables*
- *Exhibit 27 40 00-1 AV System Performance Criteria; will be completed and be a part of the first AE submittal. Is used to set the basic performance criteria for the specified space and space usage.*
- *Exhibit 27 40 00-2 AV Basis of Design; Used to show AV design reasoning, assumptions, and formulas. Continually updated throughout design phases and throughout construction.*
- *Exhibit 27 40 00-3 AV System Design Review; Used to review system design submittals*
- *Exhibit 27 40 00-4 Submittal Drawing Checklist – AV Systems and Equipment; Used to verify that designer’s drawing package is ready for bid and is concise, accurate, and easily understandable for bidding.*

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Contractor / Integrator Verification and Deliverables

- *Exhibit 27 40 00-4 Submittal Drawing Checklist – AV Systems and Equipment*; Used to verify that contractor/integrator has reviewed and properly prepared submittal and is ready for procurement and installation.

The main AV milestones that testing will be required are all Prototype verifications (both off-site and on-site) [a.k.a. Staging], Final System Checkout, Final Checkout, and any follow up testing as required to complete any of these three (or four) identified milestones. The two testing report formats that shall be used are:

- *Exhibit 27 40 00-11 AV Staging Testing and Verification*; Used to systematically test and document the system, or prototypical system of multiple-like design, before complete installation on the job site is started. Also used to verify and document workmanship to that point.
- *Exhibit 27 40 00-12 AV Commissioning Testing and Verification*; Will be used by the contractor/integrator to test system operation, and verify workmanship conforms to project requirements. Also used by University's Technical Representative (CITES-CCME) to verify system operation and verify workmanship meets project requirements.

Note: for example and supporting documents to assist in the AV design, installation, and commissioning process please see *Section 27 40 00 – Audio-Video Communications*, and *Exhibits 27 40 00-1 through 12*, located in the Technical Sections of these Facilities Standards.

Compliance and References

Industry standards, guidelines, and best practices (InfoComm):

1. ANSI/INFOCOMM 1M-2009, *Audio Coverage Uniformity in Enclosed Listening Areas*.
2. ANSI/INFOCOMM 2M-2010, *Standard Guide for Audiovisual Systems Design and Coordination Process*

3. ANSI/INFOCOMM 3M-2011 *Projected Image System Contrast Ratio*
4. ANSI/INFOCOMM 4: 2012 *Audiovisual Systems Energy Management*
5. AV Design Reference Manual, from INFOCOMM International.
6. Audiovisual System Design and Coordination Components, from INFOCOMM International.

Quality Management is guided by The Association for Quality in Audio Visual Technology (AQAV, and that association's standard)

1. AV 9000:2012 *Quality Management System*

Conduit, pathway, and dedicated equipment room considerations shall follow:

1. *ANSI/TIA-569B Commercial Building Standard for Telecommunications Pathways and Spaces*

Acoustical guidelines for classrooms, consult:

1. ANSI/ASA S12.60; *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools*

Intelligibility of sound systems and public address systems:

1. NFPA 72; *National Fire Alarm and Signaling Code*

Further Reference

1. Davis and Davis, 1987 "Sound System Engineering"
2. Giddings, 1990, "Audio Systems Design and Installation"

Design Considerations Section

Below is a partial listing of design considerations. No one document is going to cover all details for all projects. This section is meant to give general Audio Video (AV) design considerations relating to the building mechanical design, sightline considerations, and infrastructure guidelines.

For further considerations relating to AV please consult with Classroom and Conferencing Media Engineering (CCME).

Line of Sight: Of special importance in the design of classrooms and lecture halls are the coordination of the room layout (e.g. the three-dimensional location of seating relative to blackboards, projection screens, equipment cabinets, etc.) and the installation of audio-visual equipment to ensure optimal lines of sight for all occupants, and the optimal projection lines and field of view for the AV equipment.

Coordination of Ceiling Height / Interstitial Areas: The bottom of the image shall be placed so all audience members can see the complete image. Therefore, the height of the finished ceiling will have to account for this requirement to allow for the actual extended screen (or image height).

This is typically the biggest building design challenge with implementing AV and requires special attention at the beginning of the design when the building's floor heights are being determined, and shall take into account:

1. How much seating capacity requirements are going to drive the size and layout of the space being designed
2. Placement and size of the screens to properly cover the intended area and display the intended content to be shown
3. The area required above the ceiling for mechanical equipment, which takes away ceiling height

In the area above the finished ceiling and below the deck of the floor above, allow for conduit / cable tray, media support accommodations (projector lifts, speaker housing, etc.), and other specialty equipment.

All AV support/mounting accommodations shall be attached directly to the building's structure, and not shared with any other support structure for other building systems. AV mounting accommodations must be vibration free.

Projection Screen(s):

Screen Size: When displaying images, there is a direct relationship to the room seating. When figuring the image height to be displayed, measure the distance to the farthest seat from the screen. For detail type of viewing, most common use, divide

this distance by six (6). This will give you the minimum image height required. The width of the image should accommodate a 16:10 aspect ratio for computer resolutions.

Screen Type: The material for the screens shall have a matte white finish. Choosing between a manual pull-down screen and an electrically operated screen will be determined by the physical layout of the room and the project budget. All screens ten (10) feet or wider shall be electrically operated.

Placement of the First Row: The first row of seats shall not have a vertical viewing angle greater than 30°.

Intelligibility: All sound systems and public address systems need to be intelligible. This intelligibility requirement has a direct relationship to room acoustics, required volume and minimal system distortion.

The NFPA 72; *National Fire Alarm and Signaling Code*, is being referenced for the speech intelligibility requirements and testing procedures that it contains for reference when designing sound systems and public address systems that may be part of a campus emergency alert system (for immediate or future use).

Acoustics / Sound Transmission: Internal acoustics are more critical in the design of rooms with AV than in most other types of spaces. These rooms shall also be designed and constructed so as to minimize sound transmission into and out of these spaces. Avoid locating rooms with A/V close to exterior and interior noise sources such as service entrances, equipment rooms, restrooms, and high traffic areas. Take appropriate measures to minimize unwanted noise in rooms with Instructional Media.

ANSI standard; *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools* (ANSI/ASA S12.60) shall be used as a baseline for classrooms and ancillary learning spaces that do not exceed 20,000ft³.

For specialty rooms such as rooms using video and audio conferencing technology,

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and/or recording, the noise control requirements are even more stringent.

Acoustical design goals need to be established early on by the architect so all structural and mechanical designs can conform to these criterion. Further, these designated design goals are a baseline for the AV design (amplifiers and loudspeakers). Designs and/or construction that fail to develop a reasonable acoustical environment will prevent the successful implementation of AV into the space.

HVAC: The portion of the HVAC system that is designed for an AV enhanced room shall be designed and constructed with special consideration given to noise control.

Each large venue projection booth and AV equipment room shall have a dedicated HVAC system that is tailored to the specific needs of the area being served, plus create positive pressure to keep dust problems at a minimum. To create positive pressure and for occupancy requirements, a minimum amount of outside air shall be supplied from a central AHU. The dedicated system will control the temperature and humidity of the space.

All AV rooms that are heavily equipped and generate more heat than can be reasonably vented year round should allow for maintaining proper temperature and humidity with the implementation of specific control strategies. These rooms must be evaluated and if there is a continuous process load due to AV and/or other equipment, they must have a dedicated cooling system. These rooms may also need a minimum amount of outside air due to occupancy schedule of equipment operators. The dedicated systems would be subject to the U of I's requirement to utilize Campus Central Chilled Water unless it is not available or can be proven not to be economical/practical, in which case a variance request must be submitted.

Electrical: In a room with AV enhancements, the various equipment locations shall have their power supplied from the same phase and power panel wherever possible. In those rooms that are heavily equipped with AV, dedicated

audiovisual power panels should be considered. In either venue the circuits (or power panel) shall be dedicated to the audiovisual needs and isolated from the other electrical needs of the room.

Conduit Pathway: Follow *ANSI/TIA-569B Commercial Building Standard for Telecommunications Pathways and Spaces* for determining conduit capacity, conduit routing, and pull-box positioning and layout. The conduit pathways shall utilize sweep bends and pull-boxes; no hard 90-degree bends shall be used. All pull-boxes shall be easily accessed and promote ease of use.

Lighting: Electrical lighting in AV enhanced rooms is not only planned using the *University of Illinois at Urbana-Champaign Facilities Standards*, but there are special lighting/darkening requirements for note taking and media projection. Determination of lighting controls is part of the architectural planning process, and should account for AV usage and requirements.

In rooms with AV projection, pendant lighting fixtures shall be designed to allow the AV projected image light to be properly displayed on to the screen. The lighting fixtures shall not block the projection path, or place too much light on the screen surface.