Campus Technology Space Standards

Revised: 1/3/2019

University Classrooms – Space Management
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1. **Introduction**

There are three types of guidelines that impact the programming, design, and construction/renovation of a classroom: *Classroom Space Utilization Guidelines*, *Campus Technology Standards*, and *ASU Design Standards*. The *Classroom Space Utilization Guidelines* are a reporting tool and a planning tool. The *Campus Technology Standards* are designed to create functional, flexible, sustainable, and aesthetically pleasing classrooms. The *ASU Design Guidelines* are a roadmap to planning, designing and constructing Arizona State University (ASU) facilities. The *Campus Technology Standards* are part of the *ASU Design Guidelines*.

Classroom Space Utilization

The purpose of *Classroom Space Utilization Guidelines* is to estimate the overall amount of classroom space that may be needed by an institution to meet the current or projected conditions for each type of room. The Guidelines are global in nature, institution-wide, and typically used in the preparation of facilities master plans, for setting capital project priorities, and for reporting utilization to the Arizona Board of Regents (ABOR). The estimated amount of classroom space is compared to the actual inventory of classrooms on campus to determine need.

These *Classroom Space Utilization Guidelines* are not to be taken as absolute standards. They are to be used in programming specific classrooms. They are balanced with the needs of specific programs for flexibility and modified responsibly by the design conditions of specific projects. All applications of the Classroom Space Utilization Guidelines must be approved by University Classroom Management group (UCL).

University classrooms are rooms used for scheduled classes that are not limited in their use to a specific subject or discipline. University classrooms include general purpose classrooms, lecture halls, seminar rooms, auditoriums, and computer classrooms. In the calculation of space utilization, classroom space is defined as the square footage within the walls including the seating area, the circulation space, any instructor/demonstration area, and storage/service area associated with the room. The square footage of each classroom is then aggregated campus wide and includes associated support rooms.

Utilization of classrooms is defined by the student station size, room use in terms of hours, and station/seat occupancy rate. Spaces can vary by institution or campus, depending upon the existing or desired mix of classroom capacities, size of the institution, hours of use and types of programs. The station/seat space factor includes an allowance for students, instructor, internal circulation and 5% service. It can vary by room subtypes and type of seating, and depends upon the desired mix of room capacities. Architects should take into consideration the geometry of the room, since form can also impact the capacity of the room rendering a less efficient space.

The current ABOR guidelines were adopted in 1997, based on the 1985 *'Council of Educational Facility Planners International Space Planning Guidelines'*. They are as follows:

Room type	Weekly Room Usage	Station Utilization	Station Size
Classrooms	35	65%	19 square feet
Lecture rooms	32	63%	17 square feet
Collaborative/seminar	35	67%	22 square feet
Computer Instructional	32	75%	32 square feet

Note: To review the formula that was used for the table above, please see the *'Space Planning Guidelines for Institutions of Higher Learning'* published in 1985 by the Council of Educational Facility Planners International (CEFPI)

Classrooms: Classrooms are defined as having both traditional tablet arm chair configuration or narrow table and chair configuration providing added student work surface. Room capacities typically range from 30 to 100 stations.

Lecture rooms: Classrooms for large classes with either fixed table and chair seating or traditional theater type seating. Room capacities typically exceed 100 stations.

Seminar: Collaborative/ Classrooms with movable tables and chairs which provide the instructor flexibility to arrange the class in small discussion teams or meet with the class as a whole. The category includes seminar rooms, which are typically small rooms, less than 30 stations, with conference style seating.

Instructional: Computer Scheduled classrooms/class labs equipped with computer terminals at each student station, providing students the ability to individually access and manipulate class materials stored on computer files. The rooms are typically equipped with standard desktop computers which support the technology requirements for courses in a broad range of academic disciplines.

ASU has refined the definition of lecture hall to distinguish lecture halls from the very large auditorium style rooms, and address the space requirements for large tiered rooms that are not auditorium fixed seating types.

Pedagogy and the Learning Environment
Technological advancement and accessibility of mediation at a lower cost, and subsequent changes in pedagogy all place demands on the physical space. There is still a need for lecture type rooms where seat count can be maximized by the nature of the learning method (instructor in front with presentation area, rows of seats). Yet, there is also an increasing need for rooms that can accommodate a variety of teaching methods, quick reconfiguration, and technology.   These changes in teaching preferences and technological advancements have not been reflected in the ABOR guidelines which were based on the *CEFPI* 1985 publication and adopted in 1997.

Recent programming exercises for new buildings and subsequent feedback on the use of the current classrooms have rendered the following valuable information:

- Faculty demand for flexible space in classrooms
- Faculty and student demand for collaborative work spaces
- Faculty and student demand for mediated classrooms
- Ever increasing demand for special needs student furnishings.

The quest to prepare students for the corporate world with experimental skills and the increase in graduate population require older facilities to perform differently than originally designed. The non-castered tablet-arm chairs once essential in classrooms design are no longer viewed as appropriate. The increased use of laptops creates a need for larger flat work surface to accommodate the technology and books. The changes in teaching methods require team/collaborative work. For these reasons, and based on other research completed by organization such as Educause, ASU suggested the planning guidelines for each type of classrooms in Section 3.

2. **Design Review and Approval**

   2.1. **Approvals**
   All classroom designs must be approved in writing by Arizona State University's University Classroom Management group (UCL). Reviews by UCL will be required at each step of the planning, design, and construction process (conceptual design, schematic design, design development, construction documents, and any value engineering or changes).

2.2. Discrepancies

Any discrepancies between these *Classroom Design Guidelines* and the *ASU Design Guidelines*, *ASU's Accessibility Standards*, or the *ADA Standards for Accessible Design*, shall be resolved with Office of the University Architect (OUA).

3. Room Definitions

Different pedagogical techniques require different types of learning spaces. ASU has defined seven basic classroom types that are prevalent on its campuses. The recommended square footage requirements reflect the pedagogical style, and take into consideration the diversity of cultural values regarding personal space. **Mediation level (Section 10) with projection, digital displays and audio is also critical to space design. Standards require provisions for respective screen size and ceiling height to allow a screen height of 1/6 the distance to the furthest audience member. The lower edge of the screen shall be placed a minimum of 42 inches above fixed floor to reduce obstructions by a seating audience. Room dimensions that exceed this 1/6 screen ration may require additional displays to accommodate viewers.**

3.1. Classroom: Traditional, Loose Seating

Traditional classrooms are our most common learning spaces. They have movable furniture, and are very flexible. Furniture can be rearranged to allow for lecture, seminar, group work, or anything else the instructor might require.
- Traditional classrooms contain 25 to 60 non-fixed seats.
- Flat floors are required.
- The first row of student seating should be a minimum of 1.5 times the width of the projection screen from the front of the room. Example: projection screen size 90"H x 120"W, first row of student seating would be 15'-0" from front of room. If not possible to maintain formula outcome, allow a minimum of 9 feet from the front of the room to the first row of seats.
- The instructor's station will require 10 square feet.
- 20 – 22 square feet per student accommodates some collaborative functions.

3.2. Classroom: Traditional/collaborative

Collaborative classrooms are a subset of traditional classrooms in which the teaching methods require group work. The furniture is movable and flexible.
- Traditional/collaborative classrooms contain 25 - 40 non-fixed seats.
- Flat floors are required.
- 25 - 30 square feet per student accommodates flexibility in furniture arrangement to meet most types of pedagogy.

3.3. Classroom: Seminar

Seminar rooms generally accommodate smaller numbers of students seated in any number of seating configurations.
- Seminar rooms contain 19 - 25 seats.
- A face-to-face seating arrangement is possible.
- The instructor sometimes sits with students.
- 25 - 30 square feet per student accommodates this type of pedagogy.

3.4. Lecture Halls

Lecture halls are larger tiered classrooms, usually with either fixed seating or fixed tables and movable chairs.
- Lecture Halls contain 50 - 150 seats

- Tiered floors (aisles may be sloped but seating areas must be tiered)
- The dimensions of the seating tier or tray must easily accommodate movement behind seats
- Theater-style seating with attached tablets *or* fixed tables with free-standing chairs.
- A curved configuration is preferred where possible
- 18 - 20 square feet per student overall, but at least 10.5 square feet per students for the seating area, allows for ample circulation amongst the seats.
- The square feet per student ratio is proportionate to the space associated with the podium/front of room, and amount of circulation space required. If the function of the room requires a large stage area or specific circulation pattern, the overall square feet per student may be over guideline.

3.5. Auditoriums

- Auditoriums contain more than 150 seats
- Aisles may be sloped but all seating areas must be tiered
- Theater-style seating with attached tablets are allowed
- A curved configuration is optimum
- 18 square feet per student overall, but at least 6.5 square feet per student in the seating area, allows for ample circulation amongst the seats.
- The square feet per student ratio is proportionate to the space associated with the podium/front of room, and amount of circulation space required. If the function of the room requires a large stage area or specific circulation pattern, the overall square feet per student may be over guideline.

3.6. Computer Classrooms ("Student Mediated")

Student Mediate classrooms are specific to the prescribed instruction mode.

- 32 square feet per student accommodates the larger station sizes for equipment and writing space, and generous aisle widths to allow unobstructed instructor movement behind seated students.
- Design for future, and current cabling and electrical requirements.

3.7. Conference Rooms

Conference rooms are typically categorized by 4-6 person and/or 7-12 person spaces.

- The can be mediated with one on more displays or projectors based on user requirements, including presentation, teleconference (phone), and/or videoconference.
- V-Shaped trapezoid tables are recommend for any scope that may include videoconferencing to ensure camera coverage of participants.

4. General Applications

4.1. Locations

- Classrooms should be located no more than one floor up or one floor down from the main entrance to the building.
- In some urban buildings**,** classrooms may be placed on upper floors, but the building design shall provide for ease of access and for convenient vertical mobility of students. In such cases, elevator studies must be provided to satisfy movement requirements especially between class changes.
- Classrooms should be located away from noise generating areas such as mechanical rooms, elevators, vending machines, and restrooms. If physical separation is not feasible, increased acoustical treatments may be needed.

4.2. Hallways/Corridors

- Hallways should not only be part of the building design and aesthetics, but should also be viewed as an extension of the learning environment. They should always be as visually interesting as possible.
- Egress hallways should be sized to accommodate at least double the loads indentified in code due to the large number of students leaving and entering the rooms, and provide gathering space during class changes.
- Hallways should be viewed as an opportunity to improve classroom acoustics.
- Non-recessed doors that open into the hallways are to be avoided.

4.3. Informal Interaction Spaces

The design of adjunct teaching/learning space for small or one-on-one collaborative and instructional interaction is encouraged. Small spaces can be incorporated within lobbies, hallways or any other architectural opportunities that might be present.

4.4. ADA

- Design all classrooms to comply with *ADA Standards for Accessible Design* and *ASU's Accessibility Standards*, which can be found in *ASU's Design Guidelines*. Any discrepancy between the ADA Standards and this document shall be resolved in design review.
- Provide accessible wheel chair seating positions distributed in each room according to chart below.

Capacity of Seating in Assembly Areas	Number of Required Wheelchair Locations
4 to 25	1
26 to 50	2
51 to 300	4
301 to 500	6
over 500	6, plus 1 additional space for each total seating capacity increase of 100

4.5. Applicable Procurement Requirements

Classroom design and product specification must conform to procurement requirements set by the ASU Purchasing Department.

4.6. Classroom Storage

There is often a need for a small storage room for classroom supplies that is separate from the audio/visual storage. It should be approximately 100 square feet to store board supplies, movable lecterns and additional chairs. This space requires lighting, a lockable door, conditioned air, power, and a few shelving units for small supplies. It should have no window and needs to be equipped with a storeroom function lock. Classroom storage should be accessible from outside the classroom.

4.7. Digital Signage Displays

Protrusion – Displays and mounting must adhere to ADA guidelines. Objects shall not protrude more than four inches into accessible routes at or below 80 in (2030 mm) above the ground or floor surface (figure 4.7a)

Less than 4"
Greater than 4" | Greater than 4"
Overhead View

Greater than 4"
Greater than 4" | Greater than 4"
Overhead View

Greater than 4" | Greater than 4"
Less than 4"

6'-8"

2'-3"

Front Elevation

Side Profile
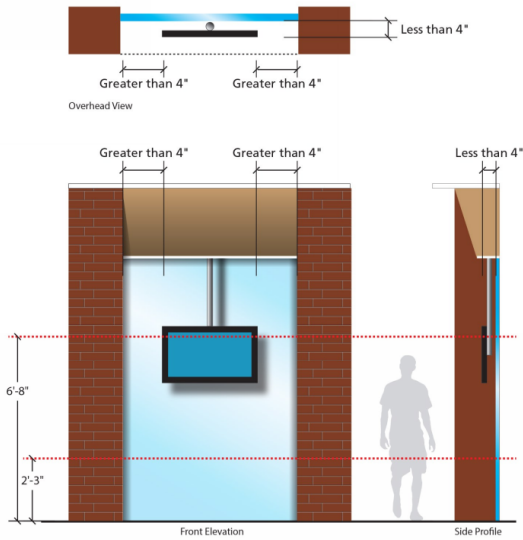
A Display in front of broad niche in pathway
Scale: 3/8" = 1'-0"

APPROVED
Signface may not project more than 4" from rear wall
If any portion of sign is inside of the 27"- 80" zone and
there is more than 4" clear space on either side of sign.

Display cannot block view of 'EXIT' sign from any direction.
Location must be approved by OUA.

Greater than 4"

6'-8"

2'-3"

Front Elevation

Side Profile
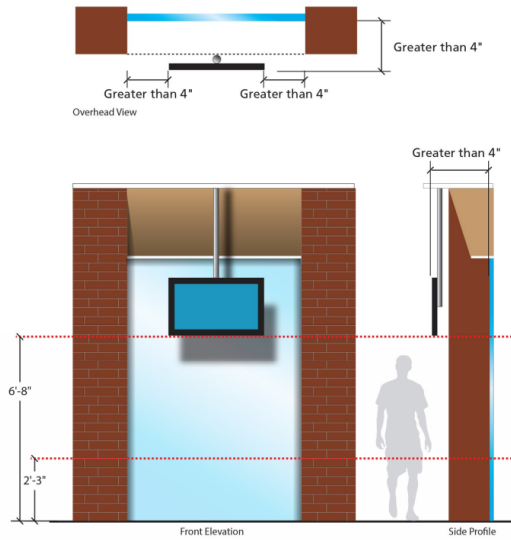
B Display in front of broad niche in pathway
Scale: 3/8" = 1'-0"

APPROVED
Sign may project more than 4" into path of travel
if bottom of sign is higher than 80" and outside of the 27"- 80" zone.

Display cannot block view of an 'EXIT' sign from any direction.
Location must be approved by OUA.

Less than 4"
Greater than 4"
Overhead View Less than 4" Less than 4"

Less than 4" | Less than 4"
Less than 4"

6'-8"

2'-3"

Front Elevation

Side Profile
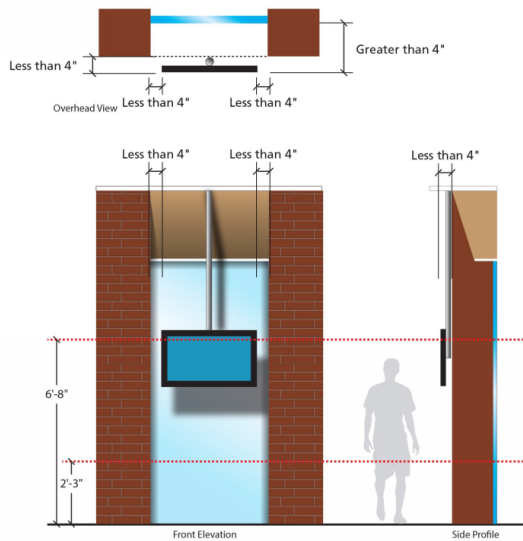
C Display in front of tight niche in pathway
Scale: 3/8" = 1'-0"

APPROVED
Signface may not project more than 4" into path of travel
If any portion of sign is inside of the 27"- 80" zone and
there is less than 4" clear space on either side of sign.

Display cannot block view of 'EXIT' sign from any direction.
Location must be approved by OUA.

Greater than 4"

6'-8"

2'-3"

Front Elevation

Side Profile
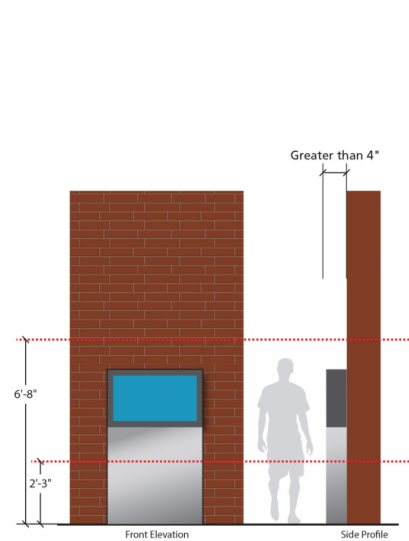
D Display in floor mounted cabinet
Scale: 3/8" = 1'-0"

APPROVED
Sign may project more than 4" into path of
travel If sign continuosly goes to the ground
and does not interfear with path egress.

Display cannot block view of 'EXIT' sign from any direction.
Location must be approved by OUA.

Less than 4"   Greater than 4"

6'-8"

2'-3"

Front Elevation   Side Profile

E Display in front of wall in pathway
Scale: 3/8" = 1'-0"
APPROVED
Sign may not project more than 4" into
path of travel from rear wall
within the 27"- 80" zone

Display cannot block view of 'EXIT' sign from any direction.
Location must be approved by OUA.

F Display in front of wall in pathway
Scale: 3/8" = 1'-0"
APPROVED
Sign may project more than 4" into path of
travel If bottom of sign is higher than 80" and
outside of the 27"- 80" zone

Display cannot block view of 'EXIT' sign from any direction.
Location must be approved by OUA.

G Display on wall in pathway
Scale: 3/8" = 1'-0"
APPROVED
Sign may not project more than 4" into
path of travel from rear wall within the 27"- 80" zone

Display cannot block view of 'EXIT' sign from any direction.
Location must be approved by OUA.

H Display in front wall in pathway
Scale: 3/8" = 1'-0"
NOT APPROVED
Sign is not to be installed if it projects more
than 4" into path of travel within the 27"- 80" zone.

An ADA guard at the floor is not approved for
use in an egress path for this purpose.

ADA guard

Interactivity- Interactive digital signage displays shall adhere to ADA standard reach requirements.
Mounted displays shall have interactive sections or controls not exceeding 48 inches above fixed floor.

(a)
High Forward Reach Limit
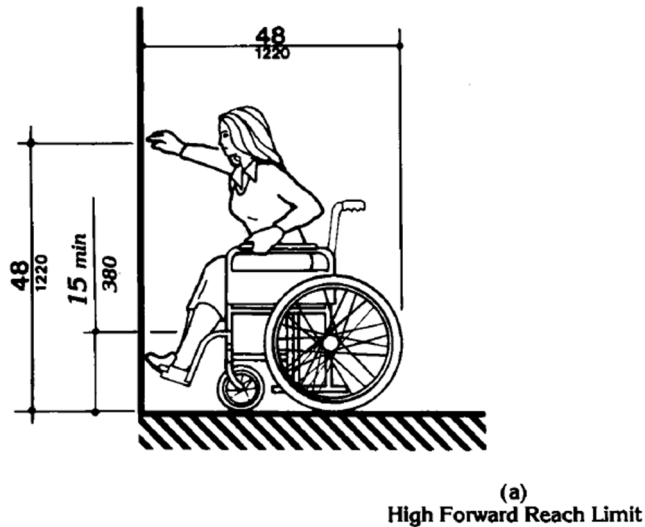
Figure 4.7b

Connectivity- Depending on content requirements, displays may require a mix of network, audiovisual, television cabling, and a signage client computer. UTO Care SSM maintains approved signage client PC models for application.

5. **The Classroom and Conference Room Interiors**

   5.1. **Design**

   Classrooms should be developed and designed from the "inside out". The following items should be considered when creating a new classroom:

   - The optimum orientation and shape of the classroom should be determined by the primary expected teaching style, the capacity of the room, and the level of mediation.
   - Designing for the flexibility of room use is strongly encouraged. The more square footage allotted to each student, the greater the opportunity for flexibility.
   - The total square footage of each room is to be based on the type of classroom, the specific capacity and the type of seating, as specified in Section 3, Room Definitions.
   - Classrooms with a capacity of 49 or less are to be as square as possible to allow for greater flexibility in furniture arrangement, and better sight lines.
   - Generally, classrooms should be sized in a 2:3 or 3:4 width to length ratio. Long, narrow, "railcar"-style rooms are not acceptable.
   - Lecture halls with capacities above 60 require tiered seating. A curved configuration improves visibility and student/instructor connectivity.
   - Every seat **must** have an unobstructed view of the teaching wall. No columns or other visual obstructions are allowed in Arizona State University classrooms.
   - Videoconference conference rooms should be outfitted with a V-shaped conference table (narrow end away from display) in order to facilitated camera view of the participants' faces.
   - In classrooms where the instructor's workstation is movable, adequate space must be provided to allow the workstation to be positioned at least 3 feet away from the teaching wall. In classrooms with fixed tables and/or fixed seating, the front edge of the instructor's workstation must be at least six feet from the front row.

   5.2. **Door/Room Security**

5.2.1.   Door Hardware

All classroom doors shall conform to *ASU Design Guidelines*.
Additionally classroom doors should have the following:

- Concave wall bumpers installed at an appropriate height to assure wall protection.
- Door silencers to muffle the noise of the door closing.
- Card readers (see ASU UTO's specifications)
- ADA accessible doors and hardware as specified in *ADA Standards for Accessible Design.*

5.2.2.   Doors

- Doors should be located at the back of the classroom to ensure that students who are entering or exiting the space will not disrupt instruction. Exceptions include large tiered classrooms or auditoriums, since those kinds of spaces can require multiple doors. In rooms that require two or more egress points, the doors should be located as far from the presentation area as possible while still meeting current building codes.
- Each door leaf to be a minimum of 36" wide, including those used in pairs at double doors. No strike mullion on double doors.
- Door opening force, hardware, width, thresholds and maneuvering clearances should comply with ADA Standards.
- Occupancy within the classroom should be clearly (but discretely) visible from the hallway. Any viewing device must be positioned to meet ADA standards. Door shall be equipped with a vision panel made of shatterproof glass and tinted to reduce light transmission. The area of the glass shall not exceed 100 square inches and should be double-paned with acoustically rated seals. Doors without vision panels shall have either a viewer peep hole installed to provide a view into the room to check activity or have a separate sidelight.

5.3.   Windows

Daylight is an important part of most learning environments.   Windows should be included in classrooms whenever possible. Windows must comply with the "Glass and Glazing" specifications in *ASU's Design Guidelines*.

- If easily accessible, window coverings can be manually operable; otherwise, coverings must be motorized with controls located at the instructor's workstation on the AV touch panel. Where applicable, the depth of the window should be designed to allow for the installation of motorized shade tracks.
- Vertical blinds and drapes are not desired. If necessary, they are to have non-plastic, heavy-duty operating components.
- Use of a light diffusing roller shade in conjunction with a room darkening roller shade is required such as Draper Dual Roller Flexshade. Percentages of light diffusion will be determined for each window by evaluating the individual window's orientation and the intensity of the exposure.
- All window treatments are required to have a non-reflective matte finish and unless otherwise specified, the color selection should match or blend with the window frame.

5.4.   Flooring

- Specify an anti-static, high traffic, commercial grade carpet tile. No solid or light colors are permitted.
- All carpet must conform to the ASU Purchasing Department's "green" guidelines. Carpet shall have a high recycled content. All demolished carpet to be recycled when renovations occur. Contact ASU Recycling Program Manager for additional information.
- A four-inch or six-inch cove base must be included when carpet is specified.
- If carpet cannot be installed underneath fixed seating, all aisles and other open areas must be carpeted.

- All aisle risers must be of contrasting color to the remaining floor to highlight level change.
- Aisle risers' nosings to be metal only. Vinyl and rubber nosings are not permitted as they do not hold up in high traffic areas such as University Classrooms.

5.5.   Walls and Ceilings

5.5.1.   Walls
- Internal classroom walls shall run deck-to-deck, with a Sound Transmission Coefficient (STC) rating of 50 minimum.
- Folding or moveable walls must meet the STC rating of 50 and should be specified for unique use only.
- Walls in lecture halls should be designed to provide the optimum acoustical environment. (See Acoustical Section 9)
- Walls to be painted in an eggshell finish. No wallcoverings should be used. No-VOC paint should be used to improve Indoor Air Quality (IAQ).

5.5.2.   Wall Protection
- Apply chair rail on the rear and side walls of University Classrooms that are non-masonry containing movable student furniture.
- Chair rail material should be wide enough to work with tables and chairs of varying proportions and must be mounted at a height that will prevent damage to wall surfaces. Typically, the chair-rail will be 6" – 10" wide and the bottom edge will start approximately twenty-five inches above the finished floor. Approved rails include Inpro Corp #1800 Silhouette 8" wall guard or approved equal. Rails shall match the design of the room.
- Outside wall corners (such as entry recesses) shall receive corner guards 4'-0" A.F.F. applied so that students cannot work them loose.

5.5.3.   Ceilings
- To accommodate classroom lighting and technology requirements, the ceiling height of all classrooms should be no less than twelve feet above the finished floor.
- In large sloped or tiered classrooms, the ceiling height is directly related to the distance from the front of the room to the last row of seats. Ceilings in lecture halls should be at least 9 feet high at the rear, and the ceiling height at the front of the room must accommodate the appropriate screen size.
- The surface of the ceiling must be designed to accommodate the required acoustical properties of the room. Ceiling panels shall have a Noise Reducing Coefficient (NRC) between .65 and .85, and a STC of 50.
- The ceiling should act as a sound mirror, reflecting sound downward to blend with direct sound.
- Ceiling material to be non-sagging (humidity resistant) lay-in acoustical tile for most ceiling areas. Nominal size 24" x 24" or 24" x 48".
- Access for the maintenance of technology, power, etc. must be included where applicable. (Consult UTO for current specifications.)

5.5.4.   Vertical Writing Surfaces
- A high-fired, ceramic-covered steel, dry marker writing surface shall be provided in each classroom.
- Fixed-height whiteboards should be mounted with the bottom edge at 36 inches above the floor.

- Each whiteboard should have a continuous marker tray below each marker board. Do not mount marker holder to wall due to marker bleed ruining wall finish.
- At the top of the whiteboard, a tack board strip and clips for display materials are required.
- The whiteboard should have an attached flag holder to accommodate a 2' x 3' flag.
- Multiple boards may be required depending on programming.
- Boards should be located on at least two different walls. A board must always be installed on the front teaching wall; the other wall/walls should be selected as appropriate to the layout of the room.

Sizes

Capacity of room	Minimum Writing Surface Dimensions
0-25	12 ft wide x 4 ft high
25-75	20 ft wide x 4 ft high
75-100	30 ft wide x 4 ft high – may be tiered
Lecture hall	Determined based on space available but at least 3 sections of 12 ft x 4 ft with tiers

NOTE: Single boards may not be longer than 12 feet (accessibility to classrooms through doors and elevators)

5.6.   Signage

5.6.1.   Room Identification Sign

Each room will have a standard room identification sign mounted near the door on the lockset side (exterior of room), mounted at a height as indicated by *The ADA Standards for Accessible Design.* Standard room ID sign is a modular sign produced by ASU Sign Shop consisting of (3) 3" x 9" panels and (1) 9" x 11" clear plastic page holder.

5.6.2.   Bulletin Boards

- Provide at least one 48" x 48" bulletin board in each room.
- Location and finishes of the bulletin boards will be determined at design.
- UCL reserves the right to review all posting and remove anything UCL deems inappropriate such as postings for other universities, non-ASU sponsored events & for-profit business advertising.

5.6.3.   Maximum Occupancy Sign

Provide maximum occupancy sign to be mounted in rear of room at a height high enough to discourage students from removing it. Size to be 8" x 11" minimum.

5.6.4.   University Classroom Pocket Sign

- (4) pocket room sign to be mounted in interior of room near the entry door.
- Left pocket (8-1/2" x 11") for UTO postings. Center pocket (8-1/2" x 11") for classroom furniture configuration and general room information. Top right pocket (8-1/2" x 3") for Building Street Address. Bottom right pocket (8-1/2" x 7") for ASU Recycling Program posting. Background color to be Dove Grey.

5.7.   Colors/Finishes

- Accent walls are desired. Avoid using accent color on front wall or walls that might reflect onto projection screen.

- Specify highly durable finishes that are easy to maintain.
- Use of approved "green" products in all applications is required (See ASU Purchasing Department specifications)

5.8.   Reflectance Values

The Engineering Society of North America recommends the following reflectance values for finish materials.

- Ceilings – 80% or higher
- Non-accent walls - between 50% and 70%
- Floors - between 20% and 40%

Reflectance values of paints, laminate and other finish materials should be selected to enhance ambient illumination and the illumination at the instructor's and student's work areas. Recommended value - between 40% and 60%.

5.9.   Display of U.S. Flag, U.S. Constitution, and U.S. Bill of Rights

In accordance with ARS HB2583, "All classrooms in the State of Arizona are to be equipped with a United States flag and copies of the Constitution of the United States and the Bill of Rights." United States flags must be manufactured in the United States and be at least two feet by three feet. Hardware must be provided to appropriately display the United States flag. Flags in classrooms shall be displayed in accordance with Title 4 of the United States Code.   The legible copy of the Constitution of the United States and the Bill of Rights must be manufactured in the United States, and shall be displayed adjacent to the flag.

5.9.1.   Flag Location

- Flags should be hung in the front of each room in the holder provided on whiteboards or in a separate holder attached directly to wall.
- The flag should not interfere with the screen, the writing surface, or any other classroom activity.

5.9.2.   Constitution / Bill of Rights

- The Constitution and the Bill of Rights are two separate documents, which are produced in-house by ASU.
- Install the documents next to the writing surface in the front of each room, behind the instructor, adjacent to the wall mount flag or as appropriate for the layout of the room.

6. Furniture

Consult the ASU Purchasing Department for all current furnishing specifications.

6.1.   Tables/Work Surfaces

Typical work surfaces found in most teaching classrooms are inadequate for today's university student. The tablet-arm chairs used do not allow students to take notes while referencing textbooks or others materials. Also, without specially configured chairs, a left-handed student must contort themselves to utilize the tablet. Therefore, a much larger surface area must be provided to comfortably accommodate basic needs of left or right-handed students.

6.1.1.   Design Standard

- Tables can be for 1, 2, or 3 students allowing a minimum of 30" per student. The number of students per table is flexible and is determined by the type of classroom and the configuration of the classroom.

- To allow for note taking and reference materials the minimum work surface area should be 3.75 square feet per occupant.
- Depths of table vary from 18"-24" based on room layout.
- Modesty panels are allowed.
- Fixed tables with cantilevered pivot arm seats are not allowed. If fixed tables are installed, provide loose seating with casters.
- Furniture must be able to interface with technology (i.e. pathway for power/data), based on *UTO's New Construction Specifications*.
- Tablet arms should be considered only related with theatre seating.
  - Provided tablet size should be equal to or larger than 12 inch x 15 inch (1.25 square feet).
  - 10% - 15% of the tablet work surfaces should have a left-handed orientation.

Matrix of types of seating in classrooms

	Tiered	Fixed Seat	Fixed Table	Moveable Seat	Moveable Table	Tablet
Seminar	N/A	N/A	N/A	X	X	N/A
Classroom	O	N/A	O	X	X	N/A
Lecture	X	N/A	X	X	N/A	N/A
Auditorium	X	X	N/A	N/A	N/A	O

X Preferred   O Acceptable   N/A Not Acceptable

6.1.2.   Construction/Fabrication

- Laminated work surfaces shall be constructed of high-pressure plastic laminate applied to solid wood or hardwood plywood. Tops shall have a non-glare. Medium tone surface to reduce eye strain.
- The legs of fixed tables should not block the student's knee space within the 30-inch work space allotment. Table legs should not impede configurations that allow additional students to work collaboratively.
- Table edge to be a heavy-duty extremely durable material. Edge banding can be T-mold or glued into place as long as the application is sufficient to prevent removal by a knife or other sharp object a student may have.
- Tables to withstand loading of 300 lbs of superimposed load (people sitting on table) per linear foot.

6.1.3.   Clearances

Widths between aisles of tables to range from 30" – 36" depending on room layout and number of students serviced per aisle.

6.1.4.   ADA

In cases where fixed tables and loose chairs are used or where fixed seating with tablet-arms is used, adjustable-height ADA tables must be provided according to *ASU Accessibility Standards*. Insure that 36" clear behind table is maintained for access.

6.1.5.   Replacement Availability/Warranty

- Worksurfaces/Tables shall be procured from "name brand" manufacturers that demonstrate proven track records in the marketplace, and maintain stock levels that insure replacement can be made without timely backorder delays.
- Provide written warranty for all proposed furniture. ASU prefers 10 year or longer warranty on all furniture items.

6.2.   Seating

Seating should be selected that will meet minimum comfort standards and still satisfy the requirements of Uniform Building/Fire Codes, cost, durability, functional comfort, appearance/finish, and performance over time. Chairs should be comfortable for use by people ranging in size from the 5th percentile (4'-11" tall, approximately 113 lbs) to the 95th percentile male (6'-2" tall, approximately 246 lbs).

6.2.1.   Design Standard

When selecting seating in order to achieve minimum standards of comfort, aspects such as width of seat, type of lumbar support, appearance, versatility of seating, replacement availability/ease of maintenance and cost should be considered.

- Furniture may be arranged in a row or in collaborative pods.
- ADA tables must be provided according to *ASU Accessibility Standards*.

6.2.2.   Seating Width

- Seat width comfort will range from 20 to 22 inches for loose seating such as stackers, sled base chairs & chairs with casters (4-leg or star-base).
- Auditorium fixed seat width to be at 24 inches unless restricted by row curve.
- The selection of seating width should be based upon the criteria set forth for the type of seating utilized.

6.2.3.   Seating Back Support

- All seating shall have proper lumbar support.
- The back should have a slope ranging from 12 to 30 degrees for classroom seating.
- The height of the back should not exceed 34 inch from the floor level.

6.2.4.   Seating Clearances

To ensure adequate circulation through the learning spaces, minimum clearances must be maintained as referenced in Section 3.

6.2.5.   Appearance

- The appearance shall be coordinated with the interior of the classroom and meet the acoustical requirements for the space. Light colors are discouraged.
- Upholstered seating shall be used in large auditoriums or lecture halls only where reverberation of sound is a problem. All other rooms to have non-upholstered seating.
- The construction and materials should be selected so that their color and surface are consistent with the other furnishing within the classroom.

6.2.6.   Replacement Availability/Ease of Maintenance/Warranty

- Chairs shall be procured from "name brand" manufacturers that demonstrate proven track records in the marketplace, and maintain stock levels that insure replacement can be made without timely backorder delays.
- Chairs shall be selected that facilitate cleaning of the floor surface, and require minimum maintenance of the seat covering (if applicable).
- Provide written warranty for all proposed furniture. ASU prefers 10 year or longer warranty on all furniture items.
- When casters are specified on seating, insure that the casters are the correct type of the floor finish (carpet, VCT, etc)

6.2.7. Quality

High quality seating shall be purchased to minimize the long term life cycle costs since funding for equipment replacement, repair, and maintenance are becoming increasingly difficult to obtain.

6.2.8. ADA

ADA accessible seating in classrooms should comply with *ASU Accessibility Standards*.

6.2.9. Versatility

- Fixed seating shall be provided in all large lecture halls, and shall be constructed of cast iron or steel frames. Auditorium seating shall have retractable tablet arms.
- Non-theatre lecture seating requires free-standing, chairs with casters.
- In lecture rooms where programs will typically exceed 2 hours, padded seats and backs should be selected.
- Fixed auditorium seating may require electrical/data outlets, based on programming needs.

6.3. Instructor Classroom Furniture Accessories

Teaching classrooms should be equipped with proper lecterns, podiums, and tables. In providing this equipment, attempts should be made to maintain aesthetic and functional compatibility with the overall decor of the room.

6.3.1. Design Standard

- <u>Small and medium sized rooms with less than 40 seats with seminar tables</u>. Provide a table top lectern which can be easily placed on the seminar table.
- <u>Small and medium sized rooms with less than 100 seats</u>. Provide a table with detachable lectern and a stool to be placed at the front of the room.
- <u>Large rooms with more than 100 seats</u>. Provide an instructor's podium and availability of a seminar table with lectern and stool.

6.3.2. Teaching Stations (Lecterns)

Seminar	Classroom	Lecture	Auditorium
P	P or F	P or F	F

P   Portable table type   F   Floor type

Room	Table Top	Table with Lectern	Podium	Stage
Seminar	X	O		
Classroom	O	X	O	
Lecture		O	X	
Auditorium			X	O

O Acceptable   X   Preferred

6.4. ADA Tables Mediation

All ADA tables must comply with the *ADA Standards for Accessible Design* and ASU's Accessibility Standards, which can be found in *ASU Accessibility Standards.*

6.5.   Types of Furniture to Avoid

- Tablet arm chairs in non-theatre style seating applications
- Pivot arm seats
- Pedestal seats that are bolted to the floor

6.6.   Miscellaneous Classroom Items

- Clocks are required in each classroom. They should be large and easy to read with a simple black frame. It should be placed on the back or side wall in a location visible to the instructor. Never locate the clock at the front of the classroom. Battery clocks are required but must be "noise free".
- Recycling and trash receptacles are required in all rooms. See *ASU Purchasing Guidelines.* Containers shall not encroach on circulation path.
- ASU's Emergency Response wall-mount Guide must be displayed in the front of all classrooms near the instructor's station.

7.   Lighting and Electrical

7.1.   Lighting Zones

As a rule, all classroom spaces will have lighting organized into a number of zones. These zones can be combined and dimmed to create any number of different lighting scenarios. Classroom lighting should include day lighting, multi-modal lighting, controllability, and optimize energy performance. A room can be zoned based on the amount of day lighting available, with each fixture responding to the amount of light at any time and location.

The zones described below are functional zones. There are five functional lighting zones in most classrooms:

Zone 1 – Main classroom lighting (student seating area) this zone services students and allows them to read and take notes in class. Use multi-directional recessed (lay-in) fixtures that cast a modest amount of light downward (35%) and a larger amount of light toward the ceiling (65%), provides a comfortable overall lighting with relatively high efficiency. Avoid pendant mount fixtures*. **Note: Dimensional AV coordination required for any pendant mount solutions in classrooms.***

Zone 2 – Instruction area (front of classroom and lectern area). Design whiteboard and demonstration table lighting to provide visibility when the room lights are at full intensity. The foot candles is this area should be consistent with the overall lighting of the room.

Zone 3 – Non-projection white board (board that is not obscured by a lowered projection screen). Lighting of white boards during concurrent AV presentations allows instructor to write on the board while in projection, without light bleeding over onto the projected image.

Zone 4 – Projection white board (board that is obscured by a lowered projection screen) Use the same requirements as Zone 3 during non-projection mode.

Zone 5 – Instructor workstation. The instructor should be able to read notes and use an-board AV equipment with low-light conditions of projection mode

Foot Candle (fc) Guidelines*

	Day Lighting Mode	General Mode / Non-Day Lighting	AV Mode
Student desk	30 fc min 150-200 max	30 fc min 70 fc max	10 fc min
Whiteboard	30 fc vertical min	30 fc vertical min	na
Screen	na	na	8 fc vertical allow 8:1 video image with 3000 lumen projector
Walls	10 fc vertical	10 fc vertical	na

*Based on the "*IESNA Lighting Handbook Reference and Application*", Ninth Edition

In larger auditoriums, install a down-light in a location that will provide adequate illumination on the face of the sign language facilitator when the AV mode lighting is in place.

7.1.1. Emergency Lights

Isolate emergency light radiation away from the projection screen.

7.1.2. Color Temperature

The color temperature for all light fixtures should be the same. The color temperature goal is 3200 degree Kelvin. Color temperature range of 3000-3500 degree Kelvin is acceptable as long as all of the fixtures are the same.

7.1.3. Motion Sensors:

Motion sensors are preferred in all rooms. When installing motion sensors, be sure to set timer to maximum to avoid light shut off during low-motion activities such as test taking.

7.2. Electrical

7.2.1. Wall Outlets

- Place outlets on walls of the classrooms at 6' intervals or as necessary to allow for 30% student utilization.
- Wall outlet intervals in the lecture halls are not as critical. Follow code to determine the appropriate number.
- Install one phone jack, one data port, and one electrical outlet adjacent to the instructor's workstation (Figure 1).
- Install one 2-gang AV wall box (min 2 ½" D) at least 18 inches above the finished floor. Install two 1 ¼" conduit stub-outs above the ceiling (if the existing wall is hollow, conduit may not be necessary)**.**

7.2.2. Ceiling Outlets

- Install one AC power quad outlet attached by flexible conduit to a J-box   located above the suspended ceiling to allow for the future installation of a data projector. This quad should be sited 12'-15' from the screen.
- Install one single-gang data outlet above the ceiling 12'-15' from the screen.
- Provide 120V power capped at a J-box located above the suspended ceiling to allow for the future installation of a low voltage motorized screen controller.

7.2.3. Floor Outlets

- Provide floor outlets for every classroom to ensure optimum flexibility.
- Floor boxes are to accommodate AV, AC power, data.
- The number of floor outlets is determined by the size of the room, the capacity, and the function.

8. HVAC & Fire Prevention

8.1. Diffuser Location

Diffusers should be located as to avoid any movement of the screens which would be caused by air flow.

8.2. Location of Above-Ceiling Mechanical Equipment

Access to mechanical equipment for the building should not be located within a classroom.

8.3. Noise

Excessive background noise or reverberation in classrooms interferes with speech communication and thus presents an acoustical barrier to learning. In all phases of the classroom design and construction process, careful attention must be paid to acoustics. Locate all mechanical equipment as far from the classroom as possible. If adjacency is unavoidable, provide for sound attenuation methods at doors, light fixtures, and all other ceiling or wall breaches. System components (fans, ductwork & diffusers) shall be selected to meet sound criteria of NC20 to NC25.

8.4. Fire Strobes

Locate fire strobes away from projection screen to prevent sightline obstructions when screen is extended.

9. Acoustics

When classrooms are located within close proximity to functions that generate significant noise levels, higher STC ratings and special wall-construction details must be included for all interior walls, elevated slabs, floors and exterior walls (including doors and windows). Provide for sound attenuation to contain noise generated from adjacent locations and from both above and below the classroom location.

- The review of acoustical requirements for classrooms by an acoustical consultant is recommended whenever possible.
- Minimum NC ratings: 0-59 seats: NC30-35 or less; 60 to 149 seats: NC 25-30 or less; 150+ seats: NC20-25 or less.
- In all cases, walls in classrooms should have a minimum sound transmission class (STC) of 50 as recommended: ANSI S1.4-1983 (R 2006).
- Individual equipment such as fans, ductwork and diffusers shall have ratings not exceeding NC 25 throughout the load range as recommended: ANSI S12.60-2002.

10. Mediation

ASU conference and classroom design continues to evolve as technology enhances teaching and as learning capabilities become available. Aside from actually installing technology in classrooms, ASU strives to ensure proper infrastructure is provided for classrooms in order to service upcoming technologies without incurring future construction costs. ASU specifies room layout, power locations, data connections, and audiovisual infrastructure room layout. This document identifies general elements ASU considers when planning an educational space. ASU recommends providing Basic Mediation (laptop projection) in any classroom.

10.1. Infrastructure

10.1.1. Network Requirements-

- Wired CAT6 or CAT6a data, 1GE minimum, connections are necessary at the teaching station area (quantity based on mediation level), the projector/display, the webcam, and to the fixed student computers as applicable. Managed computers require wired network connections to provide security, systems management, and guaranteed performance levels. Wireless networks can provide supplemental, but not guaranteed, shared multi-user audio-visual AV environment and rich media over a network. **Consumer-based point-to-point wireless device applications (such as Apple Airplay) are not approved for use on ASU's campus due to unlicensed frequency overlap that can interfere with ASU's wireless networks. These applications are also prone to security issues for users.** Please refer to UTO's new construction guidelines for current cable specifications and contact UTO for any special use wireless applications.
- Specific AV, PC, or other component may required specialized VLAN or other setting for performance or compliance. Contact UTO regarding current approved devices and configurations.
- Commscope Gigaspeed CAT6 and 6a patch cables are required for all network connected devices. No substitutes will be accepted.

10.1.2. Wireless Access Points – *refer to UTO Network Design Specifications for additional details*

- Classrooms will include **minimum** 2:1 (devices:user) WIFI density.
- Enclosure should be required within ceiling- or wall-mounted enclosure dependent upon room layout and ceiling height access.
- Commscope CAT 6a (required) cabling & POE Ethernet according to ASU UTO Design specifications.
- Contact UTO for any special use wireless applications.

10.1.3. Floor boxes & Poke-thru devices

- Poke-thru device to be Wiremold/Legrand 8ATCGY or 6ATCGY (or equivalent) or with the following add-on features (required). Interior Device configuration to include #682A (device plate to accept up to 2 ports of communication devices), #68REC (proprietary 20-amp duplex power receptacle), #8AAP (mounting plate to accept up to 4 Extron AAP Series device plates, & #8ACT6A (mounting plate to accept up to 6 ports of communication devices in any one of 3 gang in the center area). Underside Device Configuration to include #5PTHA (1/2 gang pass through housing assembly), #1PTHA (1 gang pass through housing assembly) & #575CHA (1/2 gang ¾" conduit housing assembly). Cover color to be grey.
- Floor box to be Wiremold/Legrand RFB9 (for retrofit floor cuts) and RFB 11 (pre-construction and where depth permits).
- Please reference ASU UTO's Design specifications for additional information.

10.1.4. AV cabling-(Twisted Pair)

- AV cabling within infrastructure (walls, ceiling, floors) requires foil shielded category 6a cabling provided by Commscope in accordance with UTO Designs wiring guidelines and must be terminated support in accordance with these guidelines by a BICSI certified Commscope integrator. Green jacketed Commscope CAT6a F/UTP is current standards.
- Commscope CAT6a F/UTP Patch cables area also required to maintain end-to-end shielding.

10.1.5.   Special Conditions

- There may be rooms that will require discipline-based equipment or additional technology, such as media systems, not listed in these guidelines. Please consult the University Technology Office for guidance.
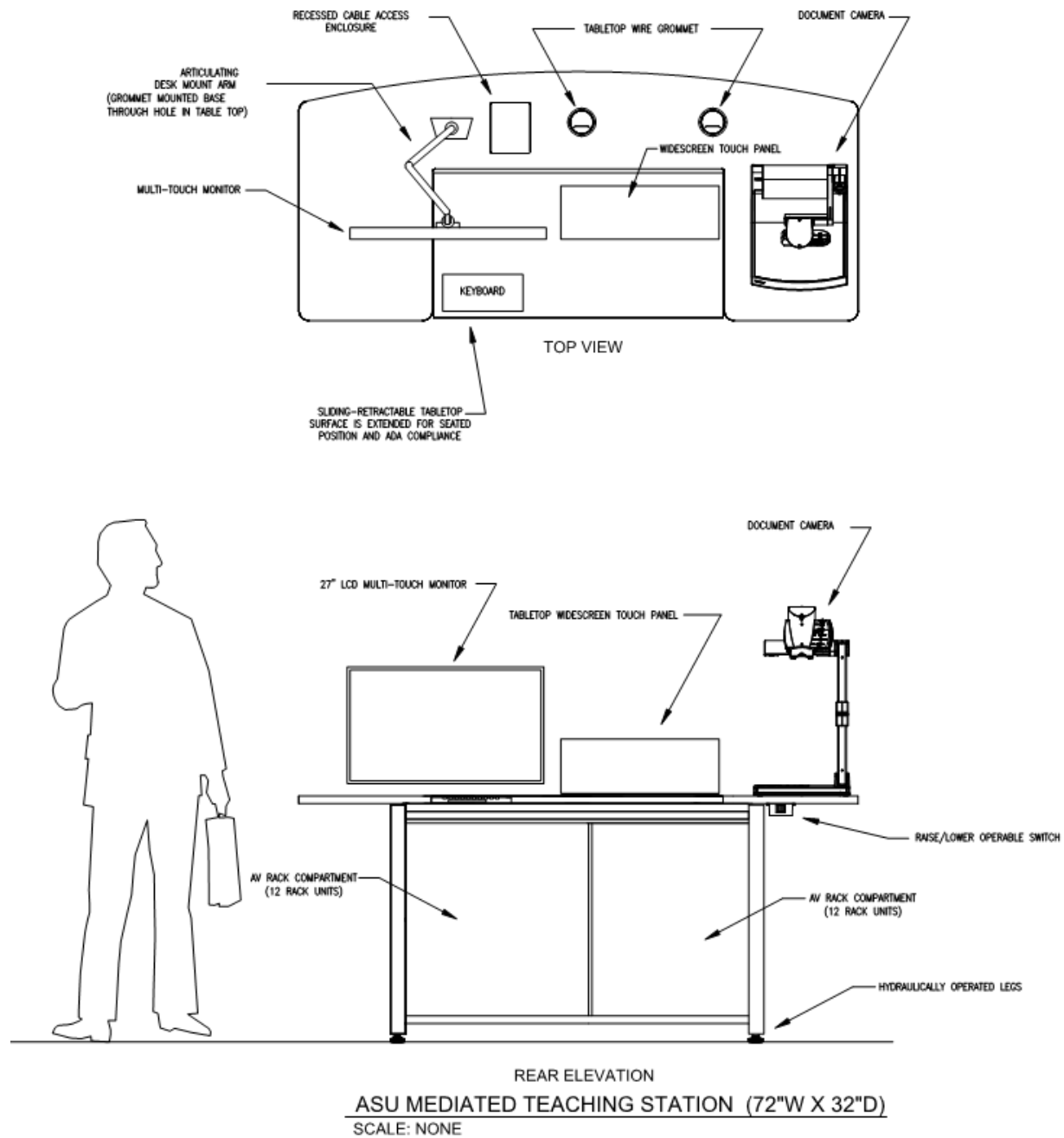
10.2.   Teaching Stations

Teaching Stations are used to provide classroom mediation packages for classrooms. These in include computer work surface for laptops (Basic Mediation) and/or integrated instructor PC (Instructor Mediation) as well as accommodate other technical equipment associated with the classroom. Teaching Stations should accommodate computer equipment, plus the necessary space for student materials. The teaching station can be wall fed or floor fed though a floor box depending on room size and requirements. The base teaching station is a Steelcase Airtouch 58" x 28" unit with cable tray and modesty panel that can be escalated to an ASU ADA-approved EuroDesignSystems model to accommodate up to 26 rack units (RU) of required mediation equipment when necessary.

When poke-thru devices are not feasible due to structural limitations or costly abatement, use Extron Electronics AVTrac, Legrand OFR series low profile floor-mount raceway system or other UL listed equivalent that meets ADA requirements. With the proper conduit infrastructure in place**,** the teaching station can range from a simple table housing a laptop connection to a permanent PC station offering rack mount equipment, microphone, document cameras, interactive monitor, audience response system, class capture (podcast), and videoconference gear.

10.2.1.   Design Standard

- Allow for a minimum surface area of six and one quarter (6.25) square feet to be provided.
- The base teaching station is a Steelcase Airtouch 58" x 28" unit with cable tray and modesty panel that can be escalated to an ASU ADA-approved EuroDesignSystems model to accommodate up to 26 RU of required mediation equipment when necessary.
- Furniture selection for teaching stations shall have provisions for securing the equipment and the furniture in the room.
- Mediated classrooms shall have provisions for increased ventilation and conditioned air supply due to the increased heat load produced by the computers.
- Provisions for electrical fires should be considered for computer workstation equipped classrooms.
- Furniture may be arranged in a row or in collaborative pods.
- ADA tables must be provided according to *ASU Accessibility Standards*.
- Computer classroom furniture is an extension of the programming requirement and should conform to *UTO's Classroom Specifications*.

Figure 10.2.2 –Teaching Station (sample)

RECESSED CABLE ACCESS ENCLOSURE

TABLETOP WIRE GROMMET

DOCUMENT CAMERA

ARTICULATING DESK MOUNT ARM (GROMMET MOUNTED BASE THROUGH HOLE IN TABLE TOP)

WIDESCREEN TOUCH PANEL

MULTI-TOUCH MONITOR

KEYBOARD

TOP VIEW

SLIDING-RETRACTABLE TABLETOP SURFACE IS EXTENDED FOR SEATED POSITION AND ADA COMPLIANCE

DOCUMENT CAMERA

27" LCD MULTI-TOUCH MONITOR

TABLETOP WIDESCREEN TOUCH PANEL

RAISE/LOWER OPERABLE SWITCH

AV RACK COMPARTMENT (12 RACK UNITS)

AV RACK COMPARTMENT (12 RACK UNITS)

HYDRAULICALLY OPERATED LEGS

REAR ELEVATION

ASU MEDIATED TEACHING STATION (72"W X 32"D)

SCALE: NONE

10.3.   Screens or Flat Panel Displays

10.3.1.   Location

- Multiple format screens may be required. The type of seating, the capacity, the room configuration and the primary instruction style dictate the optimum number.
- The number of screens required is based on the seating capacity, the configuration of the room, and the primary instruction style.
- Where possible, ASU recommends angling the screen in the corner of the classroom to both maximize the viewing angle to the audience and increase free whiteboard writing space. Angle-mounting the screen must typically addressed in building planning stages since it usually requires detailing reflected ceiling plan to address ceiling grid and lighting. If angle-mounting the screen is unfeasible, screen placement should still remain opposite from the teaching station area on the teaching wall to maintain whiteboard surface. *(Please see Figures 1 and 2).* Ceiling height is also critical when planning the layout of a Classroom. ASU recommends a minimum of 12 ft finished ceiling height to accommodate both lighting and technology.
- The higher the ceiling, the larger the screen and image size it can accommodate. Screens should drop no lower than 48 inches from the floor.

10.3.2.   Size and Automation

- To calculate the **minimum** required size of the projection screen or flat panel display the following criteria is used:
    - Minimum distance to front row = 1.5x the image width
    - Maximum distance to back row (furthest viewer) = 6x the image size (5x is recommended)
- If the 1:6 (image height = 1/6 distant to furthest viewer), cannot be met given limited ceiling height or environmental obstructions, additional projectors/screens or flat panel displays will be required to provide an adequate viewing experience for all audience members.
- Flat panel displays must meet mounting requirements consistent with Digital Signage applications ([section 4.7 above](#))
- All projection screens must be tab-tensioned with aspect ratios of 16:10 to accommodate high definition format.
- Screens shall be ordered with the LVC (Low Voltage Controller) controller for use wall plate controller and/or integration with 3rd control systems solutions.

10.4.   Classroom Mediation Packages

ASU strives to provide the basic mediation package in each classroom. The level of mediation provided is based on such variables as size and shape of the room, teaching style and discipline-based need. Contact ASU University Technology Office (UTO) for current specifications and recommended

equipment for all of the following items. ***Note: There may be rooms that will require discipline-based equipment or additional technology, such as media systems, not listed in these guidelines. Please consult the University Technology Office for guidance.***

For new building construction ASU is leveraging building-wide audiovisual infrastructure to meet many functional space requirements. The infrastructure is provided by ASU UTO Design and ASU UTO Netcomm Managed Services cabling providers to the same specification as ASU structured network cabling. Other "stand-alone" classrooms make used of the same providers and standards in a non-building-wide fashion. The figures provided (10.4.5-10.4.10).are meant to show generic feature that can be designed in either fashion as dictated by project or building environment.

10.4.1. Basic Mediation Package -

Display(s)- May require single or multiple displays based on room size and viewing requirements.

- o Projector HDCP Compliant, HD Format – 16:10 Video projector (Panasonic PT and DZ series, based on room size, required resolution, lighting, and ambient lighting conditions)
- o Flat Panel display(s) – sized based on room layout (Sharp 70"-90" units are typical)
- o Projector security mount (BMS LOCII or LOCIV)
- o Projection screen (Draper, Stewart, or Dalite size based on room size)
- o Audio System (based on room size, AMK, Extron, or Tannoy)
- o AMX Control System (based on rooms' size)
- o FTP (Foil-wrapped twisted pair structured AV cabling (Commscope shielded 6a plenum cabling)
- o Data wall or floor boxes (based on room size)
- o Wireless connections for students (multiple devices per user in high density overlay per new construction/renovation)
- o Teaching station, providing:
  - ▪ Digital Laptop connection (HDMI)
  - ▪ Laptop connection
  - ▪ Audio speakers and controls
  - ▪ Auxiliary video connection
  - ▪ Signal distribution device (AMX)

10.4.2. Instructor Mediation Package

- o Basic Mediation Package
  PLUS
- o Digital PC (DisplayPort/HDMI) connection provided on the teaching station
- o Digital HDCP compliant switcher (AMX or Extron)
- o Signal switching or distribution device (AMX supplemented as needed with Extron)

10.4.3. Student Mediation Package

- o Instructor Mediation Package
  PLUS
- o Student PC's with wired data connections
  - ▪ Can include Adaptive Learning Space rooms (see specialized functions 10.4.4)

10.4.4. Capacity and/or Discipline-Specific Requirements may include:

- o Audio
  - ▪ Microphones for large capacity rooms (over 40 capacity)

- Assisted listening (over 40 capacity)
- Stereo audio
- Surround Sound
- Video
  - HD+ 4K resolution projectors (Christie)
  - HD projection WUXGA / 1080P@ 60 (Panasonic RZ,EZ,DZ series)
  - Picture in Picture Processing
  - Document camera
  - Slide projector
  - Multiple projectors / screens
- Specialized Functions
  - Video conferencing
  - Class capture
  - Class streaming
  - Annotative monitor or "SMART" whiteboard
  - Student Desktop Sharing / Collaborative software (**Adaptive Learning Space**)
  - Multiple guest/student laptop connections
- Large-format teaching station to accommodate some of the above options.

10.4.5.   Instructor Mediated Room Sample

FRONT-TO=BACK SECTION VIEW OF ROOM

TEACHING WALL - ELEVATION VIEW

PLAN VIEW
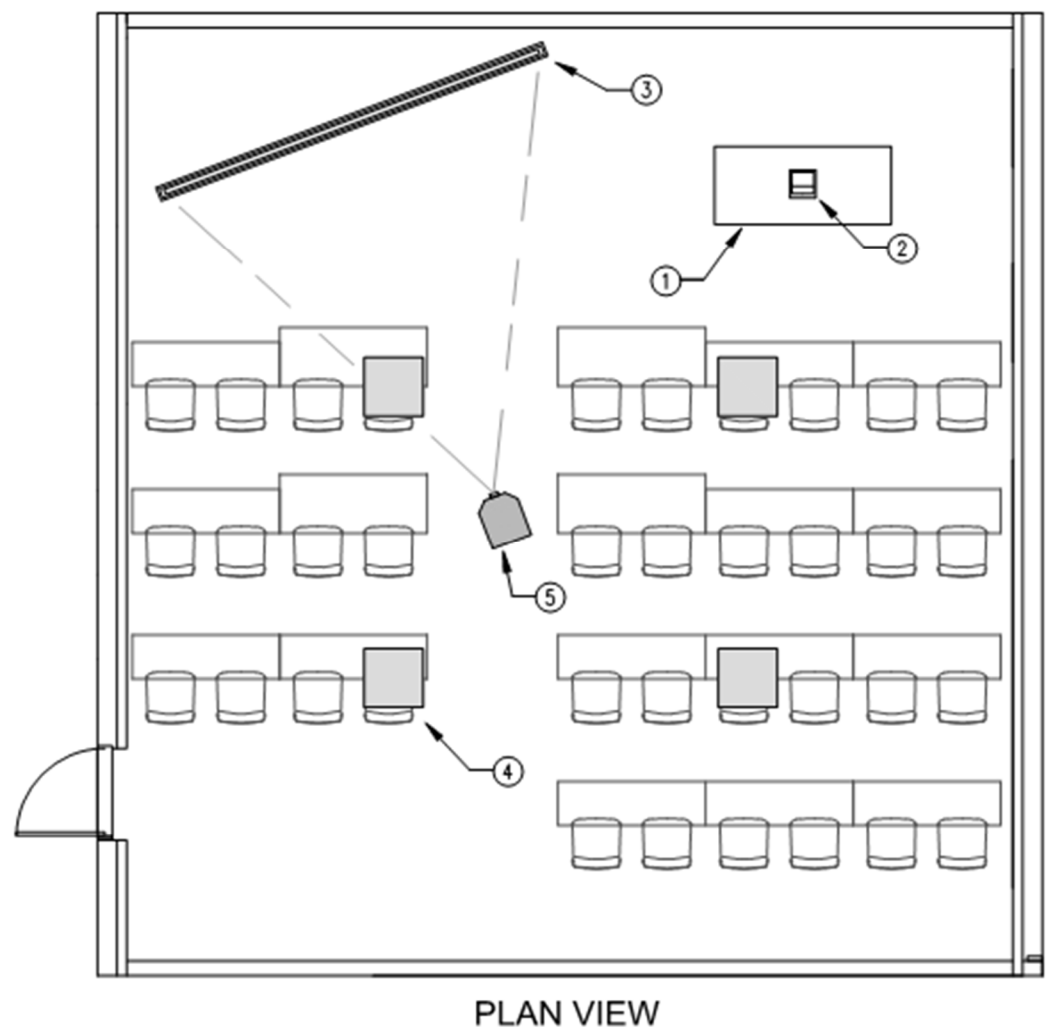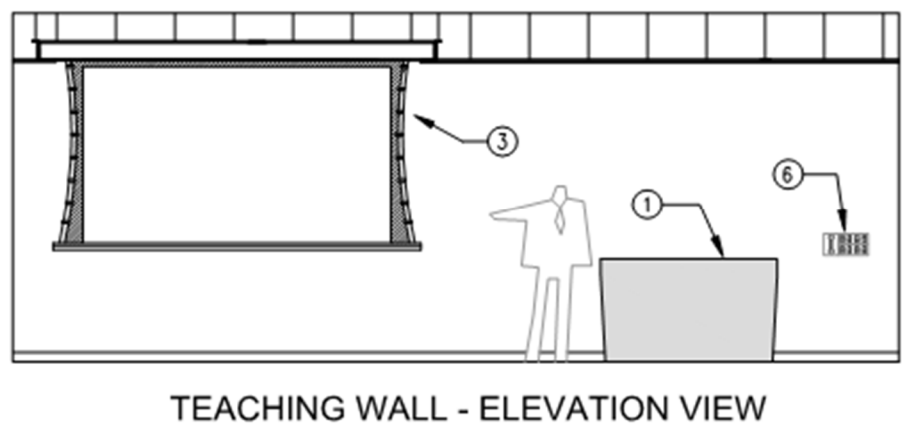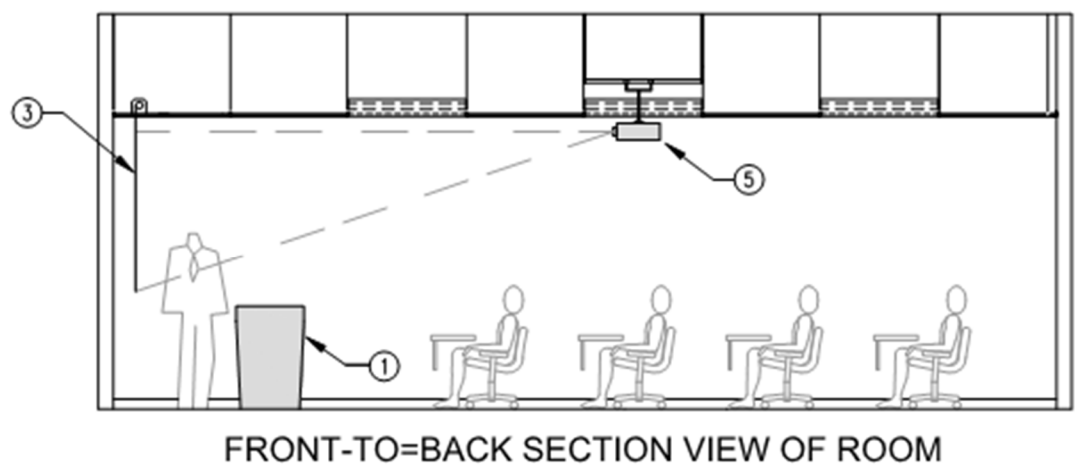
SINGLE PROJECTOR CLASSROOM
(OCCUPANCY < 40)

KEYNOTES

1. Mediated Teaching Station with instructor PC, AV touch panel control, and internal AV equipment racks to house AV components.
2. Floorbox or Poke-Thru device located below teaching station with power, data, and AV outlets.
3. Ceiling-Recessed Motorized Projection Screen. .
4. 24"x24" Ceiling Loudspeakers installed in suspended ceiling grid.
5. Video Projector ceiling-mounted.
6. Wall phone and wall switches for lighting and projection screen control. Located in close proximity to mediated teaching station.

10.4.6.   Instructor Mediated Room Infrastructure Sample
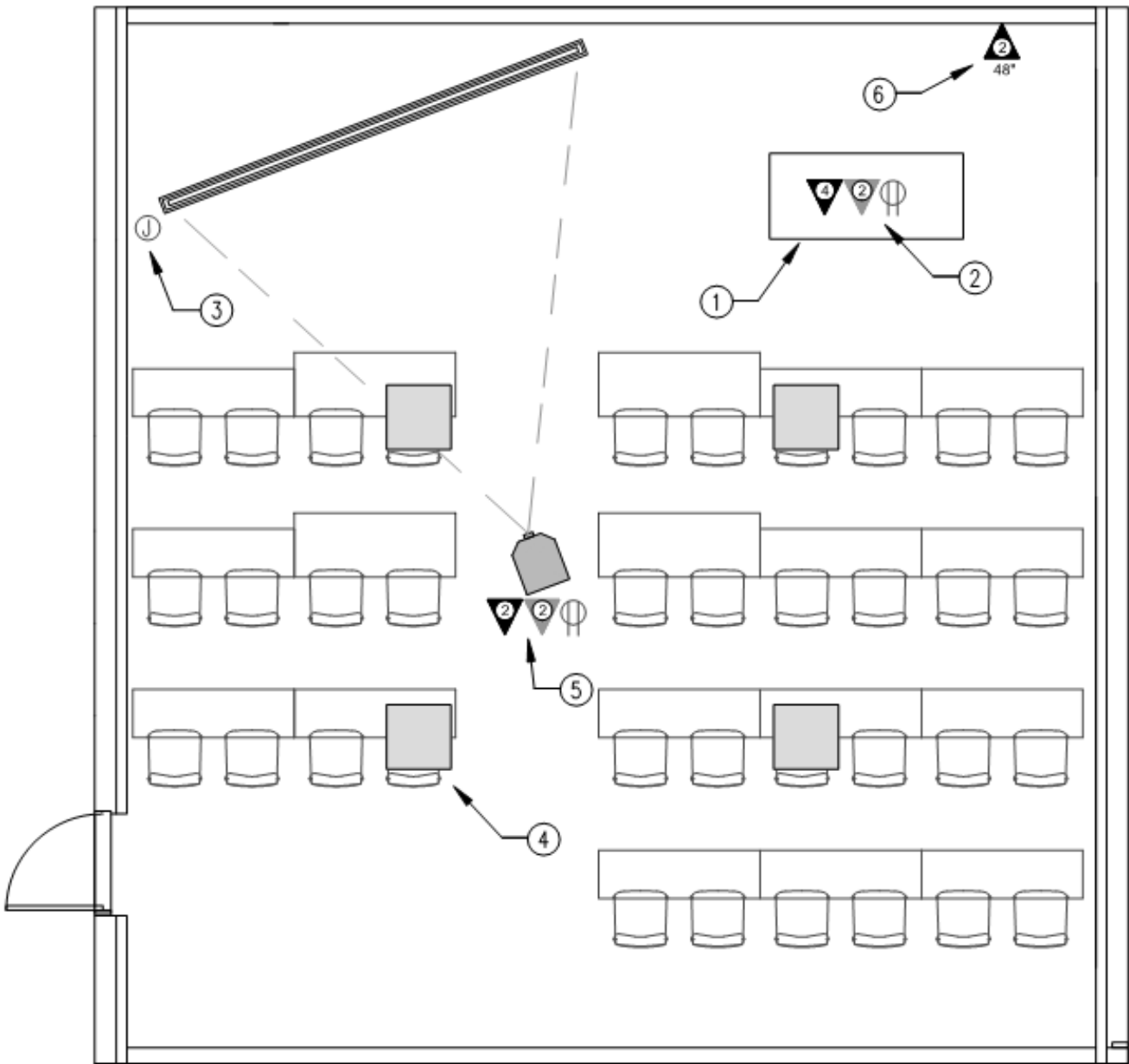
SINGLE PROJECTOR CLASSROOM
INFRASTRUCTURE AND OUTLET PLAN

KEYNOTES

1.   Mediated Teaching Station with internal AV equipment connections to floor box outlets.
2.   Floorbox or Poke-Thru device located below teaching station with 120V dedicated 20A power outlet, (4) data outlets, and AV outlets. Provide (1) 1" conduit for data and two $1\frac{1}{4}$" AV conduits from floor box that are stubbed-out above suspended ceiling.
3.   Ceiling-Recessed Motorized Projection Screen power J-box. Screen requires 120V, 1A conventional power connection. Low-voltage plenum rated cable connections from screen to front wall switch and to teaching station floor box are required for operation.
4.   24"x24" Ceiling Loudspeakers installed in the suspended ceiling grid are interconnected with a plenum-rated cable originating in Mediated Teaching Station. Speakers are powered by an amplifier installed in mediated teaching station.
5.   Ceiling-mounted Video Projector requires dedicated 20A power outlet, data, and AV outlet installed in ceiling adjacent to projector. Video signals and projector control signals originate in the mediated teaching station.
6.   Data outlet installed 48" A.F.F. for wall phone.

LEGEND

	FACEPLATE WITH (2) ETHERNET JACKS TERMINATED TO CAT6 CABLING		FACEPLATE WITH (2) GREEN AVTP JACKS TERMINATED TO CAT6A F/UTP CABLING RUNING BETWEEN FLOOR BOX AND VIDEO PROJECTOR
	FACEPLATE WITH (4) ETHERNET JACKS TERMINATED TO CAT6 CABLING		AC POWER DUPLEX OUTLET

ETHERNET CABLING IS TERMINATED TO PATCH PANEL LOCATED IN NEAREST IDF ROOM.

10.4.7.   Instructor Mediated Room Single Line Diagram Sample

SINGLE PROJECTOR CLASSROOM
(AV Single-line Diagram)

10.4.8. Instructor Mediated Dual Projection Sample
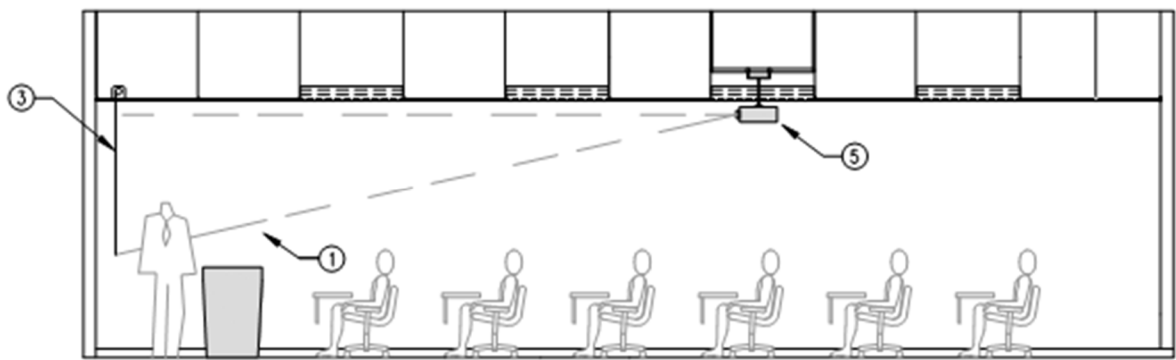
FRONT-TO=BACK SECTION VIEW OF ROOM
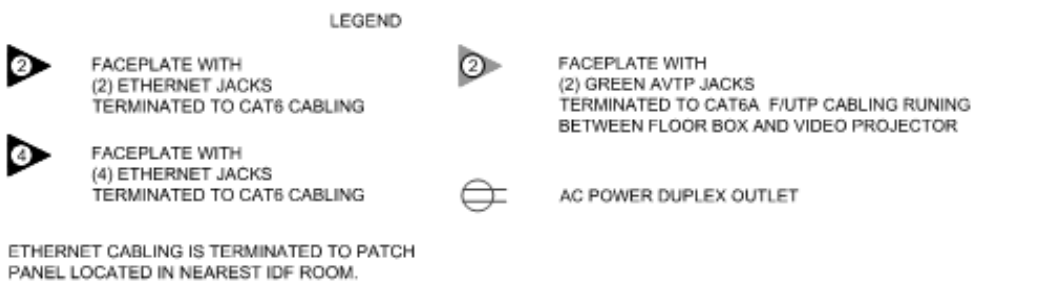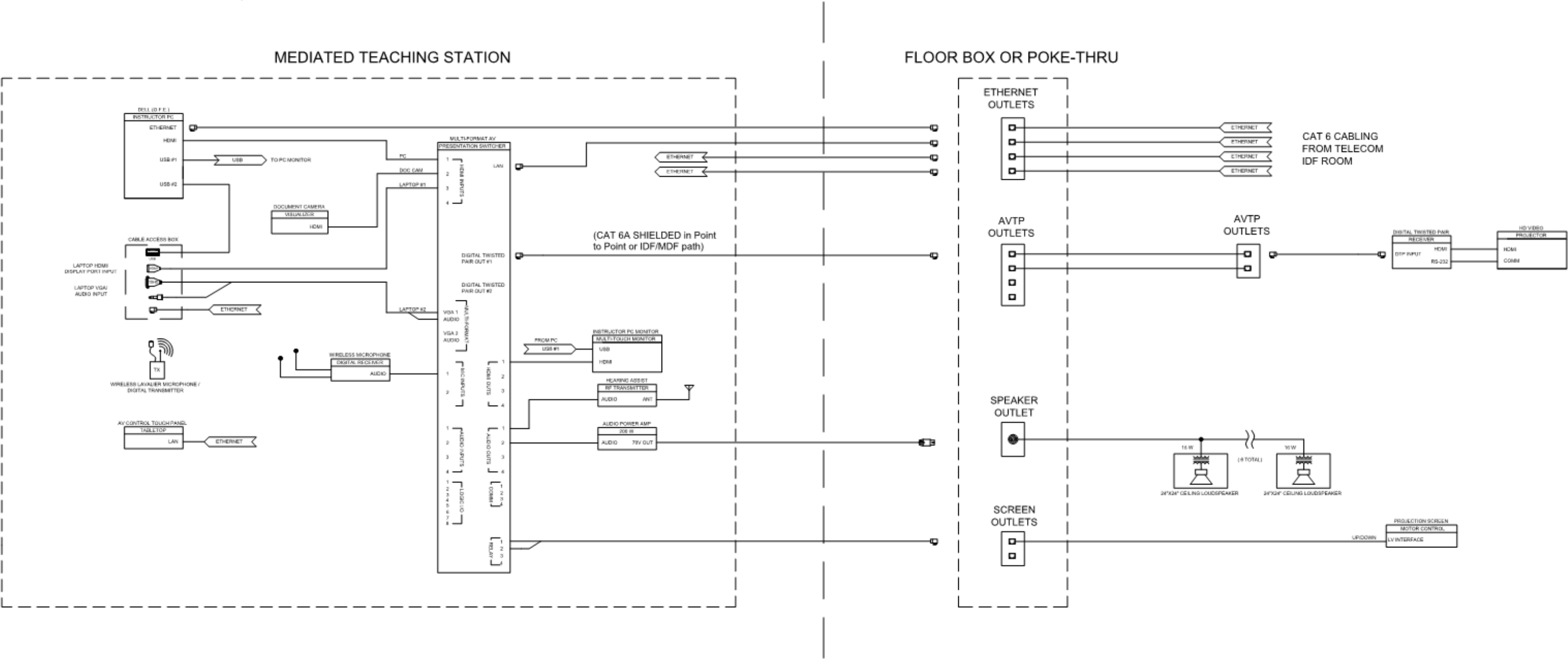

TEACHING WALL - ELEVATION VIEW
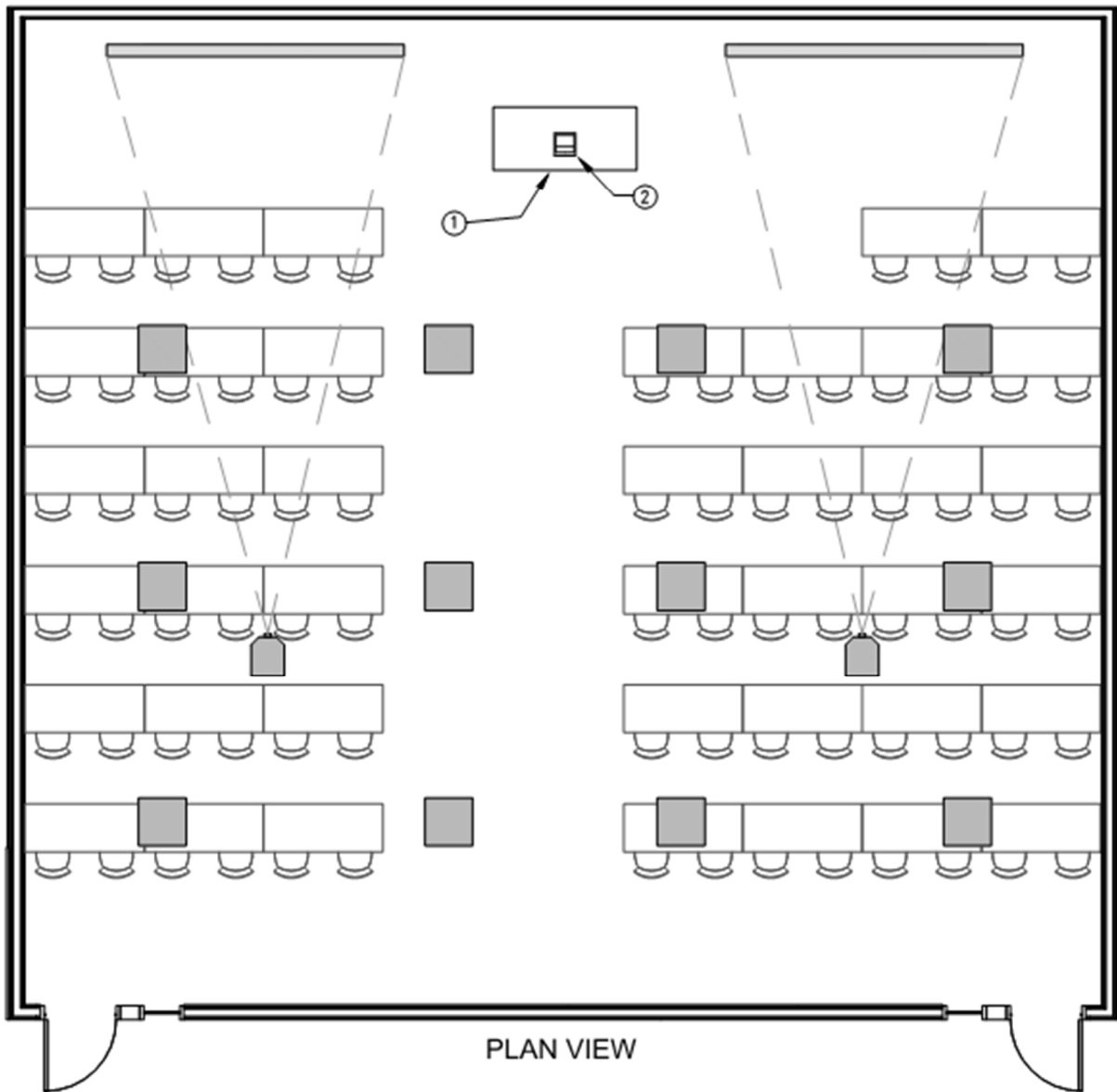
PLAN VIEW

DUAL PROJECTOR CLASSROOM
(OCCUPANCY > 80)

KEYNOTES

1. Mediated Teaching Station with instructor PC, AV touch panel control, and internal AV equipment racks to house AV components.
2. Floorbox or Poke-Thru device located below teaching station with power, data, and AV outlets.
3. Ceiling-Recessed Motorized Projection Screen.
4. 24"x24" Ceiling Loudspeakers installed in suspended ceiling grid.
5. Ceiling-mounted Video Projector.
6. Wall phone and wall switches for lighting and projection screen control.

10.4.9. **Instructor Mediated Dual Projection Infrastructure Sample**

DUAL PROJECTOR CLASSROOM
INFRASTRUCTURE AND OUTLET PLAN

KEYNOTES

1. Mediated Teaching Station with internal AV equipment connections to floor box outlets.
2. Floorbox or Poke-Thru device located below teaching station with 120V dedicated 20A power outlet, (4) data outlets, and AV outlets. Provide (1) 1" conduit for data and two $1\frac{1}{4}$" AV conduits from floor box that are stubbed-out above suspended ceiling.
3. Ceiling-Recessed Motorized Projection Screen power J-box. Screen requires 120V, 1A conventional power connection. Low-voltage plenum rated cable connections from the internal screen control relays to the front wall switch and to the teaching station floor box are required for operation.
4. 24"x24" Ceiling Loudspeakers installed in the suspended ceiling grid are interconnected with a plenum-rated cable originating in Mediated Teaching Station. Speakers are powered by an amplifier installed in mediated teaching station.
5. Ceiling-mounted Video Projector requires dedicated 20A power outlet, data, and AV outlet installed in ceiling adjacent to projector. Video signals and projector control signals originate in the mediated teaching station.
6. Data outlet installed 48" A.F.F. for wall phone.

LEGEND

▶2	FACEPLATE WITH (2) ETHERNET JACKS TERMINATED TO CAT6 CABLING	▷2	FACEPLATE WITH (2) GREEN AVTP JACKS TERMINATED TO CAT6A F/UTP CABLING RUNING BETWEEN PROJECTOR AND FLOOR BOX.
▶4	FACEPLATE WITH (4) ETHERNET JACKS TERMINATED TO CAT6 CABLING	▷4	FACEPLATE WITH (4) GREEN AVTP JACKS TERMINATED TO CAT6A F/UTP CABLING RUNING BETWEEN FLOOR BOX AND VIDEO PROJECTORS
	ETHERNET CABLING IS TERMINATED TO PATCH PANEL LOCATED IN NEAREST IDF ROOM.	⊖	AC POWER DUPLEX OUTLET

10.4.10. Instructor Mediated Room Dual Projector AV Single Line Diagram Sample

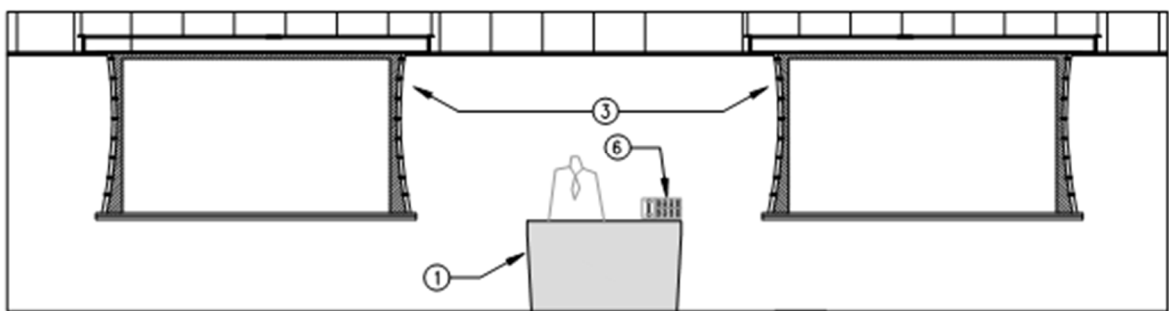# DUAL PROJECTOR CLASSROOM
## (AV Single-line Diagram)

10.4.11. Instructor Mediated Dual Projection Lecture Hall Sample
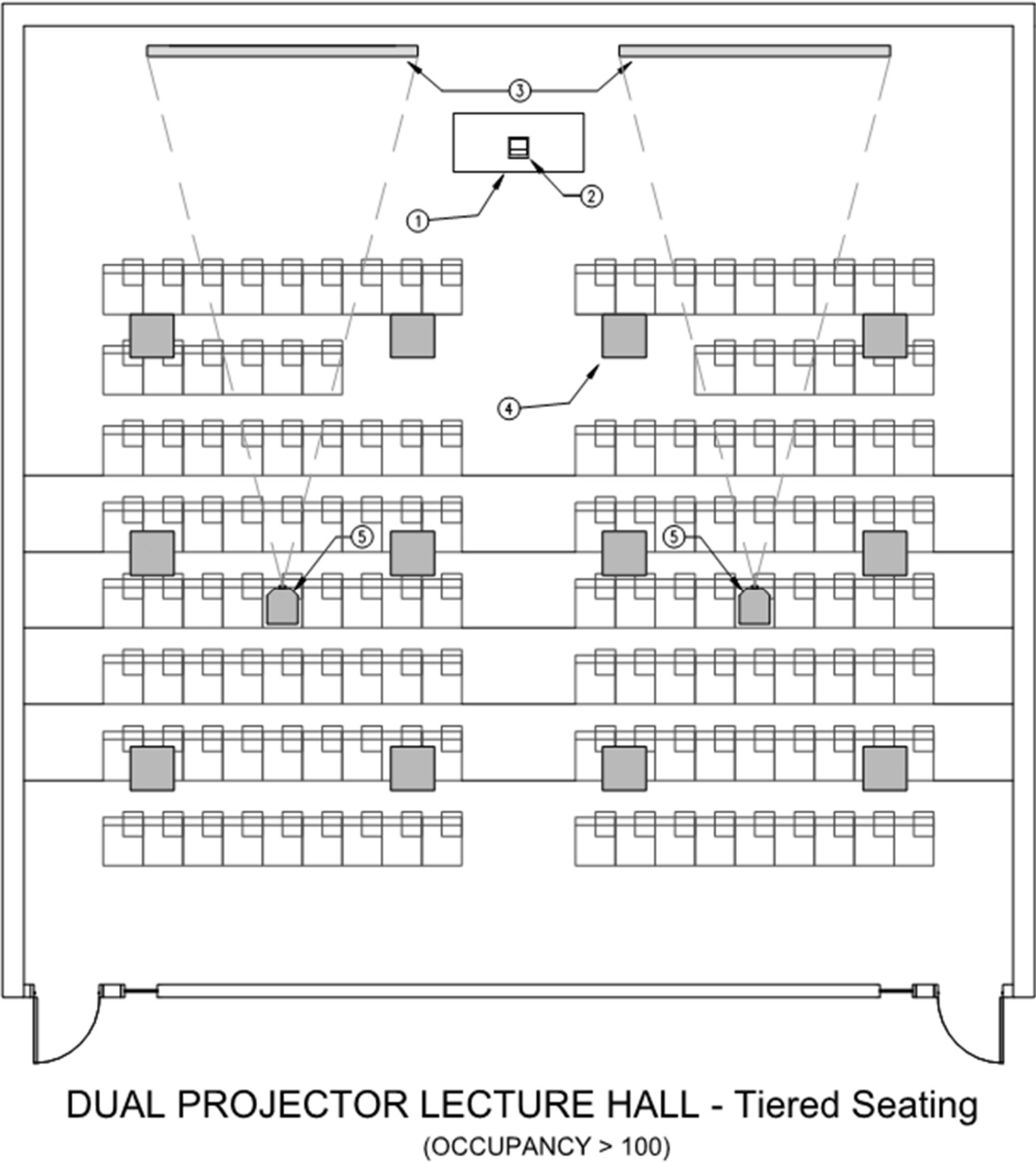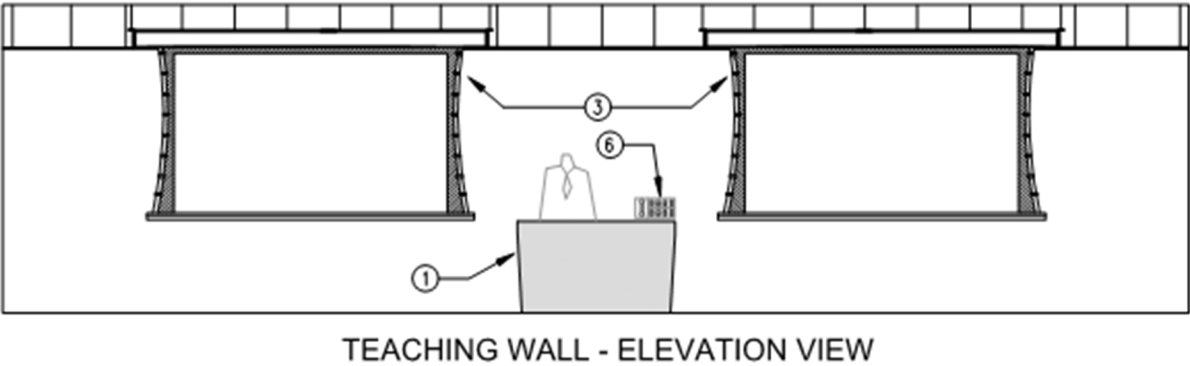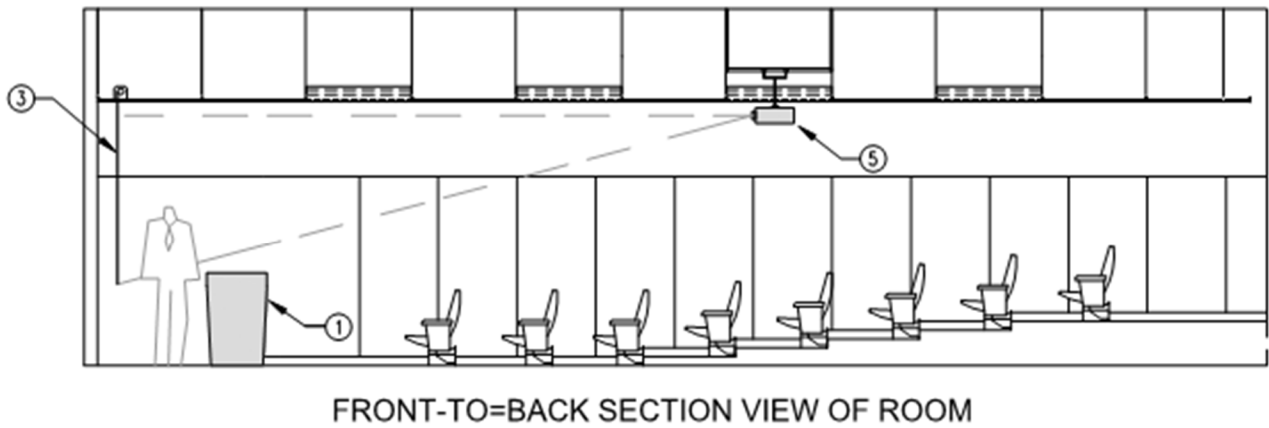
FRONT-TO=BACK SECTION VIEW OF ROOM
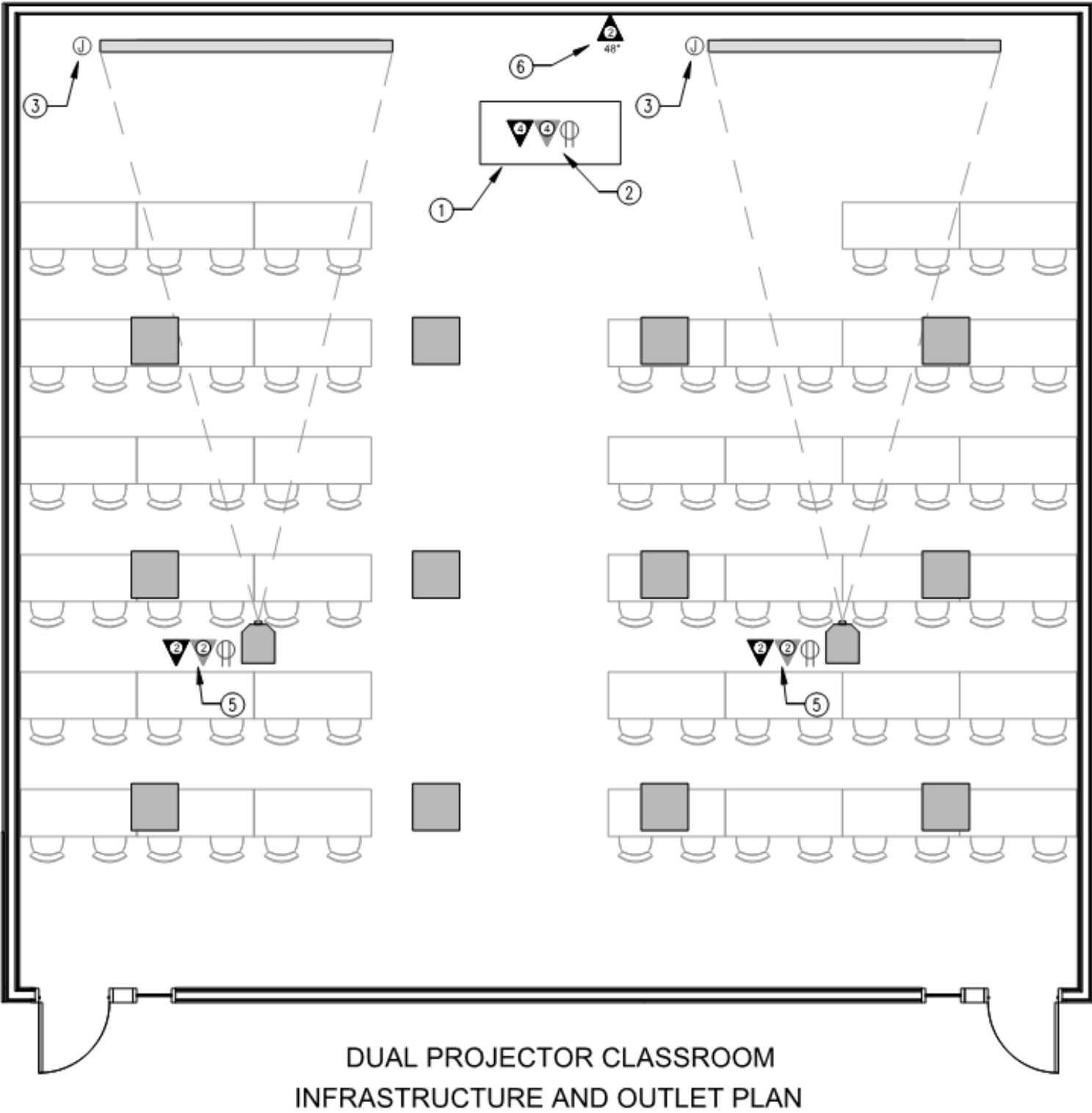

TEACHING WALL - ELEVATION VIEW

DUAL PROJECTOR LECTURE HALL - Tiered Seating
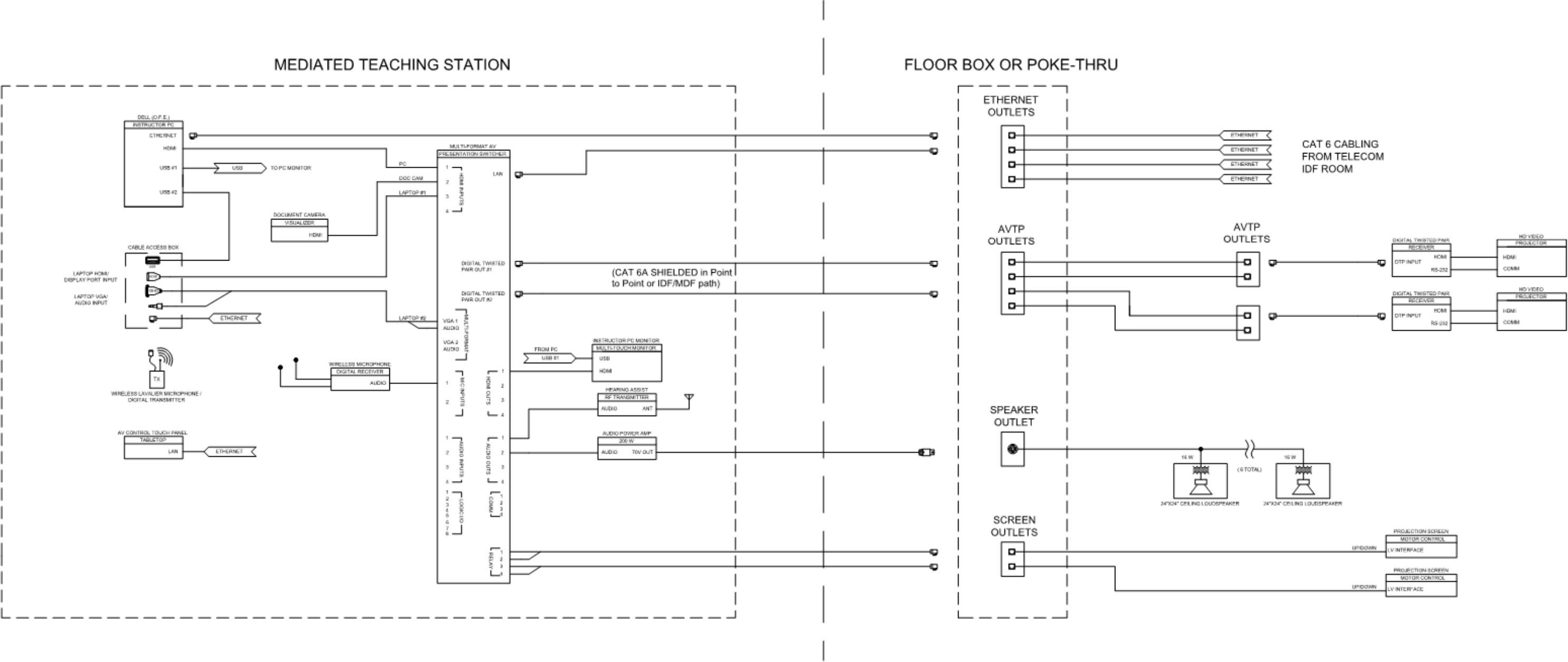### (OCCUPANCY > 100)

KEYNOTES

1. Mediated Teaching Station with instructor PC, AV touch panel control, and internal AV equipment racks to house AV components.
2. Floorbox or Poke-Thru device located below teaching station with power, data, and AV outlets.
3. Ceiling-Recessed Motorized Projection Screen.
4. 24"x24" Ceiling Loudspeakers installed in suspended ceiling grid.
5. Ceiling-mounted Video Projector.
6. Wall phone and wall switches for lighting and projection screen control.

10.4.12. Instructor Mediated Dual Projection Lecture Hall Infrastruture Sample

DUAL PROJECTOR LECTURE HALL
INFRASTRUCTURE AND OUTLET PLAN

KEYNOTES

1. Mediated Teaching Station with internal AV equipment connections to floor box outlets.
2. Floorbox or Poke-Thru device located below teaching station with 120V dedicated 20A power outlet, (4) data outlets, and AV outlets. Provide (1) 1" conduit for data and two $1\frac{1}{4}$" AV conduits from floor box that are stubbed-out above suspended ceiling.
3. Ceiling-Recessed Motorized Projection Screen power J-box. Screen requires 120V, 1A conventional power connection. Low-voltage plenum rated cable connections from the internal screen control relays to the front wall switch and to the teaching station floor box are required for operation.
4. 24"x24" Ceiling Loudspeakers installed in the suspended ceiling grid are interconnected with a plenum-rated cable originating in Mediated Teaching Station. Speakers are powered by an amplifier installed in mediated teaching station.
5. Ceiling-mounted Video Projector requires dedicated 20A power outlet, data, and AV outlet installed in ceiling adjacent to projector. Video signals and projector control signals originate in the mediated teaching station.
6. Data outlet installed 48" A.F.F. for wall phone.

LEGEND

FACEPLATE WITH (2) ETHERNET JACKS TERMINATED TO CAT6 CABLING	FACEPLATE WITH (2) GREEN AVTP JACKS TERMINATED TO CAT6A F/UTP CABLING RUNING BETWEEN PROJECTOR AND FLOOR BOX.
FACEPLATE WITH (4) ETHERNET JACKS TERMINATED TO CAT6 CABLING	FACEPLATE WITH (4) GREEN AVTP JACKS TERMINATED TO CAT6A F/UTP CABLING RUNING BETWEEN FLOOR BOX AND VIDEO PROJECTORS
ETHERNET CABLING IS TERMINATED TO PATCH PANEL LOCATED IN NEAREST IDF ROOM.	AC POWER DUPLEX OUTLET

10.4.13.   Instructor Mediated Dual Projection Room AV Single Line Diagram Sample

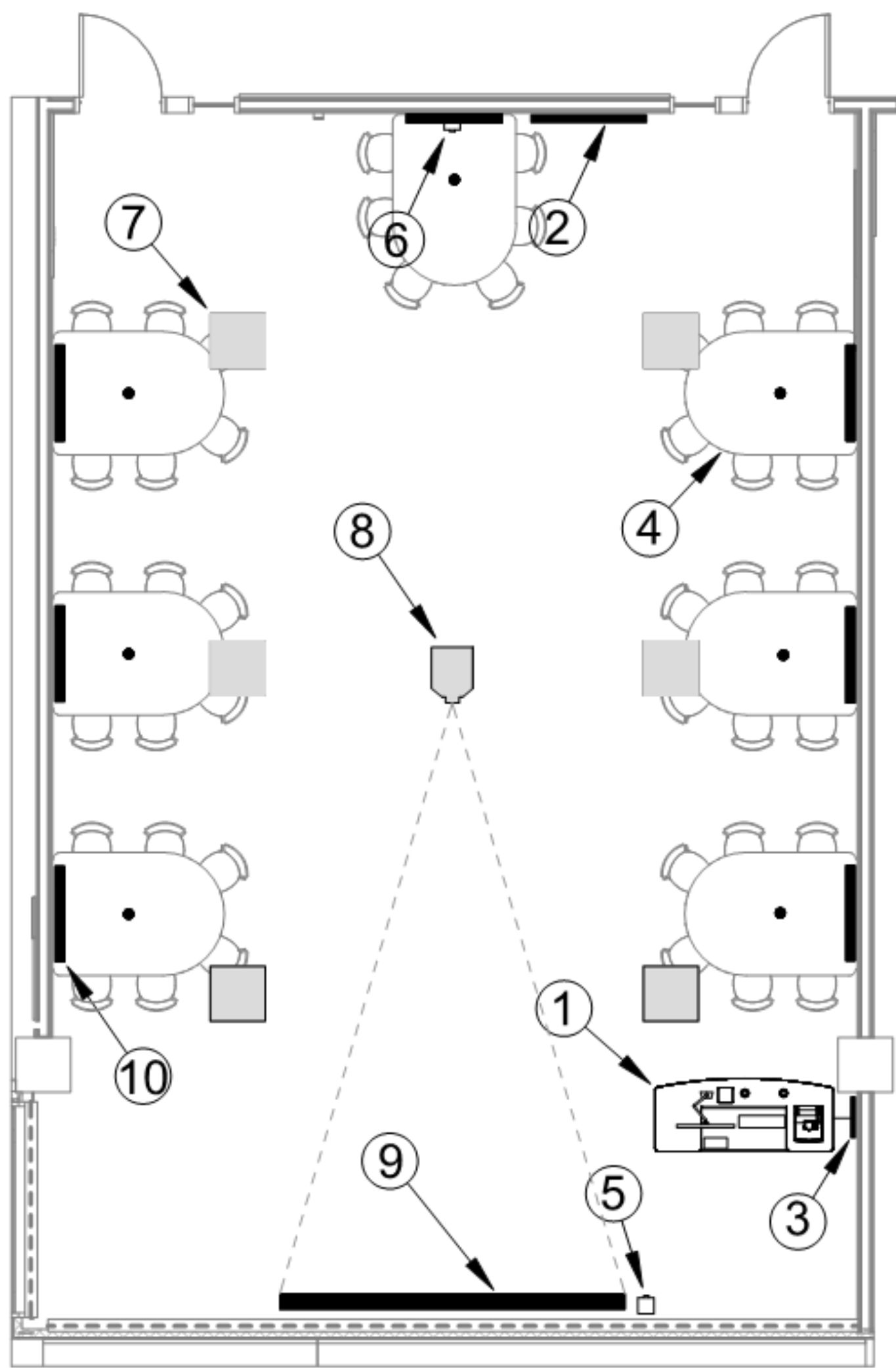## DUAL PROJECTOR LECTURE HALL / AUDITORIUM
(AV Single-line Diagram)

10.4.14. Adaptive Learning Classroom Layout Sample

ADAPTIVE LEARNING CLASSROOM

KEYNOTES

1. Mediated Teaching Station (72"W x30"D)
2. Pendant-mounted 60" diagonal LCD video monitor (Confidence Monitor)
3. AV Wall Box and cable umbilical for Mediated Teaching Station connectivity
4. Student Table with integrated boundary microphone for audio capture. Cabling, connectivity, and pathways to tables are provided by Wiremold raceway installed along length of walls.
5. PTZ Camera wall-mounted 96" A.F.F. (Student Camera)
6. AutoTracking PTZ Camera wall mounted 96" A.F.F. (Instructor Camera)
7. Ceiling Loudspeakers
8. Ceiling-hung video projector
9. Ceiling-recessed motorized projection screen
10. Pendant-mounted 47" video monitors (7 total) to display student group work or instructor content.

10.5. Conference Room Mediation Packages

Unless specifically requested, flat panel displays are generally used in conference rooms to enable videoconferencing requirements for both camera placement and room lighting levels enabling cameras to adequately show participants. One or to displays can be used based on user experience requirement for picture-in-picture viewing and/or presentation views. Two displays are recommended if the space is accommodating. Software conferencing solutions are provided in these packages to allow Vidyo, Skype, Zoom, Google Hangouts, Citrix Gotomeeting, Adobe Connect, and/or other software conferencing solutions that can be installed and configured on the room's PC.

10.5.1. Conference Room Requirements-
Identify conference room requirements using following criteria
- o Identify the number of occupants in each room
- o Identify approximately how often will each room be used? (hourly, daily, weekly, etc).
- o Identify the primary use for each conference room by % of Presentations, Conference Phone, Wireless Collaboration, Video Conferencing (Describe in Detail)
- o To further clarify the use case, please identify % usage for 1) ASU Internal Business, 2) line numbered course seminars, 3) grant-required conferencing/communications, 4) student meetings, and 5) local hosting meetings to ASU guests.
- o Identify your lead IT support personnel

10.5.2. Presentation/Teleconference room or enclave
Laptop Presentations only – Single display configuration is typical.
- o Uses flat panel display's handheld remote for control.
- o Flat panel mounts or credenza with integrated mounts.
- o Single HDMI Connection –Current laptop models offer HDMI or other digital outputs types converted to HDMI and some offer alternate VGA output to help in older environments, but no current laptops are limited to VGA only. ***Note:*** *Some personnel may have laptops greater than 4 years old with VGA only, based on departmental technology refresh budget or policy.*
  - ▪ Option - ASU phone – wired POE VOIP phone for 2-5 person enclaves
  - ▪ Option - ASU conference phone – wired POE VOIP phone for 4-8 person rooms; > 8 person often requires microphone extensions.

10.5.3. Wireless Collaboration Conference Room or Enclave:
Basic conference room or enclave as above with additional optional "wireless" collaboration device.
- o Collaboration Device such as Mersive Solstice POD connected to wired network. Allows app download for sharing of for PC, MAC, Android, and IOs content from BYOD devices. – *Note campus guests who ASUrite accounts, might require additional IT assistance to access devices on ASU's network.*

10.5.4. Basic Videoconferencing Room or Enclave
Display(s)-
- o One or two 1080P resolution, HDCP Compliant displays depending on room size (section 10.5.2) and conferencing requirements.
- o Uses flat panel display's handheld remote for control.

- o Flat panel mounts or credenza with integrated mounts.
- o i7-based Intel processor CPU
    - ASU wired network connection
    - Wireless mouse and keyboard
    - Logitech Group (PTZ Pro)
    - USB Camera (Microsoft LifeCam 1080P for PC or Logitech C920 for MAC)
    - USB audio speaker/microphone
        - Phoenix Audio Duet (1-4 persons)
        - Phoenix Audio Spider (4-6 persons)
        - Phoenix Audio Quatro3 x 2 (8- 12 persons)
        - Logitech Group (4-6; 8-12 add microphone pucks)

- o Cabling infrastructure from conference table to displays to support guest laptop. Can include conference table power and
    - Guest laptop VGA with audio (AMX)
    - Guest laptop HDMI connection (AMX)
    - USB extension cabling (Gefen and/or Extron v#)

10.5.5. Enhanced Conferencing Packages- Includes Basic Package with alternate camera, audio, and guest laptop options
- o AMX Control System (based on rooms' size or user requirement)
- o Enhanced audio AEC USB mixer (Biamp TesiraForte) with ceiling speakers and ceiling or table top microphones.
- o HD Pan/Tilt/Zoom(PTZ) camera   (Vaddio and/or Panasonic)
- o Multiple tabletop laptop connections, quantity TBD.
- o Conferencing appliance Vidyo, Cisco, Polycom

10.5.6. Hybrid Conferencing Packages- Includes Basic or Enhanced with package coupled with hardware-based conferencing solutions such as Cisco or Polycom units.

10.5.7. Small Conference Room Sample (ie Huddle Space)
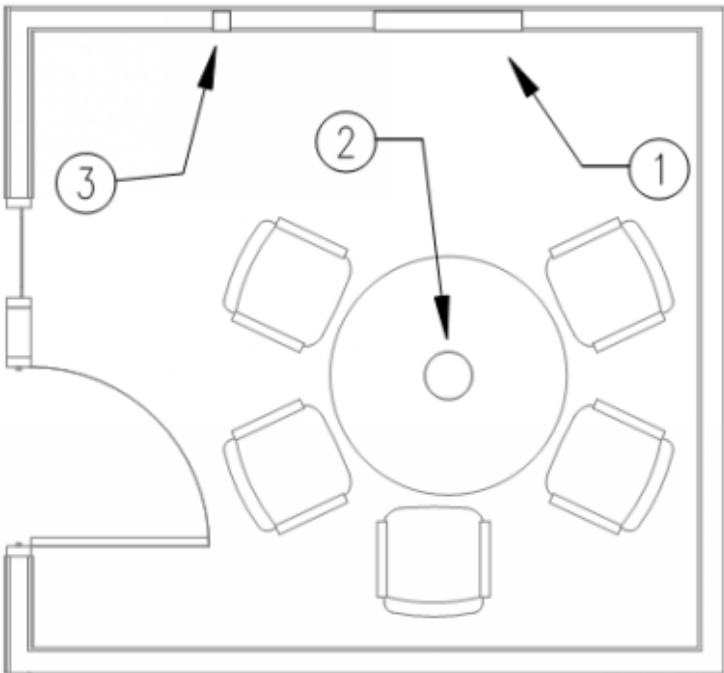
**CONFERENCE ROOM
INFRASTRUCTURE PLAN**

Alternate "Huddle" table options, required no asbestos abatement, special wall construction, only typical wall-fed power/data utilities and are easily relocated as needed.
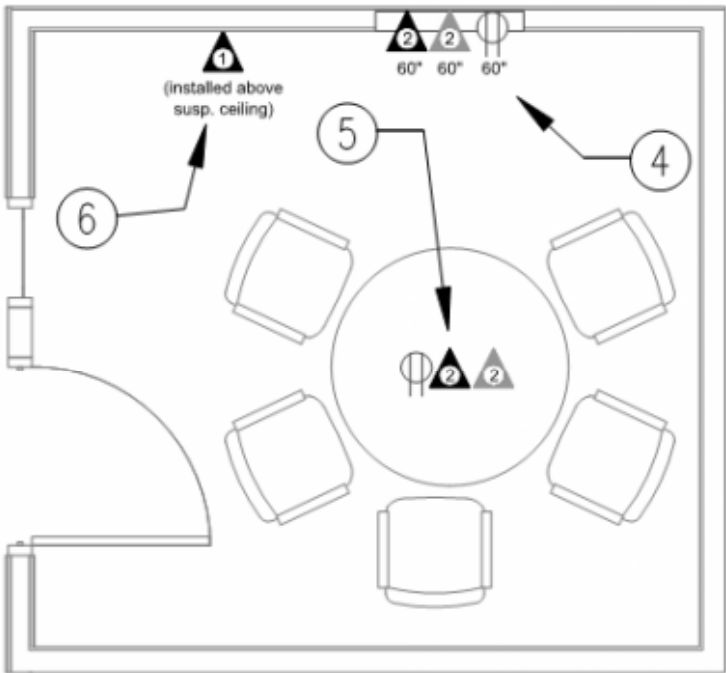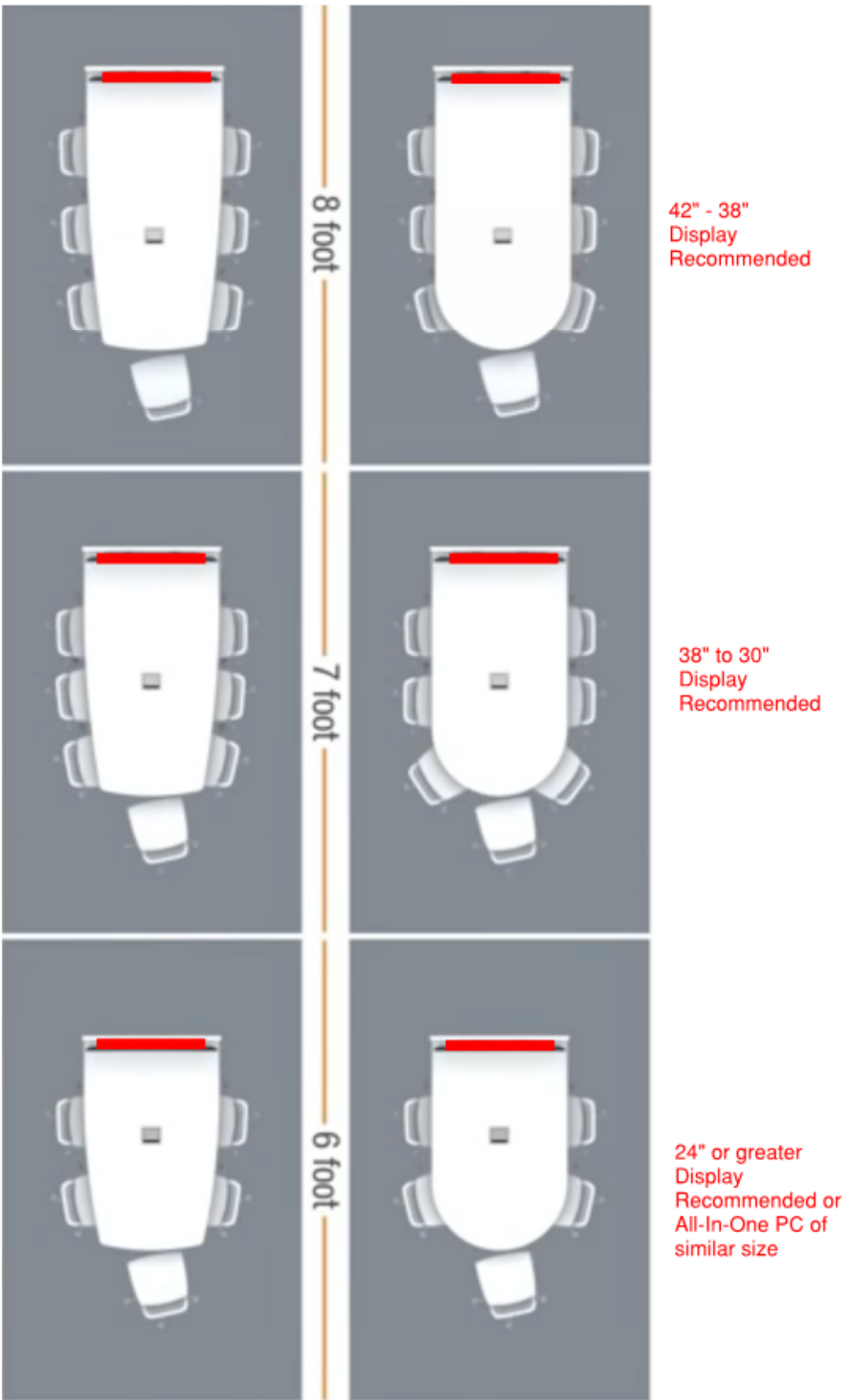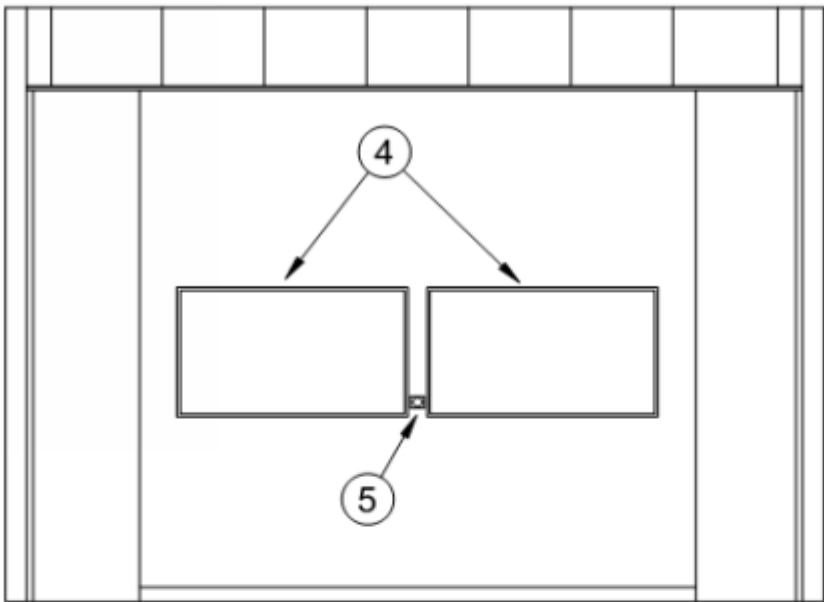

**CONFERENCE ROOM
OUTLET PLAN**

KEYNOTES

1. Recessed Wall Box (Premier Mount INW-AM325) installed 60" A.F.F. to center of box. Box provides space for video monitor bracket, power, data, and AV outlets. Provide (1) 1" and (2) 1 ¾" empty conduits extended from box and stubbed-out above suspended ceiling for data and AV conductors.
2. Floor box or Poke-thru device installed in floor for power, data, and AV outlets. Provide one 20A power circuit and (1) 1" and (1) 1 ¾" empty conduits extended from box and stubbed-out above suspended ceiling for data and AV conductors.
3. Provide 1" conduit originating at data outlet installed above ceiling and stubbed-out in wall cavity 48" A.F.F. for wall-mounted AV Control Touch Panel. AV Integrator to cut-in special backbox during installation of the touch panel. A patch cord is installed between data outlet installed above ceiling and the touch panel.
4. Power, data, and AV outlets installed within recessed wall box.
5. Outlets for power, data, and AV installed in floor box or poke-thru device located beneath table.
6. Data outlet installed above suspended ceiling for connection to wall-mounted AV control panel.

LEGEND

△1 FACEPLATE WITH
(1) ETHERNET JACK TERMINATED TO CAT6 CABLING

▲2 FACEPLATE WITH
(2) ETHERNET JACKS TERMINATED TO CAT6 CABLING

△2 FACEPLATE WITH
(2) GREEN AVTP JACKS TERMINATED TO CAT6A F/UTP CABLING RUNNING BETWEEN FLOOR BOX AND VIDEO MON. WALL BOX.

AC POWER DUPLEX OUTLET

ETHERNET CABLING IS TERMINATED TO PATCH PANEL LOCATED IN NEAREST IDF ROOM.

8 foot — 42" - 38" Display Recommended

7 foot — 38" to 30" Display Recommended

6 foot — 24" or greater Display Recommended or All-In-One PC of similar size

10.5.8. Conference Room Display Size

FRONT WALL ELEVATION
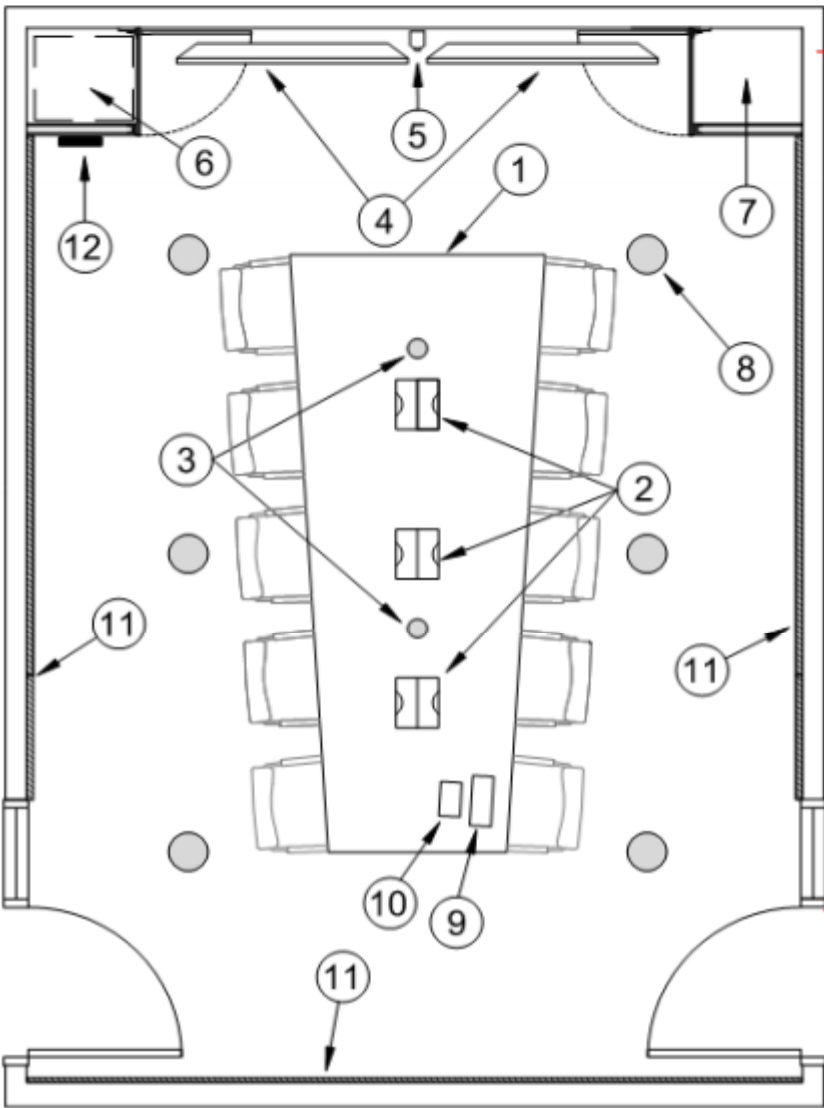
PLAN VIEW

VIDEOCONFERENCE ROOM
(OCCUPANCY = 8 - 12)

Line A-B represents the distance to the furthest viewer. For legible text height, the **maximum** distance to the furthest viewer is 6x screen height; **recommended** is 5x for 1080P HD resolution or higher.

Display Size (Diagonal Inches)	Recommended Max Distance (@5:1) feet	Maximum Distance (Furthest Viewer) feet
40	8.33	10.00
55	11.25	13.50
60	13.54	16.25
65	13.92	16.70
70	15.42	18.50
80	16.96	20.35
85	17.50	21.00
90	19.79	23.75
98	20.42	24.50

KEYNOTES

1. Videoconference Table (144" x 60")
2. Cable Access Box with hinged doors flush-mounted in tabletop. Box contains power, data, and AV outlets supporting laptop connectivity for VGA and HDMI/Display Port.
3. Low-profile conferencing microphones.
4. 60" diagonal LCD video monitors wall-mounted 60" above finished floor to center of screen.
5. Videoconferencing camera wall-mounted between LCD monitors 48" A.F.F.
6. Media equipment cabinet installed within lockable closet.
7. Lockable storage closet space for portable media components.
8. Ceiling loudspeakers utilized for videoconferencing audio reproduction.
9. Wireless keyboard utilized to operate PC installed in the media rack.
10. Portable wireless AV control touch panel utilized to operate media system from the conference table.
11. Acoustical wall treatment to reduce undesirable sound reflections in the room.
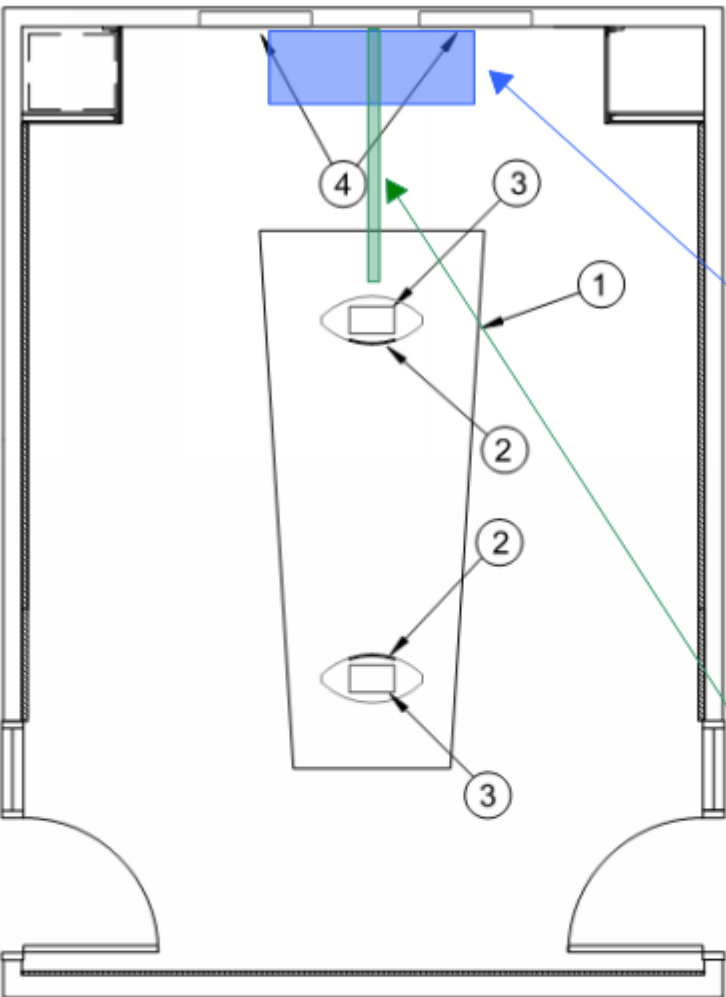12. Optional wall mounted AV control touch panel.

GENERAL NOTES:

1. The conference table and video monitors are installed along centerline of the meeting room.
2. Optionally, a single 80" diagonal video monitor may replace two 60" diagonal video monitors.
3. An optional tabletop telephone may be provided as required by user group.
4. A wall-mounted AV control touch panel may be substituted for the portable wireless tabletop touch panel as required by user group.
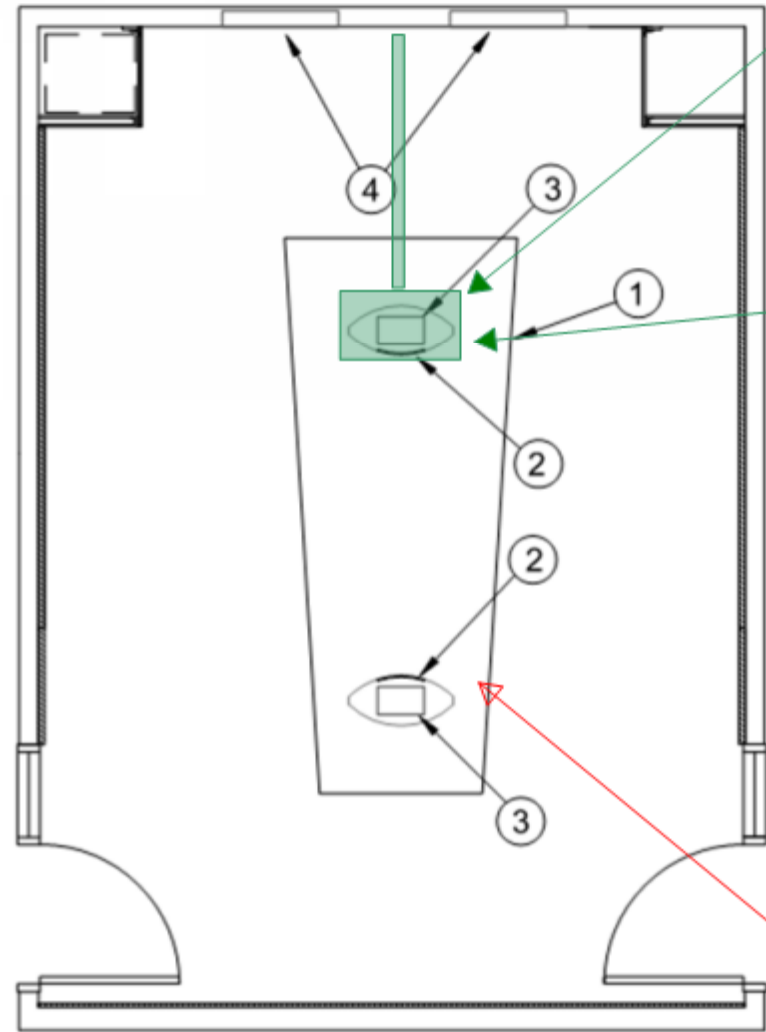
10.5.9. Conference Room Furniture Options

ASU VIDEOCONFERENCE ROOM
INFRASTRUCTURE PLAN
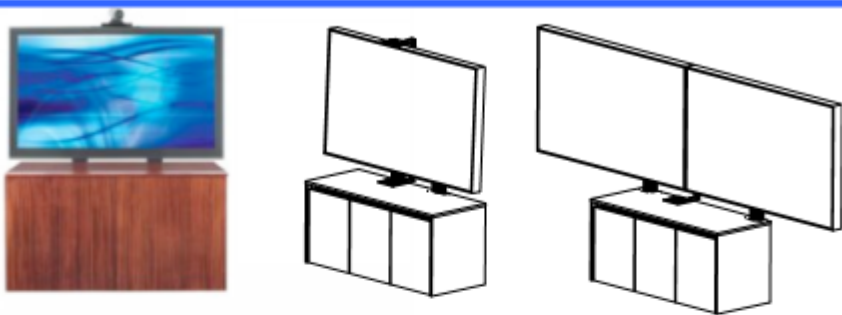
As a alternate to a building infrastructure model, technical credenza options can accommodate basic to advanced conference room requirements. They also require no asbestos abatement or special wall construction. They typically only require wall-fed power/data utilities and are easily relocated as needed. These are also recommended over traditional millwork cabinetry as they offer critical ventilation for any electrical components.

Cost for software conferencing with professional integration with warranty can range from $13K - 20K depending on display size and quantity. *This does not include power/data infrastructure.*

"Floortack" raceway, floorboxes, or PokeThrus™ are required for guest laptop connections, phone, data, speaker, microphone, and camera connections for conferencing.

ASU VIDEOCONFERENCE ROOM
INFRASTRUCTURE PLAN

As a lower cost alternate to technical credenzas, technology pedestal offer a limited amount of space for basic software conferencing requirements hidden within a ventilated furniture piece, near to or even replacing a table leg.

Cost for software conferencing with professional integration with warranty can range from $11K - 16K depending on display size. *This does not include power/data infrastructure.*

Note: V- Shaped tables (as shown) are always recommended for video conference spaces to ensure camera views of the participants faces.
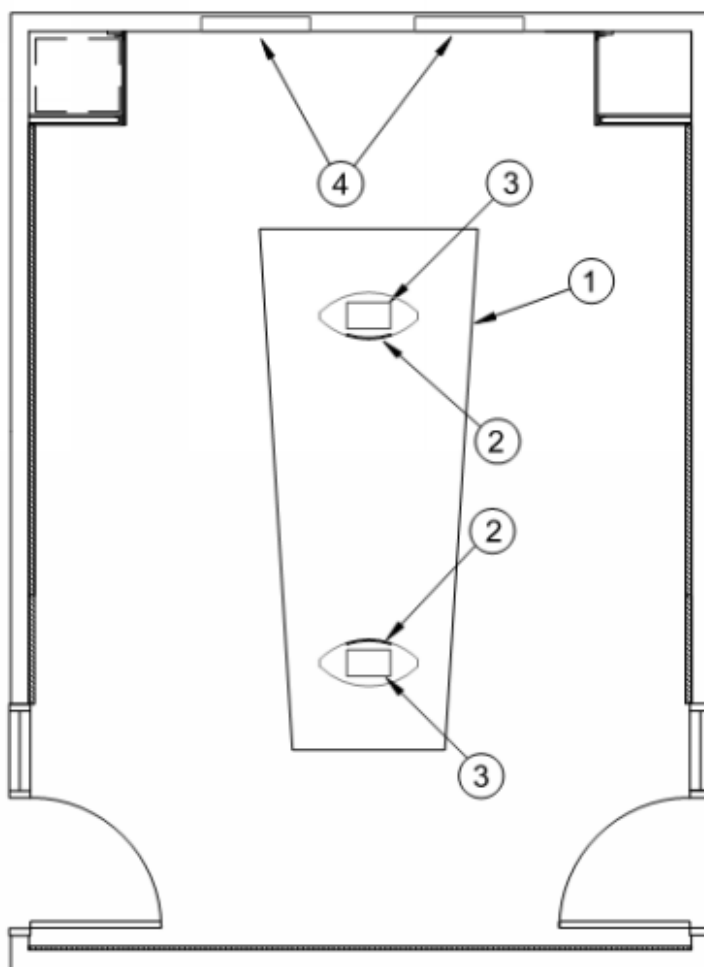
KEYNOTES

1. Videoconference Table (144" x 60")
2. Table leg cavity with removable panel for cable access
3. Floorbox or Poke-thru device installed in floor for power, data, and AV outlets. Provide one 20A power circuit and (1) 1" and (2) 1 ¼" empty conduits extended from box and stubbed-out above suspended ceiling for data and AV conductors.
4. Recessed Wall Box (Premier Mounts INW-AM325) installed 60" A.F.F. to center of box. Box provides space for video monitor bracket, power, data, and AV outlets. Provide (1) 1" and (2) 1 ¼" empty conduits extended from box and stubbed-out above suspended ceiling for data and AV conductors.
5. Power, data, and AV outlets installed within recessed wall box.
6. Power, data, and AV outlets installed within floor box.
7. Power, data, and AV outlets installed within media closet.
8. Convenience outlet installed in storage closet used to charge portable devices.

LEGEND

10.5.10. Conference Room Infrastructure

ASU VIDEOCONFERENCE ROOM
INFRASTRUCTURE PLAN

Premier INW-AM325

https://www.mounts.com/inw-am325

Directly supports low profile mounts series as applicable

ASU VIDEOCONFERENCE ROOM
OUTLET PLAN
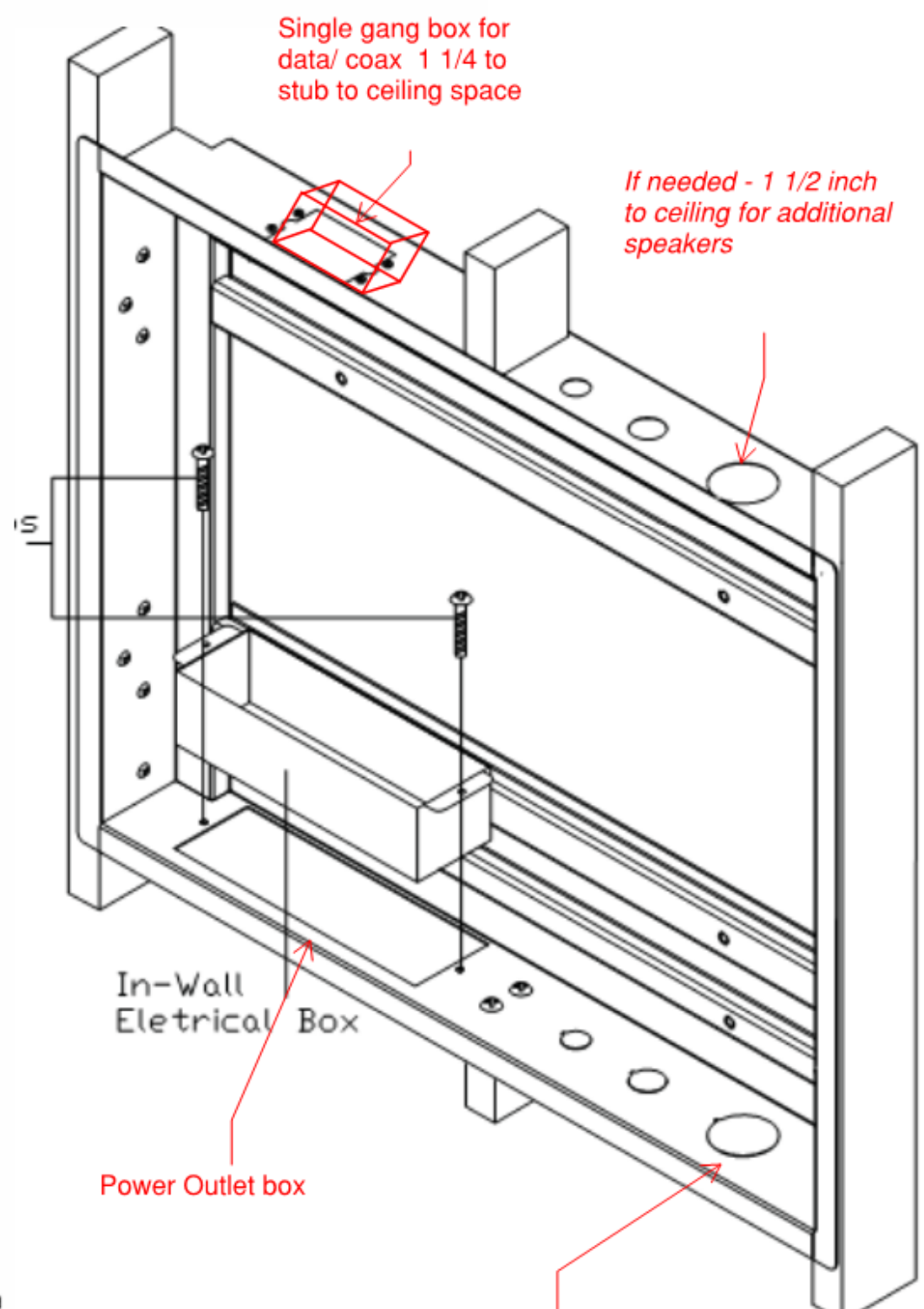
Single gang box for data/ coax 1 1/4 to stub to ceiling space

If needed - 1 1/2 inch to ceiling for additional speakers

In-Wall Eletrical Box

Power Outlet box

Conference room as applicable 1 1/2 inch to Floorbox or subfloor Pokethru Location as applicable or to wall interface panel.
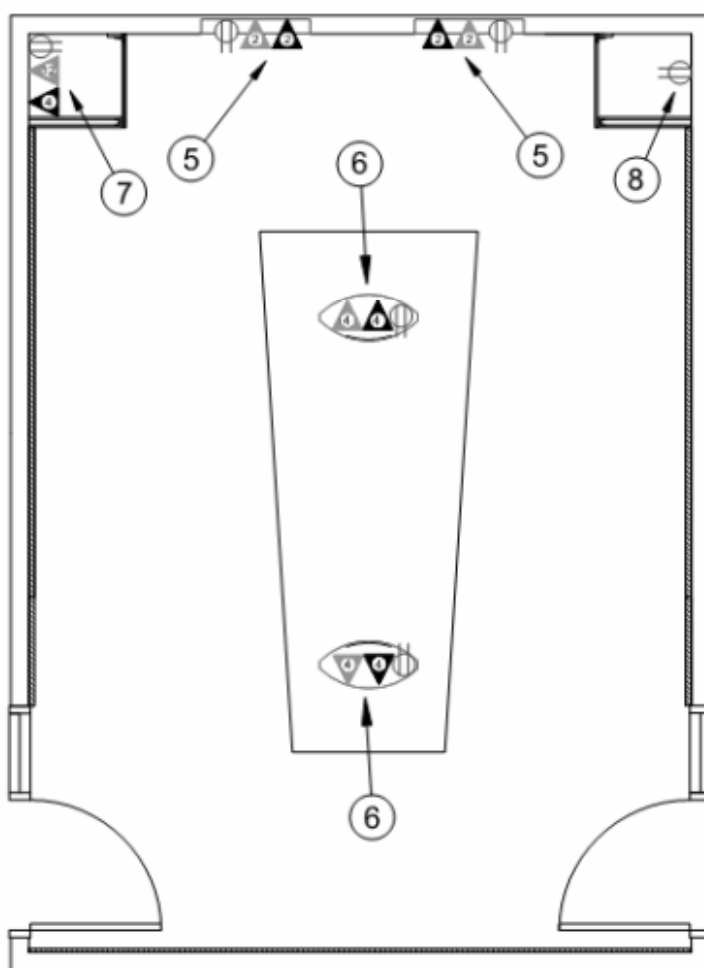
KEYNOTES

1. Videoconference Table (144" x 60")
2. Table leg cavity with removable panel for cable access
3. Floorbox or Poke-thru device installed in floor for power, data, and AV outlets. Provide one 20A power circuit and (1) 1" and (2) 1¼" empty conduits extended from box and stubbed-out above suspended ceiling for data and AV conductors.
4. Recessed Wall Box (Premier Mounts INW-AM325) installed 60" A.F.F. to center of box. Box provides space for video monitor bracket, power, data, and AV outlets. Provide (1) 1" and (2) 1¼" empty conduits extended from box and stubbed-out above suspended ceiling for data and AV conductors.
5. Power, data, and AV outlets installed within recessed wall box.
6. Power, data, and AV outlets installed within floor box.
7. Power, data, and AV outlets installed within media closet.
8. Convenience outlet installed in storage closet used to charge portable devices.

LEGEND

FACEPLATE WITH (2) ETHERNET JACKS TERMINATED TO CAT6 CABLING	FACEPLATE WITH (2) GREEN AVTP JACKS TERMINATED TO CAT6A F/UTP CABLING	2-GANG FACEPLATE WITH (12) GREEN AVTP JACKS INSTALLED IN THE MEDIA CLOSET. TERMINATED TO CABLING ORIGINATING FROM OTHER AVTP JACKS INSTALLED WITHIN THE ROOM.
FACEPLATE WITH (4) ETHERNET JACKS TERMINATED TO CAT6 CABLING	FACEPLATE WITH (4) GREEN AVTP JACKS TERMINATED TO CAT6A F/UTP CABLING	AC POWER DUPLEX OUTLET

ETHERNET CABLING IS TERMINATED TO PATCH PANEL LOCATED IN NEAREST IDF ROOM.

AVTP CABLING IS TERMINATED TO WALL PLATE LOCATED IN MEDIA RACK CLOSET.

10.5.11. Confernce Room Equipment Matrix
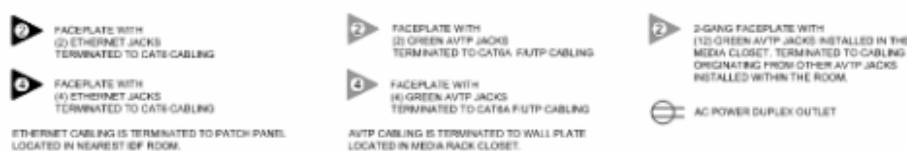
ARCHITECTURAL OPTIONS

LAYOUT

LAYOUT TYPE	LAYOUT DESC	Small	Medium	Large	Executive
Layout 1	Credenza @ display wall	✓	✓	✓	✓
Layout 2	Credenza NOT @ display wall	✓	✓	✓	🚫
Layout 3	No credenza	✓	🚫	🚫	🚫
Layout 4	Pedestal or other	✓	✓	✓	🚫

CABLING

LAYOUT TYPE	LAYOUT DESC	Small	Medium	Large	Executive
Layout 1	Credenza @ display wall	Traditional	Traditional/AVTP	AVTP	AVTP
Layout 2	Credenza NOT @ display wall	Traditional	Traditional/AVTP	AVTP	🚫
Layout 3	No credenza	Traditional	🚫	🚫	🚫
Layout 4	Pedestal or other	Traditional	Traditional/AVTP	AVTP	🚫

Product Matrix - Video Conference Rooms

Category	Item Description	Manufacturer	Model	Small (0-6)	Med (5-12)	Large (13+)	Executive
Furniture/Table	none			●			
	Basic 60" table at wall	TBD		●			
	Huddle Furniture	TBD		●	●		
	Technical Credenza	TBD		●	●	●	
	Tech Pedestal Table Leg Rack	TBD		●	●	●	
Table inteface	none			●			
	Grommet	TBD		●			
	Cable Cubby	AMX	Hyrdaport	●	●		
	Cable Cubby	Extron		●	●	●	
Camera	Webcam (Small)	Logitech	C930e	●			
	Webcam (Small)	Microsoft	Lifecam	●			
	Webcam (Mid)	Logitech	PTZ Pro (Package*)		●	●	
	Network Camera	Panasonic	AW-HE40			●	●
MIC	MIC/Speaker	Phoenix Audio	Duet	●			
	MIC/Speaker	Phoenix Audio	Spider (MT503)		●	●	
	MIC/Speaker	Logitech	Group (Package*)		●	●	
	Ceiling MIC	BiAmp	CM1			●	●
Speaker	MIC/Speaker	Phoenix Audio	Duet	●			
	MIC/Speaker	Phoenix Audio	Spider (MT503)		●	●	
	MIC/Speaker	Logitech	Group		●	●	
	Ceiling Speakers					●	●
Display	27" Display (Single)	Dell		●	●		
	42" Display (Single)	Samsung		●	●		
	55" Display (Single)	Samsung	DB48E	●	●		
	55" Display (Single)	Dell	E5515H	●	●		
	55" Display (Single)	Samsung	DC55E	●	●		
	60" Display (Single)	Sharp	LC-60LE661U	●			
	65" Display (Single)	Samsung	MD55C	●	●		
	70" Display (Single)	Dell	C7016H	●	●		
	70" Display Interactive	Dell	C7017T	●	●		
	70" Display (Single)	Sharp	LC-70LE661U	●	●		
	75" Display (Single)	Samsung	ED75E	●	●		
	80" Display (Single)	Sharp	LC-80LE661U		●	●	
	85" 4K Display (Single)	Samsung	QM85D			●	●
	90" Display (Single)	Sharp	LC-90LE657U			●	●
Control	None (Remote Control)			●	●		
	Small Master Controller	AMX	1200		●	●	
	Master Controller (Executive)	AMX	3200		●	●	
	Keypad	AMX			●	●	
	AMX 4.3 Touchpanel	AMX	MST-431		●	●	
	AMX 7" Touchpanel	AMX	MST-701		●	●	●
	AMX 10" Touchpanel	AMX	MST-1001			●	●
Audio Mixer	None			●	●	●	
	Tesira Forte	BiAmp	TesiraForte		●	●	●
Collaboration	Wireless Collaboration	Mersice	Solstice	●	●	●	●
PC - Confernece Software	PC	Dell	Micro920	●	●	●	●
Video Switcher	None			●	●	●	
	Switcher	AMX	Solecis		●	●	●
	Switcher	Extron	IN1604		●	●	●
	Switcher	Extron	IN1606			●	●
Confernce Codec	None			●	●	●	
	Codec Appliance	Vidyo	HD-230		●	●	●
	Codec Appliance	Cisco	C40		●	●	●
Camera Switch	None			●	●	●	
	Switcher/Scaler	Extron	DVS605			●	●

10.5.12.   Videoconference Room AV Single Line Sample

VIDEOCONFERENCING ROOM
(AV Single-line Diagram)