Classroom Design & Technology Standards

Standards compiled by
Office of the University Architect
University Technology Office
Revised: 12/1/2014
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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 and 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. This document is the Classroom Design & Technology Standards and it incorporates the Classroom Space Utilization Guidelines for context, as well as the critical Technology Standards for Learning Environments as set by the University Technology Office (UTO).

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 the Office of the University Architect (OUA).

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, active learning centers, 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:

<table>
<thead>
<tr>
<th>Room type</th>
<th>Weekly Room Usage</th>
<th>Station Utilization</th>
<th>Station Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classrooms</td>
<td>35</td>
<td>65%</td>
<td>19 square feet</td>
</tr>
<tr>
<td>Lecture rooms</td>
<td>32</td>
<td>63%</td>
<td>17 square feet</td>
</tr>
<tr>
<td>Collaborative/seminar</td>
<td>35</td>
<td>67%</td>
<td>22 square feet</td>
</tr>
<tr>
<td>Computer Instructional</td>
<td>32</td>
<td>75%</td>
<td>32 square feet</td>
</tr>
</tbody>
</table>

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 armchair 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, 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 traditional 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 Office of the University Architect (OUA). Reviews by OUA 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 & Technology Standards 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 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 particularly in relation to ceiling height. 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 most 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 Classroom: Active / Adaptive Learning
Active learning classrooms generally accommodate smaller numbers of students seated in any number of flexible group seating configurations. Technology integration within furnishings to connect individual students, groups of students, entire classes, and the instructor are key components to an active learning classroom. Active learning classrooms contain flexible furniture
• The instructor location is to be flexible with multiple options – including the front of the classroom.
• 25 - 30 square feet per student accommodates this type of pedagogy.
• This category includes teaching / learning methodologies such as: Flipped Classrooms, Math Labs, Active Learning / Collaborative. The space, furnishings, and technology for these more specific pedagogy driven spaces is reviewed on an individual basis. These spaces involve custom designed spaces and software dependent upon the pedagogical needs. Examples of this would be:
  - Chemistry Labs (Tempe Campus: PSH 132 and 135)
  - Physics SCALEUP Lab (Tempe Campus: PSH 356)
  - Active Learn Lab (Tempe Campus: LSC 180)
  - Math Lab (Tempe Campus: CPCOM 3rd floor)
  - Math Lab (Downtown Campus: Student Center at the Post Office)
  - Learning Studios (Tempe Campus: Hayden Library Lower Level)
  - GOEE Lab (Tempe Campus: CAVC 333 and 335)
  - SSEBE Labs (Tempe Campus: CAVC 4th and 5th floors)

3.5 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
  • Refer to applicable building code for dimension requirements
• Theater-style seating with attached tablets or fixed tables with free-standing chairs.
• A curved seating 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.

3.6 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 minimum of 1% up to 5% of the total seats in auditoriums with tablets need to accommodate left handed users
• A curved seating configuration is optimum
• Multiple access points to rows of seating are required including a center aisle (refer to code for specifications)
• 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.
3.7 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 considering future and current cabling and electrical requirements within the space and the furnishings is critical.

3.8 Conference Rooms

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

- They 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 recommended 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 identified 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.
- Durable and maintainable wall finishes shall be considered to handle the student load.
- Finishes should coordinate with other spaces in the building and take the building standard palette into consideration.

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.

- Access to these spaces should be flexible and follow the same guidelines for security and access as the classroom spaces.
• Furnishings in these areas should be flexible and provide an appropriate mix of soft seating and work surfaces – durable finishes such as those required within the classroom spaces should be selected in these areas.
  o Fabric requirements can be found in ASU’s Design Guidelines Part II – Interior Design

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. Federal ADA regulations will over rule ASU Accessibility Standards in instances of conflict or uncertainty.
• Consideration of the classroom placement within a building, and the path of travel, should be given in determining automatic door opener locations and requirements.
• Provide accessible wheel chair seating positions distributed in each room according to chart below. (per Federal 2010 Standards Table 221.2.1.1)

<table>
<thead>
<tr>
<th>Capacity of Seating in Assembly Areas</th>
<th>Number of Required Wheelchair Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 25</td>
<td>1</td>
</tr>
<tr>
<td>26 to 50</td>
<td>2</td>
</tr>
<tr>
<td>51 to 150</td>
<td>4</td>
</tr>
<tr>
<td>151 to 300</td>
<td>5</td>
</tr>
<tr>
<td>301 to 500</td>
<td>6</td>
</tr>
<tr>
<td>over 500</td>
<td>6, plus 1 additional space for each total seating capacity increase of 100</td>
</tr>
</tbody>
</table>

• Each ADA designated seat requires one companion seat accommodation directly next to the ADA seat
• In rooms where electrical plugs/power is offered to more than 50% of the overall student seats, it is required that the same features be accessible to ADA students using the designated seats
• In rooms where work surfaces, either tables or tablet arms, are offered to more than 50% of the overall student seats it is required to provide pneumatic height adjustable work surface/tables for each ADA seat.
• The overall total required number of ADA seats should be dispersed throughout the space for varied viewing angels as much as feasible.

4.5 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 and spare hardware separate from the audio/visual technical room. It should be approximately 100 square feet to store board supplies, movable lecterns, additional chairs, etc. 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 Federal 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)

A. Display in front of broad niche in pathway
   - Scale: 3/8" = 1'-0"
   - Signface may not project more than 4" from rear wall.
   - Sign may not project more than 4" into path of travel.
   - If any portion of sign or sign elements project into the 27" - 80" zone, sign shall be permitted without a clear space on either side of sign.
   - Object shall not project more than 4" into accessible routes at or below 80 in (2030 mm) above the ground or floor surface.
   - Display cannot block view of "EXIT" sign from any direction.
   - Location must be approved by OUA.

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

C. Display in front of tight niche in pathway
   - Scale: 3/8" = 1'-0"
   - Sign face may not project more than 4" into path of travel.
   - If any portion of sign or sign elements project into the 27" - 80" zone, sign shall be permitted without a clear space on either side of sign.
   - Display cannot block view of "EXIT" sign from any direction.
   - Location must be approved by OUA.

D. Display in floor mounted cabinet
   - Scale: 3/8" = 1'-0"
   - Sign may project more than 4" into path of travel.
   - Sign continuously goes to the ground.
   - Display cannot block view of "EXIT" sign from any direction.
   - Location must be approved by OUA.
Interactivity- Interactive digital signage displays shall adhere to Federal ADA standard reach requirements. Mounted displays shall have interactive sections or controls not exceeding 48 inches above fixed floor.
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 and is encouraged.
- Every seat must have an unobstructed view of the teaching wall. No columns or other visual obstructions are allowed in direct site lines within 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, as those 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 Federal 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.
- Exterior look and overall building cohesion should be taken into account when selections are made.
  - Office of the University Architect representative to provide approval when exterior look is a factor

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 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 cove base must be included when carpet is specified. This base is preferred to be rubber but a coordinating carpet base is acceptable.
• All aisle risers must be of contrasting color to the remaining floor to highlight level change.
• Preferable aisle riser nosing material should be metal. Vinyl and rubber nosing are permitted with substrate review by ASU Office of the University Architect. Tiered classrooms with concrete risers shall be furred out with a wood or equal material so allow for a more secure nosing adhesion process.

5.5 Walls and Ceilings

5.5.1 Walls
• Internal classroom walls shall run deck-to-deck, with a minimum Sound Transmission Coefficient (STC) rating of 50.
• 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-VOC paint should be used to improve Indoor Air Quality (IAQ).
• No dry erase marker paint to be used as a wall finish in University Classrooms

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 they cannot be removed.
• Interior columns located within the open space of the classroom shall receive corner guards of matching material installed up to 4’0” A.F.F. applied so that they cannot be removed.

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 when feasible.
• 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”.
• Access for the maintenance of technology, power, etc. must be included where applicable. (Consult UTO for access and location details.)

5.5.4 Vertical Writing Surfaces (Whiteboards)
• A high-fired, ceramic-covered steel, dry marker writing surface shall be provided in each classroom.
  o Back painted tempered glass of at least ¼” thickness with smoothed and polished edges and smooth and eased corners are acceptable
  o Consideration of environmentally friendly and recyclable materials should be considered when selecting
• 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 can 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.
• It is preferably that boards be installed to allow for use while screen and projection are also in use.
• Walltalkers® dry erase wall coverings and dry erase paint materials are not acceptable solutions in Classroom spaces.

Sizes

<table>
<thead>
<tr>
<th>Capacity of room</th>
<th>Minimum Writing Surface Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-25</td>
<td>12 ft. wide x 4 ft. high</td>
</tr>
<tr>
<td>25-75</td>
<td>20 ft. wide x 4 ft. high</td>
</tr>
<tr>
<td>75-100</td>
<td>30 ft. wide x 4 ft. high – may be tiered</td>
</tr>
<tr>
<td>Lecture hall</td>
<td>Determined based on space available but at least 3 sections of 12 ft. x 4 ft. with tiers</td>
</tr>
</tbody>
</table>

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

5.6 Signage
Refer to the ASU Signage Guidelines for more information on the branding and signage guidelines.

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 (1) one 48” x 48” bulletin board in each room.
- Location and finishes of the bulletin boards will be determined at design. It is preferred this be interior and adjacent to the main entry point.
- OUA and FACMAN Classroom Management team reserves the right to review all postings and remove anything OUA or FACMAN Classroom Management team 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.
- Occupancy should factor in instructor in total

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.
  - Details on this sign can be found in the ASU Signage Guidelines
  - Emergency exit maps are not to be included due to the potential need for frequent updating due to building and exterior projects that can occur at any time

**Classroom Support Information**

**Classroom Layout**

**Contact Information - All classroom contacts**

**911 Information including Building Name, Building Address, and Room Number**

**University Initiatives**

**Classroom Support Information**

*Colors shown are experimental only. Final color swatches to be approved by the ASU Sign Shop.*
5.7 Colors/Finishes
- Accent walls are desired and encouraged to create interest and energy within a space.
- 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 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. Hardware must be provided to appropriately display the flag. Flags in classrooms 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. Refer to ASU Design Guidelines Part II Interior Design for specific furniture specification requirements.

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, technology, or other 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” width per student. The number of students per table is flexible and is determined by the type of classroom and the configuration of the classroom.
  - Leg placement should be considered to maximize under table leg and chair leg space
- 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.
  - It is preferable to stay at 20” as a minimum depth unless the room restrictions and occupancy needs dictates otherwise
- Modesty panels are allowed.
  - Modesty panels are preferred in tiered classroom rooms
- If a situation necessitates fixed tables, the preferred seating solution would be loose chairs with casters. Fixed tables with cantilevered pivot arm seats are allowed.
- Furniture must be able to interface with technology (i.e. pathway for power/data), based on UTO’s New Construction Specifications.
  - Tablet arms dimension considerations: - 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.
  - Tablet arms to have anti-panic feature when feasible
  - Prefer to have tablet arms tested to a minimum 300 lb. weight limit.

Matrix of types of seating in classrooms

<table>
<thead>
<tr>
<th></th>
<th>Tiered</th>
<th>Fixed Seat</th>
<th>Fixed Table</th>
<th>Moveable Seat</th>
<th>Moveable Table</th>
<th>Tablet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar</td>
<td>N/A</td>
<td>N/A</td>
<td>O</td>
<td>X</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>Classroom</td>
<td>O</td>
<td>N/A</td>
<td>O</td>
<td>X</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>Lecture</td>
<td>X</td>
<td>N/A</td>
<td>X</td>
<td>X</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Auditorium</td>
<td>X</td>
<td>X</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>O</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

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.
  - It is preferred that laminates have a minimal pattern and not be solid color
• 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.
  o Laminate edge finish is not permitted
• 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, pneumatic adjustable-height ADA tables must be provided according to ASU Accessibility Standards. Specific seat access measurements are to follow Federal ADA Regulations.
  Each ADA student station requires one adjacent seat for their companion.
  Each ADA table/furniture item will be marked with an imbedded blue and white universal handicap symbol for identification. Sticker application of handicap symbol is not acceptable.
  Pneumatic is the preferred height adjustment changing method.

6.1.5 Replacement Availability/Warranty
• Work surfaces/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.
• Consult with ASU Purchasing Department with questions regarding manufacturer acceptability and requirements

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 and space/room limitations.

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.
• All clearances also need to adhere to Federal ADA requirements

6.2.5 Appearance
• The appearance shall be coordinated with the interior of the classroom and meet the acoustical requirements for the space. Light and/or solid 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.
  ▪ Refer to ASU Design Guidelines Part II Interior Design for fabric requirements
• The construction and materials should be selected so that their color and surface are consistent with the other furnishing within the classroom.
  ▪ Building wide finish standards used in non-classroom spaces should also be taken into consideration

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.
  o Furniture and manufacturer need to meet ASU Purchasing guidelines
• 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. When feasible the required number of seats should be evenly distributed between the front and back of the space. Refer to Federal ADA requirements for dimensional requirements.

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. Tablet arm
material to have a durability greater than or equal to a laminate finish and be scratch resistant. Tablets are required to have a 300lb test rating.

- Non-theatre lecture seating requires free-standing, chairs with casters.
- In lecture rooms where programs will typically exceed 2 hours, padded and upholstered seats and backs should be selected.
- Fixed auditorium seating may require electrical/data outlets, based on programming needs. Adding student use electrical outlets at a minimum of 50% of the seats in large auditoriums and classrooms is preferred.

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

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

6.3.2 Teaching Stations (Lecterns)

<table>
<thead>
<tr>
<th>Seminar</th>
<th>Classroom</th>
<th>Lecture</th>
<th>Auditorium</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>P or F</td>
<td>P or F</td>
<td>F</td>
</tr>
</tbody>
</table>

P Portable table type  F Floor type

<table>
<thead>
<tr>
<th>Room</th>
<th>Table Top</th>
<th>Table with Lectern</th>
<th>Podium</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar</td>
<td>X</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom</td>
<td>O</td>
<td>X</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Lecture</td>
<td>O</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditorium</td>
<td></td>
<td>X</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

O Acceptable  X Preferred

6.4 Types of Furniture to Avoid

- Pivot arm seats
- Pedestal seats that are bolted to the floor
- Any furniture type with any parts or pieces fabricated overseas creating long lead times and minimum order requirements

6.5 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.
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, or modes. 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 scenarios or modes described below are standardized based on common classroom functions zones. These should be consistent to assure instructor understanding and ease of use and familiarity. These zones or modes should also be labeled at switching location adjacent to the teaching station. There are five functional lighting modes in most classrooms:

Zone 1 – Main classroom lighting (student seating area) this mode 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: Any pendant mount lighting solutions require AV review and signoff to ensure unobstructed projection image.

Zone 2 – Lecture mode (front of classroom and lectern area). Design whiteboard and demonstration table lighting to provide visibility for lecture while the remainders of the room lights are slightly dimmed in contrast. Foot-candles should allow for student note taking.

Zone 3 – Projection Mode: All lighting in the front should be off to allow for clear visibility of projected image. The remainder of the room lights to be dimmed to ease eye strain and allow for student note taking.

Zone 4 – Movie Mode: This mode is similar to Zone 3 however the entire space is dimmed to a low foot candle level with no variation between front and back of the room. Lighting level should allow for student note taking.

Zone 5 – Instructor workstation. The instructor should be able to read notes and use board AV equipment with low-light conditions in remainder of the space. This should be switched individual of other zones.

Foot Candle (fc) Guidelines*

<table>
<thead>
<tr>
<th></th>
<th>Day Lighting Mode</th>
<th>General Mode / Non-Day Lighting</th>
<th>AV Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student desk</td>
<td>30 fc min 150-200 max</td>
<td>30 fc min 70 fc max</td>
<td>10 fc min</td>
</tr>
<tr>
<td>Whiteboard</td>
<td>30 fc vertical min</td>
<td>30 fc vertical min</td>
<td>N/A</td>
</tr>
<tr>
<td>Screen</td>
<td>N/A</td>
<td>N/A</td>
<td>8 fc vertical allow 8:1 video image with 3000 lumen projector</td>
</tr>
<tr>
<td>Walls</td>
<td>10 fc vertical</td>
<td>10 fc vertical</td>
<td>N/A</td>
</tr>
</tbody>
</table>
*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.

7.1.4 Switch Locations
Lighting control switches should be placed at entry points to the room and also at the Instructor Workstation. Exact placement at Instructor Workstation should be coordinated with white board and project screen placements. Each location to be labeled with various zones/mode settings.

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 electrical outlet, and data ports per room requirements adjacent to the instructor’s workstation.
- Install one 2-gang AV wall box (min 2 ½” D) at least 18 inches above the finished floor. Install two 1 ¾” conduit stub-outs above the ceiling per room requirements.

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, and data.
- The number of floor outlets is determined by the size of the room, the capacity, and the function.
7.2.4 Flat Panel Display Wall Outlets

- Provide AV, power, data, coaxial cable, utilities at plus 60” AFF.
- Provide back box per monitor specifications in new construction.
- Provide backing material as required in existing construction.

8. HVAC & Fire Prevention

8.1 Diffuser Location
Diffusers should be located as to avoid any movement of the screens or projectors 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.

- Ideally classrooms should have reverberation time (RT) in the range of 0.4-0.6 seconds.
- Classrooms ceiling tiles should have a noise reduction coefficient (NRC) of 0.75 or better.
- 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.
- The noise level should not exceed 35 dBA.
- 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 S12.60-2010.
- The review of acoustical requirements for classrooms by an acoustical consultant is recommended whenever possible.

10. Mediation
ASU classroom and conference design continues to evolve as technology enhances teaching and as new technologies become available. Proper infrastructure is required for classrooms in order to service current and future 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 requires Basic Mediation (laptop projection) in all classroom.

10.1 Infrastructure

10.1.1 Network Requirements
- Wired data 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.

10.1.2 Wireless Access Points
- Enclosure should be required within ceiling- or wall-mounted enclosure dependent upon room layout and ceiling height access.
- CAT 6 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 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). Color to be determined based on OUA specified finishes.
- 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
- AV cabling within infrastructure (walls, ceiling, floors) requires 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.

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 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 instructor 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 mediated teaching station (Euro Design Systems) 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 Euro Design Systems 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 and Federal ADA requirements.
- Computer classroom furniture is an extension of the programming requirement and should conform to UTO’s Classroom Specifications, ASU Design Guidelines Part II for Interior Design - Furnishings, and ASU Purchasing requirements
Figure 10.2.2 – Teaching Station

ASU MEDIATED TEACHING STATION (72"W X 32"D)
SCALE: NONE
(sample)
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 be 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 use 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

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
  o 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
  o - Specialized Functions
- Video conferencing
- Class capture
- Class streaming
- Annotative monitor or “SMART” whiteboard
- Multiple guest/student laptop connections
- Collaborative Software
  - SCALE-UP (Student Centered Active Learning Environments for Undergraduate Programs)
  - Active Learning Software

  - [Mediated teaching station](#) to accommodate some of the above options.
10.4.5 Instructor Mediated Room Sample

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 1/2" 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.

LEGEND

AC POWER DUPLEX OUTLET

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

FACEPLATE WITH (2) ETHERNET JACKS TERMINATED TO CAT5 CABLES

FACEPLATE WITH (2) ETHERNET JACKS TERMINATED TO CAT5 CABLES RUNNING BETWEEN FLOOR BOX AND VIDEO PROJECTOR
1. Mediated Teaching Station with instructor PC, AV touch panel control, and internal AV equipment racks to house AV components.
2. Floorbox or Poke-Through 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.
Instructor Mediated Dual Projection Infrastructure Sample

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 12" 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.
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 Infrastructure 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\(^{\text{st}}\) 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 the 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.
DUAL PROJECTOR LECTURE HALL / AUDITORIUM
(AV Single-line Diagram)

AV EQUIPMENT RACKS

CLASSROOM

MEDIATED TEACHING STATION

FLOOR BOX OR POKE-THRU

10.4.13 Instructor Mediated Dual Projection Room AV Single Line Diagram 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 well mounted 66" 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, 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 Basic Conferencing Package

Display(s)
- One or two 1080P resolution, HDCP Compliant displays depending on room size (section 10.5.2) and conferencing requirements
- Uses flat panel display handheld remote for control
- Flat panel mounts or credenza with integrated mounts
- i7-based Intel processor CPU
  - ASU wired network connection
  - Wireless mouse and keyboard
  - Logitech CC3000e
  - USB Camera (Microsoft LifeCam 1080P for PC or Logitech C920 for MAC)
  - USB audio speaker/microphone
    - Phoenix Audio Duet (1-4 persons)
    - Phoenix Audio Quatro3 (4-6 persons)
    - Phoenix Audio Quatro3 x 2 (8-12 persons)
- 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)

10.5.2 Enhanced Conferencing Packages- Includes Basic Package with alternate camera, audio, and guest laptop options

- AMX Control System (based on rooms’ size or user requirement)
- Enhanced audio with ceiling speakers and ceiling or table top microphones
- HD Pan/Tilt/Zoom(PTZ) camera (Vaddio and/or Panasonic)
- Multiple tabletop laptop connections, quantity TBD
- Conferencing appliance Vidyo, Cisco, Polycom

10.5.3 Hybrid Conferencing Packages- Includes Basic or Enhanced with package coupled with hardware-based conferencing solutions such as Cisco or Polycom units.
10.5.4 Small Conference Room Sample

CONFEREE ROOM INFRASTRUCTURE PLAN

CONFERENCE ROOM OUTLET PLAN

KEYNOTES

1. Recessed Wall Box (Premier Mount PW-AM325) installed 60” A.F.F. in center of box. Box provides space for video monitor bracket, power, data, and AV outlets. Provide (1) 1” and (2) 1 1/2” 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 outlet and (1) 1” and (1) 1 1/2” 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 calibrate backup 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
- FACEPLATE WITH 110-ROM JACK TERMINATED TO CAT 5E CABLE
- FACEPLATE WITH 110-ROM JUXT TERMINATED TO CAT 5E CABLE
- PATCH PANEL TERMINATED TO CAT 5E CABLE
- AD-POWER SUPPLY OUTLET
- ETHERNET OUTLETS TERMINATED TO PATCH PANEL LOCATED IN NEAREST BP ROOM
10.5.5 Conference Room Sample

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 AV 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.
ASU VIDEOCONFERENCE ROOM INFRASTRUCTURE PLAN

KEYNOTES
1. Videoconferencing Table (144" x 80")
2. Table leg cavity with removable panel for cable access
3. Fiber optic or Fiber-thru device installed in floor for power, data, and AV outlets.
   Provide adequate 25A power circuit and (1) 1" and (2) 1/2" empty conduits extended from box and stubbed-out above suspended ceiling for data and AV conductors.
4. Receptacle Wall Box (Promont Mounts PWAM325) installed 82° A.F.F. in center of box. Box provides space for video monitor bracket, power, data, and AV outlets. Provide (1) 1" and (2) 1/2" 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 cabinet.
8. Convenience outlet installed in storage cabinet used to charge portable devices.

ASU VIDEOCONFERENCE ROOM OUTLET PLAN

LEGEND