



# Classroom Design Guide

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**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*, *Classroom Design Guidelines*, and *ASU Design Guidelines*. The *Classroom Space Utilization Guidelines* are a reporting tool and a planning tool. The *Classroom Design Guidelines* are overarching principles to create functional, flexible and aesthetically pleasing classrooms. The *ASU Design Guidelines* are a roadmap to planning, designing and constructing Arizona State University (ASU) facilities. The *Classroom Design Guidelines* are part of the *ASU Design Guidelines*. This document is the *Classroom Design Guidelines* and it incorporates the *Classroom Space Utilization Guidelines* for context.

### 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, 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. 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 Space Management group. 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 Guidelines and the *ASU Design Guidelines*, *ASU's Accessibility Standards*, or the *ADA Standards for Accessible Design*, shall be resolved with OUA.

## 3. Room Definitions

Different pedagogical techniques require different types of learning spaces. ASU has defined six 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.

### 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.
- Allow 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 Classroom

Computer 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.

## 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.
- 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.

### 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 Section 1 of *ASU's Design Guidelines*. Any discrepancy between the ADA Standards and this document shall be resolved in design review.
- All classrooms must have at least one ADA-accessible work space. The location of this workspace must be easily accessible but do not position it in such a way as to single out the student. See ADA addendum for more specification.

#### 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.

## 5. The Classroom 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.
- 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.
- Occupancy within the classroom should be clearly (but discretely) visible from the hallway. Any viewing device must be positioned to meet ADA standards.
- If sidelights are used, be sure to address any light pollution from the hallway that could affect the media viewing.

### 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*, section II, Division 08.80.00.

- Where applicable, the depth of the window should be designed to allow for the installation of motorized shade tracks.
- 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.
- Use of a light diffusing roller shade in conjunction with a room darkening roller shade is required. 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.
- Unless the window shade is concealed within the window mullion, blackout shades are discouraged.

### 5.4. Flooring

- Specify a high-contrast, multi-colored carpet for all classrooms. No solid or light colors are permitted.
- In most cases, carpet tiles are preferred. All carpet must conform to the ASU Purchasing Department's "green" guidelines.
- 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.

### 5.5. Walls and Ceilings

#### 5.5.1. Walls

- Internal classroom walls shall run deck-to-deck, with a STC rating of 50 or better.
- 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 7)

### 5.5.2. Chair Rails

- 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 a minimum of six inches wide and the bottom edge will start approximately twenty-five inches above the finished floor. In rooms with movable furniture, chair rails shall be installed on the sidewalls and the rear walls.

### 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 NRC between .55 and .65, and a STC of 40.
- The ceiling should act as a sound mirror, reflecting sound downward to blend with direct sound.
- 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 and a wall-mounted holder nearby (the holder must be large enough to accommodate six markers and an eraser).
- 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	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. Communication board

- Each room will have a standard communication board 24" x 12" mounted near the door on the lockset side, mounted at a height as indicated by *The ADA Standards for Accessible Design*.

### 5.6.2. Bulletin Boards

- Provide at least one 48" x 48" bulletin board for each room.
- Location of the bulletin boards will be determined at design.
- Finishes will be determined at design.

## 5.7. Colors/Finishes

Colors and finishes are an integral part of great design.

- Accent walls are encouraged.
- The A/E shall 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%

## 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.
- Install the documents next to the writing surface in the front of each room, behind the instructor or as appropriate for the layout of the room.

## 6. Furniture

Consult the ASU Purchasing Department for all current furnishing specifications.

### 6.1. 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

- Fixed tables with cantilevered pivot arm seats shall not be used.
- Tables can be for 1, 2, or 3 students.
- In cases where fixed tables and loose chairs are used, adjustable-height ADA tables must be provided according to *ASU Accessibility Standards*.
- The number of students per table is flexible and is determined by the type of classroom and the configuration of the classroom.
- 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.
- Furniture must be able to interface with technology (i.e. pathway for power/data), based on *UTO's New Construction Specifications*.
- To allow for note taking and reference materials the minimum work surface area should be 3.75 square feet per occupant.
- 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% of the tablet work surfaces should have a left-handed orientation.
- Laminated work surfaces shall be constructed of high-pressure plastic laminate applied to solid wood or hardwood plywood.
- In lecture rooms or auditorium with fixed seating with tablet-arm, each ADA locations shall have an appropriate work surface for the student.

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 / X	NA	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

### 6.2. 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 5<sup>th</sup> percentile (4'-11" tall, approximately 113 lbs) to the 95<sup>th</sup> 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.

### 6.2.2. Seating Width

- Seat width comfort will range from 20 to 22 inches.
- 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.
- Soft coverings shall be used in large auditoriums or lecture halls where reverberation of sound is a problem.
- The construction and materials should be selected so that their color and surface are consistent with the other furnishing within the classroom.
- Solid and light colors are discouraged.

### 6.2.6. Replacement Availability/Ease of Maintenance

- 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).

### 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 theatre-type rooms should comply with ASU's 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. Computer Workstations

Computer workstations are used for teaching methods which require University-procured computers/laptops. Computer workstations should accommodate computer equipment, plus the necessary space for student materials.

### 6.3.1. Design Standard

- Allow for a minimum surface area of six and one quarter (6.25) square feet to be provided.
- Furniture selection for computer workstations shall have provisions for securing the equipment and the furniture in the room.
- Computer workstation 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.
- Computer classroom furniture is an extension of the programming requirement and should conform to *UTO's Classroom Specifications*.

## 6.4. 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.

### 6.4.1. 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 chair 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 chair.

## 6.4.2. 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			
Classroom	O	X		
Lecture		O	X	
Auditorium			O	X

O Acceptable

X Preferred

## 6.5. 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 Section 1 of *ASU's Design Guidelines*.

## 6.6. 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

## 6.7. 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 visible location. 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*.

## 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 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.

- 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 in 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 on-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.

## 7.2. 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

### 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. Site 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.

## 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; 60 to 149 seats: NC 25-30; 150+ seats: NC20-25.
- 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 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. Network Requirements

Wired data connections are needed at the teaching station area, the projector, the webcam, and to the fixed student computers if applicable. Wireless networks are considered a supplement to the classroom network. Presently, our wireless networks will not provide guaranteed shared multi-user and rich media over a network. Please refer to UTO's new construction guidelines for current cable specifications.

### 10.2. Teaching Station

The teaching station can be wall fed or floor fed though a large floor box depending on room size and 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. ASU uses AMX control systems to standardize and simplify room control as well as provide network administrative functions such as equipment status.

### 10.3. 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 for all of the following items.

Mediation package options are as follow:

- **Basic Mediation Package**  
 Video projector (based on room size)  
 Projection screen (size based on room size)  
 Audio System (based on room size)  
 Control System (based on rooms' size)  
 Data wall or floor boxes (based on room size)  
 Wireless connections for students  
 Teaching station, consisting of:
  - Laptop connection
  - Audio speakers and controls
  - Auxiliary video connection
- **Instructor Mediation Package**  
 Basic Mediation Package  
 PLUS  
 PC provided on the teaching station

- **Student Mediation Package**  
Instructor Mediation Package  
PLUS  
Student PCs  
Wired data connections
- **Capacity and/or Discipline-Specific Requirements may include:**  
Microphones for large capacity rooms (over 40 capacity)  
Document camera  
Slide projector  
Assisted listening (over 40 capacity)  
Multiple projectors / screens  
Stereo audio  
Video conferencing  
Class capture  
Class streaming  
Annotative monitor

## 10.4. Screens

### 10.4.1. Location

- Multiple 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.

### 10.4.2. Size and Automation

- To calculate the distance from the projection screen to the seats the following formulas are adequate:  
Minimum distance to front row = 2x the image size  
Maximum distance to back row = 6x the image size
- All projection screens must be tab-tensioned with aspect ratios of 16:9 to accommodate high definition format.

## 10.5. Wireless Access Point

- 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 specifications.

**10.6. Infrastructure**

Please reference ASU UTO's design specifications.

**10.7. 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.

Figure 1



