



UNIVERSITY OF HAWAII AT MĀNOA | DESIGN GUIDELINES

Classroom & Class Lab

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PREPARED BY
THINK

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**UNIVERSITY OF HAWAII
AT MĀNOA**

**CLASSROOM & CLASS LAB
DESIGN GUIDELINES**

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Prepared By
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& MKThink

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1 Introduction

The unique core mission of the University of Hawai‘i at Mānoa suggests the need for environments that serve five interdependent spatial domains: instruction, research, administration, campus life, and host culture. The “Classroom and Class Labs” volume addresses basic requirements for all UH Mānoa instructional space and technology—furniture, room configuration, lighting, audio-visual equipment, wall composition (including windows, doors, and writable surfaces), floor and ceiling systems, ventilation, acoustics, accessibility, safety, and security, among others. Design for maximum flexibility is the central recommendation for all new and renovated classroom space. Likewise, design guidelines for class labs seek to maximize flexibility within the pedagogical requirements of all disciplines and programs requiring bench-based coursework.

These Design Guidelines appear after an unprecedented change in the environmental context of university instruction, indicating a new calculus for the management and design of virtual and physical space. Among the many lessons universities around the world learned from this experience, one conclusion is clear: 21st century higher education presupposes the ongoing evolution of instructional space and technology. Conventional assumptions about spatial organization, buildings, and their relationship to diverse scenes of teaching intimate new and hybrid instructional practices, new and hybrid techniques, and new and hybrid typologies.

In view of the 2017 UH Board of Regents “Integrated Academic and Facilities Plan,” emerging university policies embody expectations for significantly higher rates of classroom utilization, serving a wider range of needs. Accordingly, the university has established a target efficiency for classrooms based on 45 hours of primary instructional use per week optimum, 30 hours minimum.

2 Occupancy

2-1 Classroom occupancy

2-2 Class lab occupancy

Occupancy guidelines address the optimal number of students and teachers in a classroom at any given time. These occupancy standards, which establish target occupant loads, ensure productivity and safety in every classroom environment, while also improving the efficiency of university space.

The table below provides a range of guidelines for different types of classroom and class lab spaces.

Actual space per station or seat in a classroom may vary depending on existing room configuration, furniture, and seating types—e.g., fixed versus movable, tablet arms of varying sizes, tables, or theater-type seating, etc.).

As classrooms adapt to increasing demand for sophisticated audiovisual equipment and connectivity—streaming video, rear projection capacity, etc.—room capacities may need to adjust accordingly.

2-1 Classroom occupancy

Recommended capacity occupancy and square footage for classrooms.

Size	Capacity	Target occupancy	Target ASF
Seminar	16	12	480
Small	24	20	600
Medium	40	32	1,000
Large	80	64	1,800
Extra-large	120	96	2,400
Hybrid	40	32	1,200
Active	24	18	800
Lecture Recording Studio	4	4	400

2-2 Class lab occupancy

Dry class labs

Dry class labs are classrooms that require analog or digital equipment for instruction.

Dry class labs support a wide range of instruction. Typical dry class labs include computer science labs, electrical engineering labs, statistics labs, behavioral analysis labs, neuroscience labs, space flight labs, animation studios, digital printing labs, drawing and design studios, music studios, and dance studios.

For planning purposes, assume 30 to 50 SF per student.

Wet class labs

Wet class labs require some combination of lab benches, sinks, hoods, specialized ventilation, and safety equipment, dedicated panel circuits, water and gas supply, and other discipline-specific equipment.

Examples of wet class labs include chemistry labs, biology labs, microbial analysis labs, rare plant labs, painting studios, printmaking studios, architecture studios, fabrication labs, and culinary arts studios.

Each class lab assumes between 40–80 sf per student.

3 Utilization guidelines

3-1 Classroom utilization

3-2 Class lab utilization

3-1 Classroom utilization

General classrooms support regular instruction typically requiring little if any special-purpose infrastructure beyond standard audio-visual equipment, mindful that digital technology changes at a rate suggesting the need to design in anticipation of periodic upgrades and modification. Utilization guidelines support the optimization of classroom value through scheduling.

Recommended scheduling: 45 hours of instruction per week. Minimum: 30 hour per week.

3-2 Class lab utilization

The class lab houses formally scheduled classes requiring special-purpose equipment, room configurations, and integrated storage space fundamental to bench-based pedagogies and their required apparatuses, supporting experimentation, observation, and other laboratory practices in all relevant academic disciplines. As always, the design and location of classroom lab equipment, resources, and configurations must seek to maximize flexibility and scheduling.

Recommended scheduling: 25 hours per week for instruction and 20 hours per week for independent student work, 45 hours per week total.

4 Layouts

4-1 Classrooms

4-2 Class labs

These guidelines help estimate classroom size in two contexts: dimensions established in the design of newly constructed space; and optimization of existing dimensions in space scheduled for major renovation within the university's annual RIM expenditures—"Renew, Improve, Modernize." The following guidelines assess existing classroom space in alignment with more efficient university scheduling protocols.

Flexibility is the most important criteria in 21st century classroom design and renovation, likewise the design of classroom furniture systems and technologies that can adapt in response to evolving pedagogy. Wherever possible the design of rooms and selection furniture shall offer users the maximum number of alternative room configurations.

See the "Furniture Design Guidelines" volume for recommended furniture types; classrooms and class labs take Tier 3 furniture types. See also Section 5 of the "Color Design Guidelines" volume for alternative finishes and paint samples.

Built environment

Classrooms and class labs

- Provide a minimum ceiling height of 14'-0" for all classrooms.
- Install standard doors with vision panels
- Equip spaces with automated blackout shades
- Provide lockable equipment cabinets

Lecture recording studio

- Provide a minimum ceiling height of 12'-0" for lecture recording studios
- Install standard doors with small vision panels
- Equip with automated blackout shades

4-1 Classrooms

Classroom proportions

The following classroom diagrams specify minimum clearances required for optimal furniture configurations, circulation, and size, in addition to layout geometries oriented around screens. Classroom proportions and layouts shall be designed to maximize student engagement and focus on the subject matter. Rooms that are too deep or wide may interfere with the acoustical performance of the room, compromising audibility, attention, and student engagement. Align the design of all new classrooms in accordance with these guidelines; likewise, align the design of renovated classrooms with these guidelines to the greatest extent possible, given existing conditions. .

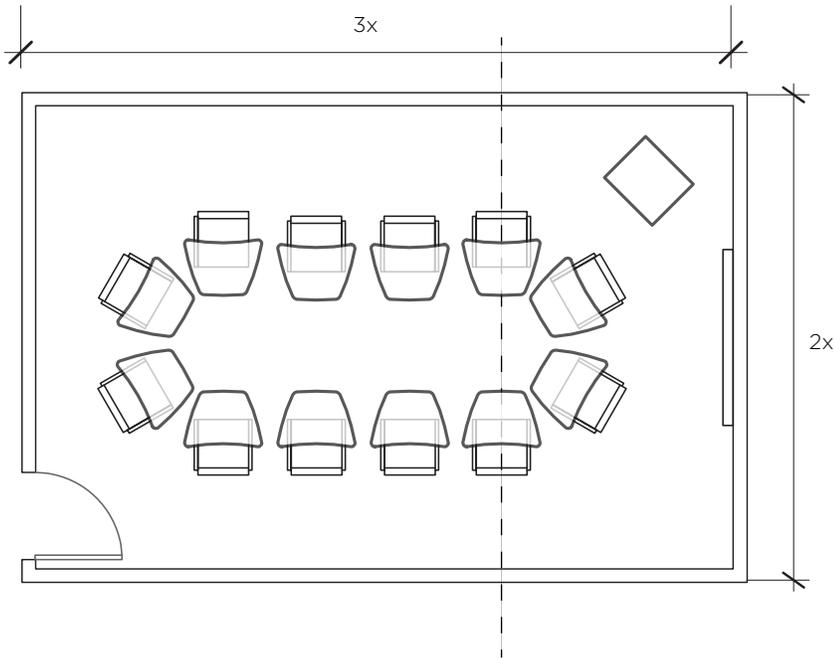
Seat type	Table type	Side-to-side distance (o.c)	Front-to-back distance (clr.)
Movable	Movable	26" – 30"	36" between tables
Movable < 20 seats	Fixed	26" – 30"	36" between tables
Movable > 20 seats	Fixed	26" – 30"	38" between tables

Access isles must comply with applicable fires codes. Each room must ensure egress requirements within the room and between furnishings as follows:

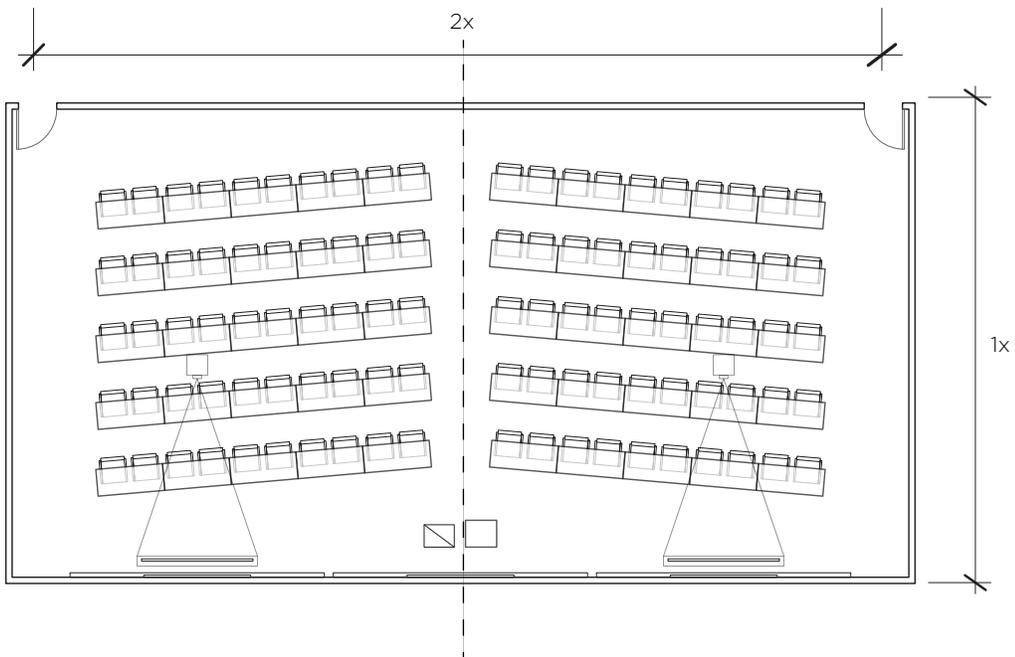
- **36" min.** aisle width to front of room
- **28" min.** aisle width to other locations of room

Recommended room proportions

Ideal: 3:2

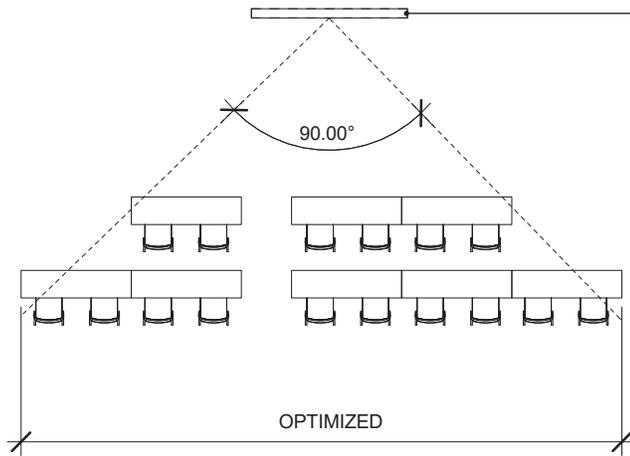


Do not go beyond 2:1

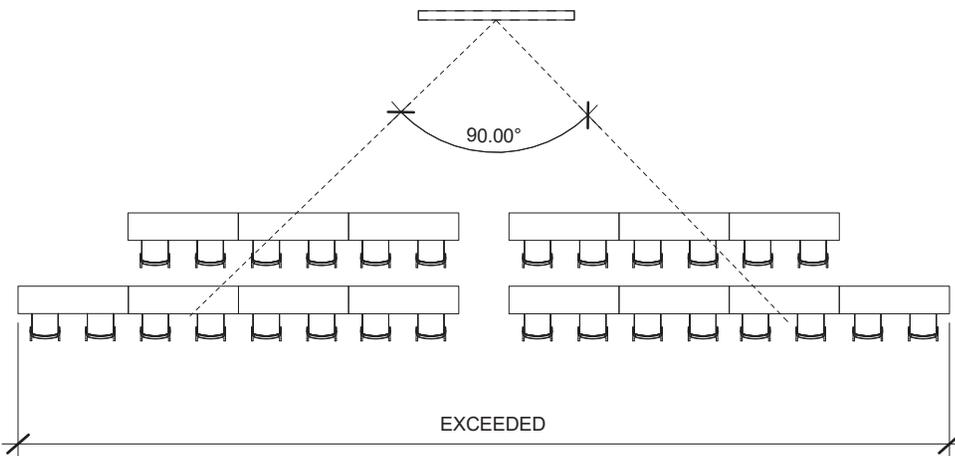
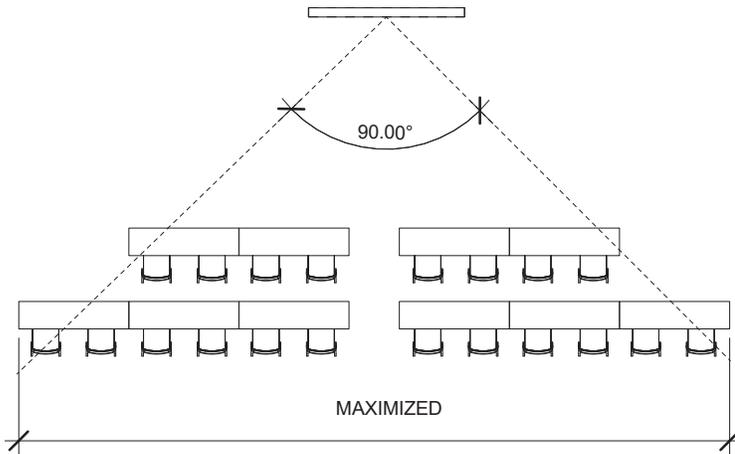


View angle room considerations

Whiteboard or projection screen.
Size will vary based on room
dimensions and occupancy

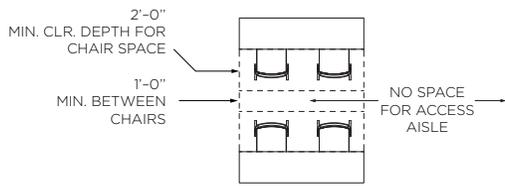


Optimized: all seats are within a 90° degree angle of the screen or whiteboard.

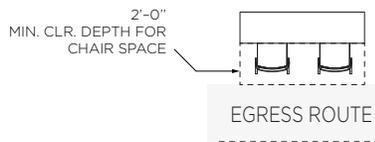


Exceeded: seats are outside of a 90° degree angle of the screen or whiteboard.

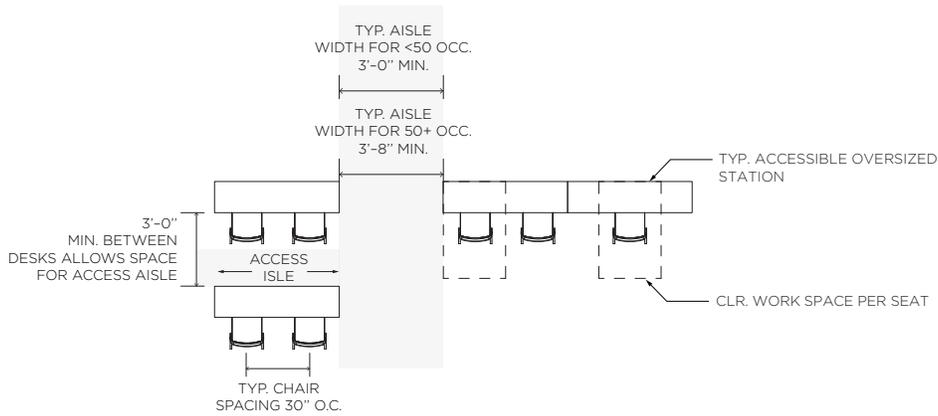
Recommended back-to-back desk spacing.



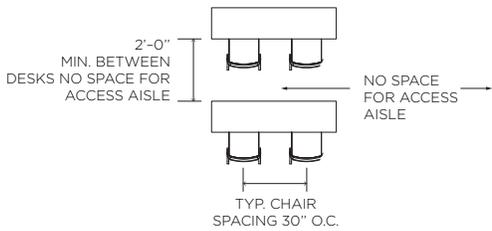
Recommended egress route desk spacing.



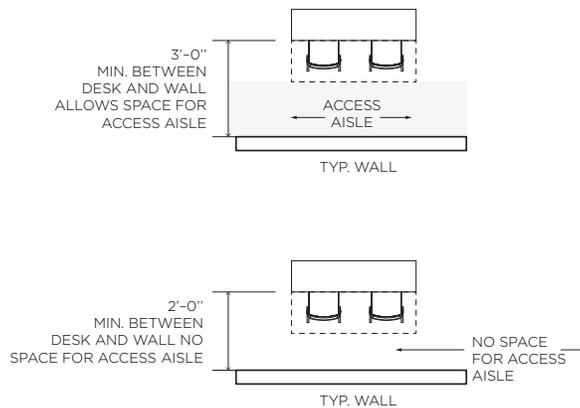
Recommended desk spacing for aisles.



Recommended desk spacing for aisles.



Recommended desk-to-wall spacing for aisles.

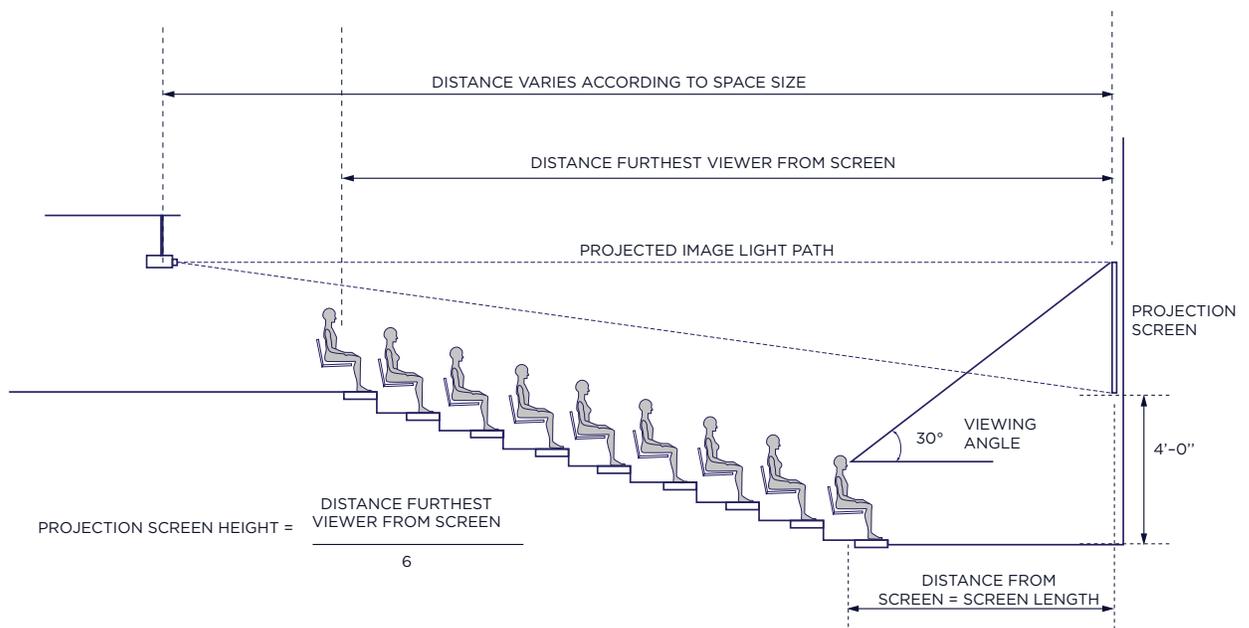


Screen Placement and Proportions

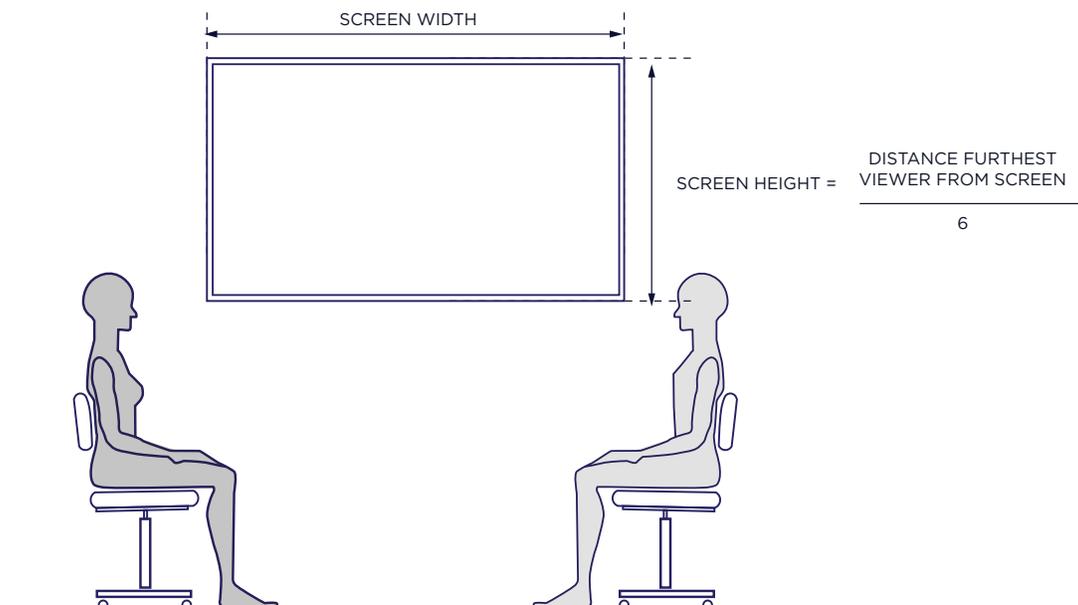
Place screens so that all occupants enjoy an optimal viewing experience whenever pedagogy requires projected content that utilizes conventional or digital large-format screens. Since classrooms vary in size and configuration, always design in consideration of diverse spatial variations and class types. If needed, additional mobile screens can be added to maximize classroom performance.

When designing ceiling heights and access to the ceiling plenum, factor for ceiling-mounted projectors and screens. When placing other ceiling-mounted fixtures—fans, speakers, suspended lighting fixtures, etc.—ensure unobstructed projection paths.

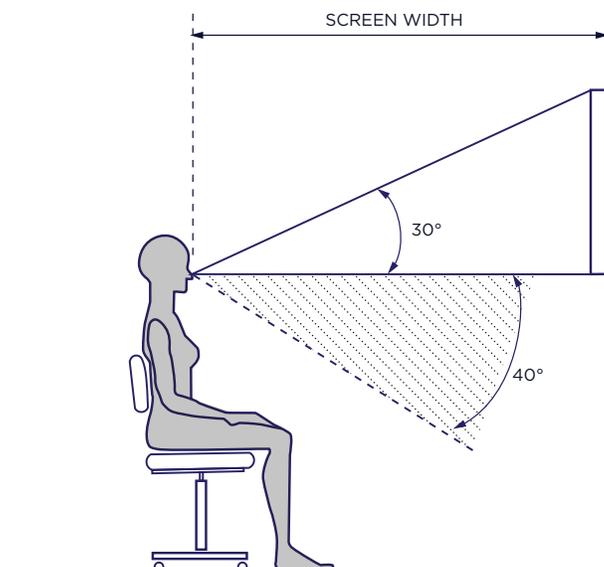
- The number of screens required is based on the seating capacity, the configuration of the room, and the primary instruction style.
- Where possible, angle the screen in the corner of the classroom to both maximize the viewing angle to the audience and increase free whiteboard writing space. If angle-mounting the screen is not feasible, screen placement shall remain opposite from the teaching station area on the teaching wall to maintain whiteboard surface.
- Screens shall drop no lower than 48 inches from the floor.
- 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.
- All projection screens must be tab-tensioned with aspect ratios of 16:10 to accommodate high definition format.



Recommended projection screen placement and size in a room with tiered seating.



The closest viewer should be no closer to the display than the width of the screen.



Closest viewer should have an angle of 30 degrees or below from the top of the screen for ergonomic viewing

NOTE: FOR CLASSROOMS WHERE THE FURTHEST VIEWER DISTANCE REQUIRES A SCREEN SIZE THAT WOULD NOT FIT ROOM SPACE STANDARDS, MORE THAN ONE SCREEN IS RECOMMENDED WITHIN A COMFORTABLE VIEWING RANGE.

Source: Bright Tree Studios <https://brighttreestudios.com/calculate-display-size>

Whiteboards and writing surfaces

Equip classrooms with white boards and display technology screens.

- Mount the bottom edge of fixed-height whiteboards 36 inches above the floor.
- Equip each whiteboard with a continuous marker tray.
- Where instructional programs require multiple whiteboards, install horizontally sliding or vertically tiered whiteboard systems appropriate to room size and proportion.
- Include mobile whiteboards and huddle boards as required.

Size	Maximum student capacity	Recommend configuration	Total linear feet of whiteboard
Seminar	12–16	fixed whiteboard on one wall + one mobile whiteboard	18 feet
Small	20–24	fixed whiteboard on one wall + one mobile whiteboard	18 feet
Medium	32–40	fixed whiteboards on two walls + two mobile whiteboards	36 feet
Large	64–80	fixed whiteboards on two walls + two mobile whiteboards	48 feet
Extra-Large	96–120	fixed whiteboards on two walls + three mobile whiteboards	54 feet
Hybrid	32–40	fixed whiteboards on two walls + one digital whiteboard	42 feet
Active	18–24	two digital whiteboards + 2 mobile whiteboards	23 feet
Recording Studio	4	one mobile digital whiteboard + one mobile whiteboard	12 feet



Connectivity and Wi-Fi

All work areas must be outfitted with Wi-Fi. The minimum Wi-Fi density shall be 2:1 (devices:user). The units must be enclosed within the ceiling or wall-mounted depending upon room layout and ceiling height. In addition, provide Cat 6 Data connections, Wireless Data Network Connectivity, telephone, and a Coax Cable Television Connection.

Audio equipment

Audio equipment is used in classrooms to enhance instruction. Install fixed microphones on the lectern, ceiling mounted microphones in hybrid and active learning classrooms, and wireless microphones where needed. Rooms used for music, film studies, and other specialized instruction shall be professionally designed for these purposes. Place speakers in front of the room or project sound from the lectern and/or screen. Mount speakers in or close to the ceiling.

Visual equipment

- Seating capacity determines the number of screens required, and the configuration of the room.
- 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. Address angle-mounted screens in the building planning stage, since it requires detailing in the reflected ceiling plan, ceiling grid, and lighting. If angle-mounting the screen is unfeasible, screen placement shall remain opposite from the teaching station area on the teaching wall to accommodate whiteboard surface. Ceiling height is also critical when planning the layout of a classroom. See diagrams on page 13.
- The higher the ceiling, the larger the screen and image size it can accommodate. Place screens no lower than 48 inches from the floor. See diagram on page 14.
- If the image height to furthest viewer ratio 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.
- All projection screens must be tab-tensioned to accommodate high definition format.
- Screens shall be ordered with the LVC (Low Voltage Controller) controller for use with a wall plate controller and/or integration with third control systems solutions.

Interactive technology

Advanced technology has steadily transformed the contemporary learning environment. Classrooms shall incorporate appropriate advanced technologies and control all the audio-visual equipment, lighting, blinds, and other devices where needed. To improve ease of use, employ standardized color touch panel screen layouts and clearly labeled buttons for rooms without touch panels. Design classrooms for maximum flexibility and accommodation of new and upgraded equipment.

Power and data

Each room shall be equipped with at least 2 duplex outlets on each wall, spaced at 16ft or less. Rooms shall have one duplex outlet in the ceiling for projectors.

Classrooms, laboratories, and meeting rooms with fixed seating may have additional outlets as required. Rooms and spaces with flexible layouts shall be equipped with wall and floor boxes.

Classrooms and meeting rooms shall be equipped with TV cables to be pulled for future service.

All spaces on campus shall have wireless network coverage. Classrooms and gathering spaces seating 75 or more students require multiple wireless transmitter point locations.

Some furniture options provide built-in power and data sources. For more details see the Furniture design guidelines.

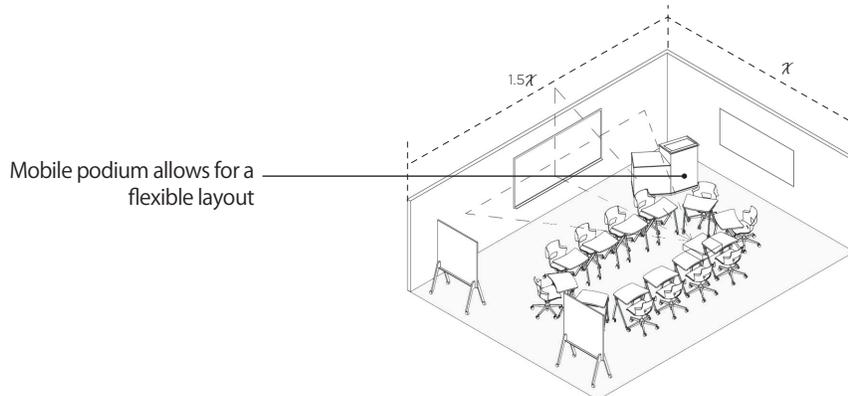
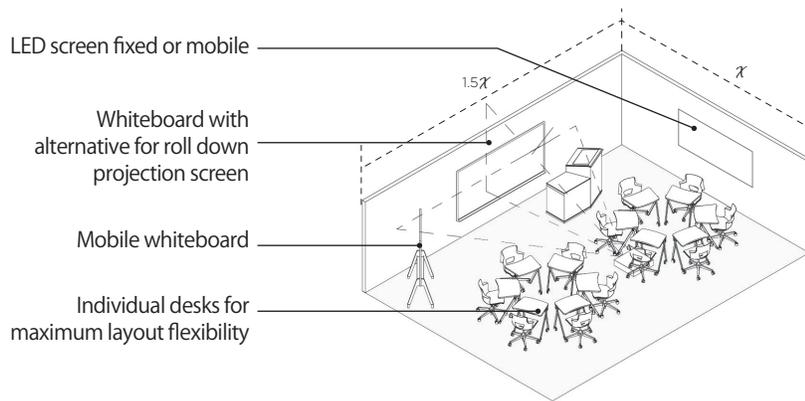


Classroom: Seminar

Maximum capacity: 16

Target capacity: 12

Target area: 480 SF



Design intent

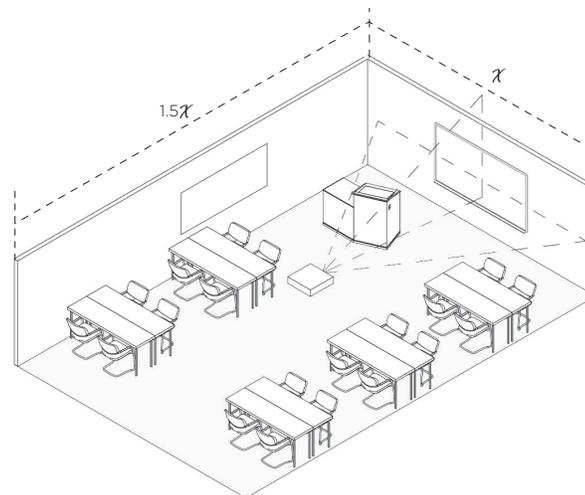
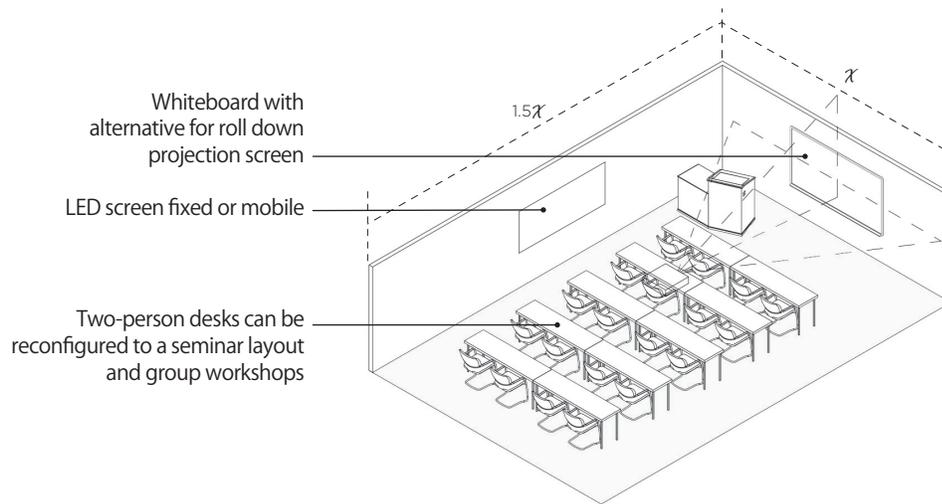
Assume a target capacity of 12 occupants; use mobile single-seat desks; ensure a minimum of two active teaching walls that support easily rearranged, alternative furniture configurations, including a standard seminar layout, breakout groups, and round table discussions. Provide LED screens if a screen meeting the size requirements is available within the project budget, otherwise specify a projector and screen.

Classroom: Small

Maximum capacity: 24

Target capacity: 20

Target area: 600 SF



Design intent

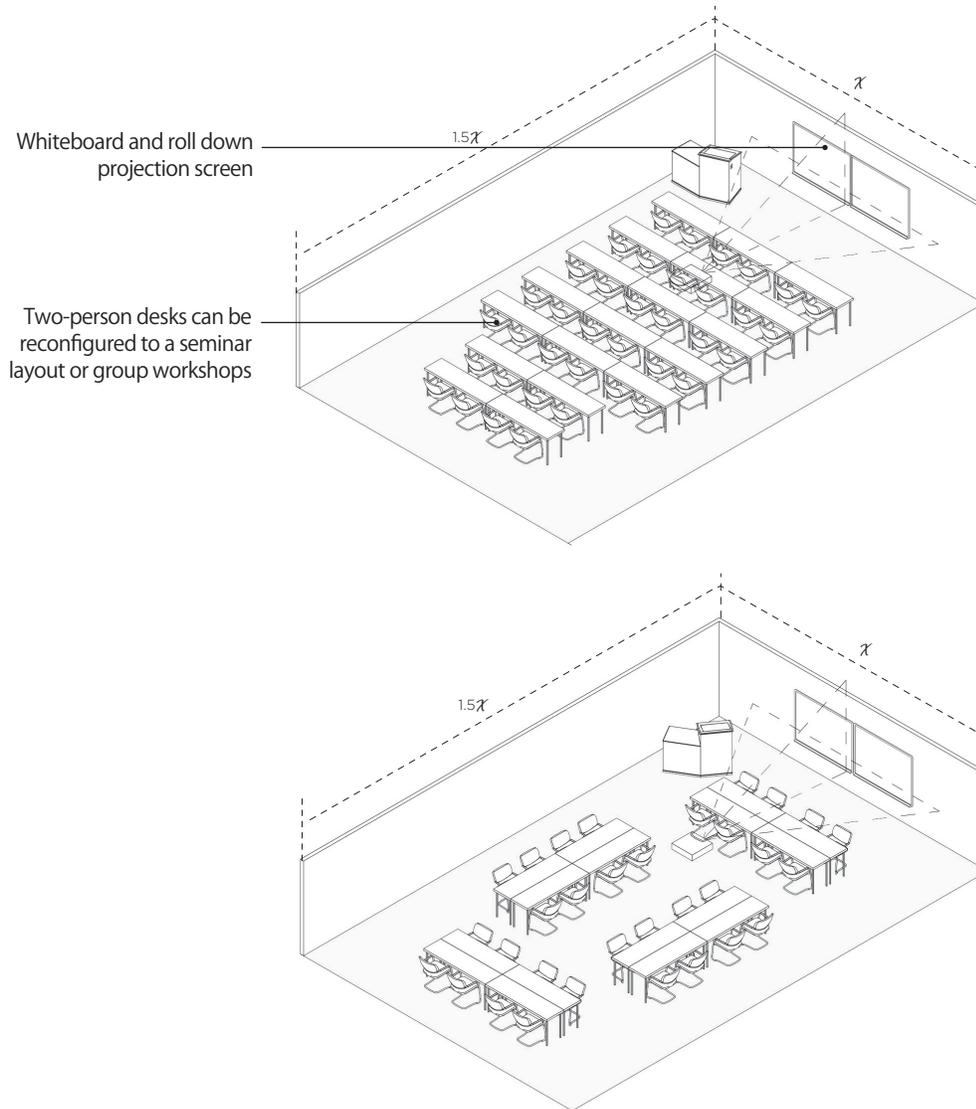
Assume a target capacity of 20 occupants; use mobile double-seat desks and at least two active teaching walls to ensure maximum, easily rearranged, alternative furniture configurations, including a standard lecture layout, breakout groups, and round table discussions. Provide LED screens if a screen meeting the size requirements is available within the project budget, otherwise specify a projector and screen.

Classroom: Medium

Maximum capacity: 40

Target capacity: 32

Target area: 1,000 SF



Design intent

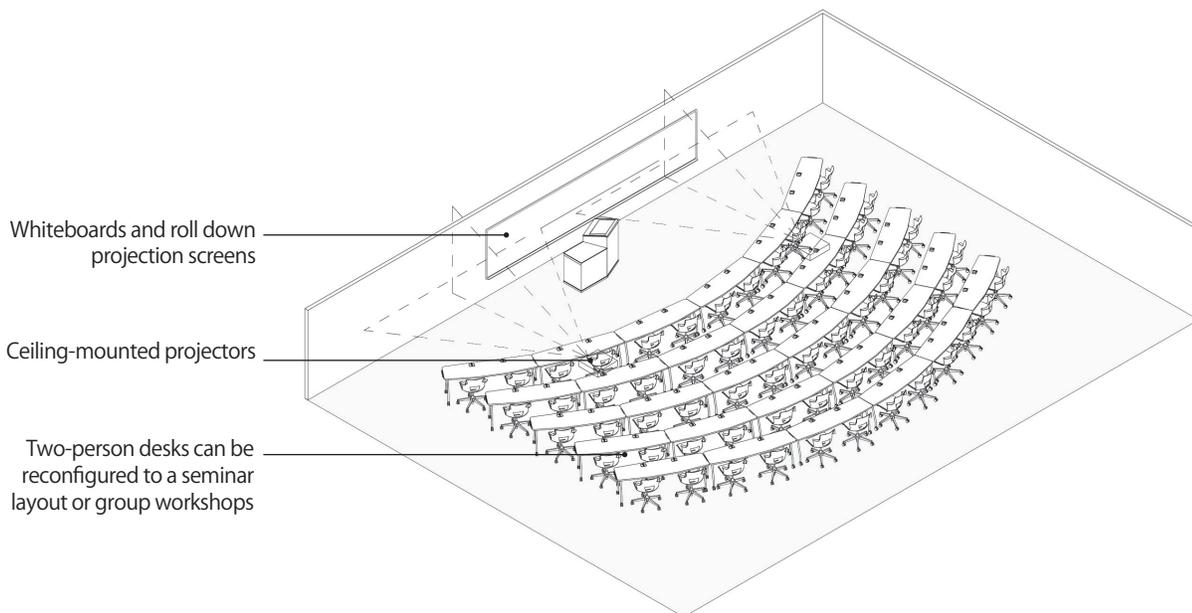
Assume a target capacity of 32 occupants; use mobile double-seat desks and at least two active teaching walls to ensure maximum, easily rearranged, alternative furniture configurations, including a standard lecture layout, breakout groups, and round table discussions.

Classroom: Large

Maximum capacity: 80

Target capacity: 64

Target area: 1,800 SF



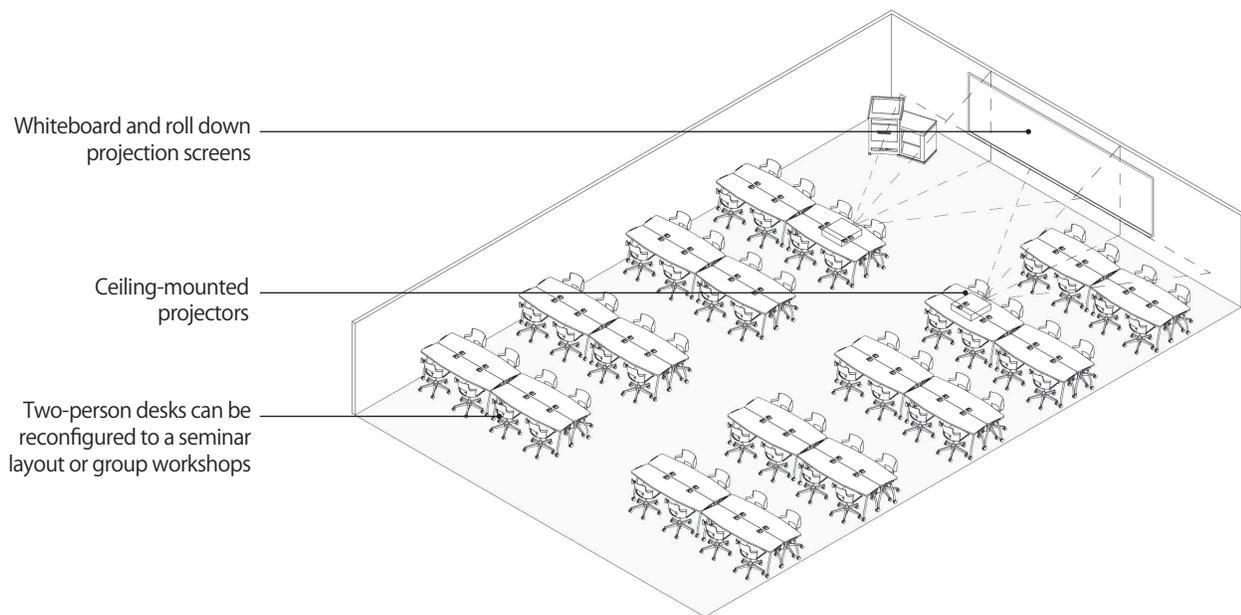
Design intent

Large classrooms offer a variety of layouts that maximize efficiency and accommodate diverse teaching styles. Alternative layouts include active learning space with movable furniture, tiered fixed seating, and U-shaped desk layouts.

Large classrooms typically accommodate up to 80 occupants and support traditional lectures and presentations. Layouts typically focus sightliness on a single point in the front of the room. However, for instruction that departs from the traditional “sage-on-a-stage” geometry, select movable furniture systems easily reconfigured to support group work.

While the aspect ratio of large classrooms typically optimizes sight lines and audibility, the incorporation of movable risers accommodates tiered seating configurations without compromising flexibility. Evaluate the appropriateness of tiered seating options during the architectural design phase.



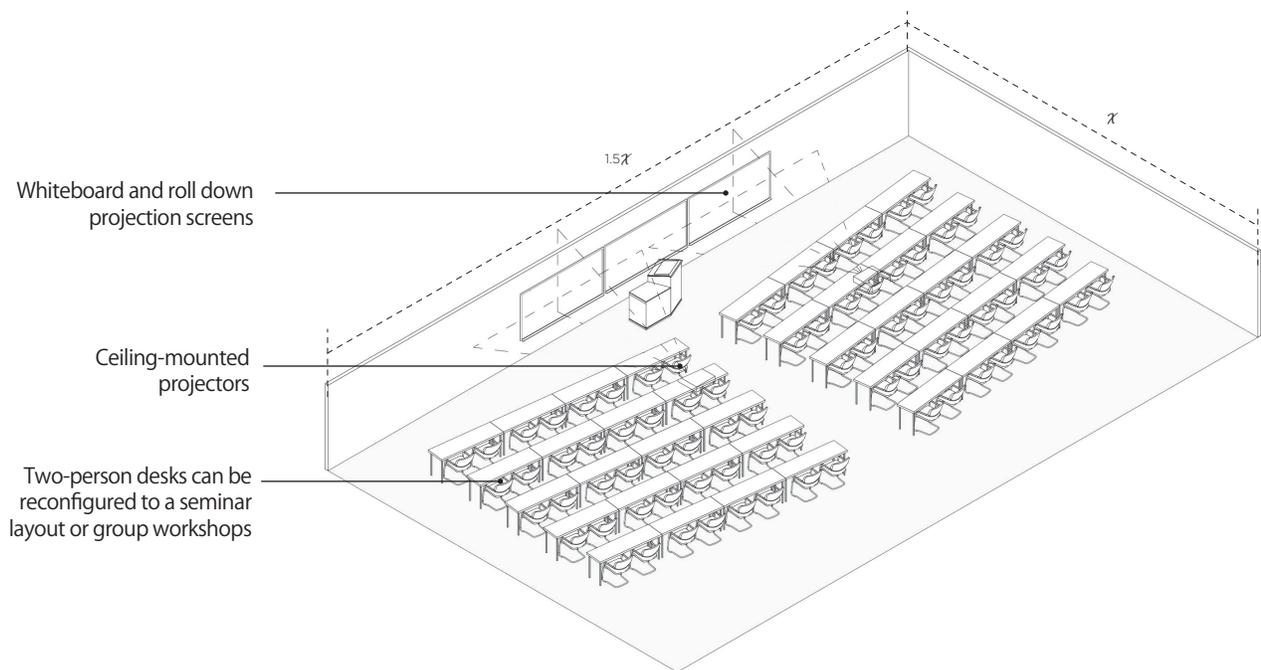


Classroom: Extra-large

Maximum Capacity: 120

Target capacity: 96

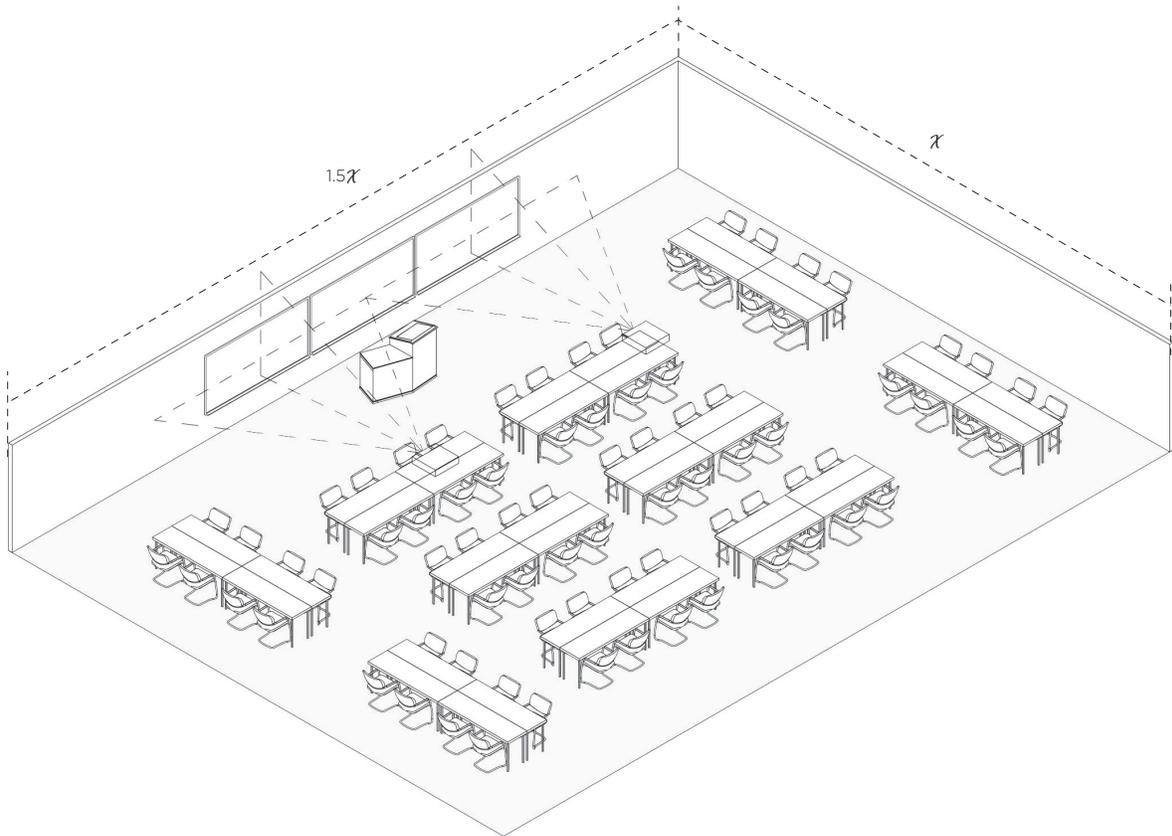
ASF: 2,400



Design intent

Extra-large classrooms support traditional lectures, presentations, and large-group test-taking. Select movable furniture systems that support reconfiguration for group work or room division into smaller, discrete, learning spaces.

The aspect ratio of extra-large classrooms optimizes sight lines and audibility, movable risers can be incorporated into the design to improve visibility.

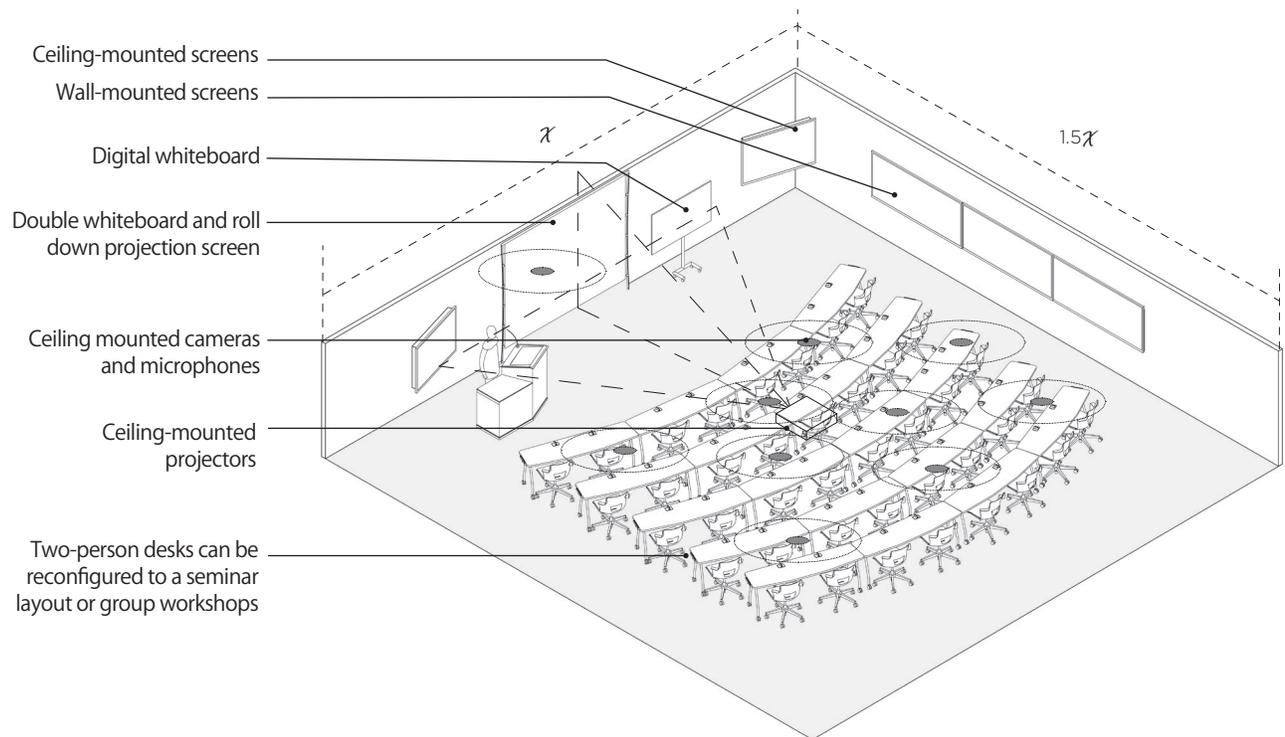


Classroom: Hybrid

Maximum capacity: 40

Target capacity: 32

ASF: 1,200



Design intent

Hybrid classrooms support traditional and online lectures, where students can attend the class on-site, allowing off-site students to join through video conferencing technology. The large lecture room layout supports projector presentations as well as whiteboards and digital tools.

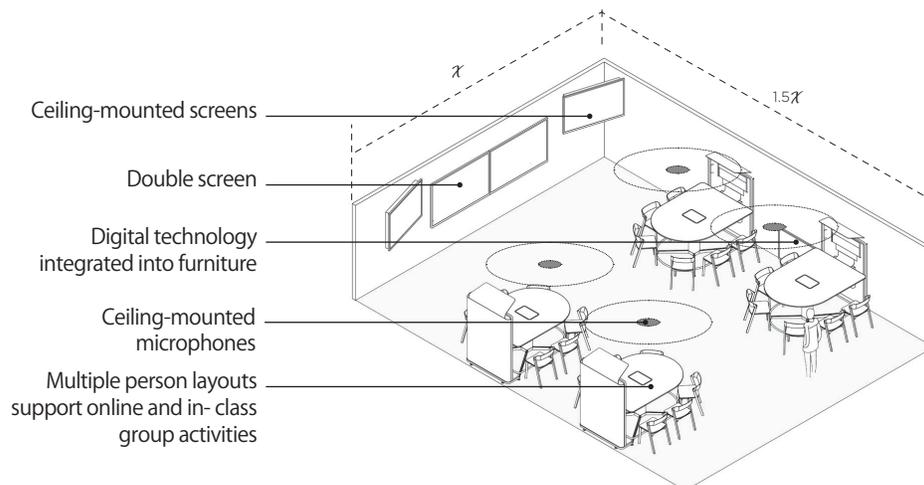
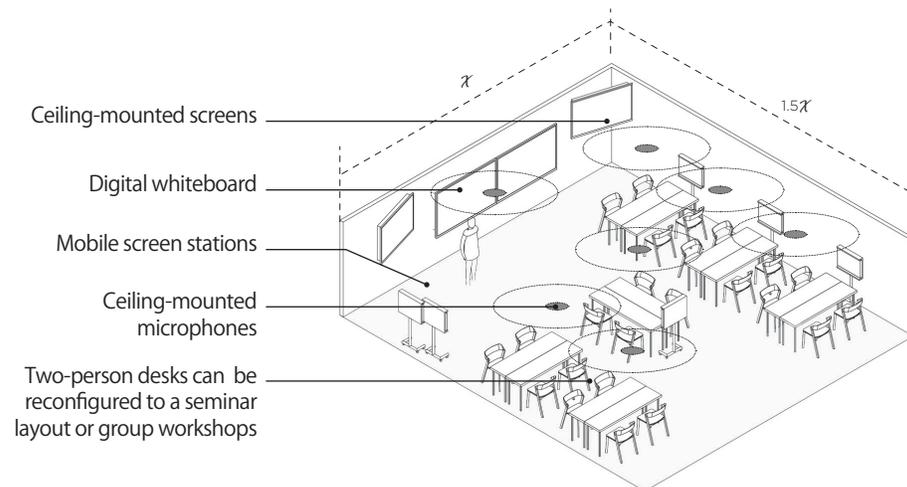
Movable furniture and add-on technology can accommodate hybrid seminars within existing classrooms, enabling faculty members to use rooms as needed.

Classroom: Active

Maximum capacity: 24

Target capacity: 18

Target area: 800 SF



Design intent

Active learning classrooms support on-campus and online instruction, maximizing student participation. Digital infrastructure and related technologies remove physical boundaries from the site of instruction and enables the class to enjoy greater interaction among on-campus and off-campus participants, both promoting and optimizing active collaboration.

Active learning classrooms with a flexible layout support breakout groups and functional group collaboration while maintaining the principles of connecting and sharing.

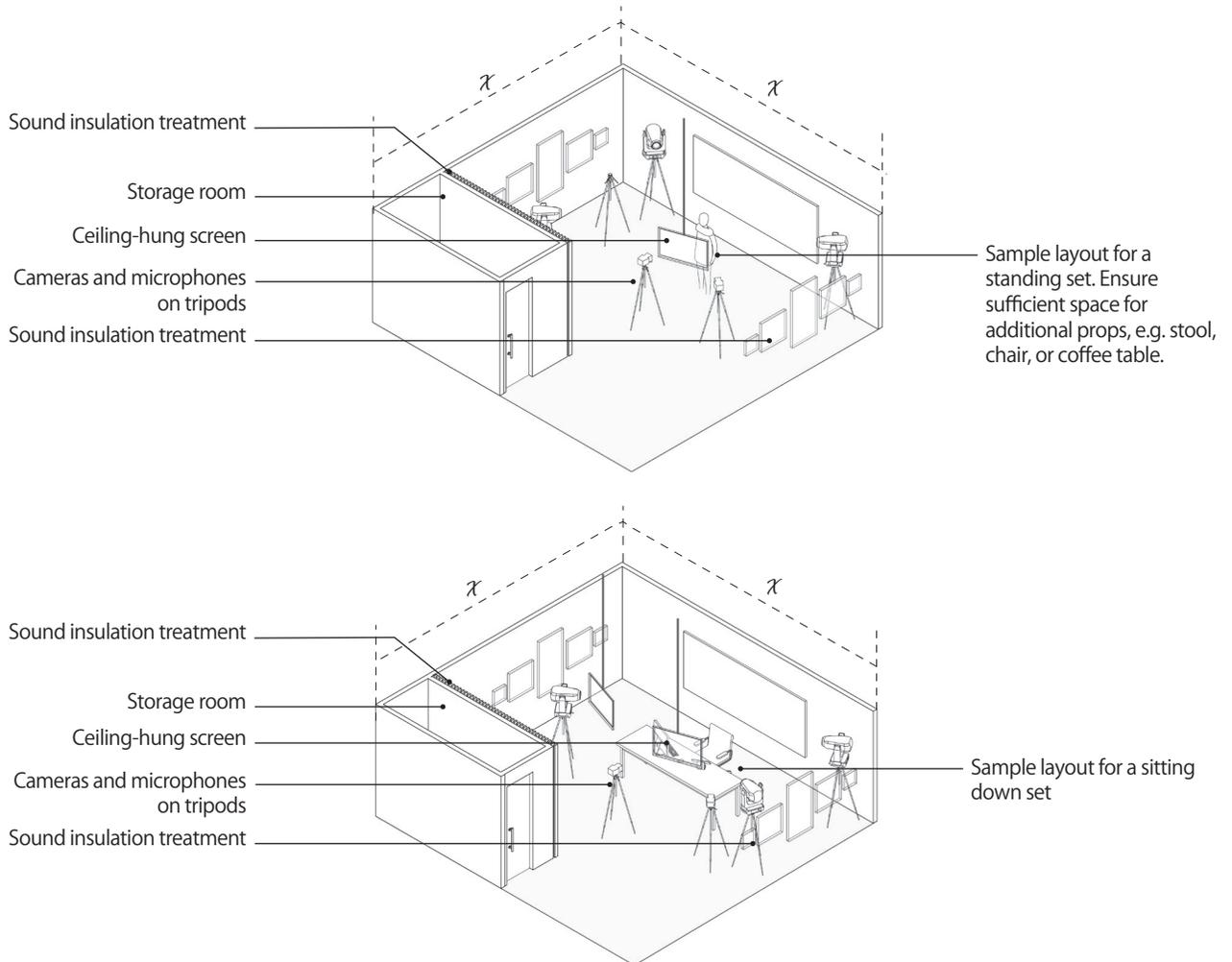
Equip active classrooms with appropriate audiovisual technology, e.g., interactive whiteboards and screens; furniture systems featuring integrated technology; microphones; voice tracking cameras; front-mounted screens; and mobile screen stations supporting both fixed and flexible furniture layouts.

Lecture Recording Studio

Maximum capacity: 4

Target capacity: 4

Target area: 400 SF



Design intent

The recording studio supports a space for both synchronous and asynchronous online teaching. Faculty members can record lectures ahead of time for online classes or conduct lectures.

Equip space with acoustic and environmental control, lighting controls, microphones (desk, overhead, clip), cameras, tactile screens, studio monitors, computer, software/plugins, storage, desk type furniture layout, seats or stools, coffee table, lounge furniture layout, and backdrop options.



4-2 Class Labs

Dry class labs

Design intent

Dry class labs require custom layouts supported by equipment- and subject-specific movable furniture systems. Provide dry labs with whiteboards at the front and sides of the room; projection screens; HDMI connections for laptops and mobile devices; and additional power and data ports, if needed.

Dry class lab sizes range from 30–50SF per person.

Target utilization is 25 hours per week scheduled activity, plus 20 hours per week student use. The target occupancy is 80 percent of capacity during scheduled courses, minimum.

Wet class labs

Design intent

Supply wet class labs with water- and gas-serving work stations and/or benches. Furnish the room with fume hoods and additional ventilation. Furniture and equipment layouts shall accommodate diverse subject matter. Additionally, provide wet labs with whiteboards at the front of the room: a projector and screen: HDMI connections for laptops and mobile devices; integrated storage; and additional subject-specific power and data, if needed.

Wet class lab sizes range from 40-80SF per person.

Target utilization is 25 hours per week scheduled activity, plus 20 hours per week student use. The target occupancy is 80 percent of capacity during scheduled courses, minimum.