

MTSU Campus Standards for Instructional Spaces

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1. Introduction

- These campus standards were developed by an ad hoc committee consisting of Academic Affairs, ADA Compliance Office, Key Shop, ITD, Construction and Renovation, Facilities Services, and Campus Planning, and are maintained by the Director of Academic Space and Technology Planning.
- These campus standards are a collection of design decisions developed from MTSU's current practices with additional information obtained through research of other institution's best practices, from architects assigned to capital projects, and from literature reviews. They are to be used for both capital projects and internal renovation projects.



2. Infrastructure

- Instructional spaces should be accessible, yet away from distractions such as vending areas, elevators, restrooms, mechanical rooms, and informal studying/gathering spaces.
- Building signage should be accessible, easy to change, and appropriate to direct individuals to the instructional spaces.
- Bulletin and display boards should meet ADA and building codes for paths of egress.
- If possible, appropriate seating for students waiting on classes should be provided.

3. *General instructional space considerations*

- If possible, the classroom should be configured so the front of the room is the longest wall and the wall closest to the door. This will provide the best access and seating for students with disabilities and the closest instructor-to-student interaction. If not possible, accessible furniture should be located closest to the exit door for ease of access.
- Tiered configurations should only be used in classrooms that seat 100 or more.
- Typically, the front of the room will have accent paint. The color of the other walls should be one of the four campus standard beige colors.
- The maximum capacity for a general-purpose classroom is calculated as the total square footage minus 50 square feet for the instructor. The remaining square footage is divided by 20 square feet to obtain the maximum student capacity. For instructional spaces with student computers, the remaining square footage is divided by 30 square feet. If a room has a capacity of >50 people, the room must have two exits. Maximum capacity may be reduced due to furniture and equipment placement, student comfort, and/or pedagogical reasons.
- Instructor stations should be positioned so the location does not interfere with student-faculty interaction. In most cases, the instructor station is perpendicular to the front wall, and not the main focus at the front of the room
- Style 2 signs are to be used for exterior door signs.



- Doors
 - Doors should include a security mesh window (blinds not required). The purpose of this window is to provide a view into the classroom and the hallway. In most installations, this window is approximately 35" high and 6" wide. However, considering a 1-hour rated corridor partition adjoining a classroom, the maximum view panel size in a 3/4-hr rated door is 1,296 sq. in. of 1/4" thick wired or other approved fire resistive glass with neither height nor width exceeding 54". The aggregate area of all glazing is not to exceed 25% of the area of the classroom wall. Considering a 2-hour rated corridor partition adjoining a classroom, the maximum view panel size in a 1 1/2-hr rated door is 100 sq. in. of 1/4" thick wired or other approved fire resistive glass with a maximum height of 33" and a maximum width of 12". Allowable area of glass in a non-rated partition is

unlimited. Notwithstanding the above mentioned requirements, side windows and door view kits must meet the most restrictive requirements of applicable adopted codes.



- BEST is the campus standard for locks. Access to master classrooms should be controlled by Stanley Security Solutions/BEST B.A.S.I.S. online access control system utilizing magnetic card readers formatted to accept University issued ID cards. Doors should be equipped with ADA, ANSI 117.1 and NC Accessibility Code required handles. Any additional doors are monitored through the card access system. Key override is required for police and security. A lock down switch is also installed for emergency override of the card swipe access programming.



- Whiteboards and bulletin boards
 - Whiteboards (marker boards) are used for all instructional spaces to protect A/V equipment and to save on custodial efforts. Departments are responsible for cost of markers. When possible, special erasers are purchased through classroom maintenance to assist in cleaning whiteboards. Suggested mounting of whiteboards is 36" between floor and lower edge of board. A 50-year warranty on the writing surface is

preferred. Whiteboards should be seamless (without divider strip moldings) with round or beveled edge for the marker tray. Whiteboards should cover the entire front wall of the room.

- Bulletin boards and tack strips should be provided when possible and ordered from the vendor who supplies the whiteboards.



- Shades and blinds
 - Motorized black-out shades are used to block light during projection. These shades are to be controlled through the AMX control system with a manual override switch. Shades to be connected to building power by licensed electrician.



- Flooring
 - Departments should be encouraged to use vinyl-type floor coverings because vinyl is more durable and appears cleaner longer than carpet. If carpet is used, carpet tiles are preferred.



- Ceiling tiles
 - Ceiling tiles to be used are Armstrong Fine Fissured High NRC 1810 non directional white or an equal product.
 - Acoustical wall panels are recommended in large classrooms (>50 people) with non-carpet floor covering.
- Instructor station
 - The Spectrum Media Director will be the standard teacher station in all new master classrooms. The Media Director will replace the NOVA teacher station and the accompanying equipment rack so that all classroom AV equipment and computers are in one location. The Media Director has been designed to secure and protect equipment from being stolen or rewired. The front of the teacher station has strategically placed openings to provide access to equipment. The front and back doors have locks and some equipment will have security covers to protect the wiring configuration. ITD maintains the keys to the Media Directors.
 - Instructor stations, and installed equipment such as the visual presenter, should be placed in the room so the field of vision is not affected. The placement of the instructor's station should be positioned so that it is not a barrier between students and faculty, and faculty cannot stand behind the station.

Listed below are the items typically used in a standard master classroom with estimated costs.

<u>Item</u>	Estimated Cost
Standard master classroom configuration (not required to itemize these items on the TAF form)	
TOTAL	30,350.00
PC Computer	1,300.00

ADA Assisted Listening Device	2,400.00
LCD Projector (3500 Lumens) Wide XGA w/ mount	1,600.00
Digital Document Camera (Visual Presenter)	2,200.00
Projection Screen (Electric) HDTV size in-ceiling	1,200.00
Motorized Shades	2,400.00
AMX System Control Package including Processor/Digital Switcher & 10" Touch Panel	11,150.00
Instructor Station with AV Equipment Rack, Cables, & Accessories, typically a Spectrum Media Director Lectern with keyboard tray, flip-up shelf, and appropriate shelving (http://www.spectrumfurniture.com/products/productDetail.cfm?pc=1&psc=82&prod=1177)	3,300.00
Audio Playback	1,000.00
AV Installation Labor (Contract and ITD)	3,800.00
Other • Data projector mount with security • Lutron lighting system interface • Audio Amplifier • Wall or Ceiling Mounted Speakers • Extron Video Scaler (to send video to computer monitor and projector) • Extron Matrix Switcher • Laptop Connectivity • iPod/iPhone/iPad Connectivity, including HDMI cable	
Optional items (must be itemized on the TAF form)	
Mac-Mini Computer for instructor (does not include a monitor where an existing monitor will be used) (8GB RAM, 500GB or current standard hard drive, 3 year Apple Care Protection plan)	768.00
21.5"; iMac computer for students (8GB RAM, 1 TB or current standard hard drive, 3 year Apple Care Protection plan)	1,518.00
LaserJet Printer (optional)	3,200.00
PC computers for student workstations (optional)	1,300.00
Course Response System	300.00
Wireless Microphone System (optional)	1,000.00
Audio PA system	3,000.00

94"; Smartboard	2,000.00
Laptop, Latitude E6440	1,450.00
MacBook Pro, 13", Apple Care Plan	1,911.00
55" Flat Panel	3,000.00
Tidebreak (TeamSpot and ClassSpot PBL - https://tidebreak.com/) collaborative software (campus license) requires flat panels and computers for the server	2,000.00 each group

New style instructor station:



Old style instructor station – existing, not used for new classrooms:



- Furniture
 - To accommodate various instructional methods, furniture should be flexible and movable, not fixed or cantilevered. Tables and chairs (individual student or multiple students per table) should be used whenever possible to address a variety of student needs (left-oriented, larger sizes, and ADA). The preferred furniture is 18x60 tables and armless chairs. These chairs shown below are acceptable but a model with coasters is not required. Sled-based chairs are also acceptable. For collaborative classroom, 60” round tables (half moons) are appropriate. The use of tablet arm student desks should be discouraged. Departments should be encouraged to use non-fabric chairs and to purchase all furniture through Construction and Renovation and Campus Planning to ensure warranties and fire codes are maintained. Furniture should be color-coded to a room (white is discouraged) so the items can easily be identified as belonging to a specific room.
 - Stadium seating should be rarely used. However, when used, the tablet should be large, but allow for the passage of students to other seats in the row.
 - A mobile lectern (Izzy Dewey model) and instructor’s stool are included.
 - Additional furniture may be purchased for additional computer equipment such as printers and scanners and/or storage.
 - Furniture should be arranged so voice and data connections are easily accessible.
 - Modular office partition systems (Herman Miller, Steelcase, etc.) should be connected using MTSU voice and data systems. Do not use the voice and data systems provided with these furniture systems.
 - Rooms with modular workstations that have data computer connections should connect those computers via a patch cable not more than 25 ft long to a wall jack.







4. Technical Guidelines & Formulas

- Screen Size vs. Room Size
 - The minimum height for a screen from the floor must be at least four feet to see over individual's heads. Screen aspect ratios changed to 16:9 for the wide screen format HDTV utilizes; and, all screens will be the correct size to accommodate the HDTV format. The standard projection screen is 10 feet wide and 5.6 feet high, and is installed above the dropped ceiling. Most classrooms will have the projection screen centered on the front wall, but the screen may be angled in the corner for classrooms that require simultaneous use of whiteboards and projection screen. The Da-Lite Advantage Electrol in Matte White finish or equal is our preferred brand and the exact size of the screen to be used will be 65" x 116".

- Optimum Ceiling Heights

- The minimum ceiling height for rooms less than 50' deep should be at least 10'; for larger rooms the following heights are recommended:

Distance to Last Row	Rear of the Lecture Hall	Front of the Lecture Hall
50 feet	10 feet	14 feet
75 feet	10 feet	16 feet
100 feet	10 feet	20 feet

- In consideration of new building designs, alternative delivery will be considered if optimum ceilings height cannot effectively be included in the design of the building.

- Sound – Playback only and/or Public Address

- There is a major difference in speaker choice and placement depending on whether the system is only for source playback and/or for sound re-enforcement (PA). For simple playback of source material in stereo, a 60-100 watt amplifier and two small speakers (i.e. EAW UB12S or equal) located on either side of the screen is sufficient. If the capability to playback DVD movies in true 5.1 or 6.1 Dolby Digital Surround is required, a high-end amp/receiver is needed to provide a signal to five or six speakers as well as a line signal to a powered subwoofer. These rooms will have a center speaker near the screen, two speakers in the front on either side of the screen, and two speakers in the rear corners of the room. The center speaker should be a 2' x 2' ceiling tile grid speaker (such as the KSI 8081CS or equivalent). Location of the center speaker should be 4' from the screen. The subwoofer should be placed on the floor next to the teacher station. The cables for these speakers should be run in panduit for existing rooms or in ¾" conduit for new buildings. No power or junction boxes are needed for the speakers.
- If a room is large (>50 people), it will be necessary to install PA speakers, mounted on the wall, on either side of the room at least 3-4 feet in front of the presenters work area. This is required to prevent audio feedback (either a low rumble or high end squeal). Acoustical treatments on the side and rear walls are often necessary to make the sound clean and audible to all students. PA systems require additional amplifiers, EQ's, mixers and various microphones, both wired and wireless. These components will be located in the AV equipment rack inside the instructor station. If there is a lot of ambient noise in the room or nearby, it may be necessary to add a PA system for rooms as small as 25 seats (a good example is DSB 130). All classrooms need to meet the current American National Standard for Acoustical Performance Criteria, Design requirements, and guidelines for schools. (ANSI S12.60-2002)



- A/V packages should include a jack and transmitter for hearing impaired students. ADAAG requires all assembly spaces that have audio amplification systems to have assisted listening devices equal to 4% of the total number of seats but no less than two. The preferred system must be equal to the Williams Sound Personal PA 775 FM system with R35 receivers. FCC rules limit the use of the 72-76 MHz band to hearing assistance for the handicapped only.
- LCD Projector Requirements and Limitations
 - The recommended minimum requirement for a LCD data/video projector is a brightness level of 3500 ANSI lumens or greater and a resolution of 1280 x 1024. MTSU will begin using the Epson PowerLite 6155w, 3500 lumens, series projector or equivalent replacement from Epson as the standard projector for most classrooms along with the appropriate mounting gear recommended for this projector. The PowerLite is recommended due to its long life expectancy, higher cooling capacity, longevity of filter, built-in closed-captioning (required for all master classrooms), ease of maintenance, and overall brightness. Other makes and models will be considered for rooms that have special needs that the PowerLite 6100i will not meet. All projectors are secured with heavy-duty nylon covered aircraft cable (.31 inches in diameter). The ITD department will stock security hardware and will engrave "Property of MTSU" on each projector using a template with an etching tool.



- The AMX control system will be programmed by the AV vendor to turn off all projectors at eleven p.m. so as to save lamp life and wear and tear on the projector. The AMX control system will also exit the system turning off the projector after five hours of no activity. Projectors are now tied to the door alarms and a new mesh covering is being used for some projectors. See the AMX Programming section later in this document for a detailed list of AMX programming requirements.
- LCD projector must be located 12-14 feet from projector screen. In Film Studies classrooms this distance will be 17' or if placed in a control room behind the classroom, the projector will have a long-throw lens.
- It is mandatory that the projector be placed exactly level with the top of the screen as well as be centered on the screen. There should never be any lighting fixtures or other obstructions in the light path of the projector to the screen. The LCD projectors have a serious problem with fluorescent light fixtures (ceiling 2'x4' drop in units included); if a light is placed too close to the projector, IR interference can cause the projector to become locked up and inoperable. Because of this, we use RS-232 serial cables to control all projectors in rooms where AMX control systems are used. In rooms with no AMX System, the only way to control the projector is with the IR remote. This method of control has proven to be very unreliable in rooms all over campus, so we now require AMX control for all Master Classrooms.



- Lighting Types and Control Systems
 - T-8 4'0" lamps with a temperature of 3500 Kelvin and a minimum CRI of 75 is the campus standard for general instructional spaces; however, in areas where better color viewing is required, CRI of 85 is recommended.
 - The IESNA (Illumination Engineering Society of North America) recommended practices guidelines should be used.
 - Lights should not be located in front of or near the LCD projector to reduce interference with projection pattern. A good rule of thumb is within a 2' radius. Light fixtures should be designed to reduce collection of bugs.
 - All classrooms should have motion detectors/occupancy sensors. Lights should be programmed to turn on when one enters the room and off after 30 minutes of no movement in the room. A manual light switch at the entry door(s) is to be available and should not affect the functioning of the motion detectors/occupancy sensors.
 - All Master Classrooms to have dimmable fluorescent fixtures that do not interfere with the projector. Lay-in 2' x 4', pendant type, or recessed can lights may be used. Zoning of lights (or classroom scenes) should be accomplished by using the Lutron Grafik Eye 4000 Series control unit with the GRX-RS232 interface; the particular model depends on the number of zones to be controlled. It is imperative the front of the room near the screen be able to darken via zoning and dimming, and a separate can light over the instructor's work area on its own fader be installed. Each classroom will require individual programming of the Lutron control system.





- Off-hour lighting control for energy efficiency should be accomplished with an occupancy sensor tied in with the room lighting control unit. The sensor should be a dual technology device utilizing infrared and ultrasonic sensing technologies with adjustable sensitivity and time delay settings.



- Control Systems are available that will not only control automatic lighting switching when the projector is energized, but can also control window shades, etc. These systems can be created based on the needs of the owner.
- During non-emergency times, emergency lights should be programmed to function the same as other classroom lights.
- Electrical Requirements
 - In order to prevent 60 cycle hum in the sound system and on the video screen, the instructor's computer(s), AV rack (inside the instructor station), and projector must be on the same phase of power in a quadruplex electrical outlet located at the AV rack location. The LCD projector requires a duplex connection in the ceiling and has a power consumption of 400 watts; the computers and AV rack draw about 17 amps on average. For rooms with larger PA systems, an additional 20-amp circuit is

required. The AV vendor does not supply an electrician since they are only certified for low voltage installations. Therefore, a MTSU designated electrician is needed to make the high voltage connections to the low voltage controller for the electric screen.

- All loose equipment and/or hardware connections, whether below or above the ceiling, must be installed to meet or exceed all applicable fire and life safety codes.



- Data Requirements: Wired and Wireless
 - For a standard Master Classroom, there should always be at least four network jacks (RJ-45) located at the teacher station. These four are used for one PC, one Apple, one laptop and one AMX Web Server. Additional lines for printers or student computers need to have jacks available to each location that are no more than 25' from the jack to the device.
 - Wireless Internet connectivity is an option available to augment the wired network connections; the current standard used is IEEE 802.11b/g.
 - Any wireless equipment purchased should be coordinated with ITD to determine interference with the LCD projector.
- Conduits for AV Equipment
 - A 2" conduit with a 4 x 4 junction box is needed for the cables from the Spectrum instructor station. Then the instructor station floor box also needs to have a conduit path to the data outlet and have a quad electrical outlet on the same phase as the projector, computers and AV equipment. In new buildings or where possible, it would be best to have a 2" deep cable trough with metal cover plate from the teacher location to the wall where the rack is located. This trough should have separate channels for electrical and data/AV lines.
 - An electrical source is needed in the ceiling to power the electrical projection screen. For the electric screen, a conduit will be needed from the low voltage screen controller to the AV rack area; 1/2" or 3/4" conduit is sufficient for this cable. A single gang electric box is required at the end of the conduit for the three button switch; this box should be located at 49 1/2" A.F.F. the conduit should be run vertically from recessed outlet box and stub out above the ceiling far enough to permit attachment of bushing or cap.

- Mount other standard outlets 18” (data, AV and electrical) from finished floor to centerline of bottom outlet if vertically oriented or to centerline of outlets if horizontally oriented behind the AV rack location.



- All cables above the ceiling should be plenum rated.
- Cable runs shall maintain a minimum distance of six (6) inches from fluorescent lights, motors, and other sources of EMI radiation.
- ADA, ANSI 117.1, and NC Accessibility Code Requirements
 - The Americans with Disabilities Act Accessibility Guidelines (ADAAG), ANSI 117.1, and NC Accessibility Code clearly define what is required of the University in our classrooms. Dr. Watson Harris is the campus contact for ADA related issues.
- New Technologies
 - Future classrooms will begin using digital signals from computers; this will provide a better image, but will require new cabling and interfaces.

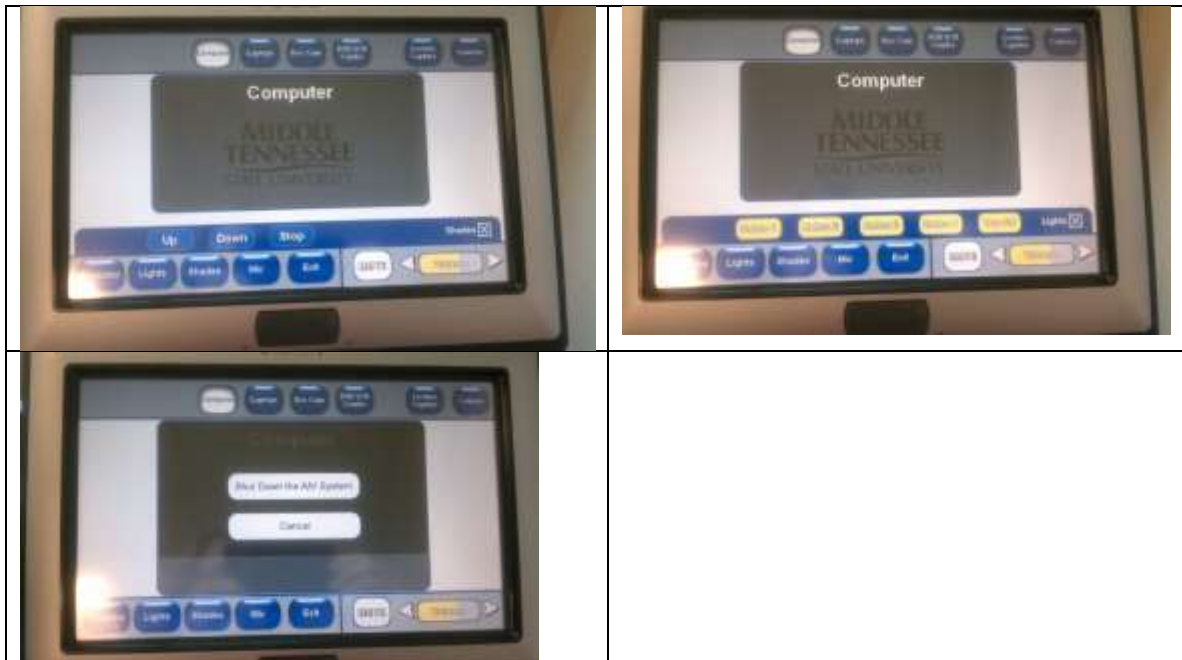




- AMX Programming Requirements
 - Main Page:
 - Access to turn projector on and off
 - Access to raise and lower screen
 - Access to raise and lower shades
 - Access to adjust lights to various presets from Lutron room lighting control
 - Access to volume control
 - Select input device to Projector
 - PC and/or Mac
 - Laptop computer
 - Document Camera
 - DVD
 - VCR
 - I-Pod
 - Document Camera Page
 - Power on and off
 - Focus controls
 - Zoom controls
 - Internal/External control (if necessary)
 - Lights on and off
 - Turn page selection from landscape to portrait (180 degrees control)
 - DVD
 - Controls to Play, Pause, Fast Forward, Rewind, and Stop
 - Menu controls to go Up, Down, Left, and Right.
 - Access to audio control without leaving the DVD page
 - Access to the DVD Menu
 - Closed-Captioning On or Off (this will be for the CC built in on to the projector or out of the DVD player depending on the room and equipment configuration)
 - Other Programming Items

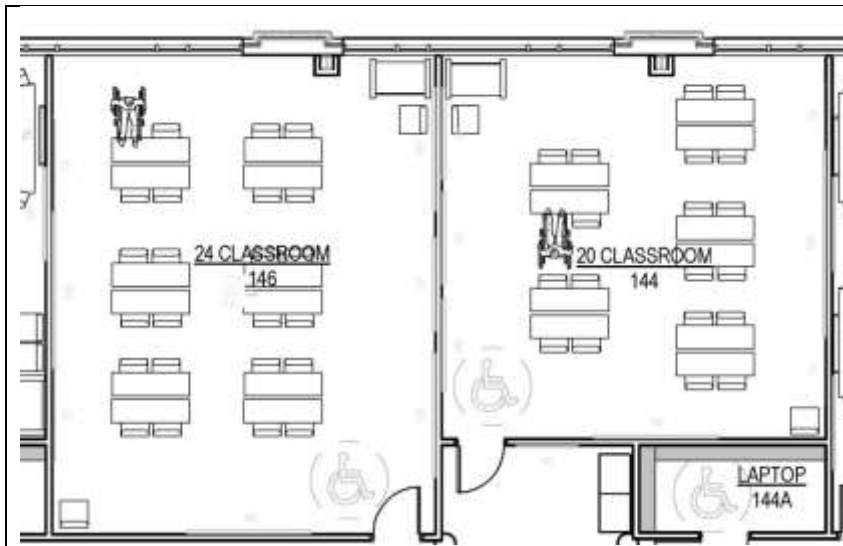
- All rooms with an AMX system will be setup to have the projector shut off at 11pm each evening to protect damage to the bulbs and the projectors from potential overheating.
- All rooms with an AMX system will be setup in the “AMX Classroom Manager” software application, which allows technicians to remote into the AMX system of a particular classroom to assist an instructor with technical issues and also creates an electronic maintenance notification system to let technicians know of immediate problems in a particular room.





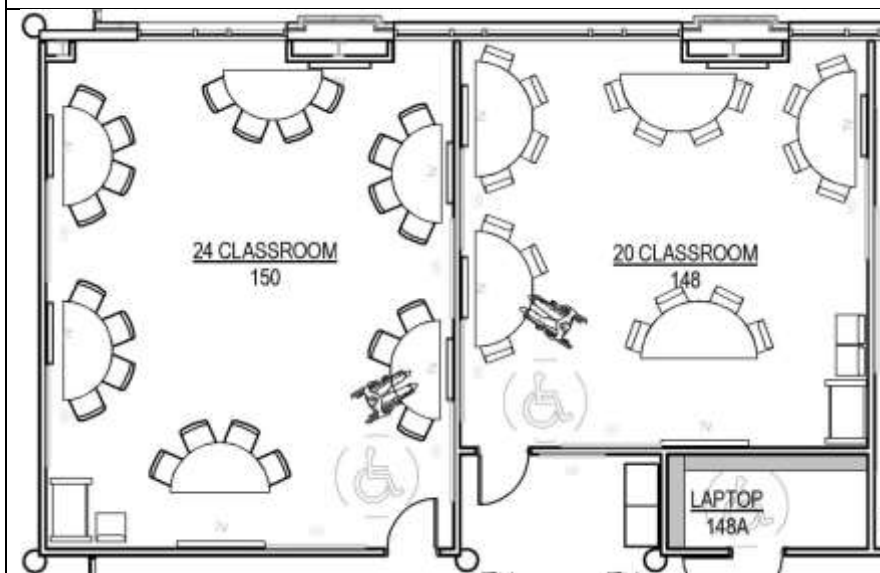
5. Classroom configuration examples- please note the instructor station examples are Spectrums and are designed to fit against the wall. Spectrums are A/V carts and are not designed to be in the middle of the classroom. With the equipment installed on the top of the Spectrum, the sightlines between faculty and student are blocked. Novas are used when there must be a piece of furniture in the middle of the classroom. Equipment is installed underneath the top of the Nova.

	<u>A. Classroom type 10.</u> Classroom seats 10, with fixed furniture, a whiteboard, flat panel projection, and a wall mounted AMX control.
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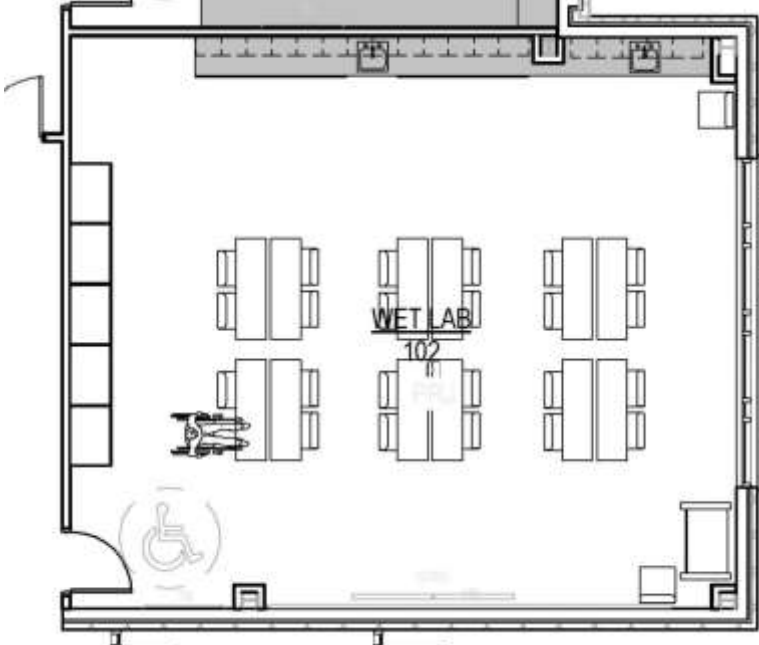
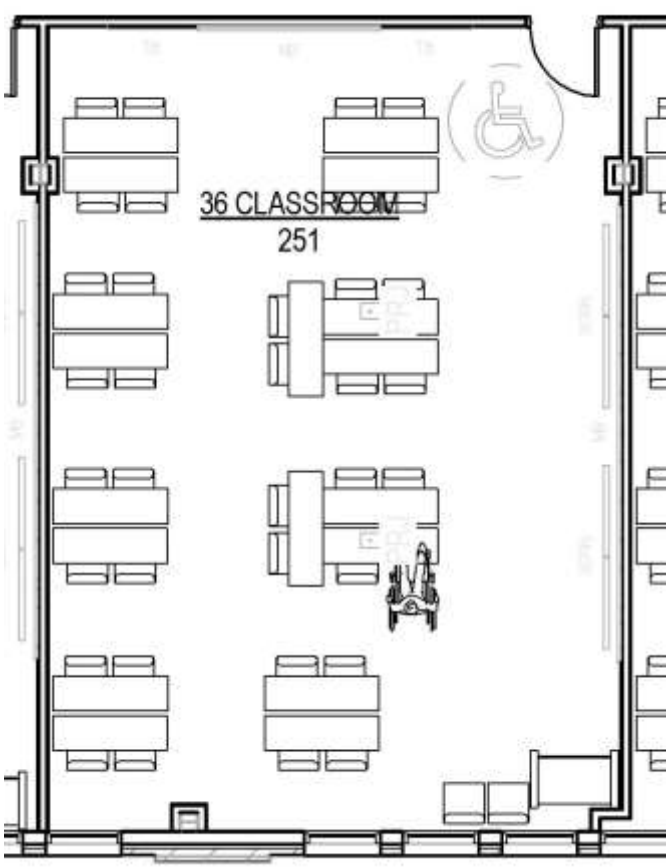
B. Classroom
type 20 or
24
traditional.

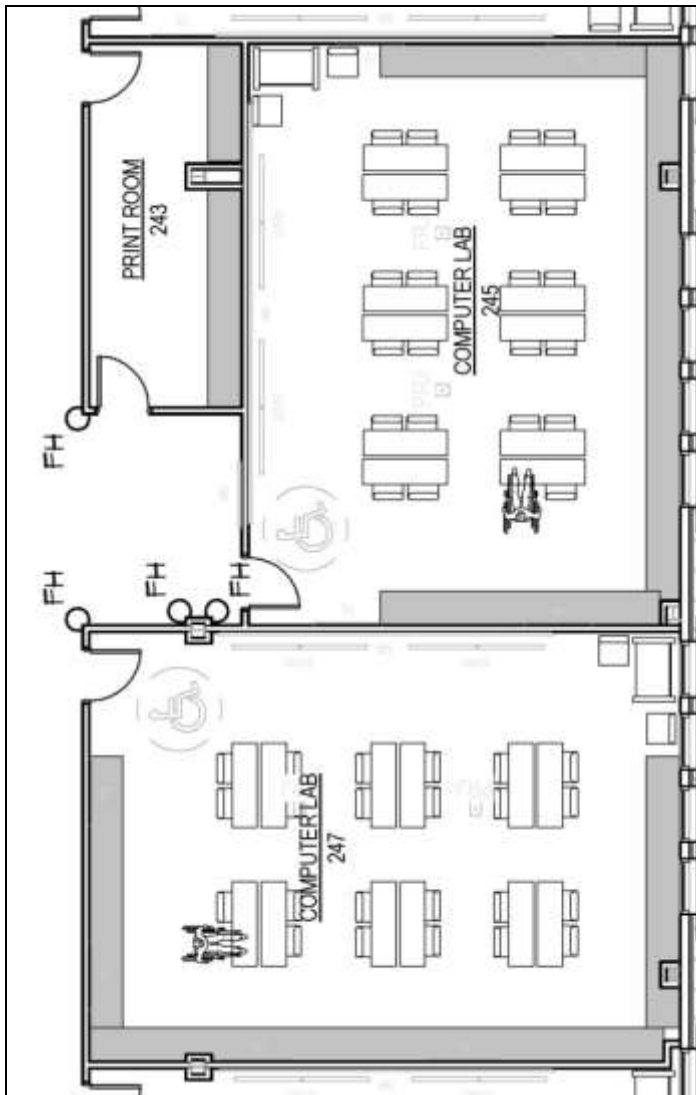
Traditional
master
classrooms
with movable
furniture for
either 20 or 24.



C. Classroom
type 20 or
24
collaborativ
e.

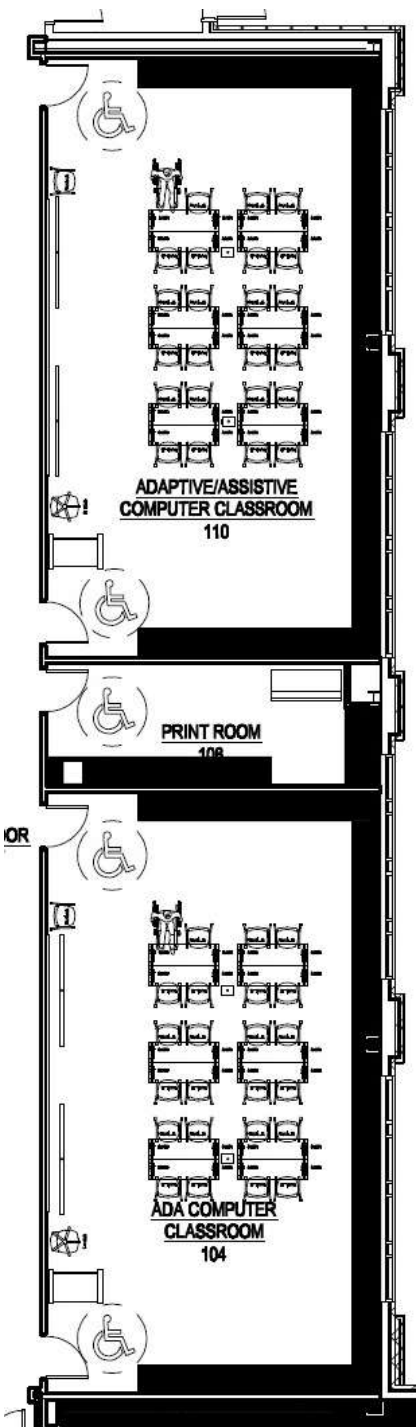
Master
classrooms
with movable
round tables,
multiple flat
panels and/or
smart boards
for lecture and
team work.

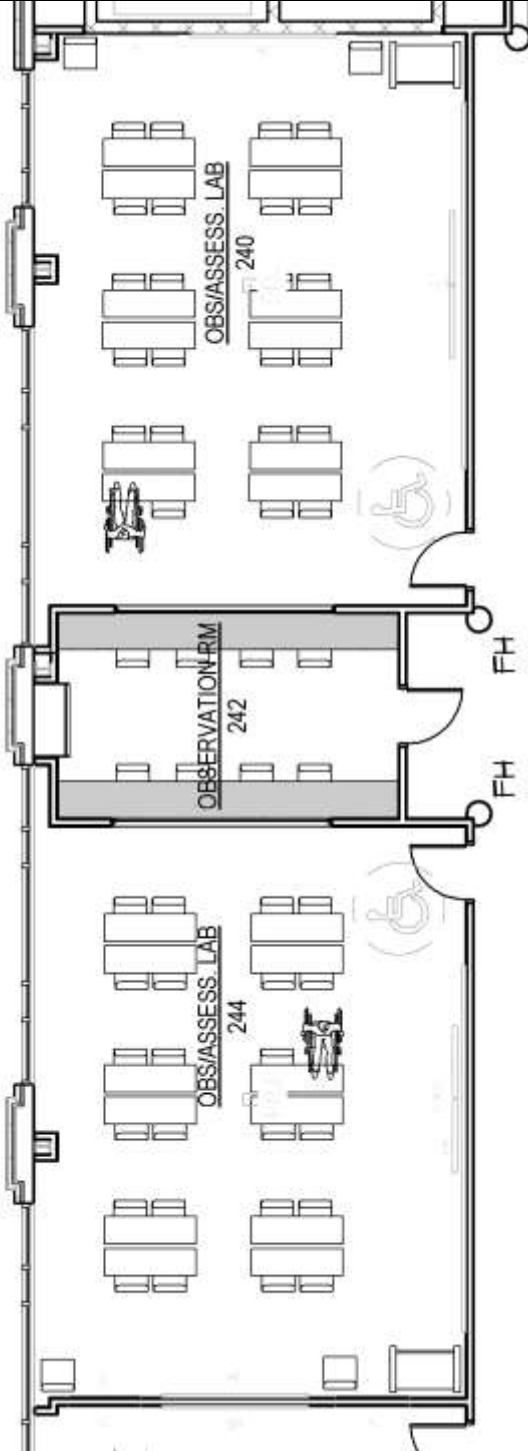
 A floor plan of a rectangular classroom. The room features a long counter with two sinks along the top wall. The main area is filled with several rectangular tables and chairs. A central table is labeled 'WET LAB' and '102'. A wheelchair icon is located near the bottom left corner. The room has a door on the left wall and a small storage area on the right wall.	D. <u>Classroom</u> type 24 <u>traditional</u> <u>with sinks.</u> Standard master classroom with two sinks and storage.
 A floor plan of a rectangular classroom. The room is filled with several rectangular tables and chairs. A wheelchair icon is located near the top right corner. The room has a door on the left wall and a small storage area on the right wall. The text '36 CLASSROOM' and '251' is visible in the center of the room.	E. <u>Classroom</u> type 36 <u>traditional.</u> Standard master classroom with movable furniture for 36.

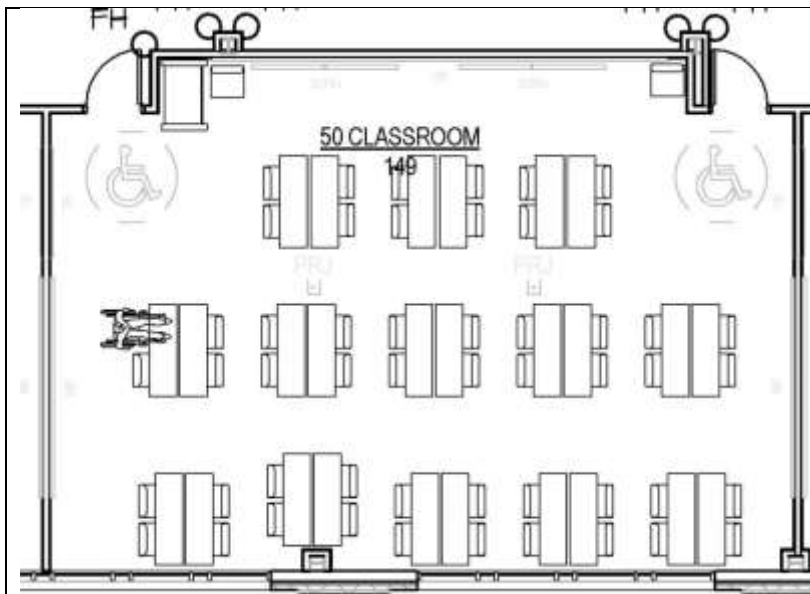


F. Classroom
type
traditional
24 with
student
computers.

Standard
 master
 classroom with
 movable
 furniture for 24
 and 24
 desktops
 around the
 perimeter of
 classroom.

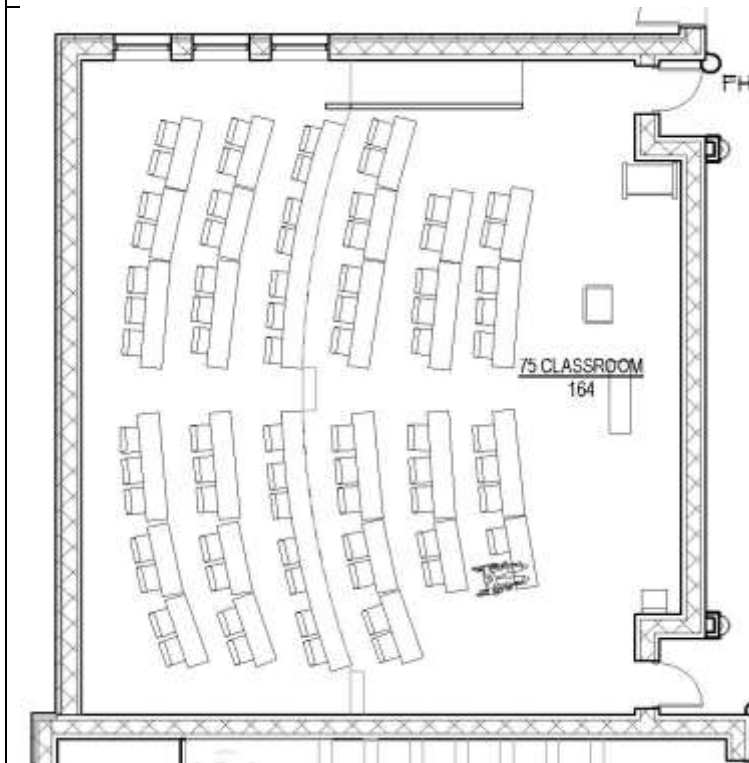
 The diagram shows a vertical layout of three rooms. The top room is labeled 'ADAPTIVE/ASSISTIVE COMPUTER CLASSROOM 110'. The middle room is labeled 'PRINT ROOM 108'. The bottom room is labeled 'ADA COMPUTER CLASSROOM 104'. Rooms 110 and 104 are identical, showing a U-shaped desk arrangement with 24 computer workstations and a teacher's desk. Room 108 is a small rectangular room. All rooms have wheelchair accessibility icons.	G. <u>Classroom</u> <u>type</u> <u>traditional</u> <u>24 with</u> <u>student</u> <u>computers.</u> Standard master classroom with movable furniture for 24 and 24 desktops around the perimeter counters of classroom.
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	H. <u>Classroom</u> type 24 <u>traditional</u> <u>with</u> <u>observation</u> <u>capability.</u> Standard master classroom with movable furniture for 24. Between classrooms is an observation room with one way windows and recording capability.
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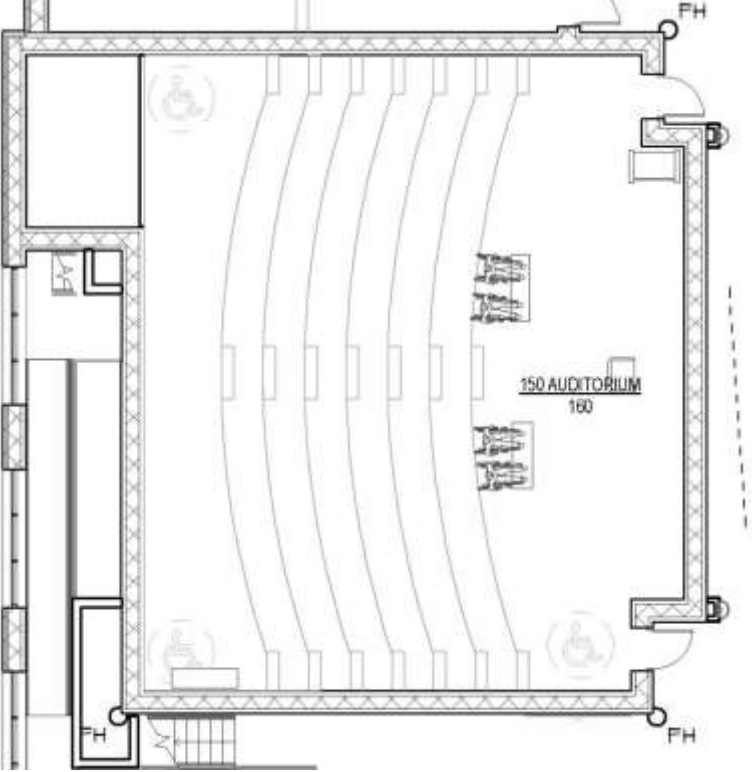
I. Classroom
type 52
traditional.

Standard
master
classroom with
dual projection,
movable
furniture for
52.



J. Classroom
type 75
traditional.

Standard
master
classroom with
two tiers,
mostly
movable
furniture, and
dual projection.

	K. <u>Classroom</u> <u>type 150</u> <u>stadium</u> <u>seating.</u> Standard master classroom with fixed seating, one projector with four images, and control booth for recording or broadcasting.
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