

MTSU Campus Standards for Master Classrooms and other instructional spaces

Renovation & New Construction

- Room configuration
 - If possible, the classroom should be configured so the front of the room is the widest wall and the wall closest to the door. This will provide the best access and seating for disabled students and the closest instructor-to-student interaction. If not possible, disabled student furniture should be located closest to the exit door for ease of access.
 - Tiered configurations are not preferred in small classrooms (<80 capacity). However, a tiered configuration may be necessary in larger classrooms (>80).
 - Typically, the classroom front will have accent paint. The color of the other walls should be one of the three campus standard 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. 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.
 - Type 5 signs are to be used for exterior door signs.

- Construction items
 - Whiteboards (marker boards) are used for all master classrooms 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 2' - 6" 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.
 - Motorized black-out shades are used to block light during projection. The 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.

- 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 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.
 - Doors should include a security mesh window (blinds not required). 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. Key override is required for police and security.
- Furniture
 - 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.
 - 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 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 so the items can easily be identified as belonging to a specific room.
- Additional furniture may be purchased for additional computer equipment such as printers and scanners and/or storage. Computer CPUs should be placed in racks for protection of equipment and convenience of custodial services.
- 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.

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 conduit for existing rooms or in 3/4" 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 6100i 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 6100i 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.
- Standard Teacher Station Equipment Configuration
 - 3500 Lumen or greater ceiling-mounted data projector
 - Data projector mount with security
 - Document Camera
 - Electric Projection Screen
 - Lutron lighting system interface
 - AMX Touch Panel Control System
 - Spectrum Media Director Lectern with keyboard tray, flip-up shelf, and appropriate shelving
 - Audio Amplifier
 - Wall or Ceiling Mounted Speakers
 - DVD/VCR Combo Player
 - Extron Video Scaler (to send video to computer monitor and projector)
 - Extron Matrix Switcher
 - Smart Sympodium with USB connections (Smartboard & Computer Monitor)
 - Turning Point Response System (not including student response devices)
 - Laptop Connectivity
 - I-Pod Connectivity

- Computer (PC and/or MacIntosh)
- 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.
 - All classrooms to 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)

 - VCR
 - Controls to Play, Pause, Fast Forward, Rewind, and Stop
 - Tape tracking control buttons (often the same as channel up and down on the remote control)

- Access to audio control without leaving the VCR page
- Access to the setup menu with up, down, left, and right controls to reconfigure if power is lost
- 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.