



Information Technology Services

Standards for General Purpose

Multimedia Classrooms

*General Guidelines for Design and Construction
of
Technology Enhanced Learning Environments
at
Louisiana State University*

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Standards for General Purpose Multimedia Classrooms

Introduction

Classroom Information Technology, a division of Louisiana State University - Information Technology Services (LSU ITS), provides consultation, design, installation, and maintenance services for the University's general purpose multimedia classrooms. These are the general audio-visual technical guidelines for designing, constructing, and renovating instructional spaces at LSU. These are minimal standards and are not all inclusive. There will be unique situations that will require modifications.

This manual offers current standards for the design of instructional spaces at LSU. Periodic reviews of classroom facilities are done to identify deficiencies and develop plans for any needed upgrades or improvements. This is a “living document” that will be under constant review and adjusted as audio visual technology advances.

Types of Learning Spaces

- Seminar TEC – 1-19 seats
- Classroom TEC - 20 to 59 Seats
- Lecture Room TEC - 60 to 149 Seats
- Auditorium TEC - 150+ Seats
- Tier 2 Hybrid Classrooms – A Tier 2 hybrid classroom can encompass any classroom and includes technology to allow onsite and remote instruction. A Tier 2 room includes a camera, microphone, speakers, and appropriate AV switching technologies. A consultation is highly recommended to determine whether the classroom will be used as a hybrid room.
- Computer Labs Classrooms – Classrooms with desktop computers installed at student seating locations.

General requirements for all classrooms

These standards apply to new construction and renovation of existing facilities unless otherwise noted.

1. Network

Six (6) Cat6 drops for networking: 3 drops to the lectern; one is for classroom PC and two are for monitoring/control of MM equipment (projector, controller, etc.) and one in ceiling for wireless access point. Additionally, there are 2 Cat6 cables from the lectern to projector location for video signals and control, terminated with RJ 45M on both ends. Contact LSU/ITS for specifics. Network ready devices include all AV equipment in the classroom, plus the 802.11x Access Point and a lectern PC.

2. Conduit: See Appendix 5 for diagram

- 2.00 inch conduit shall be installed from lectern to projector (see Appendix 5).
- 1.50 inch conduit shall be installed from the lectern or equipment rack location in each learning space to all locations where equipment will be installed that must be connected to

the lectern or rack (screens, speakers, instructor area equipment/inputs, lighting control system, cameras, ceiling mics, wireless mic antenna, assistive listening transmitter, etc.).

- No section of conduit shall be longer than 30m (100ft) or contain more than two 90 degree bends between pull points or pull boxes.
- Fill capacity for conduit shall not be more than 50%.
- AV cables cannot be in the same conduit as power.

3. Electrical

- One isolated 115v/20-amp circuit shall be provided for the lectern and one isolated 115v/20-amp circuit shall be provided for the projector (see Appendix 5) each in its own conduit. No AV cables shall be mixed with electrical/power cables in the same conduit or raceway.
- All low-voltage connections shall be separated from the electrical circuits to the room through separate conduit or separate channel within a raceway or cable tray. These services include control and signal cables for audio, video, data, and voice feeds.
- Cables and conductors of Class 2 and Class 3 circuits shall not be placed in any cable, cable tray, compartment, enclosure, outlet box, device box, raceway, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm circuits, and medium power network-powered broadband communications cables.
- Audio, video, voice and data telecommunications cabling shall not be run parallel to power cabling – even along short distances – unless one or both cable types are shielded and grounded. For low voltage communication cables, a minimum 5-inch distance is required from any fluorescent lighting fixture or power line over 2 kVA and a minimum of 24 inches from any power line over 5 kVA.

4. Physical security

- Data projectors shall be attached to security type mounts as theft deterrent. A two-tray system is preferred. Projectors should not be able to be removed without a key or security screw removal. However, the mount should be able to be adjusted by pivot in az. and el. for proper alignment of image.
- Document cameras shall be attached to security type mounts as theft deterrent. A two-tray system is preferred.
- Lectern PCs shall be contained in PC cage mount accessible only by key.
- Key locked access drawer shall be designed into Lectern for storage of mics, remote advancers, etc. Key access shall be attained by checkout from Classroom Information Technology in Himes Hall.
- Flat panel displays shall be secured to the lectern with Kensington type combination lock.

5. Telecommunications

- Each room shall have a ring-down telephone installed onto wall phone block for Technical Support.
- Telephone block/jack shall be installed near the lectern location.

6. ADA Compliance

- Every consideration should be taken to accommodate requirements set forth by the ADA, including but not limited to appropriate lighting and space for an interpreter, wheelchair access, and any other accommodations.
- The ADA Code of Federal regulations may be found at <http://www.usdoj.gov/crt/ada/adastd94.pdf> (PDF document).
- Infrastructure for assistive listening devices should also be considered.

7. Lighting (see Appendix 4)

- Less than 5 Vertical Foot-candles shall be on screen.
- Apply window treatments if necessary to control ambient light.
- Room lights shall be conveniently controlled from the teaching area, along with any lights that are capable of being dimmed during projection.
- There are four 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.
- Zone 2 – Projection area:
 - While light bleed isn't the problem it once was, it is still important that light not shine directly on a screen during projection. Because of this, we recommend that lights which shine directly on the screen be controlled separately. They can be turned off during presentations, but turned on when maximum whiteboarding needs to be illuminated.
- Zone 3 – Instructor Workstation:
 - The light direction above the instructor workstation should be switched separately whenever possible to allow the instructor to see their materials while conducting a class with the rest of the lights off for projection.
 - Touch screen lighting control panel (in new construction) should be mounted on wall near lectern for presentation zone controls.
- Zone 4 - Emergency Lights:
 - Due to fire and safety codes, many classrooms must have an emergency light that stays on at all times, even when the lights are shut off. Because this can cause interference with the clarity of the projected image on screen, every effort must be made to isolate light radiation to the back of the room away from the projection screen.

A/V Technology

1. Design and Technology Employed

The design and the technology remain relatively consistent; the actual equipment manufacturer model numbers may vary as new technology becomes available. Please reference Appendix 6 for current model numbers of equipment as of 2023.

2. Screen: Draper or DaLite Manufacturing (see Appendix 3)

- Screen shall be 16:10 or 16:9 (depending on application).
- Screen shall be sized vertically (furthest viewer divided by 5).
- Electric screen shall be recessed mounted when appropriate.
- The bottom of screen shall be dropped no lower than 60 inches (where conditions allow).
- Screen shall be matte white with gain of about 1.0 (30 Lamberts per square foot of screen area).
- An unobstructed view shall be provided of the entire image on all screens from all seats within the viewing angles.
- The viewing angle shall be a maximum 45-degree horizontal angle from the perpendicular to the center of screens and a maximum 35-degree vertical angle from the perpendicular to the top of each screen.
- Screens should be oriented towards the “center of gravity” of the seating area so students in all seats can easily see projected images and the whiteboards.
- Minimum distance between screen and closest seat is 9 feet.

3. Audio Systems: Please contact LSU ITS for specific model numbers as model numbers change.

- Speech reinforcement sound amplification shall be present and distributed through a minimum of four ceiling 2 X 2 ceiling drop-in speakers where applicable or pendant where applicable. Depending on room size, more speakers may be needed.
- Program sound amplification shall be present when a data/video projector is designed into the room.
- Special Performing Arts rooms: faculty should be consulted about their specific needs.
- Wireless microphones, if needed, should be frequency agile and the transmit frequencies shall be set upon collaboration with LSU ITS to eliminate interference.

4. Lectern

- There shall be laptop connectivity support via cable pass through or chassis bulkhead plates to include HDMI and USB – a minimum of 3 feet cable reach from cubby/plate.
- A power conditioner shall be provided with an 8-outlet minimum.
- The lectern shall be Mulnix, KSI, Marshall or equivalent Instructor’s Lectern and be ADA compliant.
- Custom Designed Lectern
- NOTE: Most “off-the-shelf” lectern furniture does not meet our goals. The University has worked closely with A/V vendors and A/V Furniture Manufacturers to develop custom designs that do meet these goals and seek to standardize workstation and user interface

design for each classroom. This standardization simplifies ease of use and minimizes instructor training. Refinements to the University's custom-designed instructor workstations are made periodically. Architects and Consultants should obtain electronic copies of drawings for the appropriate current design(s) from LSU ITS (SEE APPENDIX 1)

- Equipment Standards for control and signal distribution in standard MMC.
 - Note: Tier 2 standard classrooms will have additional requirements (Tracking camera, ceiling mics, matrix switcher, additional networking, etc.). Contact ITS for updated information.
5. Control Interface: Crestron equipment is required in classrooms. Please contact ITS for specific model numbers given that equipment changes over time.
- The touch control interface manufactured by Crestron shall be configurable and centrally controllable.
 - The Touchscreen control interface shall be mounted in custom lectern cutout or modify existing cutout to allow for Crestron TLP mounting.
 - The interface shall have controls for AV equipment and other selected programmable devices.
 - The touch panel on the instructor lectern shall be easy-to-read, simple menu choices which mirror the LSU chosen standard design. Contact LSU ITS for details.
 - All source codes, compiled codes, and access passwords shall be provided to the University at acceptance and become University property.
 - AV vendor shall provide updates to existing code during the life of the AV vendor equipment service warranty.
6. Scaler Switcher: Crestron standard required. Please contact ITS for specific model numbers given that equipment changes over time.
- Switcher shall be remote controllable via RS 232 or LAN connection and have a minimum of three simultaneous video outputs
 - Integrated DTP inputs and output support transmission of video, control, and analog audio up to 330 feet (100 meters) over a shielded CAT 6 cable
 - Include a twisted pair output that can send video and embedded audio, plus bidirectional RS-232 and IR signals to an HDBaseT-enabled display.
 - Two mic or line level audio sources can be independently mixed with program audio and embedded onto the HDMI output. Selectable 48-volt phantom power allows the use of condenser microphones.
 - Embedded HDMI two-channel PCM audio can be extracted to the analog outputs, or multi-channel bitstream formats can be passed to the HDMI outputs.
 - Selectable output rates from 640x480 to 1920x1200, including 1080p/60 and 2K
7. Processor: Crestron standard for General Purpose MMC, alternatives NOT supported by LSU/ITS. Please contact ITS for specific model numbers given that equipment changes over time.
- Three AV LAN ports allow AV devices to be isolated from the corporate network
 - AV LAN ports provide PoE+ to external devices
 - Two bidirectional RS-232 serial ports with software handshaking

- One bidirectional RS-232/RS-422/RS-485 serial port
 - Two IR/Serial ports for one-way control of external devices
 - Ethernet monitoring and control on each Ethernet port
 - Central Deployment - Use the primary control processor to deploy all system files, configurations, and programs
8. Computer: Please contact ITS for specific model numbers given that equipment changes over time.
- There shall be at least one computer installed in the classroom with the following specifications:
 - Ultrasharp LCD display (monitor) with DisplayPort\HDMI input
 - DVD ROM drive
 - Minimum two HDMI/DP output ports
 - Minimum USB 2.0, 6 port standard
 - Minimum One active USB 2.0 powered extension
 - One micro or standard sized keyboard
 - One optical scroll wheel mouse
 - A current version of Windows operating system
 - Front USB connections
9. Document Camera
- There shall be at least one Document Camera installed with the following specifications:
 - Progressive scan camera
 - Digital SXGA, WXGA, 720P, 1080P, HDMI and USB simultaneous outputs
 - 75Hz and 60Hz output modes
 - RS232 (preferable) IR and USB inputs for control and connection to other devices
 - Automatic and manual focus
 - Brightness controls
 - Lamps for overhead lighting
 - USB connectivity for live document camera preview and control on local PC
 - HDMI and USB simultaneous outputs
10. Video/Data Projector (WUXGA preferred)
- NOTE: To keep pace with current technology, the Classroom Information Technology team should work directly with audio-visual consultants/vendors to specify projectors that meet current criteria established by LSU. Cost should not be the only consideration when selecting projection options.
 - The criteria for projector selection shall include the minimum criteria:
 - Seminar TEC – 1-19 seats - 6000 Lumen (laser preferred)
 - Classroom TEC - 20 to 59 Seats – 6000 Lumen (laser preferred)
 - Lecture Room TEC - 60 to 149 Seats - 6000 Lumens (laser preferred)
 - Auditorium 150+ seats – 6000+ Lumens (laser preferred)
 - Low noise output - 38 dB (High Brightness Mode) 30 dB (Low Brightness Mode)

- Compatibility with classroom computers, laptops, and other audio-visual components
- Uniformly bright, clear images with good resolution and excellent color rendition
- Reliability including proven track record for good customer service and next day advanced replacement warranty
- Low-profile size to avoid blocking views of screens and whiteboards
- Availability of specialized projectors and/or lenses for unique classroom spaces
- Accessibility of filter change without removing projector
- Lens shift preferred with standard Throw Ratio Range: 1.35–2.2:1
- Closed Captioning capability (preferred)
- Laser lit light source 20,000 hours full brightness 30,000 hours low
- RS232 or HDBT control (HDBT preferred)
- Input requirements - HDMI, HDBT, Composite Video
- Projectors shall be mounted with security mount (BMS Mfg.).
- NOTE: Projector mounts should not cover the lamp or filter change housing area so that lamp and filter changes can be made without removing the projector from the ceiling mount.
- Projector location: The center of the lens shall be exact height of the top of white projection area of the screen and perpendicular to the center of the screen. Zero keystone preferred.

New Construction

1. Room Layout (see Appendix 3)
 - Minimum Ceiling Height = Screen Size (vertically) + 5'
 - Prefer Square Room
 - For fixed tables, include power and conduit for data. If non-fixed, put power in floor boxes in strategic locations around room.
 - Table rows should be separated enough to allow students to enter row easily when others are seated.
 - Leave 9 feet between front of room and first student seat.
 - Instructor location should be to the left or right of screen. Preferably on the opposite side of room entry location

2. Acoustical (including room properties and the effects of HVAC and mechanical systems)
 - Intelligibility: STI > .9
 - Hard surfaces up front and soft in the back
 - Overall Noise Level <= 35dBA SPL
 - Sound Level 70dB +/-3dB over entire seating area, THD >0.5%
 - HVAC designed for NC30 or below
 - No AC vents by screen, no noise generation to interfere with the teacher or back rows where students sit, and classrooms placed away from noise generating locations (i.e., mechanical rooms, bathrooms, elevator shafts, etc.).

- For entrances in the back of the room, any door should have a window for viewing whether class is in session.
- Acoustic Ceiling Tiles and Carpeting (Tiles) for flooring – static resistant, lifetime warranty for wear/ravel/stain.
- The front wall may reflect sound to the rear of the room. If a reverberation problem occurs, apply a small amount of acoustical material to the walls in the rear of the room to deaden the effect. Walls in the classroom should have a minimum sound transmission class (STC) of 50.
- The rear wall of any large classroom (over 75) should have an acoustically absorbent finish. Side walls in large lecture halls should not be parallel and they should have a rough or textured surface. Noise levels should not exceed NC 25-30.

Design and Consultation process

Design guidance is of little value if it is not read, understood, and followed. We welcome suggestions to improve it, and we actively solicit opinions from faculty, staff, and students.

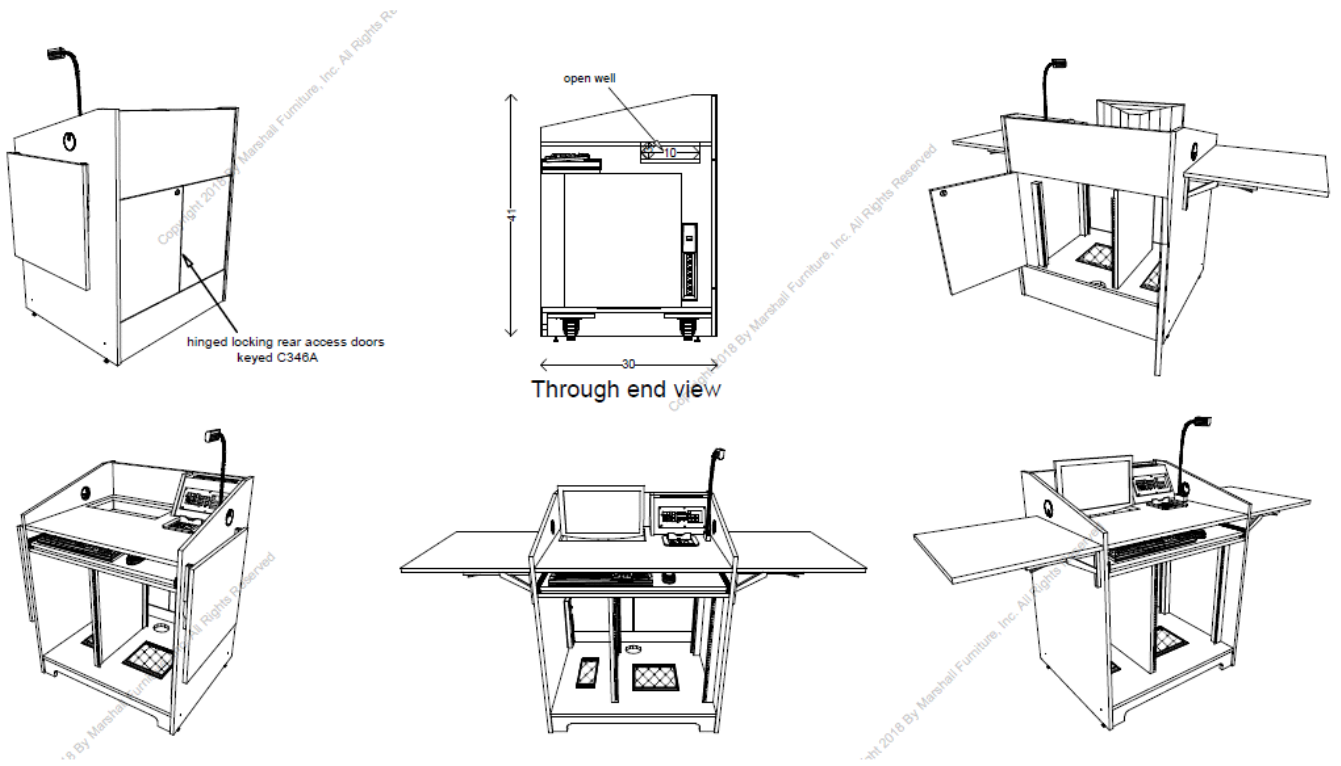
APPENDIX 1 – Lectern Specifications

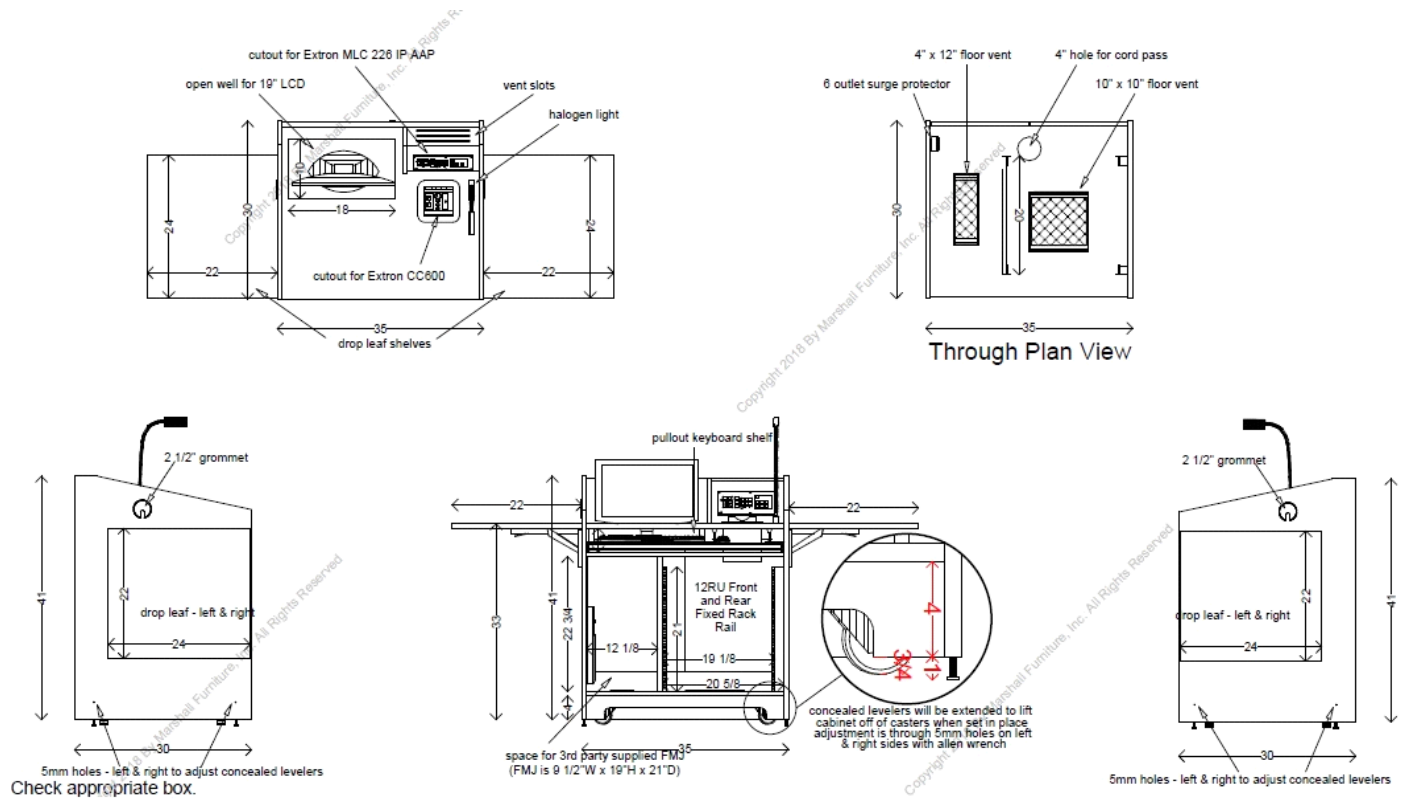
Marshall 35S Instructor's Lectern

- Lectern shall include:
- Exterior dimensions - 35" w x 30" d x 41" h
- Split work surface - rear sloped portion for touch panel/interface cut out - balance of work surface is flat
- Well for a 17" LCD monitor on presenter's left with integral cable management
- Cutout for interface device on angled work surface for flush mounting
- Cutout for Crestron Cable Cubby
- High intensity dimmable gooseneck LED light on presenter's right
- Space for a CPU tower to the left of the 12 space rack on an adjustable shelf
- 7 outlet power strip in lectern bottom
- Keyboard/mouse shelf with heavy duty ball bearing slides
- Flip- up down side shelf - 22"w x 24"d – on both sides- rated at 70 lbs, double bracket with positive spring locks with large finger pulls.
- 12 space rack rail in lower section to the right of the CPU section, with heavy duty side mounts including large mechanical fasteners at every space
- Hinged front locking access panel for the lower section with continuous security mounting bracket
- Standard lectern base with exclusive L-shaped structural support re-enforced with multiplied cleats at all joints - no power inlet
- Manufactured cable well for auxiliary cable and duplex outlet
- Blank rack plates as needed
- Middle Atlantic TD2-LK Rack mounted locking drawer
- Back doors for equipment access with C346A lock
- Constructed with black laminate
- All laminated edges with exclusive edge-wear treatment
- All laminate surfaces glued with PVA glue with applied continuous pressure at 1250 pounds per square inch
- The laminate should be mounted to a Medium Density Fiber board that has been rated for core screw holding of 290lbs. with internal bond of 117psi and modulus of rupture 4,400 psi. Moisture content should be between 4-7%
- All construction includes super structure wrap around continuous glue joinery with mechanical re-enforcement at load critical joints
- Work surface constructed in modular sections for facilitating possible subsequent retrofitting of new or additional integration items
- All work surface cut outs made with computer controlled machinery for accuracy of fit and excellence in finish
- Verify all equipment for size prior to fabrication
- Crestron Cable Management with a duplex outlet and pass-through AAP for Laptop HDMI
- 115 volt rack mounted power strip

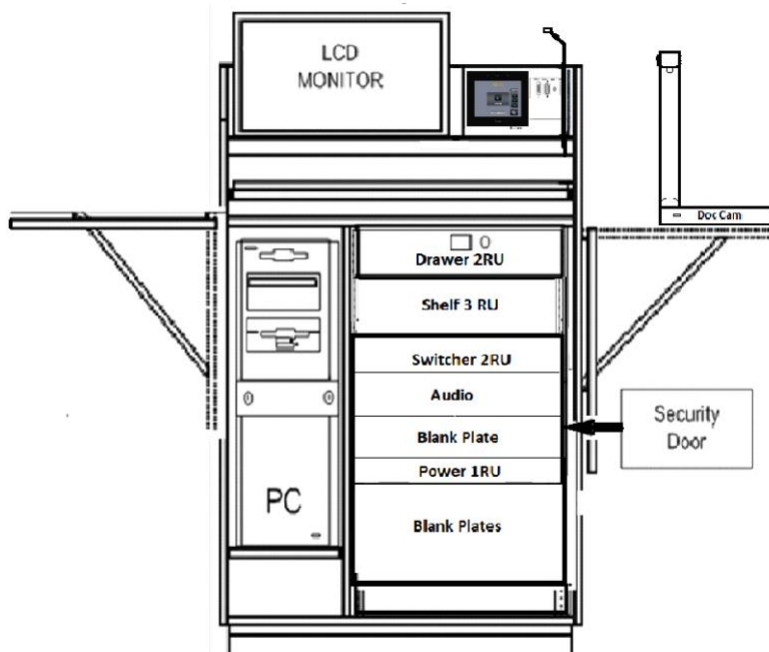
- Middle Atlantic SDR series security doors for equipment racks to cover switcher and power strip
- Four lockable swivel carpet casters and concealed levelers to lift off casters when in place
- Warranty- 3 years parts and labor
-

Shown below: Model ELSU35S



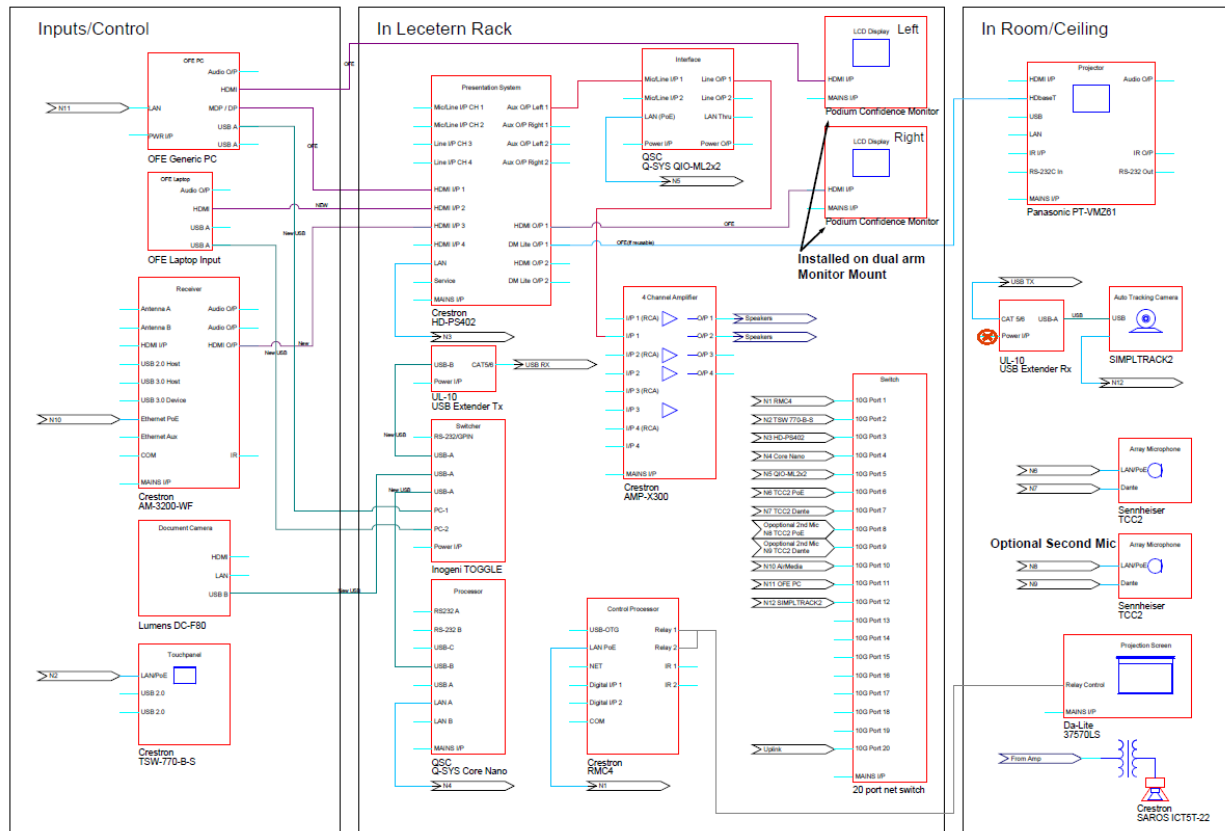


Lectern Rack Equipment Layout

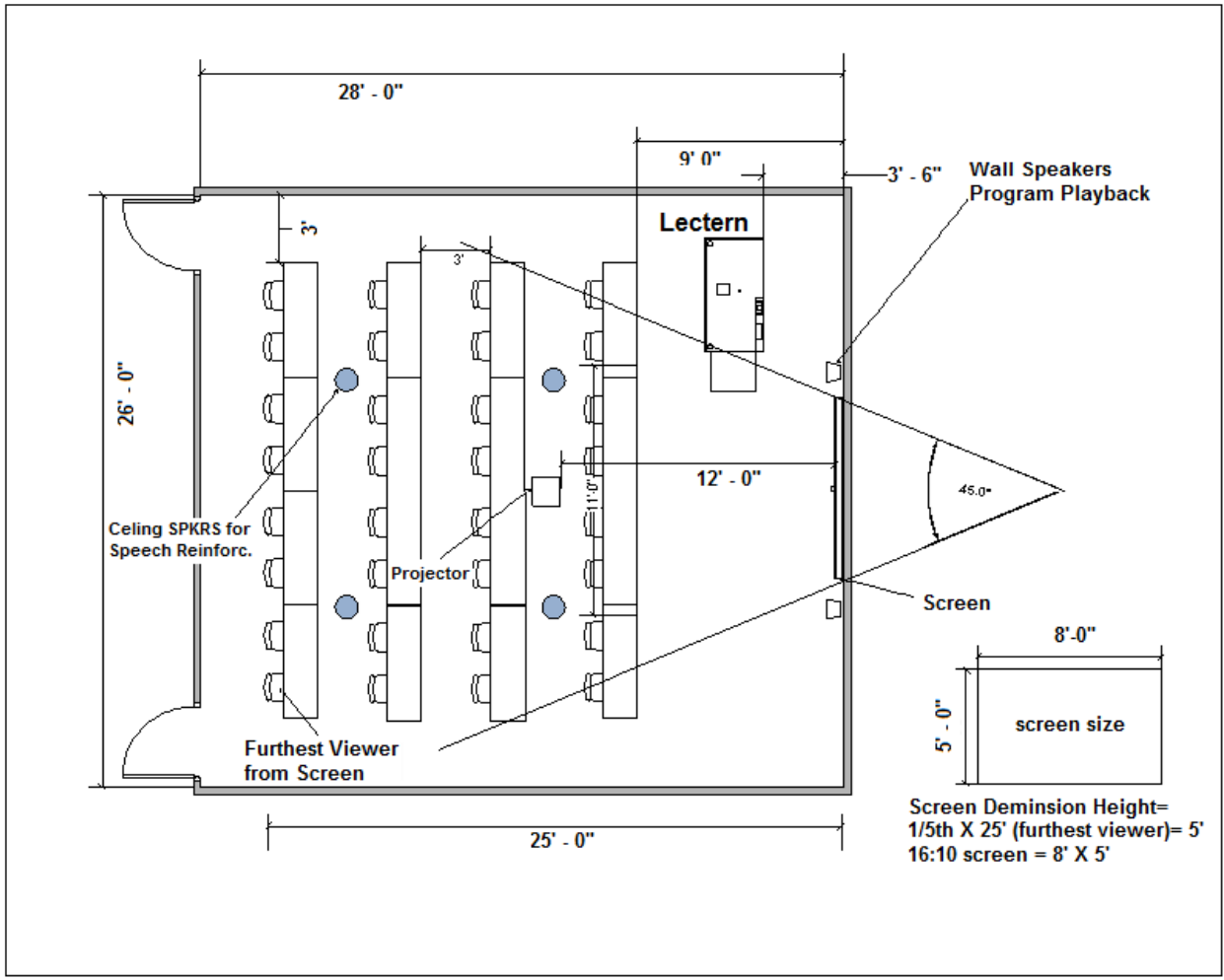


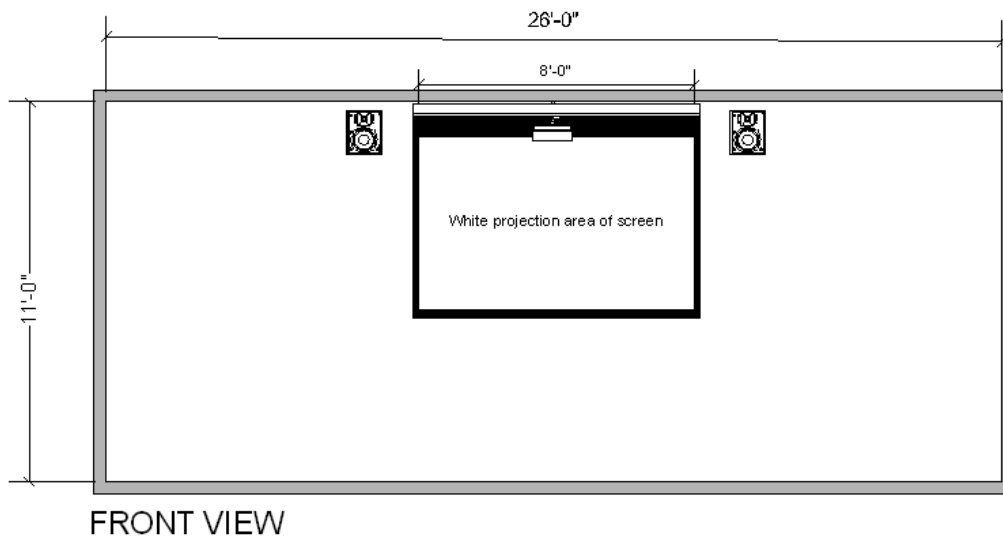
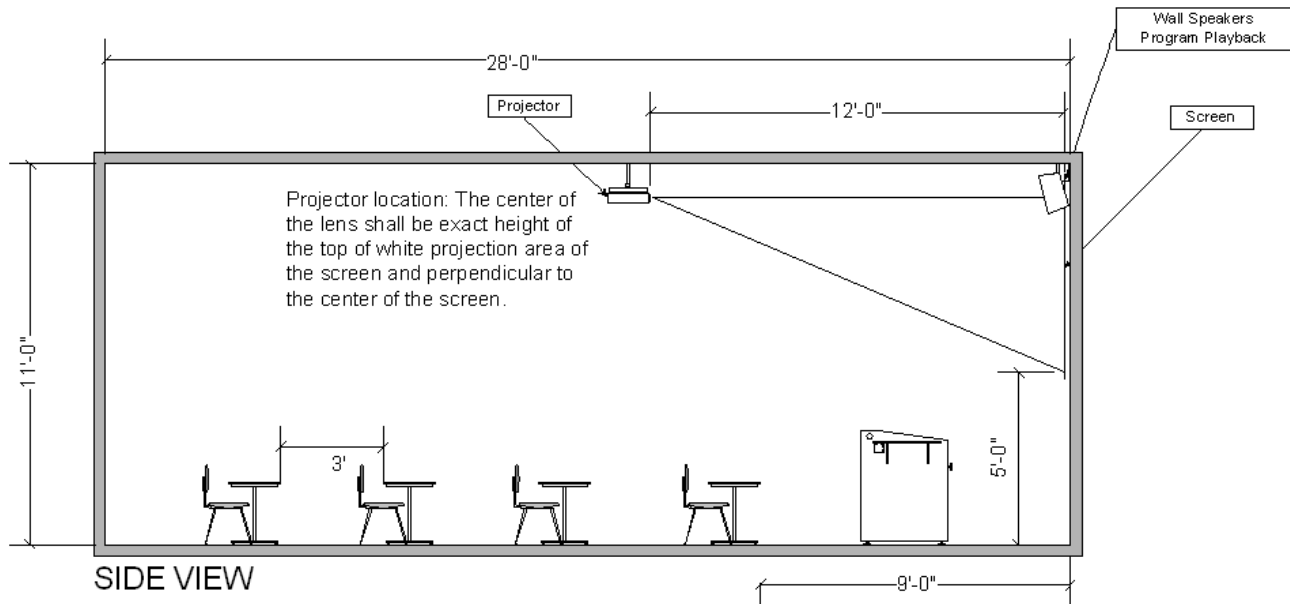
APPENDIX 2 – Line Drawing

LSU Generic Classroom Update

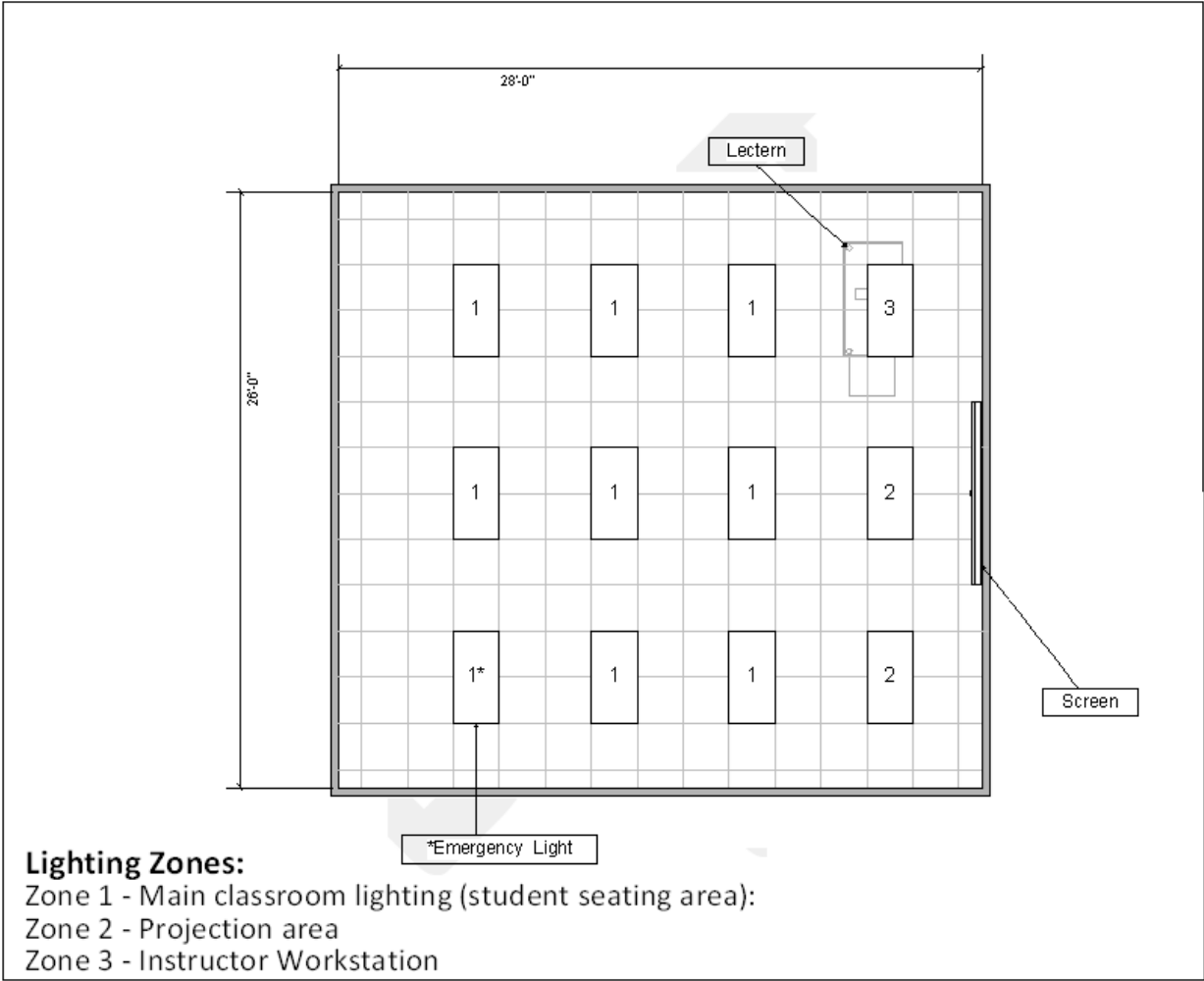


APPENDIX 3 – Typical Room Layout

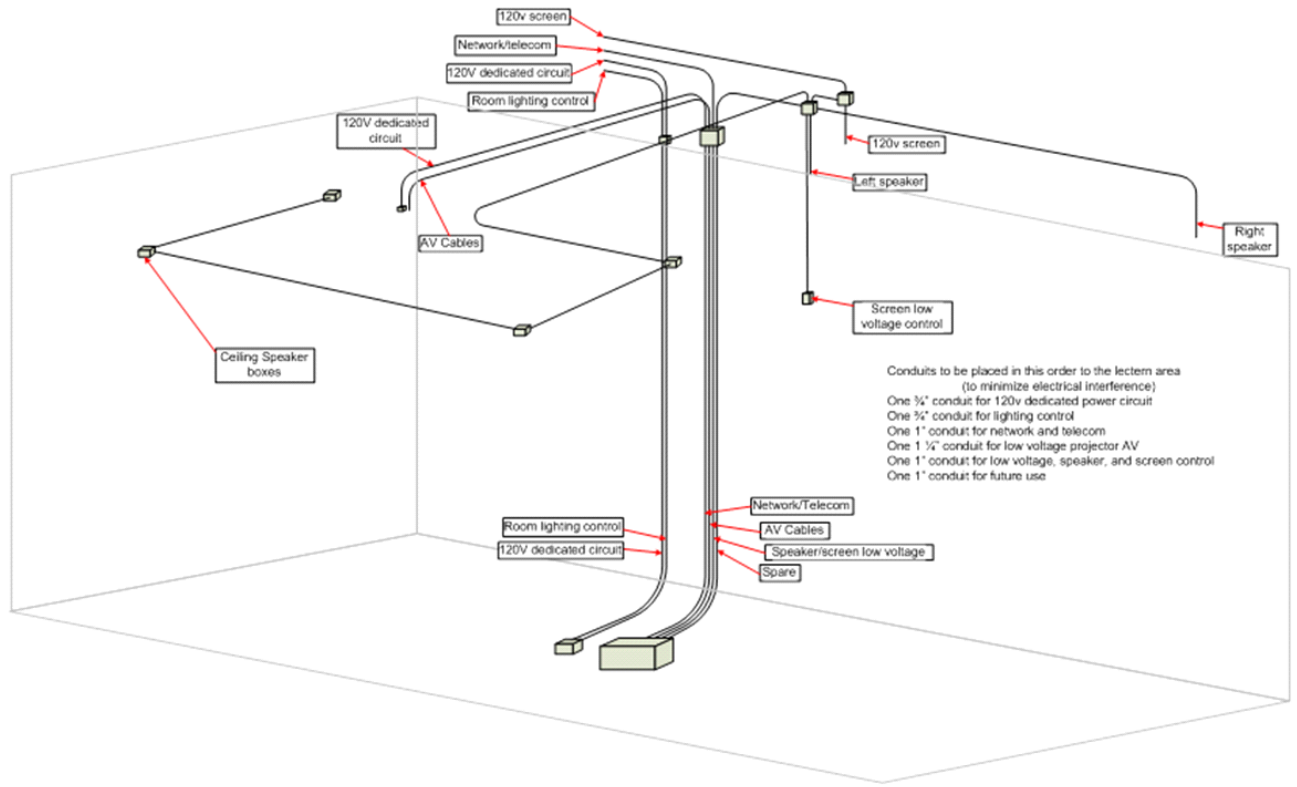




APPENDIX 4 – Lighting Zone Diagram



APPENDIX 5 - Conduit Layout



APPENDIX 6 – Current equipment as of 2023

- Crestron AMP-X300
- Crestron SAROS ICT5T Ceiling Tile Speakers
- Crestron SAROS SR8T-B-T Speakers
- Crestron HD-PS402 switching
- Crestron RMC4 processor
- Crestron Air Media
- Crestron TS-770-B-S touchscreen
- QSC Core Nano DSP
- Sennheiser Team Connect Ceiling 2
- HuddleCam Simpletrack 2 Auto-Tracking Camera
- Panasonic PT-VMZ61 Data Projector
- Epson DC-21 Document Camera
- Marshal Furniture Lecterns