

**SECTION 27 41 16.51 – INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT FOR CLASSROOMS****27 41 16.51 Integrated Audio-Video Systems and Equipment for Classrooms****1.01 MINIMUM TECHNOLOGY ENHANCED CLASSROOM DESIGN STANDARDS**

THIS CLASSROOM STANDARD IS FOR USE IN THE DESIGN OF FACILITIES FOR TEXAS STATE UNIVERSITY – SAN MARCOS. CONSULTANTS SHALL ENSURE COMPLIANCE WITH ALL APPLICABLE REGULATING CODES. ANY DEVIATIONS FROM THESE GUIDELINES REQUIRE INSTRUCTIONAL TECHNOLOGIES SUPPORT (ITS) APPROVAL. A DETAILED EXPLANATION OF THIS STANDARD CAN BE COORDINATED THROUGH THE CONSTRUCTION OFFICE.

These installations and purchases do not preclude, but compliment, existing construction standards. None of these installations will take the place of standard requirements and locations. For example, if standard wiring practices require three power outlets in a wall, and this document requires one outlet, then there will be four outlets in that wall. The end user may have additional requirements that must be coordinated with ITS.

**1.02 Basic Technology Enhanced Classroom**Classroom Design Standards

- A. ALL classrooms will be designed and engineered from the classroom needs standpoint, not by forcing any classroom into a specific shape formed by the building. Precedence is given to enhance human interaction in the audio and the visual aspects of the learning environments.
- B. ALL students and audience members shall be able to easily see and hear all presenters and program materials, and ALL Faculty and presenters shall be able to easily see and hear all students and audience members.
- C. ALL entrances/exits must be at the opposite end of room from the staging/teaching area, thereby eliminating unnecessary interruption of student in-flow. If more than one door is required, it is preferred to be in back of room, if configuration allows. If not, the second door shall be set back greater than 8' from the instructional wall.
- D. All student seats to be within 90-degree side-to-side cone established from center of screen. No greater than 45-degree horizontal angle to centerlines on screen, and no greater than a 35-degree vertical angle defined from the eyes of the closest student viewer to the top of any screen; horizontal line parallel to the floor that extending through the eyes.

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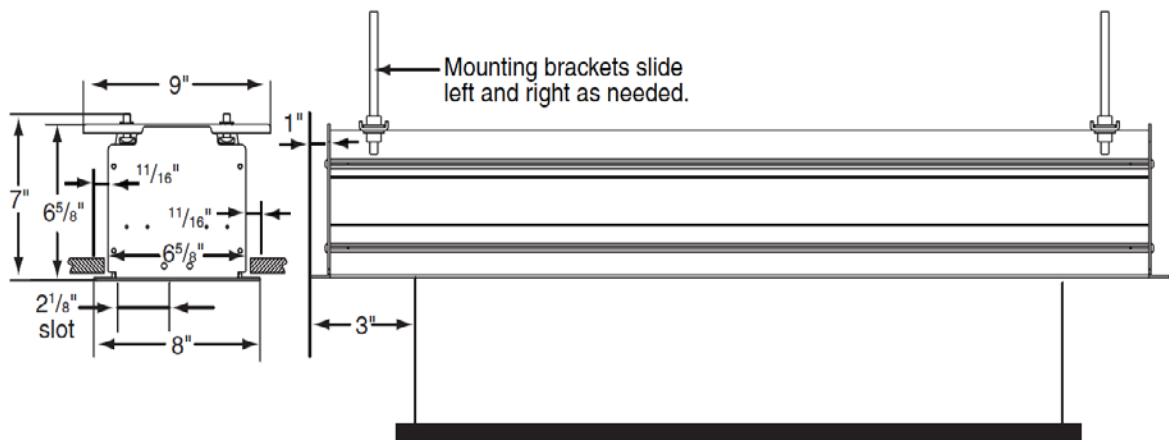
- E. Closest seats to projected image are 1.5x the width of projection screen.
- F. Farthest seats to projected image are 5 x the height of projection screen.
- G. Finished ceiling no less than 9'-6" AFF for small rooms (less than 20 students); clear height at instructional end of room, not dropped ceiling.
  1. Up to 75 students – 11' minimum clear height AFF
  2. 75 to 150 students – greater than 13' AFF
  3. 150 & over students – greater than 15' AFF
- H. Room layout should be relatively rectangular, ratio not exceeding 1.5 to 1. Staging area shall be on the narrow wall.

### 1.03 Projection Screens, Basic Technology Enhanced Classroom

- A. ITS will always specify screen. Contractor will install ceiling recessed screens.
- B. Where ceilings do not exceed 10', ITS currently specifies: Ceiling recessed Draper Access Series M with Auto Return (16:10 GREEN GUARD matt white XT1000E), manually operated. Screen should be installed flush with ceiling with no more than 6" of drop material at top of screen when lowered.

### Access/Series M by Draper

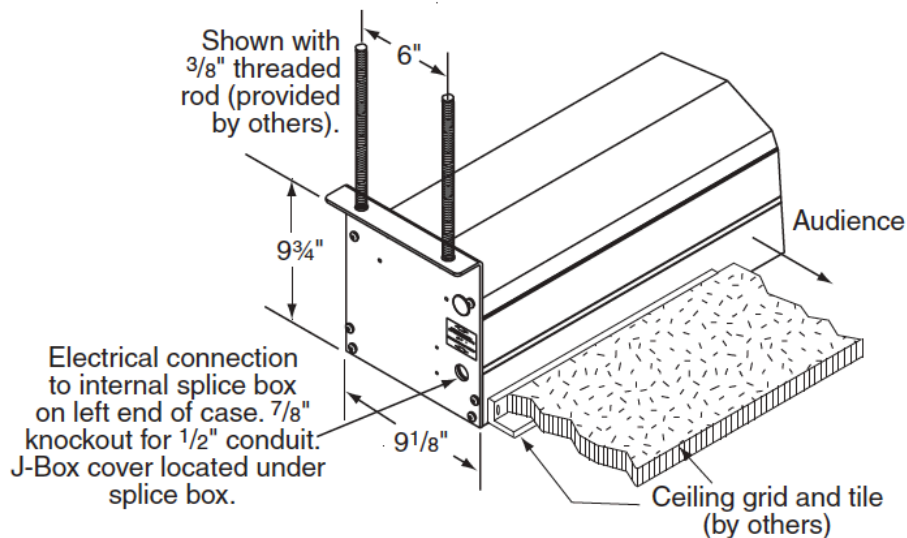
#### Case Dimensions



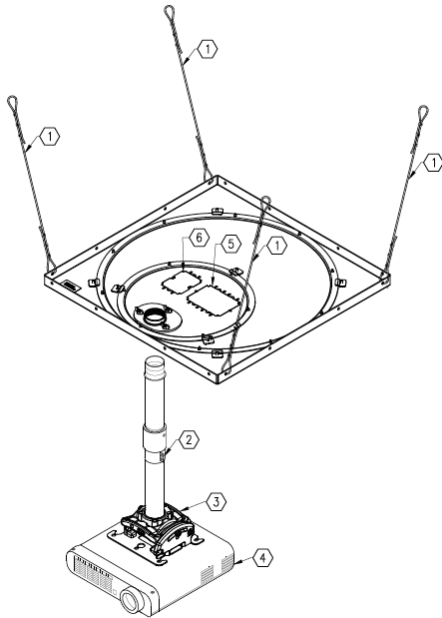
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- C. Where ceilings exceed 10', ITS currently specifies: Ceiling recessed Draper Signature/Series V (16:10 GREEN GUARD, matt white XT1000E, Quiet Motor Option, Serial Communication Option, and 24 Volt 3-Button Control Switch), Electrically Operated with no more than a 12" drop material at top of screen when lowered.

### ***Small Signature Case***



- D. Optimal distance between the first row of seating and the projector screen is 1.5 x the width of the specified screen. Optimal distance to farthest is 5-x screen height.
- E. If electrical screens are used in larger rooms, wall-mounted raise/lower switches would be required adjacent to lighting controls, centralized at location of instructor's station. These switches would need to be clearly marked with text "Screen Control," "Raise," and "Lower."
- F. Provide space for whiteboard on side(s) of screen
- G. The bottom of the screen should be a minimum of 4 feet above the audience floor, allowing those seated toward the rear of the audience to see the screen.

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- A. Based on configuration of room and ceiling height, ITS will determine the exact placement for the projector. ITS will specify, order, and install the projector.
- B. ITS currently specifies the Chief CMS-445, 2' x 2' Tile Replacement Projector Mounting Kit. Contractor will furnish and install per manufacture's specification with anchors to concrete deck in the location specified by ITS, and provide one (1) 120 VAC I.G. quad electrical outlet and one (1) network drop installed directly into the Chief CMS-445. Power should be supplied through a 15' flexible whip that will allow the mount to be repositioned later to another location, as the projector model requires.
- C. In general, the projector is ceiling mounted approximately 12' - 16' from screen to front of projector lens in a room with standard 9'6" or 10' height ceiling. Distance from screen to front of projector lens varies with size of screen, which is determined by height of ceiling and depth of room, and projector model/type.
- D. The projector ceiling kit is aligned to be centered on the projector screen—center row of ceiling grid should be clear between 0' – 20' (from projection screen) of all A/C vents, smoke detectors, ceiling fans, lighting, etc. to allow for future repositioning of projector infrastructure.
- E. HVAC intake/exhaust ducts should not be located any closer than 6' to the projector location; this will eliminate circulation competition with the projector's own fan and cooling unit.

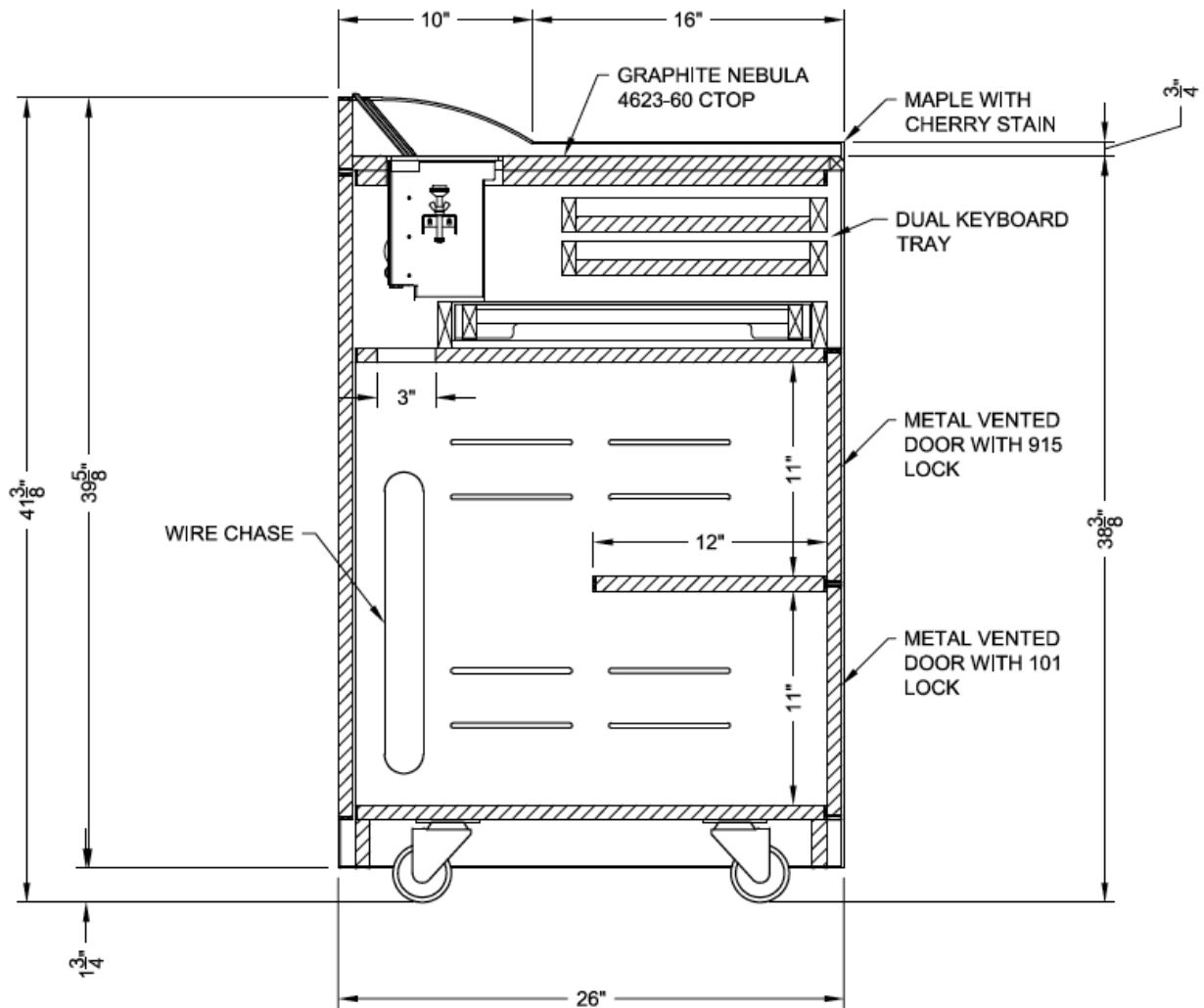
**SECTION 27 41 16.51 – INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT FOR CLASSROOMS****1.05 Audio, Basic Technology Enhanced Classroom**

- A. Assistive listening systems (ALS) shall be installed in all rooms with audio-amplification systems which accommodate at least 50 persons (See Americans with Disabilities Act Accessibility Guideline ADAAG 4.1.3., 19, 4.33). ITS will specify ALS technology and contractor will purchase and install, test, and coordinate integration into Classroom media cabinets with ITS.
- B. Noise level is to be no higher than NC = 30 in general and NC = 20 at grills or registers. ANSI/ASA S12.60-2002 sets 35 decibels for maximum background noise for unoccupied school classrooms. Separate classrooms should not share same plenum area, as sound will carry over into adjacent rooms. Walls or sound-attenuation barriers must be used to insure each classroom's audio environment is isolated from each other.
- C. Currently ITS specifies a monaural system using the JBL Model Control 24CT where each speaker should be spaced based on a minimum 130° conical coverage at a 10" ceiling, and the JBL Model Control 26C where each speaker should be spaced based on a minimum 110° conical coverage for ceiling heights greater than 10'. Speaker placement should be coordinated and approved by ITS.
- D. ITS will install speakers in all Suspended Acoustic Tile (SAT) ceilings, not exceeding 11' AFF, unless otherwise coordinated. Contractor is to install speakers in non-SAT ceiling materials, regardless of ceiling height.

**1.06 Multimedia and Video, Basic Technology Enhanced Classroom**

- A. ITS media cabinets will be designed and purchased by ITS. Funds for these purchases will be included in the construction budget. Estimates will be provided by ITS to the university's construction director.
- B. Classroom media cabinets typically contain rack-mounted computers, monitors, visual presenters, media players, sound amplification, signal routing/switchers, power conditioners, control systems, and cabling to connect to wall outlets. The media cabinets range in size from 36" wide x 26" deep, to 48" wide x 30" deep relative to classroom size and instructional requirements. While these cabinets are mobile, they are typically tethered to wall connections with a large umbilical up to 10'. The wall connections for the components in the lectern/instructor workstation will also be installed by ITS. Conduit with pull strings in walls are to be installed by contractor.

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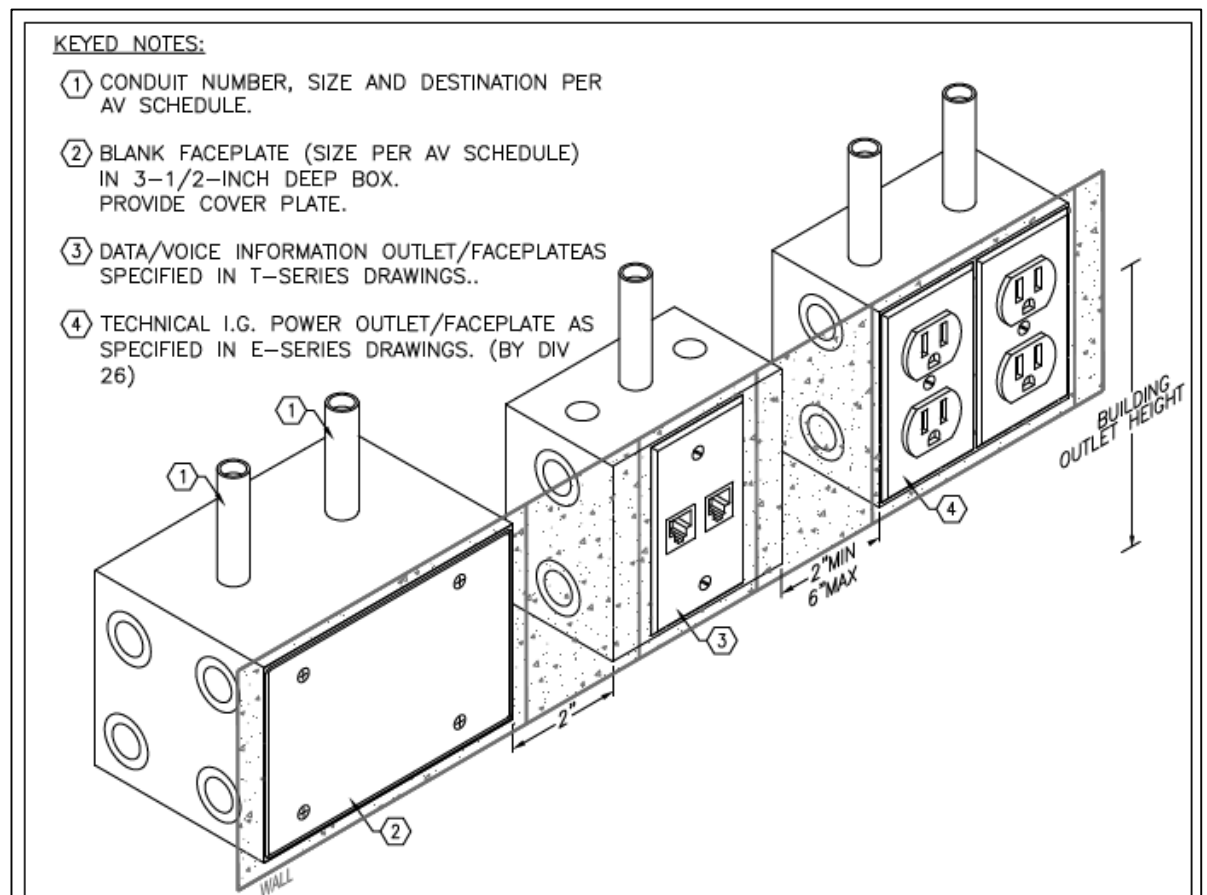


#### 1.07 Networking and Communications, Basic Technology Enhanced Classroom

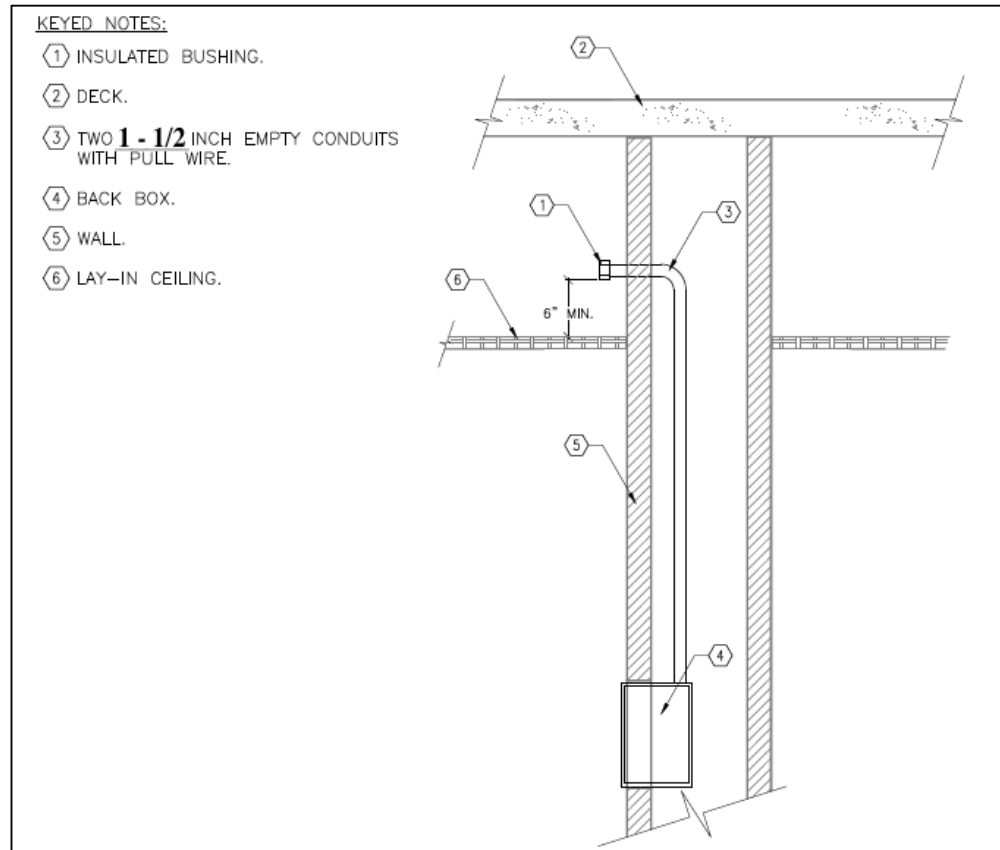
- A. Four (4) Category 6 or better network connections direct from the MDF/Switch shall be wall mounted adjacent to the 120VAC I.G. quad electrical outlet at the side wall of the classroom 5' from the front projection wall and on the side of the room opposite the main entry. The lines will have a ten-foot service loop AFC.

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- B. Contractor will provide one (1) three-gang 90 cu.in. metal electrical outlet box (8-5/8”L x 4-1/2”W x 3-1/2”D) fed by two (2) 1-1/2” rigid conduit running from top of box to AFC with 90 degree sweep terminating into plenum area towards location of projector for control and signal cables. The three-gang 90 cu.in. metal electrical outlet box will be mounted adjacent to the data connections and quad power outlet. Contractor to provide metal wall plate with 2” centered opening and nylon bushing. Contractor to provide nylon bushings on both ends of AV cable conduits or pipe. Special wall plates with AV connections to be installed by ITS as required. These conduits will accommodate all A/V cabling between the projector and the media cabinet.



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- C. In case of floor box/poke-through device, all conduit sizes remain required unless otherwise coordinated by ITS; two (2) 1-1/2" conduits for A/V cabling, two (2) 1" conduits for network and electrical.

### 1.08 Power, Typical Classroom, Basic Technology Enhanced Classroom

- A. Provide isolated ground (I.G.) and neutral power circuits that are clean of ambient and stray signals for the lectern/tech projector circuit(s). No other powered items are to be tied into circuits supporting instructional technology. All equipment is to be on the same phase.
- B. Provide a 120 VAC I.G. quad electrical outlet on the sidewall of the classroom, approximately 5' from the front wall at standard height. It will be on the sidewall of the room opposite the main entry.
- C. Provide a 120 VAC I.G. quad outlet, installed in the ITS specified Projector Mounting Kit (see 1.04), approximately 12 to 16 feet from the screen location. Conduit will be installed to a point four feet above and centered over the projector



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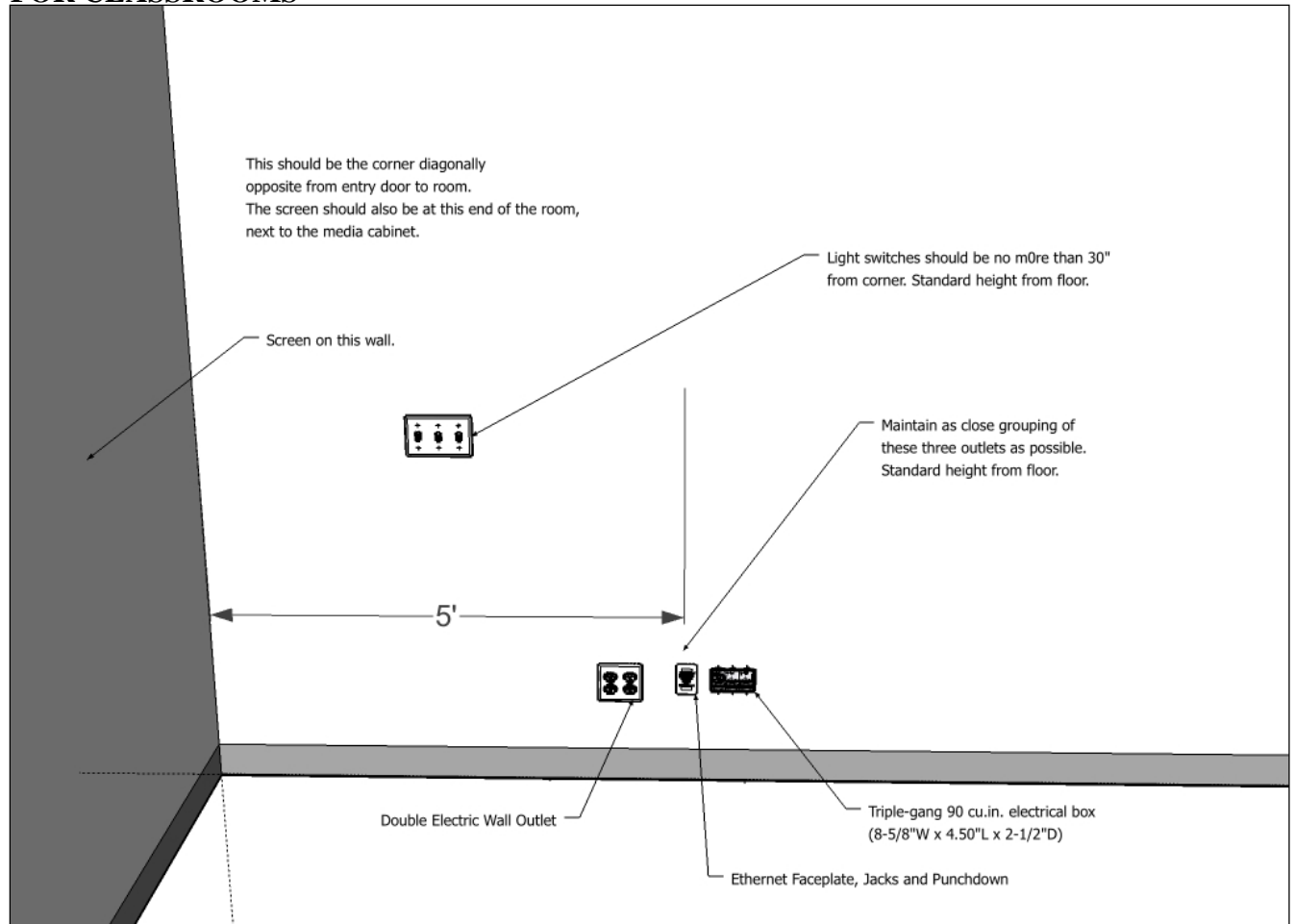
mounting location. Outlet will be connected to the conduit by a fifteen-foot flex cable. This outlet will provide power for the data projector at the front of the classroom. Exact location for Projector Mounting Kit to be determined by ITS.

- D. Floor penetrations for the conduits into the instructional tech lectern are to be centered under the ITS media cabinet and located so that the minimum 4' behind and 2' to each side are maintained for both access and cooling/air flow of equipment.

**1.09 Lighting, Basic Technology Enhanced Classroom**

- A. Do not place any ceiling light fixtures within 7' of any projection screens, unless reflectors restrict lights directly downward to not spill or reflect onto screens. The front panel of lights reflecting onto the screen will be independently controlled.
- B. Plan for the instructor to adjust all the lighting levels for his needs from near the teaching position. All lights will be controlled from a minimum of two points; near entry/exit to room, and near location of instructor/media cabinet. Besides being able to completely shut off the front panel of lights near the projection screen, the other lights in the room should be able to be dimmed by switching off either half the fluorescent bulbs in each fixture, or either one or two bulbs in each fixture should they only contain three bulbs.
- D. First switch panel above the sidewall quad power outlet positioned so the instructor can easily adjust lights while standing behind lectern or media cabinet (approximately two feet from front wall on side wall opposite the main entry.) All light controls must be clearly marked with engraved switch plate with 1/8" high lettering. (See picture below for control placement relative to A/V cabling and electrical.)

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- D. Fire-alarm strobes are not to be placed behind projection screens, which when in the down position would block the light from the strobes.
- E. Classrooms and lecture halls need the ability to be made totally dark, therefore, all lighting, including night lights and emergency lights should be de-energized with localized switching in the room. Emergency Lights will be re-energized at building power loss or activation of the fire alarm system.
- F. Whiteboards may be lighted via a single tube fluorescent fixture with a directional reflector and must be independently switched. Use a separate on/off, circuited and wall mounted light strip above the instructor's whiteboard. Provide proper clearances to the fully extended projection screen. Whiteboard lighting should not be supplied with ceiling mounted hanging fixtures that interfere between projector and projector screen sight lines.
- G. Automatic lighting systems must have manual overrides.

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- H. Fixtures shall be full spectrum fluorescent type. Generally, the fixtures should be 2'x 4' parabolic fluorescent. Light levels will be 50-70 foot candles via recessed fluorescent fixtures, and lighting shall be glare free, with the appropriate colored lamps that do not flicker or provide uneven light.

**1.10 Storage, Basic Technology Enhanced Classroom**

- A. Provide at least one lockable closet per building, minimum 36 square feet (6'W x 6'D x 10'H). Support and storage closets will be accessible from hallways and will NOT be inside the classrooms, with 36" wide entrance, electrical power and lighting for Instructional Technologies Support storage of emergency support ladder and replacement equipment to prevent loss of class time.

**1.11 Windows, Basic Technology Enhanced Classroom**

- A. Action must be taken to eliminate outside light.
- B. Windowless rooms are preferred (subject to user group input).
- C. Windows will be located on the side of the rooms, not the ends. Windows to have two coverings; one layer is to allow some light entry into room; the second layer is to cut all light entry into room. Provide enough recessed pocket space at ceiling system or window recess to allow proper placement of the dual layer shade system.
- D. Venetian blinds or drapes are not desired. All windows must have blackout shades. Dual roller blinds, with translucent layer opening density adjusted for light exposure for particular building elevation most desired, such as "MechoShades."
- E. No windows on the same wall or near projection screens.

**1.12 Ceiling Material and Heights, Basic Technology Enhanced Classroom**

- A. Use regular 2' x 2' lay-in acoustical tile in exposed metal suspension system tiles (not narrow designs or metal edged tiles). Use non-sagging (humidity resistant) lay-in acoustical tile for most classroom ceiling areas to allow easy overhead access.
- B. Ceiling heights should be: (minimum clear height AFF at both projector and screen location.)
  - 1. 10 – 25 students – 9'6" – 10'6"
  - 2. 30 – 50 students – 10'6" - 11'6"
  - 3. 50 to 75 students – 11'6" - 12'6"
  - 4. 75 to 150 students – greater than 13' AFF
  - 5. 151 & over students – greater than 15' AFF

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- C. If ceilings are higher than 12' high, the contractor will coordinate with ITS for an alternative projector and screen mounting plan.

**1.13 Entrances, Basic Technology Enhanced Classroom**

- A. Entry/exit should be at back of room. Doors shall be located opposite the designated instructor station or the far corner of the adjacent wall.
- B. Doors shall be a minimum of 36" wide and contain a small window, have quiet operational and closing characteristics. Minimize noise transmission into classroom from corridors – no door transfer grills.
- C. Doors shall have automatic door bottoms and edge sound treatment where high noise levels may occur outside of the door (some classes run two periods so should not be disturbed by class changes). Consideration for them to also have bumpers, gaskets, sound strips, nylon bushings, silencers or sound strips on the strike jambs and hardware to minimize closing and impact noises and noises outside the door.

**1.14 Floors, Basic Technology Enhanced Classroom**

- A. Floor and other elements surrounding classrooms to have an Impact Isolation Class (IIC) that prevents sound transmission into room from floors or equipment surrounding the classrooms. Refer to ANSI/ASA S12.60 for minimal requirements.
- B. The needs of ADA access and pathways must be addressed. Only seating tiers are allowed in classrooms with 100 or more student seats, as long as accessible positions are located at the front, back and middle of the room and visual sight lines are maintained between student positions, instructor and screens.
- C. Sight lines relative to floors with differing elevations – consideration must be given to sight lines between instructors and students so that eye contact is possible between instructor and all students in all situations – for instructors as tall as 6'-8" or as short as 4'-10", as well as those in wheel chairs.

**SECTION 27 41 16.51 – INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT FOR CLASSROOMS****1.15 Multimedia and Other Hardware, Basic Technology Enhanced Classroom**

- A. Technology hardware, unless specified elsewhere, will be installed by ITS, in most cases. The cost of these items will be estimated by ITS, included in the construction budget, purchased by ITS, and installed by ITS, or under their supervision. ITS will provide a spreadsheet of items and cost estimates as required. Based on time lapse between initial cost estimate and selection of items and actual time of construction, ITS may alter equipment selection based on costs or features, or both.

**1.16 Chalk Boards/Whiteboards/Tack boards, Basic Technology Enhanced Instructional Space/Classroom**

- A. All Whiteboards 4' high w/ flat porcelain on steel surfaces, with aluminum trim, tray and end caps, concealed spline connections. Set trays at 36" AFF, and provide 25-year warranty against surface defects, shadowing after erasing, etc.
- B. Do not place whiteboards behind technology lectern areas where lectern will block view of whiteboard from student seating positions.
- C. ITS does not recommend traditional chalkboards in rooms with electronics which rely on intake/exhaust fans or filter mediums for cooling. Chalk silica has a proven damaging effect on open electronics and reduces the life expectancy of projectors, and computers. It is also very difficult to clean from monitor screens and keyboards.

END OF SECTION 27 41 16.51