



CLASSROOM & TECHNOLOGY DESIGN & CONSTRUCTION MINIMUM REQUIREMENTS

PREPARED
IN
COLLABORATION
WITH

THE SUB-COMMITTEE OF THE
UNIVERSITY COMMITTEE OF
INSTRUCTIONAL FACILITIES

12/19/07

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DIVISION 00.30.00 INTRODUCTION / GENERAL INFORMATION:

00.30.01 Why is there this Minimum Requirements Document for PSU Classrooms:

- a. To help minimize recurring design and construction problems that negatively impact classrooms;
- b. To help eliminate incongruities in classrooms, especially related to use of the various switches, labeling, and other controls;
- c. To document those classroom aspects very critical to supporting the room users and those parts that can negatively affect the room;
- d. To define distractions that can hinder the learning and instructional process so that the distractions are eliminated;
- e. To minimize “redo” change orders and help save on project cost;
- f. To help be a communication tool by helping all design team members work with those involved with responsibilities for the PSU classrooms.

00.31.00 Minimal Considerations:

- a. The information presented in this document deserves minimal considerations for the design and construction of all PSU **classrooms, seminar rooms and lecture halls** being designed or planned new or in remodeled work.
- b. Please note that this is a “living” document that is periodically updated as new needs are introduced to the ever evolving educational environment. Due to this evolutionary need, the design team may be introduced to some of the newer and very important developments not yet identified in this document. Such changes need to be carefully considered and incorporated into the design and construction process when presented to the leadership involved with the project.
- c. The intent of this document is to NOT impede progressive thinking relative to classroom design. However, the information is presented to indicate the minimum requirements necessary when this document was last updated. New ideas that can be conducive to the educational process are encouraged and are to be presented to the **Instructional Support Group** for evaluation and feedback to the design team, should the new idea have merit or not appear appropriate for the particular circumstances. Such communication should be in writing.

00.31.01 General Purpose Classrooms (GPCs):

GPCs are defined as those classrooms, seminar rooms and lecture halls that are scheduled via the Registrar’s Office for use by PSU faculty, staff, colleges, departments or PSU organizations. To allow easy use across the campus by all instructors, all **GPCs** by necessity require common elements.

- 00.31.02** **GPCs** are monitored and maintained by representatives from the Office of Physical Plant (janitors, area services, maintenance personnel, etc) and the **University Committee on Instructional Facilities (UCIF) Sub-Committee**, composed of members from various disciplines. The **GPCs** are up-graded by OPP and the disciplines representing the above Committee.
- 00.31.03** Additional considerations are often addressed and included in the **GPCs** that may be specific to the localized needs of a college or department, while including these **Classroom and Technology Design and Construction Minimum Requirements** hereafter referred to as **GPC Minimum Requirements**. Such additional considerations in **GPCs** are the responsibility of the college or department to pay for, maintain and upgrade.

00.31.04 Priority vs. No Priority Scheduling - GPCs where departments or colleges are given a lead time before the University wide scheduling of the classrooms are said to have priority scheduling. All other GPCs have no priority scheduling. Priority scheduling occurs when a department or college fully or partially funds a classroom and then contributes it to the GPC pool fully scheduled by the Registrar's Office. All classrooms that can be used by the University wide population are to be GPCs. Some graduate level and very special classrooms, such as art or music rooms, may not be easily adaptable to general classrooms usable by the University wide population. These classrooms would remain departmental or college classrooms.

00.32.01 College and/or departmental classrooms, seminar rooms and lecture halls:

(CDCs) - The recommendation is that **ALL CDCs** comply with these **GPC Minimum Requirements**. At the very least, do not design and build classrooms, seminar rooms and lecture halls that inhibit the later upgrade of the **CDCs** to **GPCs**. Additional components may be added to **CDCs** that address the specific needs of the college or department as qualified above.

00.32.02 **CDCs** are defined as those instructional spaces generally maintained and upgraded at the expense of the college or department. During late design, construction or shortly after a project is completed, many colleges or departments decide to have rooms originally defined as **CDCs** converted to **GPCs** – usually due to financial issues. Conversion from **CDCs** to **GPCs** is relatively simple when constructed according to the **GPC Minimum Requirements**. The proper infrastructure and components would be in place. Thus, the college or department would not have to pay to upgrade the **CDCs** to the minimum requirements of the **GPCs**, in order for the classroom to become a **GPC**.

00.33.00 Trends:

00.33.01 The trend is for technology in the learning environment. The infrastructure needs to be provided, even if not immediately used or activated.

00.33.02 Please note that very often the technical design and construction documents do not include enough background information identifying expected performance characteristics of the spaces or systems. Please include such commentaries on construction documents.

00.33.03 The most current version of these minimum requirements is available for viewing on the Web at:

<http://clc.its.psu.edu/Classrooms/Design/>

00.33.04 Other web sites that may be helpful:

<http://www.libraries.psu.edu/mtss/equipment/purchase.html>

<http://clc.its.psu.edu/>

http://www.registrar.psu.edu/staff/instructional_facilities/inst_facilities_index.html

00.34.00 University Committee on Instructional Facilities (UCIF):

The UCIF is a group of 16 individuals that take responsibility of the instructional spaces at Penn State. The chair is from the Office of the Vice-President and Dean for Undergraduate Education at Penn State. The UCIF has members that represent professors, students, the Registrar's Office, Media Tech and Support Services, OPP, the Commonwealth Campuses, Information Technology Services, Teaching & Learning Technology, Educational Equity for Underrepresented Groups and the Schreyer Center.

00.34.01 The UCIF-Sub-committee (UCIF Sub-com):

The **UCIF Sub-com** is a working and detail committee that reports to the **UCIF**. The University Committee on Instructional Facilities Operations & Technology Sub-committee members are:

Dave Bagley	MTSS - Manager, Media Technology Support Services	814-863-0665 814-867-0665	<dpb5@psu.edu>
Lisa Berkey	OPP - Project Manager	814-865-7187	<lab2@psu.edu>
Bill Bishop	MTSS - Director	814-863-3100	<wob1@psu.edu>
Deb Blythe	OPP - Facilities Resources Committee Liaison	814-865-0795	<dzh2@psu.edu>
Becky Carolus	ITS-TLT - Manager Technology Classrooms – Chair - UCIF GPC Sub-committee	814-653-1522	<beckycarolus@psu.edu>
Ron Dodson	ITS-TNS - Director of Special Projects	814-863-4453	<rpd4@psu.edu>
Ed (Skip) Eagles	ITS-TLT - Lab and Classroom Support	814-865-0832 814-777-0832	<eae@psu.edu>
Chuck Enfield	ITS-TNS – Sr. Communications Engineer	814-863-8715	<ChuckE@psu.edu>
Ron Gurskey	OPP – Project Coordinator	814-863-8734	<rag7@psu.edu>
John Harwood	ITS-TLT - Sr. Dir. For Teaching & learning Technology	814-863-0421	<jth@psu.edu>
Dave Hollen	ITS-TLT – Director Classroom & Lab Computing	814-865-4769	<dch1@psu.edu>
Bob Myrick	OPP – UCIF GPC Facilities Coordinator , FR&P Architect	814-865-1598	<rdm6@psu.edu>
Paul Peworchik	ITS - Coordinator Information & Administrative Systems	814-863-1511	<pjp@psu.edu>
John Holman	ITS-TLT - Manager Window Systems Software	814-867-0527	<jholman@psu.edu>
Don Reed	University Police - Technology Security	814-863-1977	<reed@police.psu.edu>
Penny Smith	Registrars Office – Scheduling Coordinator - Enrollment Services	814-865-5091	<daa1@psu.edu>

- a. The individuals indicated in **Bold Lettering** above comprise the **Instructional Support Group (ISG)** from this Committee. These six individuals are **CLOSELY** involved with all design, construction and operational aspects of the general-purpose classrooms. They are to be heavily involved from the very start of any project with the design and planning team on all project aspects related to GPCs and CDCs. The **UCIF Facilities Coordinator (UCIF-FC)** is the primary contact and **CLIENT** for new and renovation project meetings that require the Penn State expertise related to GPCs. The **UCIF-FC** in turn involves the various specialists that are also **CLIENTS** on any classroom project, while also being a part of the **ISG**.
- b. The **UCIF Sub-Com** realizes that the design process is most dynamic and that continuing innovations can and should be weighed against the information included in this document. If conflicts from new innovations do occur, all such parameters are to be noted in writing to the **UCIF-FC** for the **ISG** to consider. The **ISG** will then make recommendations to the **UCIF Sub-Com** for acceptance or rejection and submit the response in writing or email form.
- c. **CONFLICTS:** If conflicts are found between these and other University design and construction requirements, please note the locations within the documents and the conflicts, so that the problem areas can be properly addressed and hopefully eliminated in the next update to this **GPC Minimum Requirements** document.

00.35.00 Abbreviations Used:

ADA	Americans with Disabilities Act
AFF	above finished floor
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
CDC(s)	College and department classroom(s), seminar room(s) and lecture hall(s)
CD	Compact Disk
CRI	Color Rendering Index
DVD	Digital Video Disk
FC	Facilities Coordinator
FR&P	Facilities Resources & Planning
GPC(s)	General Purpose Classroom(s), seminar rooms(s) and lecture hall(s)
>	greater than
HER	Head end room (for technology that routes data to different rooms in a building)
HVAC	Heating, ventilating and air conditioning
IIC	Impact Isolation Class
ISG	Instructional Support Group
ITS	Information & Technology Services
<	less than
MTSS	Media Technology and Support Services
NRC	Noise Reduction Coefficient
OPP	Office of Physical Plant
PC	Project Coordinator
PM	Project Manager
SSTs	Stacking Student Tables
STC	Sound Transmission Coefficient
TLT	Teaching & Learning Technology
TNS	Telecommunications & Networking Services
TV	Television
UCIF	University Committee on Instructional Facilities
VCR	Video player

DIVISION 01.40.00 QUALITY REQUIREMENTS**01.41.01 BACKGROUND AND BUILDING NOISES AT OR NEAR GPCs:**

Room Acoustics – To be designed for speech with reverb decay of less than:

- 0.6 seconds at the mid-speech frequencies of 250, 500 & 1,000 Hertz for room sizes up to 10,000 cubic feet.
- 0.7 seconds for same range for rooms up to 20,000 cubic feet.
- See following sections for NRC, IIC, NC, etc.
- Refer to ANSI/ASA S-12.60, “American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools” for additional minimal acoustical considerations that apply to the GPCs. Note that this classroom requirement document has more stringent requirements in some cases.

01.41.02 COMMISSIONING AT CLASSROOMS – refer to section 40.80.00.

01.42.00 GENERALIZED CLASSROOM DESIGN CONSIDERATIONS:

01.42.01 General Building Design Considerations Related to General Purpose Classrooms:

- a. Locations for GPCs (new construction and if possible in renovations):
 - (1) Preferably on ground entry level and as close to main traffic entry doors as possible due to high traffic volume.
 - (2) Near major stairs and elevators on levels immediately above ground level to isolate class change noise and high traffic functions from office and lab functions.
 - (3) Keep away from noise generating sources as restrooms, building system rooms, labs and hazardous material rooms.
- b. Provide long walk-off mat space (at least four full steps) from exterior doors to first classroom doors to trap dirt, mud, salt, snow, moisture, etc.

01.42.02 Corridors & Seating Outside Classrooms:

- a. Corridors to be sized for double the loads identified in codes due to the heavy number of students leaving classrooms competing with those trying to get in classrooms.
- b. In any case corridors to not be less than 10' wide.
- c. Bench type seating is to be provided outside classrooms. The bench length is to total the length of the corridor and can alternate side to side or be continuous on one side, except at doors. Integrate waste receptacles into bench seating areas.
- d. Consider cleaning, maintenance and comfort requirements when detailing bench seating.



01.42.03 Student Waiting/Meeting Alcoves/Commons:

- a. Encouraged along circulation paths serving classrooms, to allow groups to meet and have discussions while waiting for class changes.
- b. Such spaces can be equipped with chalkboards to facilitate student discussions and interactions.
- c. Such spaces should be well designed to contain noise that may be generated in such settings.

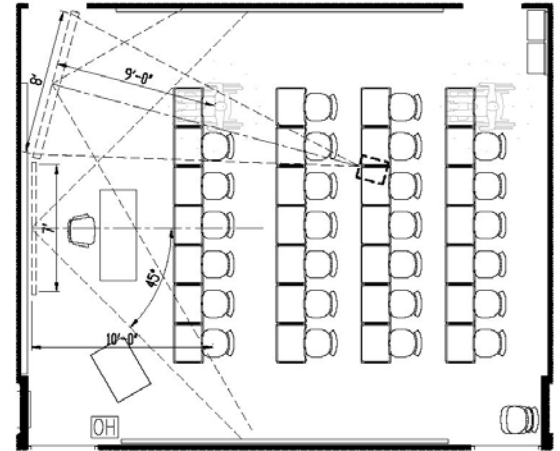


01.42.04 Classroom design – should be dictated from the classroom needs and out from there, not by the building thus forcing the classroom into a specific shape formed by the building:

- a. Better sight lines can be achieved.
- b. Better seating arrangements can be situated.
- c. Better technology needs can be addressed.
- d. Adequate instructional area can be included:



- (1) To have all areas and writing surfaces easily visible from all student seating.
- (2) To have 24" x 60" instructor table w/ modesty panel, with chair(s) at table(s).
- (3) To have minimum 8' space with 10' preferable (as further restricted by screen viewing needs identified later) from board wall to first row of student seats.
- (4) To have all lighting, screen, tech controls and telephones easily accessible from a defined wall area near any instructional technology lectern (podium).
- (5) To be totally accessible.
- (6) To have space for parking cart-mounted overhead projectors.



- e. Machinery and other noises need to be located remote from the classrooms – and the list can go on and on!

01.42.05 Room Dimensional ratios:

- a. For rectangular rooms – width to length – between 1-1/2 to 2 and 3 to 4 with the instructional end on the narrower dimension.
- b. Room shape greatly impacts space efficiencies for a particular classroom need – carefully consider and do not use a cookie cutter approach.
- c. For auditorium rooms – more fan-shaped with seating, screen and instructional needs dictating the shape. Such spaces need early involvement of the **ISG** for detail needs so that floor and furniture plans, as well as cross sectional drawings can be prepared and used for discussions with the **Instructional Support Group**.

01.43.00 Codes, ADA, accepted standards, controlling authority and agency requirements:

- a. Comply with or exceed on all new and renovation work.
- b. PSU requirements in some cases exceed these minimums, thus enhancing the code, ADA, accepted standards, authority and agency requirements. Comply with the PSU enhancements when more stringent.

01.44.00 Visual:

- a. All student seats to be within 90-degree side-to-side cone established with 45-degree angles to screen centerlines in room and the 35-degree vertical angle defined from the eyes of the closest student viewer to the top of the screen and a horizontal line parallel to the floor that extends through the eyes.
- b. Seats to be no closer than the dimension of the screen width with 1 to 1-1/2 times the screen width the preferred minimum distance. Example: 8' screens should have seats no closer than 8' to 12'. The 90-degree side-to-side cone and the 35-degree vertical requirement can increase this distance to greater than the 1 to 1-1/2 times requirement.
- c. No visual obstructions, like columns or podiums, between student seating areas and chalkboards and screens at instructional end of room.

d. **Glare (on chalkboards, projection surfaces, or whiteboards):**

- (1) Glare from overhead lighting causes distractions to learning.
- (2) The contrast ratio for the student viewing area of the front of the room shall not exceed 3 to 1.
- (3) A light meter is to be used to check this in new and renovated construction in a three-row three-column matrix at the front, with contrasts recorded and noted for correction.
- (4) See requirements for higher density of reflective louvers in recessed lighting fixtures to reduce this problem.

01.45.00 Classroom Equipment Storage:

- a. Space (closet type alcove) to be provided in each classroom for storage of classroom media equipment, such as projection stands, carts, etc.
- b. In classrooms also doubling as computer lab/classrooms, additional space shall be provided for printing tables and lockable storage space for printing supplies, batteries, paper, cartridges, etc.

DIVISION 02.00.00 GENERAL REQUIREMENTS:

02.60.00. ASBESTOS:

- 02.60.01** Asbestos may be encountered in renovation projects.
- 02.60.02** Identify early in design process in the room and at other external locations critical to the project area.
- 02.60.03** Identify piping and conduit routes early in design outside the space being built or remodeled to complement planning, design and construction needs.
- 02.60.04** Contact Mike Burke at Environmental Health & Safety – 814-865-6391 – burke@ehs.psu.edu

DIVISION 08.00.00 OPENINGS:

08.10.00 DOORS:

08.10.01 Classroom Entry/exit Door Locations:

- a. For single doors - at rear sides or back of rooms.
- b. For more than one door – preferred in back of room if configuration allows; if not, greater than 8' back from the instructional wall for one of the doors, with the other at the rear sides or back of a room.

08.10.02 General to All Classroom Doors:

- a. Use darkened glass in tall & narrow vision panels allowing wheel chair users to see in and out as well as tall individuals.
- b. Each door leaf to be minimum 36" wide, including those used in pairs at double doors – no strike mullions on double doors.



08.50.00 WINDOWS:

08.50.02 Exterior: (none preferred in most classrooms – exceptions – those with northern exposures)

- a. Are to be operable & have key locks mastered alike for a building, to allow staff to open in case of HVAC failure.
- b. Are to have STC capabilities of > 50.
- c. Are to be located and designed to not cast beams of sun or day- light onto projected surfaces or chalkboards at the front instructional area.
- d. Are to be thermo double or triple glazed units with e-glass to minimize heat loss and gain.
- e. Limit locations to rear sides of rooms, as chalkboards are to be on front and side walls (no windows on front wall or within 15' of front walls).
- f. Not recommended in lecture halls and interactive video conferencing classrooms used for distance education.



08.50.01 Interior – NO glass beside doors (unless translucent glass block is used) where only narrow mullions separate the glass and door areas – separation must be at least 24”; or glass must be black – no covers.

08.50.03 Window Coverings – defined in **12.20.00 WINDOW TREATMENT** below.

08.70.00 HARDWARE (DOOR):

- a. To comply with PSU and code requirements with “CR” key lock cores.
- b. To have totally quiet operational and closing characteristics. Minimize noise transmission into classroom from corridors – no door transfer grills.
- c. To have only key lock and unlock **CLASSROOM FUNCTION** assemblies – no pushbuttons in edge plate, no dogging buttons or knobs on panic hardware, must always be able to egress from the classroom side.
- d. To have drop sill plates 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).
- e. To 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.
- f. To have minimum 14” high kick plates on both sides of each door.
- g. **Special Door Hardware** – doors to projection booths, media technology rooms and media technology closets – use five push-button re-settable combination locksets (combination is changed each year; no power required in or to units) with “MTSS” key lock core.



DIVISION 09.00.00 FINISHES:

09.20.00 WALLS:

09.20.01 General – applying to all classroom walls:

- a. STC = or > 50
- b. All openings, cracks, joints to be caulked to minimize sound transmission.
- c. Pipe, conduit, duct, cable tray penetrations to be totally stuffed with sound batt with both sides of wall covered by minimum 5/8" thick drywall.

09.20.02 Inside:

- a. All walls surrounding rooms to run tight to structural surfaces and elements above ceilings.
- b. Corridor walls to have double studs staggered to isolate inside and outside wall elements.
- c. All to have non-cellulose sound blankets.

09.20.03 Exterior walls common with classroom:

- a. All penetrations and wall elements to be sealed and designed to minimize noise entry into room.



09.20.04 Finishes:

- a. Apply paint on most surfaces (other than pre-finished wood, stone or masonry surfaces).
- b. Use epoxy like paints for low wall areas subject to abuse, such as below chair rails.
- c. Apply chair rails on all non-masonry back and side walls in GPCs with movable student furniture - make of 1 x 6 oak, countersink fasteners & use wood plugs in fastener holes, fill, natural stain, & finish.
- d. Outside wall corners (such as entry recesses to classrooms) – provide corner guards to 4' AFF applied so that students cannot work them loose.
- e. Accent colors on walls are desirable – do not place on front wall or walls that might reflect onto screens.



09.50.00 CEILINGS:

09.50.01 Heights:

- a. **Renovation & Remodels** – keep the finished ceiling as high between screens and ceiling mounted projectors as possible to complement screen viewing, though no less than 9'-6" AFF for small rooms (less than 20 students) with Instructional Technology.
- b. **New Construction – clear height at instructional end of room:**
 1. Up to 75 students – 11' minimum clear height AFF between tech projector and screens.

2. 75 to 150 students – greater than 13' AFF
3. 150 & over students. – greater than 15' AFF

09.50.02 Special Requirements:

- a. **Screen cases or housings** – ceiling systems to NOT fasten to recessed screen units – units need to be dropped for servicing and replacing worn parts – screens to be placed in recessed box.
- b. **Sight lines** – between screens and any student seating to not be obstructed.
- c. **Obstructions** - keep any ducts and piping along side-walls to avoid recessed screen housings and so area between screens and ceiling mounted projectors is as high as possible.
- d. **Ceiling Materials:**
 1. Use non-sagging (humidity resistant) lay-in acoustical tile for most classroom ceiling areas to allow easy overhead access.
 2. Lay-in tiles with color and pattern (painted) are desired.
 3. Use tegular tiles & 24 x 24 or 24 x 48 sizes and normal grid members (not narrow designs or metal edged tiles).



09.60.00 CLASSROOM FLOORS:

- 09.60.01 **Multiple floor levels in a GPC** – no longer desired for instructional stages or seating tiers accessed by steps – ADA access needs must be addressed. 100 seat or greater lecture halls are the exception.
 - a. If used at student seating, all aisle riser nosings must be of contrasting color to the remaining flooring colors.
 - b. Aisle riser nosings to be metal only – plastic and vinyl do not last in high traffic areas like GPCs.
- 09.60.02 **Sloping floors** – under auditorium seating and/or at sloped aisles with flat tiers under seating are acceptable.
- 09.60.03 **Ergonomics – 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.
- 09.60.04 **Noise** – 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.
- 09.60.05 **Flooring** - as identified in project scope or program.
 - a. Use carpet tiles in classrooms, >10 stitches per inch; Antron 6.6 fiber nylon, yarn weight of 20 to 30 ounces; multi-dark colors to not show spills; stain, moisture & wear resistant; impervious and thick Unibond type backing material not affected by moisture; edge curl resistant with no edge ravel; glue resistant to wet cleaning, anti-static, UL Class A.
 - b. Use only carpet squares pre-glued (preferred) w/ temporary backing to protect glue until carpet in place, where possible.



- c. Other special flooring usage requires ISG acceptances, examples vinyl tile or sheet goods – if okayed, use the thickest materials.

09.60.06 To complement acoustical needs for room for meeting acoustical requirements defined under **Room Acoustics** and **Noise** above.

09.60.07 **Wall Bases** – generally 4” vinyl or rubber to match existing materials in room. If a vinyl or rubber base, use pre-molded corner shapes.

DIVISION 10.00.00 SPECIALTIES:

10.11.00 CHALK AND TACK BOARDS:

10.11.01 Size:

- a. 4' high w/ absolutely flat porcelain on steel surfaces.
- b. All GPCs except large auditoriums are to have chalkboards.
- c. Provide with aluminum trim and tray, concealed spline connections.
- d. Furnish with 50-year warranty against surface defects, shadowing after erasing, etc.



10.11.02 Location:

- a. Provide chalkboard WRITING surface at the instruction end and at sidewalls (except where student tech stations may be against walls – chalkboards may also be required at rear wall).
- b. DO NOT place behind technology podium areas where podium will block view of chalkboard from student seating positions.
- c. Set chalk trays at 36” AFF.

10.11.03 Add-ons:

- a. Tack-boards:
 1. ONLY IN STUDENT TECH LABS – include tack surfaces on each side wall and back wall to allow special postings, with minimum of 4' x 10' behind printing stations.
 2. In other classrooms – only place 4' h x 4' to 6' wide tack boards near rear entry doors.
- b. Chalkboards: Include top tack strip and map hook rail with movable map hooks, 1 for each 24” of chalkboard length plus one to have even number, unless otherwise accepted by the **Instructional Support Group**.
- c. Erasers: provide one per every 4' (or fraction thereof) of chalkboard. Use Finney 12” erasers. More information is available at: 1-800-846-7027, <http://www.finney-hobar.com/erasers.html>.



10.11.04 **Definition in construction documents** – include board(s) sizes, mounting information, hidden fasteners, top cork tack strip and hook rail, hooks, chalk tray and specifications on construction documents.

10.11.05 Recommended manufacturer: Aywon, 100 E. Diamond Ave., Hazleton, PA 18201; 800-523-6671

10.11.06 Whiteboards:

- a. Not supported in general-purpose classrooms at University Park Campus.
- b. Special circumstances may require them - only after UCIF **Instructional Support Group** approval.
- c. If provided, the right markers that do not damage the surface are to be furnished by the users.

10.14.00 ROOM SIGNS:

10.14.01 Required:

- a. Room numbers and “**Classroom**” is to occur at all classroom doors - see Sign Standard at OPP and adjacent example. Also include the Braille for these raised letter signs in a 6” x 6” frame.
- b. OPP Sign Standard defines signage system and type.



10.14.02 Other signs:

- a. At each entry door from corridor place below the 6” x 6” Classroom and Room number “**No Food, Drinks, Tobacco-use Allowed in Room**” and “**Doors Locked? Call Classroom Hotline 863-6000**”. An example is above.
- b. Beside each main door exiting a classroom place a 6” x 6” sign reading “**Do Not Remove Tables, Chairs or Tech Items – These Are Classroom Materials**”. An example is above.
- c. Above or beside each help phone near the podium, a special 6” x 6” sign with “**Room Number and BUILDING NAME**”, “**Tech Helpline 8-777-0035 – dates and times**”, “**Environment/Room Hotline 863-6000**”, “**University Police 863-1111**” and “**Security Escort Services 863-WALK**” is to be provided. An example is provided for 111 Forum – verify Tech Helpline number as it can be different in different buildings. Examples: Thomas is to list first 3-8506, then 8-777-0035; Willard is to have 5-8254, then 8-777-0035; Wartik is to list 5-8285 then 8-777-0035.



- d. Include horizontal or vertical 9-1/2” x 15” slip-in sheet “**Classroom Information**” sign frame and transparent cover to be mounted as follows:



- 1. At classroom/computer labs – two “ad-hoc” information frames at each door, 1 above and 1 below each room sign or as otherwise noted;
- 2. At front of all classrooms above help phone – horizontal or vertical depending on room layout chart that will be placed in frames.

- e. **Room seat count identification** - Apply vinyl number for janitorial and maintenance purposes.

- 1. **Numbers** – to be 1/8” to 1/4” high.
- 2. **Location at door** – on top hinge plate fastened to frame, so that when door is closed the number does not show.



3. **Which door** – put at east and/or south most door if codes require room to have more than one exit door. If two or more doors are necessary for room, place numbers at southeast most door.
4. **Codes** – include “**Room ###**”; are for all and only loose furniture to go in classroom – “**IC = #**” Instructor Chair, “**IT = #**” Instructor Table, “**SC = ###**” Student Chairs, “**ST = ###**” stacking student tables, “**LTAC = ###**” loose tablet arm chairs.
- f. **GPC Directional Building Signs** – locate at each building entrance a graphic building plan directory showing viewer location and classroom locations by outlines, room numbers and differing colors. Coordinate with Scott Hord at OPP in FR&P.

DIVISION 11.00.00 EQUIPMENT:

11.52.00 PROJECTION SCREENS:

11.52.00 General – applies to all projection screens:

- a. **Image Area** - provide motorized and manual with seamless, matte white finish, as large as possible, depending on room size. See below. Da-Lite screens with heavy black backing are recommended. Avoid side-tab tensioned screens.
- b. **Quantities** – a minimum of 2 screens should be provided in classroom, lecture and seminar rooms, even the small ones.
- c. **Viewing:**
 1. Align screen so that 45-degree sight lines left and right of the perpendicular centerline cover all student seats within the 90-degree cone.
 2. The vertical angle for the front seated viewer to the top of the screen to not exceed 35-degree to floor at student viewing height.
- d. **Construction Documents** – note screen angles and dimensions on plan to allow exact placement in field to avoid wall mounted projections (wall lights, chalkboards, etc.).
- e. **Screen Size** – size main screen width to most distant viewer - use a ratio of 1 to 4 for 4 x 3 format (*1 to 3 for 16 x 9 format*). *Example - 32' to most remote viewer gives an 8' wide screen (gives 11' – rounded up – for 16 x 9 format).*
- f. **Screen Mounting Height** – Set high and fully recess the housing to keep bottoms of viewing area 36” or greater above floor.
- g. **Recessed Screen Housing & Ceiling System** – do not tie together. Build box around screen unit not equipped with box so that components of the screen unit can be dropped out for maintenance or replacement without destroying ceiling, soffits or other surrounding finish materials.
- h. Mount so that in the down position it will clear wall-mounted lights at chalkboards or other protrusions.

11.52.01 Motorized Main Screen:

- a. Fully recess into ceilings at ALL locations unless identified otherwise in writing w/ **ISG**.
- b. Use engraved **SCREEN - UP, STOP, DOWN** control switch to operate screen movement.

- c. **MOMENTARY SCREEN CONTROL SWITCHES ARE NOT ACCEPTABLE. THERE MUST BE A CENTER OFF POSITION AND SUSTAINED ELECTRICAL CONTACT WHEN SWITCHED TO "UP" OR "DOWN"**. Screen units have limit switches that stop screen up and down movement.
- d. Screens 8' wide and wider to be motorized, unless defined otherwise by the **ISG**.
- e. Recess fully into the ceiling all main screens used in conjunction with ceiling mounted tech projectors - fabricate 5-sided wood boxes to house the smaller screens not equipped with the wood boxes; anchor wood box securely to building structure, not ceiling grid system.
- f. In rooms with over 60 student seats, two main screens to be provided – possibly three in auditoriums. In such case the manual second screen is not necessary.
- g. Co-ordinate the electrical screen needs with the piping, duct and other building equipment section 20.01.03 and electrical conduits, wireways, etc. section 26.05.06.

11.52.02 Manual Second Screen:

- a. Size width to room, but no less than 5' wide or 1 to 6 ratio screen width to most remote seating position.
- b. Identify exact height from bottom of screen housing to floor, again as high as possible and when extended no less than 36" AFF.
- c. Do not hang screens from T-bars as hangers pull down – ceiling edge angles may be fasted to such boxes.
- d. Hang screen housing inside 5-sided box recessed into ceiling as pictured and noted above.
- f. Provide pull **chain** with knob on end for pulling down screen. Pull knob to be at 6' above floor for rolled screen.



**RECESSED
MANUAL SCREEN**

11.52.03 Fixed Screens:

- a. May be used where bottom is over 7' AFF and wall space from this level to the ceiling is sufficient – exception – in auditorium where all viewers can see a lower bottom (generally in tiered spaces).
- b. Mostly restricted to auditorium type classroom environments.
- c. To be angled at top toward GPC to minimize keystone effect from cart-mounted overhead projectors – work with **MTSS** for projector location for particular screens.

DIVISION 12.00.00 FURNISHINGS:

12.20.00 WINDOWS & WINDOW COVERINGS:

12.20.00 General to Window Coverings:

- a. Provide these dual layer shades at any classroom/seminar/lecture rooms having exterior windows.
- b. Auditoriums to NOT have any windows in walls surrounding the space.
- c. Window coverings with plastic parts used in operating mechanisms fail badly - do not use.

- d. Mount tightly to window frames to prevent light spill around ends.
- e. If chains are used, they are to be long enough to allow wheel chair bound people to operate.
- f. Mount such window coverings to clear any hardware projections (when fully extended toward the room side of the window) at all windows being covered.
- g. Provide enough recessed pocket space at ceiling system or window recess to allow proper placement of the dual layer shade system.
- h. Construction documents in design phase to include adequate space in area over window openings for such window cover housings, including adequate space to allow easy maintenance and servicing.
- i. **Venetian blinds or drapes** are not desired. If necessary due to special circumstances, they are to have non-plastic and heavy duty operating components (photo example – NO plastic wands or wand connectors).



12.20.01 Combination Opaque & Translucent Window Coverings

- a. Windows to have two coverings. One layer is to allow some light entry into room. Second layer is to totally cut all light entry into room.
- b. Dual roller blinds, with translucent layer opening density adjusted for light exposure for particular building elevation most desired, such as MechoShades – 55 Rorer Avenue, Hatboro, PA 19040 – Richard Rosenbaum.



12.20.02 Window locks - required to operable windows at spaces with air conditioning.

- a. Building staff can open windows until non-functioning HVAC systems are operational.

12.20.03 Mullion sun light shields - Provide vertical shields to prevent exterior sun light from passing between adjacent shade units. Sun light to not hit projection screens.

12.50.00 FURNISHINGS – SPECIAL EQUIPMENT:

12.50.01 Student seating - general:

- a. Locate front row back from room front sufficiently to allow all student positions to be within the 90-degree side-to-side viewing cone and up to the 35-degree vertical viewing angle identified for viewing all screens. See **Visuals** and **Screens** noted previously for more definition of this minimum distance to the front of the classrooms.
- b. Fixed seating attached to rows of tables not accepted unless demonstration unit is accepted and noted in writing by the **UCIF-ISG**. Such attached seats do not accommodate large or tall users.
- c. Fixed and continuous tables acceptable in auditorium and large classrooms with movable chairs on casters.
- d. Moving SSTs to be considered for all other classrooms with loose furniture used for student positions.

e. **CLEARANCES:**

1. Where possible, keep 4 to 5' between the last row of any seating type and the rear wall to handle projectors and foot traffic (except auditorium seating where a few seats can be left out for a projector position).
2. At fixed seating, check with **MTSS** to see if space is necessary at the rear wall for projection equipment. If so, do not place seats in this position. Coordinate w/ **UCIF-FC** and **MTSS** for space that should be left clear.

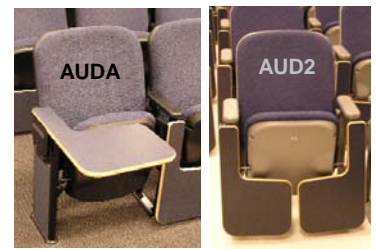
12.50.02 Square footage requirements for seating types:

Room shape, function, and configuration causes a wide range of square feet for each seating type. In no case is the square footage for a type to be less than the minimum noted below and should fall close to the center of the range for each category.

- a. **AUDA** – Classroom Lecture Hall with Auditorium seating having single movable writing surface – 10 to 16 square feet;

- b. **AUD0** – Classroom Lecture Hall with Auditorium seats where lap boards may be used for writing surfaces – no longer to be used in new installations.

- c. **AUD2** – Classroom Lecture Hall with Auditorium seating having dual movable writing surfaces – 15 to 20 square feet.



- d. **AUD3** – Classroom Lecture Hall in Auditoriums type setting w/ fixed table work/writing surfaces & rolling chairs – 25 to 30 square feet.



- e. **FTAB** – Fixed Tables and attached chairs – not desired in new installations (see 12.50.01 b. above);

- f. **FTAC** – Fixed Tablet Arm Chairs – no longer to be used in new installations;

- g. **FTLC** – Fixed Tables and Loose Chairs – 25 to 42 square feet;

- h. **LTAC** – Loose Tablet Arm Chairs – no longer to be used in new installations;

- i. **STAB** – (**SSTs**) Stackable Student Table and Chair – 20 to 27 square feet;

- j. **TABL** – Moveable Tables and Chairs – 22 to 85 square feet;

12.50.03 Student seating Space Planning Parameters:

- a. **AUDA** – Classroom Lecture Hall - maintain no less than 39" from seat back to seat back, and preferably 44".

- b. **AUD2** – Classroom Lecture Hall - keep all seating at no less than 44" seat back to seat back, to allow passage of students when writing tablet surfaces are being used.

- c. **AUD3** – Classroom Lecture Hall - clear distance to be maintained from back of front table to front of next table behind adjacent rows (or back walls) to be minimum of 32" (measured horizontally), with 36" preferable and 30" side to side of centers of chairs. 4' minimum clear distance between rows is to be maintained in rows with wheelchairs.

- d. **FTLC** – in auditorium arrangements with fixed tables, keep at least 36” for the seating distance between a row’s rear table edge and next row’s front edge for loose chairs, & 30” side ways for each student position.
- e. **STAB** – maintain at least 36” for the seating distance between rows of SSTs and 28” side to side for each student position and no less than 36” for aisles (no less than 48” when chalkboards at side walls) unless distances changed and okayed with the **ISG**.
- f. **TABL** – use a spacing distance front to back of 30 to 36” between table edges for sled or wheel based chairs, & 30” of width for each student position.



1. **Table Construction:**

- a) At student seating positions, table legs are to be tight to the corners for all table sizes, including 5’, 6’, or 8’ tables. Legs shall not be recessed from the table ends 4” to 18”.
- b) Tables to withstand loading of 300 pounds of superimposed load (people sitting on table) per lineal foot.
- c) Table edges to be heavy duty extremely durable material and glued to not be removable by knife or other sharp objects users may possess.



g. **Programmed Seat Counts:**

- 1. When seat counts are given, that is the number to be placed in the room, even if square footage needs to be larger than programmed.
- 2. Squeezing the required seat count into too small spaces will not be accepted.
- 3. Reduced front instructional area or aisles will not be accepted to achieve the required seat count.
- 4. If the acceptable seat count cannot be achieved this must be documented in writing and graphical form by the architect who will then forward the information to the **FC** via the PM or PC. The **FC** will convey the situation up the chain for a response that will be documented in writing or by email.

12.50.04 Labeling: “GPC” – to be *printed* on the bottom of all loose classroom furniture items in 1-1/2” to 2” high contrasting color block letters.



12.51.00 Seating Types:

12.51.01. Classroom Lecture Hall Auditorium Seating:

a. **AUDA & AUD2**

- 1. 22” and wider seat pans are to be used. If wider sizes become available these should be considered.
- 2. ADA required positions are to also be equipped with writing surfaces and the chairs defined below, to allow full use by other students when wheelchair users are not in the ADA required locations.
- 3. 15% at least, of the auditorium seats, if AUDA, are to have BOTH left and right-handed tablet arms on the same chair for use by both left and right-handed individuals. KI has prototyped such a seat for PSU usage. Contact for space requirements to be sure the programmed and required seat count can be achieved.

- 4. Power is to be run to all seat rows for use with laptops – coordinate with ISG for exact details.

b. **AUD3**

- 1. Critical to have distances defined above to allow movement when exams underway.
- 2. Table to be minimum 16” front to back and to have full-length front modesty panel, except at wheelchair positions, where the front panel would not allow the wheelchair user to get close enough to the writing surfaces.
- 3. Outlets may be required between pairs of seats for power and data – power only in wireless environments.
- 4. Heavy T-spline edges to be used on all tables at student positions and the T-molded spline edge is to be additionally glued in place. Do not use laminated plastic edges.
- 5. Chair type – to be capable of swiveling, have casters appropriate for the type floor surface the chair is to be located upon and is to have only a lever to raise or lower seat. No arms, knobs or back leaning or back height adjustments. Chairs are to have durable fabric and construction with minimum of 10-year warranty on all parts and fabric. Example of this chair type used as specification standard - KI Torsion Pedestal, armless, casters, fabric covered with only rising & lowering control lever. **Departments or colleges that require more than this basic seat configuration will be responsible for replacing such seats in the affected GPCs.**



12.51.02 Seating with tablet arms, when used (mostly for large classroom lecture hall auditorium seating):

- a. Tablet surfaces to be largest model available (for laptops and paper) and not less than 212 square inches (280 square inches preferred) at the writing area.
- b. >15% in a room are to be for left handed users.
- c. Tablet surfaces are to have reinforced supports to prevent breaking of tablet arm when sat on by 350-pound individual.

12.51.03 SSTs - student stacking tables

- a. **24” wide x 19” deep x 30” high by CORT** Special Projects Group, 11250 Waples Mill Road, Suite 500, Fairfax VA 22030 - 800-565-2678 - Dan Huber
- b. **26” wide x 20” deep x 30” high by KI** - their Intellect unit modified for PSU, 3457 Babcock Blvd, Pittsburgh, PA 15237 - 412-921-2611, ext 12 - Dave Whiting
- c. All SSTs to have “C” support frames, and “PSU blue” tops with the frames powder coated in the “Starlight Silver” metallic finish.



12.51.04 Student and instructor chairs - stackable with perforated seat/back

- a. Example: **Thonet – Wafer Side Chair #5290** – can use any color other than Sand for the seat plans and backs with the frames P-498 Silver Dust at SSTs
 - 1) McCartney’s, PO Box 1714, Altoona, PA 16603 – 800-548-4138 – Mary Beth Schmidhamer
 - 2) Educational Furniture Solutions, 305 Woodcrest Circle, Limerick, PA 19468 – 610-630-3995 – Kevin Christman or Kathy Crilly
- b. See **12.51.01 b. 5.** above for another allowed seat type defined at **AUDA 3.**

12.51.05 Instructional and student laboratory technology seating stations – tables, chairs, etc.

- a. **Leg positions and other requirements** – see **12.50.03 f. 2.** for very important table construction requirements.
- b. **Full size samples submittals** – all seating, tables, podiums, cabinets, etc. are to have such submitted to the **UCIF-ISG** for review and approval before placing such products out to bid. See **12.51.01 b. 5.** above for another chair type noted under AUDA 3 heading.
- c. **Technology tables** - to have hidden-from-view and integrated wire management systems that are continuous from one table to the next and to the point of connection with the building infrastructure.

**12.51.06 Instructor table (and in some cases student tables – see previous picture):**

- a. Folding w/ modesty panel.
- b. by Maywood - Training Table 24 x 60 x 30 H, LMO top, BL edge – Educational Furniture Solutions, 305 Woodcrest Circle, Limerick, PA 19468 – 610-630-3995 – Kevin Christman or Kathy Crilly.

12.51.07 Coat hanging racks / strips:

- a. Provide at least space for 50% of the room occupants.
- b. Locate as close to room rear as possible.
- c. Exceptions may be allowed as cleared with the **Instructional Support Group**.

**12.51.08 Trash and Recycling Containers:**

- a. Provide recessed space for such containers at **each** door to AND from each classroom. 16" x 10" x 32" high recycle containers are to be placed in each GPC at each door for only **NEWSPAPERS, PAPER TRASH** and **PLASTIC BOTTLES**.
- b. Do not encroach on circulation pathways; in fact provide more space in front of such containers to allow easy access and movement of students as they pass the recycling containers.
- c. Containers to have a unitized look and not to be random and "mixed" designs.
- d. Colors to work with those used in the surrounding space.
- e. These containers are to be in addition to those provided outside classrooms in the corridors or near drinking fountains, vending machines, newspaper dispensers and other such waste generating sources.
- f. Include space in design next to printing stations in computer lab-classrooms for recycling waste containers for **WASTE PRINT PAPER, NEWSPAPERS** and **PLASTIC BOTTLES**.
- g. All waste containers to be in place prior to the start of classes and use of the rooms.
- h. Coordinate functional considerations closely with the **UCIF-FC** and **AI Matyasovsky**, Supervisor of Labor and Equipment, at 863-4719 and cell 777-2954.



12.51.09 Cart Mounted Overhead Projectors:

- a. Used in nearly all GPCs - plan for their use as well as storage when not used in a class.
- b. Generally will be used on secondary screen in rooms having instructional technology, though they can also be used on the main screen.
- c. Distance from screen can vary from 9' in small GPCs to 16' in lecture halls – do not plan rooms to have these set in the student seating areas.

DIVISION 20.00.00 PLUMBING, HVAC, FIRE SPRINKLING SYSTEMS, ETC.:

20.01.00 GENERAL TO PLUMBING, SPRINKLING SYSTEMS AND HVAC NEAR CLASSROOMS:

20.01.00 NOISES, VIBRATIONS AND VISUAL CONSIDERATIONS TIED TO PLUMBING, SPRINKLING AND HVAC COMPONENTS:

20.01.01 Pipes:

- a. To be dense and well insulated (cast iron pipes) for rain-water, and other pipe conductors close to classrooms. Pipes are not to touch the finished surfaces. Minimize sound transmission into the classroom of running water. Comply with ANSI/ASA S12.60-2002.
- b. All pipe penetrations through walls, floors or overhead slabs are to be isolated and caulked at the penetrations to prevent sound transfer.
- c. If baseboards used, ALL pipes to be hidden by the covering – none below the shroud.

20.01.02 HVAC and Air Movement:

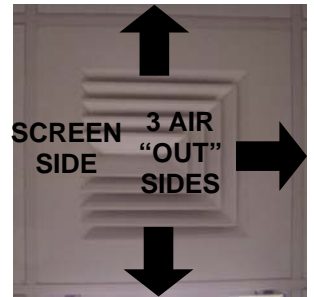
a. Room Air:

1. Use air-handling systems with **low velocity discharge diffusers.**
2. Design and install systems that isolate machine and other air noises from classrooms and classroom equipment.
3. Size ducts, diffusers and air returns large enough **to achieve a noise free “library quiet” environment. ASHRAE minimum requirements are not low enough for classrooms.**
4. Noise level is to be no higher than NC = 30 in general and NC = 20 at grills or registers.
5. ANSI/ASA S12.60-2002 sets 35 decibels for maximum background noise for unoccupied school classrooms – this is too high and needs to be 30 decibels or lower.

b. Transfer grills

1. Not allowed in doors or corridor walls.
2. To be used to equalize air pressure of auditorium classroom spaces on both sides of large-attached-fixed projection screens.

- c. **No open return air plenum space between ceiling and structure** – due to need for electrical components for ceiling mounted technology projectors and document cameras, and wireless computer system receivers/transmitters.
- d. **Diffuser throw** – orient so that air from diffusers does not hit any projection screens, as shown by three way diffuser to right.
- e. **HVAC system for classrooms:**



1. Zone independent of rest of building so zone can operate the entire year during class hours, whereas the rest of the building system may have the AC functions disabled during late fall, winter and early spring.
2. Maintain proper room air exchanges at all class occupied times, during both the cooling and heating seasons and size for the people loads, any heat generating and technology equipment loads, as well as loads from adjacent side, below and above spaces.

20.01.03 Piping, duct and building equipment interferences with GPC equipment:

- a. Route all piping, ducts and other necessary system components around the perimeter of the classroom and away from the front area of every classroom, **to keep the ceiling surfaces between the screens and projectors tight to the structure.**
- b. **Projection screens** require recessing to place the full projected image as close to the ceiling as possible – this is necessary to keep the bottom of the screen high so that students can see the full image even when at the back of a room.
- c. Projection equipment mounted near the ceiling usually from the building structure needs clear paths from the structure to the projector for the supporting pipe.

20.01.04 Building, mechanical and machinery noises and vibrations:

- a. Isolate from Classrooms, be the noise or vibrations from elevator, HVAC equipment and ducts, other kinds of motors or other noise generators (including light fixtures). Comply with ANSI/ASA S12.60-2002 for maximum sound and vibration levels allowable at classrooms.
- b. Building equipment vibrations transferred into building structure not desired as such vibrations can cause classroom ceiling hung technology projectors to bounce around. Do not allow this to happen.

20.01.05 Thermostats:

- a. Place locking clear covers over all room thermostats or temperature sensors to prevent tampering or use different units with setting controls separate (like above ceiling) from the wall sensor units.
- b. Locate away from chalkboards, tackboards, any cabinets to be installed in the classrooms and away from any heat producing elements in the room (including technology used in the educational process).

20.01.06 Fire Strobe Lights: Locate away from projection screens that may block sight lines to the strobes when screens are extended for projection.

20.01.07 Commissioning at classrooms – refer to section 40.80.00.

DIVISION 26.00.00 ELECTRICAL:

26.00.00 GENERAL:

26.05.00 CONDUITS, WIREWAYS, LOW VOLTAGE WIRES, OTHER WIRES, WIREMOLD and OTHER UTILITY AND SPECIAL CABLING SYSTEM NEEDS:

26.05.01 Commissioning at classrooms – refer to section 40.80.00.

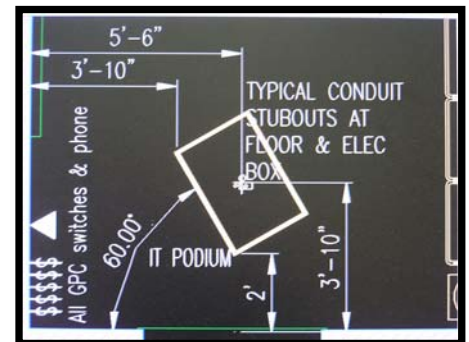
26.05.02 Note that all such utility products are to be run behind the wall, ceiling, and floor finishes.

26.05.03 If exceptions are needed, identify them early in the design/construction process with the Classroom **FC** in which case they are to be limited to “special” surface applications absolutely necessary due to structural issues.

26.05.04 Special wire management systems: may be allowed on surfaces where they can be well integrated into the intended function and needs of the room. These signal cable and power wireways are to be identified early in the design process.

26.05.05 Conduits between projector and instructional technology podium:

- a. 2" metal electrical conduit (no substitute sizes or plastic) to be used for control and signal cable from tech podium to tech projector for cables with molded ends (example: **NO BNC CABLES TO BE USED**) and to equipment racks in some rooms requiring more equipment than will fit in the instructional tech podium.
- b. Two 1" conduits required for power and security wires between tech podium & tech projector:
 1. Power to be same phase, ground, neutral, etc. at a GPCs tech projectors, podium and equipment rack (where needed).
 2. Security conduits to be separated from power conduits by a minimum of 6" due to power interference with signal and security cables.
 3. Security conduits to be separated from lights and their circuits by at least 24" due to electrical emissions that interference with signal and security cables.
- c. Two 2" conduits (no substitute sizes or plastic) required for signal cables with 3 tech projectors used in a room.
- d. Floor penetrations for the conduits into the instructional tech podium are to be centered under the IT Podium and located so that the minimum 3'-10" and 2' dimensions are maintained behind and beside the podium.
- e. See **26.70.01** for wire management systems (wireways).



26.05.06 Conduits for Flat Panel Information Screens outside Computer Lab / Classrooms:

- a. Provide conduits to data outlets and security box in wall beside doors to such rooms to operate and secure the flat panel monitors.
- b. Conduits can terminate above accessible ceiling systems. Otherwise run to telecommunication closet.

26.05.07 Electric Screens: coordinate power needs, control switches, conduit locations and clearances with motorized screens as identified in section **11.52.01**.

26.50.00 CLASSROOM LIGHTS AND LIGHTING CONTROL:

26.51.00 GENERAL:

- a. Use energy efficient lights, with tight light ray directional control, 3500 degree K bulbs with minimum CRI of 82, often specified as 835 light bulbs.
- b. Fluorescent fixtures with parabolic louvers to have reduced grid size to minimize horizontal light spill and glare.
- c. Do not hang any pendant direct/indirect fixtures between existing / new / future ceiling-mounted projectors and screens, nor use any within the front 2/3rds of the room – screens have to be dropped when such fixtures are used – not acceptable.



d. Foot candles:

1. Minimum uniform light level at desk height is to be 50 FC, after bulb burn-in and after dirt accumulates, which means that 70 FC needs to be the minimal design level.
2. Final lighting (with all lights fully on and none dimmed) FC measurement to be in 12 spots from front to back, thus:

IL	IC	IR	(Instructor left section, center section and right section)
FL	FC	FR	(Front row seating, left, center and right at any seat in each section)
CL	CC	CR	(Center row seating, left, center and right at any seat in each section)
BL	BC	BR	(Back row seating, left, center and right at any seat in each section)

3. These 12 measurements will be averaged to check the 50 FC in each classroom before project closeout – any “under-designs”, especially at corners, will require additional placements of light fixtures as part of errors and omissions.

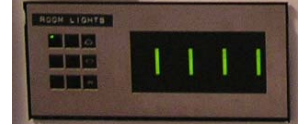
e. Lamp Replacement Serviceability and Maintenance:

1. In auditoriums and rooms with sloped or tiered floors, and high ceilings, maintenance access via catwalks with railings (or other easy access methods) is to be included above the lights for changing burned out light bulbs.
 2. High ceilings are those that cannot be accessed in all locations with a 10' ladder and require scaffolding to replace burned out bulbs.
 3. Auditoriums are considered to be any tiered or sloped instructional space with seating for 140 or more students.
 4. Such classrooms have very heavy use, and bulbs burn out regularly. Such bulbs need to be replaced when they are seen to be burned out – not between semesters as is essential when scaffolding is necessary for removing burned-out bulbs and installing new ones.
- f. For more information on electrical/lighting refer to **OPP design standards section 16A.4 C** at:

http://www.opp.psu.edu/construction/standards/design_standards/DIVISION16A.doc

26.52.00 SCENE CONTROL SWITCHES:

- a. Do **NOT** use, unless integrated into the computer control system (usually in large rooms) and/or cleared in writing with the **UCIF-Sub-Committee**.
- b. Low voltage lighting control systems can be used, though.

**26.53.00 MOTION & SOUND SENSORS:**

- a. Use in all instructional/classroom areas and entry vestibules into classrooms.
- b. Sensors are to automatically shut down all lights about 1 hour after no room activity is sensed.
- c. Sensors are to automatically and **within 1 second** turn on the main room lights when activity or noise occurs in a room and upon entering the room.
- d. Use units only that mount high on walls or ceilings – not as part of light switches at entry doors.

**26.54.00 GENERAL ROOM LIGHTING:****26.54.01 LIGHT SWITCH CONTROL LOCATIONS AND TYPE:**

- a. Place at the instructor's area.
- b. Center on the rear wall **ONLY** in rooms having rear projection capabilities;
- c. Duplicate in rear projection booth, if any, and
- d. **Place at each room door.**
- e. Use only a single on-off switch at each entry/exit door position tied to main room lights.
- f. Locate lighting rheostat dimming controls only at the instructional and rear projection (if any) positions.
- g. Use pilot lights or illuminated panels to help locate all light control switches in the dark at the podium position.

**26.54.02 SWITCH CONTROL ENGRAVING AND RELATIVE POSITION:**

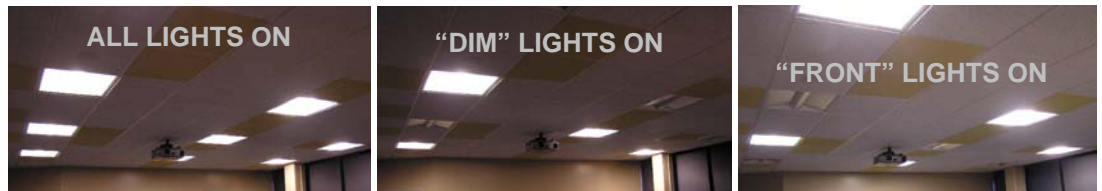
- a. Engrave all light control switch device plates only at instructional podium position and rear projection (if any) positions.
- b. Possible engravings for the lights operated – **FRONT, MIDDLE, BACK, BACK DIM, PODIUM DIM, TABLE, CHALKBOARD, AISLES**, etc.
- c. Lettering to be minimum 1/8" high unless other size authorized in writing by **UCIF - FC**.
- d. Orient all switching positions and labeling to the room orientation.
 1. **Controls at side walls** - control front lights with front most switch, operate middle lights with middle control, back lights with back switch;
 2. **Controls at front walls** – control front lights with left switch, operate middle lights with middle switch, run rear lights with right one;

3. **Controls at vertically stacked locations** – control front lights with top switch and rear lights with bottom one. Mount switches in one row. Mount other controls for podiums, chalkboards, screens, etc. in a separate row below or next to the room lights, again considering positions that best relate to the room location of each piece of equipment.

26.54.03 GENERAL ROOM LIGHTING ZONES:

- a. Plan for at least 2 main room light zones in each room at the ceiling.
- b. Plan each zone to run parallel to the front wall. Tie fixtures between the ceiling tech projector and screen to this front zone. Large **GPCs** may require special consideration and discussion with the **ISG**.

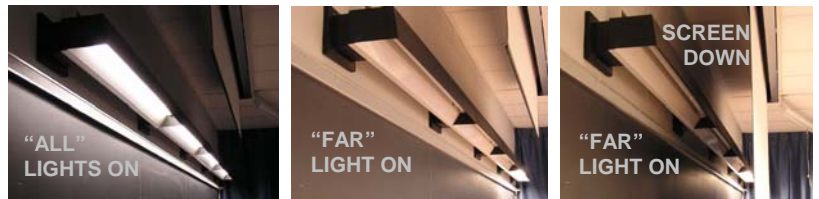
- c. Plan middle (if any) and rear zones using multi-tube light fixtures.



1. Half or greater than half of each fixture tubes are to be tied to the front zone and manually controlled on/off by switches at all entry/exit doors, podium and rear projection or booth area.
2. The remaining tubes are to be manually controlled to dim or turn off lights with switches only at podium and at rear projection or booth area.
3. Alternatives:
 - a) All lights of fixtures come fully on with the front fixtures when activated at the door plus allowing independent control at the instructor station of the front fixtures and the back fixtures. These back fixtures would then be entirely dimming from the instructional area.
 - b) All lights go on when the motion-sound sensor turns on lights upon entering a dark room.
- d. Plan for the instructor to adjust all the lighting levels for his needs from near the teaching position.
- e. **LIGHTS/SWITCH LAYOUT:** relate as noted for **SWITCH CONTROL ENGRAVING AND . . .**
- f. **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.

26.54.04 CHALKBOARD LIGHTING ZONE:

- a. Use a separate on/off, circuited and wall mounted light strip above the instructor's chalkboard.
- b. Restrict light pattern to the chalkboard, so that none spills onto the back of the extended projection screen or toward the students. This means two switches for the chalkboard lights.



- c. Provide proper clearances to the fully extended screen.
- d. Mount switch with built-in pilot light on or near the instructional station.

- e. Properly label through 1/8" high engraving on the plate.
- f. 30 FC (50 FC design minimum) lighting average is to be provided on only the instructional chalkboard surfaces.
 - 1. Use light meters with the sensing element oriented toward the student seating area, NOT TOWARD THE CEILING.
 - 2. Determine by averaging 9 points of a three row and three column matrix.
- g. Suggested product: Alkco surface mounted wall washer 7500 series, phone 847-451-0700.

26.54.05 INSTRUCTIONAL PODIUM AND SIGNER LIGHTING ZONES:

- a. The ceiling mounted podium light is not needed if a light is built into the podium.
- b. Otherwise, provide.
 - 1. A very directional and adjustable fixture over the position - with no spill or wash on screens.
 - 2. Individual control, with rheostat having a pilot light, near the instructional station.
 - 3. Locate fixture on room center side of the podium, at about "11 o'clock" or "1 o'clock", and a few feet on the student seating side of the position, to minimize instructor head shadows on reference materials.
 - 4. Engrave switch plate with 1/8" high lettering.



26.54.06 INSTRUCTIONAL TABLE ZONE:

Place a dimming directional light fixture over the instructor table (when included) with no spill or wash on the screens. Individually switch from near instructional station. Position in ceiling system at 3' on student side of table.



26.55.00 CLASSROOM EMERGENCY LIGHTS:

- a. Where codes require; such lights are NOT to be on when the class is in session, unless all building power goes off. Use relay system to turn on these fixtures in case of power outage.
- b. Classrooms / lecture halls need the ability to be made totally dark.
- c. Fire-alarm strobes are NOT to be placed behind projection screens, which when extended block the light from the strobes.

26.56.00 CLASSROOM EMERGENCY EXIT LIGHT SIGNS:

- a. Use energy efficient LED type light signs where codes require emergency exit light signs.
- b. Orient exit sign lighting so that light rays do not shine onto the screen areas, causing image "color shift" or interlock via relay to light only when emergency power is activated.



26.57.00 CORRIDOR AND STUDY COMMONS LIGHTING:

- a. Provide code minimums for the general traffic areas where bench seating is also located.
- b. Locate lights above bench/alcove and study commons areas that provide 50 FC of light for reading and writing.
- c. Locate light switches adjacent to benches for bench/alcove area lights.
- d. If no benches provide 50 FC lighting in the corridors serving instructional rooms.
- e. Use occupancy-motion sensors to also turn on-off these lights, in addition to light switches adjacent to benches and at the each end of a corridor/hall served by the lights.

26.60.00 SWITCH & DEVICE PLATE LAYOUTS ON WALLS:**26.60.01 Close to Instructional Technology Podium/Desk/Instructor Areas:**

- a. Concentrate on a wall the multiple controls for lights, screens, ceiling mounted tech projectors and other components within 4 to 5 feet of the instructional tech podium in each room. Engrave each device plate for functional area – see below.
- b. Locate “**Help**” telephones near these controls, too.
- c. Provide in construction documents scaled elevation layout showing positions for all controllers, telephones, and other devices.
- d. The switch for powering on-off the ceiling data projector is to be key operated not by turning but by a slot that allows key use to slide switch to on or off..

**26.60.02 At Other Areas:**

- a. Light switches are required at all classroom vestibule doors and classroom doors, except one way emergency exit doors (no hardware on door outside room). These switches are to operate main body of room lights - only on/off.
- b. Device plates at doors do not need to be engraved.
- c. If rear classroom or building equipment booths are provided and lighting controls happen in the booth, the device plates are to be engraved with the same wording used near the instructional tech podium.

26.70.00 CONVENIENCE & DUPLEX OUTLETS:**26.70.01 In Classrooms:**

- a. Front walls – run two-channel wire management system across front of each classroom and evenly space 3 duplex outlets in the wire management system (Wiremold).
- b. Side walls – in addition to above requirement:
 1. Place at least two duplex outlets on each sidewall and space no greater than 16’ apart in classrooms **without** student technology.



2. Place two-channel wire management system the length of the sidewalls in classrooms with student technology.
- c. Rear wall - place two-channel wire management system the length of the back wall in classrooms and evenly space 3 duplex outlets in the wire management system.
- d. Wire management systems – to be mounted with tops just below chalkboard trays – same for other walls.
- e. Above Lay-in Ceiling:
 1. Special outlets may need to be in special fire rated enclosures.
 2. Locate for ceiling mounted tech projectors.
- f. At printer stations in computer-lab classrooms - Four-plex outlets to be provided above cabinet or above table top.
- g. At continuous student work surfaces where students sit in loose chairs (examples: Wartik 108, Life Sciences 100, IST 113).
- h. Special needs will be further defined for computer lab/classrooms and computer driven informational signs.

26.70.02 At Benches, Alcoves and Study Commons at or near Classroom Corridors:

- a. For laptop computer use, space duplex outlets at 5' intervals above benches.
- b. For laptop computer use, provide boxes adjacent to duplex outlets.
- c. Use non-removable screws for the cover plates.
- d. At Study Commons locate outlets on each column face and on walls at 5' intervals.

26.70.03 At Flat Panel Information Screens outside Computer Lab / Classrooms:

Provide clock outlet in wall beside doors to such rooms for power to the flat panel monitors.

- 26.70.04** Refer to **27.41.00 AUDIO-VISUAL and TECHNOLOGY** and **DIVISION 28.00.00 SECURITY** for more detail on conduits, power, cabling, etc. that would most likely be performed by the electrical trades.

DIVISION 27.00.00 COMMUNICATIONS:

27.00.00 GENERAL:

- a. Installation of all communications, media tech, security and other instructional technology must be closely coordinated. The final sequences to placing these components into the instructional technology classrooms and labs are basically as follows:
 1. All conduits and non-conduit pathways for wires must be identified, in place and made easily accessible before any installation activities can begin.
 2. Power installed at floor under podium and at data projector and at other required positions.
 3. Podium set.

4. Cables for data, phone lines, cable TV and security connections are run to equipment from central connection points.
 5. Technology, telephone and data projectors are set in place in podium, at ceiling, at wall and at racks where racks are needed.
 6. Cable connections to equipment for data, phones, cable TV and security.
 7. Testing and adjusting of equipment and control codes occur to be sure all parts “talk” to each other and function as intended.
- b. More complex systems such as interactive video conferencing capabilities require additional considerations due to use of cameras and more cabling.
 - c. Critical to the timely occurrence of the above sequence:
 1. Contractor and sub-contractor work;
 2. Material and equipment coordination, ordering many audio-visual and technology components, purchasing and placement.

27.30.00 TELEPHONES:

- a. Include in each technology classroom / lecture hall.
- b. Provide necessary outlet, wiring and conduit.
- c. Used as an intercom with a central computer/MTSS technician’s office, shop, or network room.
- d. **Locations in Classrooms:**
 1. In instructional technology classrooms – locate on wall closest to instructional podium or as designated by PSU – **ISG** members.
 2. In conventional classrooms – locate right beside the chalkboard at the instructional end of the room.
- e. Coordinate early in project cycle and identify installation time frame with ITS-TNS and ITS-TLT to allow proper and timely installation during construction, not after finishes are installed.
- f. See section **27.41.05 TECHNOLOGY OUTLETS / POWER / CONDUIT NEEDS** for more specifics.



27.31.00 WIRELESS COMPUTER SYSTEMS:

- a. Evaluate possible use for each building project in the classrooms and immediate areas outside classrooms.
- b. Coordinate closely with the **ISG** since their groups will be taking care of the systems.

27.32.00 INTERACTIVE VIDEO CONFERENCING SYSTEMS:

- a. Evaluate possible use in the classrooms for each building project.
- b. Coordinate closely with the **ISG** representatives since their groups will be taking care of the systems.

27.33.00 INSTRUCTIONAL TECH CABLING: refer to **27.41.05 c** for further requirements for technology and conventional classrooms.

27.40.00 SOUND SYSTEM:

- a. Question need in each classroom for an instructor wireless and/or fixed microphone and room speakers.
- b. Consider technology and power needs as well as use of ADA hearing assisted devices for the audio and/or visual impaired.
- c. Use speakers tied via switcher/routers to the computers, CD Roms, DVDs and VCR's, in all cases.
- d. Refer to above comments under the **27.41.04 CONVENTIONAL AV POWER / CONDUIT NEEDS** heading.
- e. Coordinate with **MTSS** leadership.
- f. Plan for speaker locations - in podium, at/in ceilings and/or on the walls (least desired). No conduits or wires on room finish surfaces.

27.41.00 AUDIO-VISUAL and TECHNOLOGY:

27.41.01 TECHNOLOGY EQUIPMENT "CLOSET":

- a. If needed, place close to the instructional space for today's electronic computer and teaching systems.
- b. Provide for a securable, **well-ventilated "closet" / cabinet** with extending shelves for server equipment.
- c. Closely coordinate with the **ITS-TLT** and **MTSS** representatives.
- d. Locate in space so that access is possible from the front AND the back of a rack.
- e. See door and 5-push-button combination lock requirements noted above under **08.70.00 HARDWARE (DOOR)**.
- f. Proper conduits identified elsewhere in this document to run into this room from the instructional tech podium(s) and the ceiling projector(s) and speakers.
- g. Provide at least one quadraplex outlet 36" above floor. Add more outlets as needed to meet tech equipment load requirements. If more are needed, locate horizontally every 4' along the walls around these technology equipment rooms, same phase, ground, and neutral as that of the instructional tech components used in the GPC.
- h. Provide cooling capacity that will adequately maintain a maximum room temperature of 70° F 24 hours a day year around.

27.41.02 POWER AND CONTROLS:

- a. Provide power for tech projectors at the ceiling and computers at the podium/instructional duplex outlet on the same circuit.
- b. Locate such outlets in each classroom space.

- c. Provide same feed with a common, same phase, same ground and neutral power circuits that are clean of ambient and stray signals for the podium/tech projector circuit(s).
- d. Include cabling, **2" conduit (no substitute sizes or plastic)**, and boxes for controls between the podium and the projector positions.
- e. No other powered items are to be tied into these circuits supporting instructional technology.
- f. Provide a keyed switch for the power circuit(s) to the ceiling mounted tech projectors in each GPC.
 - 1. Locate keyed switch(es) next to other ganged switches on the wall near the instructional tech podium.
 - 2. Key switch to match that for the Forum GPCs, with a common keyway requiring only one key for all switches.
 - 3. Keyed switch is to be used to totally shut off power to projectors to allow proper resets to occur as needed with the newer projectors.

27.41.03 CEILING HUNG DATA PROJECTOR:

- a. Provide rigid structural support for each ceiling hung projector for the current or future equipment.
 - 1. Use 4 unistrut rails, 2 set perpendicular, 6' long and spaced 3' apart and 2 set parallel to the screen, 4' long for mounting the pipe hanger support to the projector.
 - 2. Obtain needed info from **MTSS** for particular projector "pipe" hanger to be used.
 - 3. Provide threaded pipe needed between unistrut mounting plate and tech projector mounting plate.
 - 4. Isolate from all building and mechanical and system vibrations to prevent image from jumping around screen.
- b. Coordinate EXACT location with **MTSS**, if **MTSS** is involved with the project - or as specified by the projector manufacturer, based on screen size and projector model.
- c. ROUGH PRELIMINARY PLANNING RULE to aid preliminary conduit placement - the projector is centered about 1-1/2 to 2-1/2 x screen width from the screen, except when placed in a rear booth, or with special lenses fabricated for a special need.
- d. **Construction documents must indicate to check with MTSS just prior to installing the projector infrastructure for exact location dictated by the purchased projector model.**
- e. Identify in writing the exact projector model and distance factor prior to placing related components.
- f. Models change so close coordination is necessary with **MTSS** until the actual projector is installed.
- g. Mount screen top & projector as high as possible to maintain the greatest possible distance between projector bottom and floor – in no case less than 9' AFF.

27.41.04 CONVENTIONAL AV POWER / CONDUIT NEEDS:

- a. **Slide or film projector controls** - provide all junction boxes, conduits, wiring.
- b. **Sound jacks** – when requested, provide one sound jack at each box centered as follows:
 - 1. At front wall near the instructional position
 - 2. At back of the room

3. At a central riser face, if any, about 1/2 way back; similarly connect near the instructional station.
 4. Place these jacks independent of technology podiums in all classrooms.
- c. **At Technology Podiums:** Install one duplex side outlet pedestal (no higher than 3-1/2") on the floor under the podium for the podium power plugs.
- d. Engrave all outlet plates in 1/8" high letters for "**SOUND**", "**PROJ-1**", and "**PROJ-2**", etc.
- e. See **27.41.01** above for other power requirements for AV equipment.

27.41.05 TECHNOLOGY OUTLETS / POWER / CONDUIT NEEDS:

- a. **In General:**
1. Include, place boxes and conduits for fiber and other cabling needed for technology classrooms – see **DIVISION 26.00.00**.
 2. Place such power and cable boxes under/adjacent to the instructional podium, within the student area, if required and above ceilings for instructional tech projectors.
 3. Mount convenience and tech outlets next to all computers and other technology equipment.
 4. See other items in this **27.41.00** section for other needs related to instructional technology component needs as well as **26.70.00**.
- b. **Coordination** – work closely on technology outlet, locations and conduit home run needs with **ISG**.
1. Generally locate such outlets for network and fiber close to or into the instructional tech podium.
 2. Place convenience outlets close to such "technology" outlet boxes.
 3. Engrave the labels on these outlet cover plates.
 4. Cable-TV access is to be included unless otherwise told.
- c. **For Telecommunications:**
1. Into or within the room & at corridor benches, involve **ISG** & Design Team members.
 2. **Technology Classrooms:**
 - a) Provide minimum (5) high-performance UTP cables and one RG-6 coaxial cable into the instructional technology podium.
 - b) Provide minimum (1) high-performance UTP cable centered in the front wire way or if no wire way centered on the front wall beneath the chalkboard used by the instructor.
 3. **Conventional Classrooms:**
 - a) Provide minimum (5) high-performance UTP cables centered in the wire way or if no wire way centered on the front wall beneath the instructional writing surface.
 - b) Provide minimum (1) RG-6 coaxial cable at the instructional end of the room in the wire way or if no wire way then beside and below the writing surface in the location that best accommodates a cart mounted television.

- d. **At Instructional Tech Podium** – power strips provided by **ITS-TLT** will be plugged into the floor duplex outlet pedestal under the podium.
- e. **At Printer Tables or Counters in Computer Lab-Classrooms** – provide for four-plex outlet above table or counter height.
- f. **At Ceiling Mounted Tech Projectors** – provide duplex outlet at projector location. Also include key lock on/off switch for this projector. Locate key lock next to other controls on wall near instructional tech podium.
- g. **At Corridor Benches:**
 - 1. Space at 48" o.c. duplex outlet above benches for power use of wireless laptop computers.
 - 2. Coordinate closely needs with **ITS-TNS** for boxes and conduit runs to these outlet boxes.
- h. **At Flat Panel Information Screens outside Computer Lab / Classrooms:**
 - 1. Provide blocking in wall to support monitor mounting bracket and the junction boxes for the power, data and security wiring.

27.41.06 INSTRUCTIONAL TECH PODIUM:

- a. PSU design by **ITS-TLT** is to be used, as it is standard on campus. Who provides:
 - 1. On projects funded by **UCIF** or **ITS-TLT**, podium is generally provided by PSU.
 - 2. On building projects that are new, major renovations or additions, IT and all technology is fully funded by the project **F F & E Budgets**.
- b. Is to be coordinated with **ITS-TLT** for location, type, and scheduling / delivery needs.
- c. Provide **3'-6" minimum** between podium and the front wall projections (chalkboard rails, chase corners, etc) and **24" minimum** from a sidewall. See plan graphic under paragraph **26.05.05**.



27.41.07 COMPUTER LAB – CLASSROOM:

- a. Such rooms have power, network connections and security cabling run in several manners to the technology on the student computer tables. Generally, one to two computer stations are located on a table, depending on table length.
 - 1. **Table ends or sides butted to walls** – utilities feed from wall mounted multi-channel wire-ways. In such cases, all utilities are to be fed from these wire-ways.
 - 2. **Free standing tables in rows or groups** – utilities feed from **EACH** floor box serving **EACH** table. Each floor box is to have power outlets, network connections and a place for the security hard wire to rise to fasten to the black box often mounted on the bottom of a table in that row or group.

3. **Utilities to computer lab tables** are:

- a) **Network wires** – individual cables to each computer station from the central telecommunications room – necessary in floor boxes or at the wire-ways.
 - b) **Security fiber optics** – this is looped through a series of computer stations, usually in a row or group of tables that ties to a “black box” mounted to a table and hardwired back to the telecommunications room via the wire-way or the floor boxes (usually at only one floor box per group or row).
 - c) **Power:**
 - 1) **Via floor boxes** – each computer station needs two plug outlets for power or junction boxes for pigtails or whips.
 - 2) **Via wall mounted wire ways** – two possibilities exist, depending on furniture supplier:
 - (a) **Twist lock connectors** - female power connectors are desired at the wire-ways used to feed power to each of the table rows or groups of tables. A twist lock male plug is to be mounted to a 4' cord of a 6 plug power strip.
 - (b) **Pigtails or whips** - for wiring into wire ways or junction boxes.
 - 3) Some furniture suppliers use pigtails or power whips that require wiring into independent power circuits. Provide junction boxes and space needed for the minimum number of power circuits (often 4 independent circuits) used by such furniture systems.
 - d) **Tables** – are to be provided with under-table continuous enclosed and covered wire management enclosures fabricated with removable covers that secure firmly and positively into place.
- b. **Instructional technology podiums** are to be installed in these rooms as noted previously and hereafter.
- c. **Printer tables and stations** are to be included in each computer lab–classroom with capability for at least two printers (four-plex outlet and 4 data jacks).
- d. **Who does what:**
1. **The Contractor:**
 - a) **For Network wires** – pathways, conduits, labeled pull-strings, wire-ways are to be provided from the telecommunications rooms to each station via the wall mounted wire-ways or floor boxes with appropriate termination components for the boxes.
 - b) **For Security** – pathways, conduits, labeled pull-strings, wire-ways from telecommunications room to “black boxes” at each row or group of tables, whether at wall or at floor box. Exception: security contractor is sub to the contract work, then wire is pulled and terminated at each end – (1) the telecommunications closet at one end and the black box at the wall wire-ways, and/or (2) the telecommunications room at one end and the black boxes to be fastened to each group or row of free standing tables with continuous wires via the floor boxes.
 - c) **For Power** – wire-ways, conduits, wires from electrical panels (1) to the twist-locks and the wiring of the mating twist lock to the power strip for feeds from wall mounted wire ways; (2) to floor boxes (no plastic parts exposed to wearing floor surfaces or sliding tables), with the 4-plex outlets in each floor box, and (3) to pigtails or whips to be fastened at the junction boxes to the necessary number of circuits.

2. **PSU:**

- (a) **Network wires or cables** between device boxes in classroom and furniture are pulled and terminated by PSU unless noted otherwise.
- (b) **Security** – wiring and black boxes furnished and installed unless part of contracted work with contractor.
- (c) **Power** – daisy chaining power strips from the twist lock unit, the convenience outlets, the pigtailed or whips for the power to the other tables butting against walls; plugging power into floor boxes for technology on free standing rows or groups of tables.

e. **Floor box locations:**

- 1. No less than one for every two computer stations (with room for four-plex outlet, 4 data cables and security cables).
- 2. Locate toward the front edge of the tables and close to a leg.
- 3. Do not place in aisles or in seating areas where rolling chairs can damage connectors or wires.
- 4. **Furniture products and plan layouts require identification early in design to allow proper definition and location of floor boxes.**

f. **Wire-way locations:**

- 1. Tops just below tables where table ends butt against walls.
- 2. Bottoms just above tables where table backs butt against walls.

27.41.08 AMX, CRESTRON OR OTHER SPECIAL MEDIA & TECHNOLOGY CONTROL SYSTEMS:

- a. Such systems will most likely be used in large spaces requiring many technology components.
- b. Such control systems are usually subcontracted to AV integrators who write intensive software programs that permit the control system to properly and functionally operate the various devices (room lights, DVDs, VCRs, computers, data projectors, sound systems, document cameras, laptop computers, other plug-in devices, etc).
- c. Such intensive software programs most often involve compiled and un-compiled data or source code.
- d. Such compiled and un-compiled data or source codes shall be provided to PSU in written and electronic form via the subcontracted AV integrator, with the complete code system turned over to **PSU** and **MTSS** upon complete and functional installation of the system - to allow maintenance and modifications by **PSU** when system components are changed or added thereafter.
 - 1. **Code** - Provide the actual and complete operational code to **PSU**.
 - 2. **License PSU for Code and Components** - The developer/vendor shall allow **PSU** to have ALL components of the software, in essence licensing the complete code in perpetuity to **PSU**, thus allowing **PSU** to use the code to modify the system and become the exclusive Owner of the software code for the unique location to which the code is developed.
 - 3. **Warranty** - The developer/vendor shall fully warrant the Audio/Visual System furnished to be free from defects in workmanship or failure for a period of one (1) year from the date of acceptance or first beneficial use, whichever occurs first. Warranty service for such defects will be handled in a reasonable and timely manner from the time of notification to winning bidder by the Owner or

their agent. Warranty covers on-site service for equipment, installation materials, installation labor and control system programming. The developer/vendor shall also document and include in the final electronic format any code changes during the one (1) year warranty period after the FULLY functional code and system is accepted by PSU. The developer/vendor shall be responsible for all required diagnosis, labors, costs, repairs, code and documentation updates during that time.

4. **Use-testing** - Once system and code is considered FULLY functional, it shall be used for a period of at least 10 days to be proven error free and perform accurately. No Trojans or codes are to be built into the software that create problems tied to dates or times. If the operating code is not error free and if not performing accurately in this 10-days, the developer/vendor will be required to make the proper code and function changes, at which point the 10-day error free period will once again commence. This cycle shall continue at the cost of the vendor until all systems and codes operate properly and without error for the particular installation. The one-year warranty period for the software starts upon evidence that the code is correctly written and properly operating the technology. This warranty is NOT tied to the building or hardware substantial completion date. The system and code is to be noted in writing as accepted by MTSS and ITS-TLT representatives.
 5. **Documentation** - The detailed documentation of all code shall be provided to **PSU** in the care of **MTSS** by paper copy as well as in electronic form on CD in the latest version of Microsoft Word.
 6. **Equipment specifications and cut sheets** – to be provided to PSU ITS-TLT representatives at time of installation and information to include manufacturer address, phone number, email, website and very specific information about each item that allows easy replacement if components fail after the warranty period expires.
- e. **NO BNC CABLES TO BE USED – ONLY CABLES WITH ENDS SPECIFIED BY MTSS – thus the need for 2” electrical metal conduits (no substitute sizes or plastic allowed) defined in Section 16.10 in this document.**

27.41.09 HEAD END (BUILDING TECHNOLOGY CONTROL) ROOMS (HER):

- a. Audio visual systems installed in GPCs to be stand alone systems for each GPC or GPC auditorium.
- b. Separate such GPC and HER rooms and equipment so that HER components are not affiliated with operations of the GPC's instructional technology components.
- c. There can be some interconnections of the GPC instructional technology equipment to the HER components to allow data and audio to be received from or transmitted into the GPC from the HER, thus allowing information to be routed to other rooms from or into the GPCs. Understand that GPC technology functions are NOT to be routed through such HER equipment for operation of the GPC tech functions, though.
- d. Reasoning:
 1. Equipment, software and routing equipment and systems in HERs greatly complicate the operational functions of the individual GPCs.
 2. These HER components greatly affect the ability to upgrade / replace GPC technology required for class instructional needs.
 3. Such HERs house highly sophisticated systems that create additional maintenance and repair issues which in turn delay or prevent timely resolution of operational problems related to GPC audio visual systems.
 4. The HERs are the responsibility of the department/college to maintain and upgrade, including the interface components allowing the tie to the GPC technology.

DIVISION 28.00.00 ELECTRONIC SAFETY AND SECURITY:

28.00.00 GENERAL:

- a. All security components to be fully functional prior to use of classrooms for instructional purposes.
- b. Costing of work:
 1. On projects funded by **UCIF** or **ITS-TLT**, security cost is generally by these **PSU** entities.
 2. On building projects that are new, major renovations or additions, the project **F F & E Budgets** cover the costs.

28.01.01 SECURITY LINES:

- a. Provide wiring pathway from main telecommunications room to podium, projector and any permanently located classroom computer equipment.
- b. Where conduit is required, a minimum diameter of one (1) inch is required for the podium, the projector and the common raceway for permanently located classroom computer equipment.
- c. Close coordination with **Police Services** and their vendor is essential since they will be taking care of system.
- d. Refer to section **28.40.00** for more detail related to GPC and GPC-Computer Lab security information.

28.01.02 REFERENCES:

- a. PSU – Department of University Safety – Security Access Controls Specifications, including the following documents at the following web site:

http://www.opp.psu.edu/construction/standards/design_standards.cfm

1. Access Controls Document
 2. Alarm System Specification
 3. CCTV Security Systems Specification
- b. **Commissioning at classrooms** – refer to section 40.80.00.

28.10.00 BUILDING SECURITY (DOORS):

Generally not applicable to general-purpose classrooms as they remain unlocked from 7 am to 11 pm, Monday through Friday, during each semester, unless technology maintenance requires a lock-down. Rooms may be locked between semesters and during semester breaks after janitorial staff has cleaned rooms.

28.20.00 CORRIDOR SECURITY CAMERAS:

- a. Required at corridors serving GPCs and GPC-Computer Labs. Exceptions to this requirement are to be documented in writing to the designers by the ISG.

- b. Comply with other notations under this **DIVISION 28.00.00** heading relative to meetings, detailing construction documents, defining points, working with Police Services, running pathways from the cameras to the telecommunication rooms, installation, testing wires, providing power sources where needed, etc.

28.40.00 CLASSROOM TECHNOLOGY EQUIPMENT SECURITY (COMPUTERS, TECH PROJECTORS, PRINTERS, PLOTTERS, MONITORS, SCANNERS, ETC.):

28.41.00 General:

- a. All GPC and GPC-Computer Lab technology equipment is to be protected with a theft security system that will report to University Police.
- b. Consulting Design Team is to work early with the **ISG** for general equipment requirements that may
 - 1. help establish termination points for such security equipment and
 - 2. set the project security design parameters for the GPC-Computer Labs.
- c. Consulting Design Team is to continue coordinating details with the **ISG** representatives and major users of the rooms during project design and at each subsequent design refinement meeting:
 - 1. to further define the required details in the developing construction documents;
 - 2. to further refine information about the intended technology for each GPC and GPC - Computer Lab;
 - 3. to produce single line schematic diagrams reflecting all connection points and equipment and terminations at components at other end;
 - 4. to consequently produce specifications for contracting method, vendor prequalification and partnering, system testing and signoff that impact substantial completion for the project.

28.42.01 GPC and GPC - Computer Labs -- Contract Documents must define the following:

- a. Wiring pathways from the main telecommunications rooms to the points in the classrooms (examples are: podium technology, ceiling tech projectors, document cameras, student computer stations, etc.)
- b. Locations for pathways (such as conduits) where easy access cannot be obtained (as example – above drywall ceilings) to run low voltage security wiring.
- c. Sizes of conduits for such pathways from each classroom to the main telecommunications rooms.
- d. Specific security layout for the system that will be developed in conjunction with the University Police representatives to the **ISG**, based on defined furniture plans for each GPC – GPC Computer Lab.
- e. Termination points for each end of each security device necessary for properly monitoring all GPC and GPC - Computer Lab technology equipment.
- f. Wiring for the security systems from the termination points in each of the GPC and GPC - Computer Lab rooms.
- g. Duplex outlets for powering security equipment at positions needed for the security equipment components to function properly.

28.42.02 Termination devices to be noted and locations defined for each particular GPC and GPC:

Computer Lab room applications (black box for fiber optic loops through student equipment and at instructional tech podiums, resistors at ceiling hung tech projectors, the main security panel in the telecommunications rooms, etc.).

28.42.03 Who provides and does what:

- a. Wiring and conduit to be run and placed as a part of the construction contract work as defined in the construction documents - done in close coordination with the selected security vendor that will be doing the installation;
- b. Such individual sets of wiring to have each end labeled with unique identifier particular to each set of wires running from the classroom termination point into the telecommunications room.
 1. Testing of the wires to be done by installing electrical (sub)-contractor in presence of security personnel and vendor (sub)-contractor to assure that all wires properly terminate as labeled.
 2. Any wiring not testing correctly to be replaced by electrical installer and tested until it is passed and accepted by the security personnel and vendor (sub)-contractor.
 3. After successful testing of the installed wiring, and acceptance by the security vendor (sub)-contractor, the security vendor (sub)-contractor will be responsible for the wire and its terminations.
- c. Security main control panels, keypads, black boxes (fiber-optic security devices), etc. to be provided and installed by the security vendor (sub)-contractor and wired together via the wires provided in the general or electrical (sub)-contract work;
- d. Fiber optic cables will be furnished and installed by **PSU** ITS-TLT and MTSS technicians, who are to run the fiber-optic cables through the tech equipment and make connections to the black boxes as well as connect the wires to the tech projector resistors.

DIVISION 40.80.00 COMMISSIONING:**40.80.00 GENERAL:**

- 40.80.01** To include review and coordination of all trades relative to the general purpose classrooms and other classrooms that could be rolled-over to GPCs.
- 40.80.02** To apply to new and major renovation projects and minor projects costing greater than a million dollars.
- 40.80.03** To include the GPC facilities coordinator as well as other members of the ISG at all phases of the project.
- 40.80.04** To include the ISG in a punch list walk-thru and subsequent punch list follow-ups.
- 40.80.05** To require the contractor to provide interference drawings that reflect components at the ceilings, walls and floors around each classroom, including the interstitial space between the structural elements and the finished spaces.
- 40.80.06** To define gains/losses through (de)-value engineered components affecting classroom needs as required in this document.
- 40.80.07** To compare to original building space program and to identify compliance and deviations.

40.81.00 ARCHITECTURAL:

- 40.81.01** To include all elements that could be subject to installations, interferences or applications related to plumbing, sprinkling systems, HVAC components, electrical, lighting and telecommunication conduits or raceways.
- 40.81.02** To include all elements that relate to sound attenuation and need to maintain low decibel levels from building systems and components.
- 40.81.03** To apply to any and all elements that could introduce vibrations into any part of the building components passing over or by general purpose classrooms.
- 40.81.04** To cross coordinate with all other design team members in all the building aspects:
- a. To minimize conflicts at classrooms from all other building elements.
 - b. To identify to the project team any and all building aspects proposed and designed by any consultants to the architectural design firm involved with the project.

40.82.0 STRUCTURAL:

- 40.82.01** To work with all the design groups to be sure that structure can be isolated from vibration inducing elements so that structure does not transmit such vibrations into the classroom technology equipment and space.
- 40.82.02** To work with all design groups to maximize the clear ceiling heights in the classrooms.

40.83.00 PLUMBING, SPRINKLING SYSTEMS & HVAC:

- 40.83.01** To not interfere with needed high ceiling spaces at all classrooms due to educational technology needs to keep data projectors and screens tight to structural components.
- 40.83.02** To isolate vibrating ducts, building machinery, piping, etc. so as to not introduce vibrations into the structural and finish systems.
- 40.83.03** To do proper testing and balancing for heating and cooling for the occupant loads, latent heat gains, educational technology used in each classroom, solar and/or other loads incurrent in each classroom.
- 40.83.04** To do tests to be sure that diffuser air is not causing movement to projection screens or creating uncomfortable noise and distraction to classroom occupants.

40.84.00 ELECTRICAL, LIGHTING & TELECOMMUNICATIONS:

- 40.84.01** To be sure that lighting zones are properly conceived and implemented, along with the necessary switching systems in the appropriate locations.
- 40.84.02** To verify that power systems are appropriately circuited and grounded as noted herein to prevent contamination of the instructional technology components.
- 40.84.03** To verify that the appropriate pathways exist for telecommunication systems and data systems between components in each classroom and the centralized distribution points.

40.85.0 ELECTRONIC SAFETY AND SECURITY:

- 40.85.01** To test for continuity of wiring and fiber between classroom components and the security monitoring box that alarms back to police services.
- 40.85.02** To be sure that all security components related to the classrooms are fully functional before releasing any vendors from the project.

END