

PART 1: GENERAL

- 1.01 Included in this section are the requirements for Computer Aided Drafting AutoCAD standards and policies surrounding BOOKPLANS, EGRESS MAPS, & CLASSROOM PLANS for LEHIGH. The intent is to allow Consultants to utilize their own drafting standards and CAD systems while still allowing the University to utilize the drawings in its system without complications. All BOOKPLAN, EGRESS MAP & CLASSROOM PLAN drawings submitted to LEHIGH for all renovation and construction projects must conform to the Drawings Standards as defined in this document and be submitted as described in the Deliverables.
- 1.02 The department of Campus Planning & Projects at Lehigh University (LEHIGH) currently has about 99% of building floor plans (called Bookplans) in AutoCAD .dwg format. LEHIGH currently maintains approximately 170 buildings on 2,355 acres with approximately 4.5 million GSF of building footprint. Because LEHIGH actively pursues land acquisitions, building floor plans must continually be added to its collection of drawings.
- 1.03 Accurate and up-to-date Bookplans are essential for showing building information such as room numbers, room usage, square footages, department ownership, and staff locations. This data is used for a variety of purposes by many departments on Campus including, but not limited to: Campus Police, Facilities and Campus Planning, Technology Departments, Reservations, Registrar, Controller, Maintenance Staff, Transportation, Parking, Residence Halls, Dining Services, Athletics, Risk Management, and Health and Safety.
- 1.04 Information from the “as Builts” submitted by the contractor is used to create facilities’ maps. Consistency of information is important to reduce time for LEHIGH staff and outside consultants to search existing site and building conditions on campus and to update the numerous Bookplans in a timely manner for use by the LEHIGH community.
- 1.05 AutoCAD Standards
- A. The following are general guidelines and cannot address every drafting condition. The consultant may propose changes and additions or request exceptions to the requirements. Request shall be made to the Facilities Project Manager.
 - B. A Lehigh University Facilities Services and Campus Planning approved AutoCAD template is available at the Planning office. The .dwg file includes all LEHIGH established layers, preferred furniture and fixture symbols, line types, dimension and text styles, and accepted paper sizes.
 - C. CAD Drafting
 - 1. It is assumed that the CAD user has a solid understanding of the common commands and features of computer aided drafting (CAD) and AutoCAD design software. Superior drafting skills remain a very important role even with the advent of CAD systems.

2. Please pay special attention to drafting techniques. Do not allow overlapping lined, large hatch patterns, etc. which would cause the files to be unreasonably large and/or messy. Always purge drawings of excess data or unused layers, etc., prior to the submission to LEHIGH.
3. The Consultant shall assure their work and that of subconsultants are orderly and completely legible.

D. Layer Control

1. See Addendum D: "Parts of the Bookplans" and Addendum E: "Screenshot of Layers Properties" for further explanation.
2. The overall goal is to strive for as few and as uniformly named layers as possible and that all layer names be readily discernable as to the content of each layer. **Note: Numbered layering systems will NOT be acceptable under any circumstances.**
3. Each layer may have several linetypes or symbols. Be sure to use the correct color and linetype (NOT "bylayer" in the case of two or more linetypes and/or colors in a layer as used for LS-Evacuation_map).
4. Do not use blocks. Blocks cannot be imported into the InVision software, Lehigh's geographic information system (GIS). Any blocks submitted must be exploded and saved to the appropriate layer.

E. Scale and Units

1. Objects shall be drawn to actual scale 1" = 1."
2. Use engineering units for civil site plans, utility plans, paving plans, demolition plans, and profiles.
3. Use architectural units for building drawings, structural plans, floor plans, reflected ceiling plans, sections and details.

F. Object Properties

1. Properties shall be set 'BYLAYER'. Do not adjust object properties by entity (forcing colors or line types) unless approved by LEHIGH.
2. LINE TYPE: Use only AutoCAD™ or LEHIGH approved line types.
3. TEXT STYLE: Use upper case proportional text – AutoCAD style ROMANS and True Type font Arial or LEHIGH approved text styles.

4. **COLOR:** Use basic 0-9 colors as shown in the drawing standard for all walls, windows, doors, room numbers, room use, notes, and polylines as these conform to our plot style table - Bookplan.ctb
5. **FONTS:** Use only AutoCAD™ standard fonts. Do not submit third party fonts.
6. **MENU FILES:** Do not submit or use any third party *MNU* files or menus in the drawing.
7. **PLOT STYLE TABLES:** All custom .ctb files MUST be included.
8. **LINE TYPE SCALES:** The linetype scale for a given plotted scale drawing shall be as follows:
 $1/8'' = 1'0'' .30;$ $1/16'' = 1'0'' .60;$ $1/32'' = 1'0'' .90.$
9. **XREF FILES:** All linked drawings MUST be included and referenced to 0,0,0.

1.06 Sheet Size Standards

- A. All documentation provided to LEHIGH in an electronic format must comply with one of the following sizes. (Note: 30in x 42in/Arch E1 is not an-acceptable page size).

Sheet Size (inches)	Sheet Name	Usage
8.5in x 11in	Letter, ANSI A	All purpose
11in x 17in	Ledger, Tabloid, ANSI B	LEHIGH Bookplans & construction sheets
22in x 34in	ANSI D	Full size construction sheets
24in x 36in	Arch D	Full size construction sheets
34in x 44in	ANSI E	Full size construction sheets
36in x 48in	Arch E	Full size construction sheets

1.07 File Naming Protocol

- A. The protocol for naming electronic drawing files is as follows:
1. CAD files are to be named:
 BuildingNumber_BuildingName_Year_DrawingNumber-DrawingName
 Example: 001_ServiceBuilding_2014_CS001-CoverSheet
 2. PDF files follow the same format for CAD files.
 3. External References that are used only as backgrounds and not altered shall retain their original file name - AND must be included along with the drawings.

1.08 Graphics Standards

- A. Project, Record or As Built Drawing Requirements

1. Contact Lehigh University Campus Planning department to obtain symbols in electronic form.
2. All polylines used to calculate areas shall be closed.
3. All drawings shall be created and edited in model space.
4. All areas to be measured shall use polylines as the method for calculating space and retained within the drawing on the appropriate layers.
5. Use object snap grips to assure precise elements, proper text placement and no overlaid lines or symbols.
6. Provide straight leader lines at the beginning or end of single lines and notes.
7. All spaces are to be measured consistent with the most current Postsecondary Education Facilities Inventory and Classification Manual (FICM). All interior polylines are to be drawn to the interior of each room. The only outside polyline is for the GSF calculation. Go to <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=92165> for more detailed information.
8. For all areas leased by LEHIGH, the rentable area shall be measured and calculated consistent with the Building Owners and Managers Association (BOMA) standard.

B. Objects in Drawings Requirements

1. All swinging doors shall be indicated open to 90 degrees to door opening in wall and shall have the open/close swing path shown with an arc from the open door end to corresponding door opening edge at the wall.
2. All restrooms shall include fixtures: toilets, sinks, and ADA required hardware if applicable.
3. All windows shall be drawn with a single line for all types of windows. This helps with readability when printing at smaller scales.

1.09 Deliverables

- A. All documentation provided to LEHIGH must be in compliance with the following format and associated requirements.

Format	Filename Extension	Format Requirements
Microsoft Word 2010	.docx	
Microsoft Excel 2010	.xlsx	

Microsoft PowerPoint 2010	.pptx	
Adobe PDF (Portable Document Format)	.pdf	Current version and not more than two versions prior.
Autodesk AutoCAD	.dwg	Current version and not more than two versions prior.
Autodesk Revit	.rvt	Current version and not more than two versions prior.
GPS Exchange File (GIS)	.gpx	
JPEG (Joint Photographic Experts Group)	.jpg	
TIFF	.tif	
PNG (Portable Network Graphics)	.png	

B. Project Completion: Upon completion of a project or contract, all final files and as-built BOOKPLANS, EGRESS MAPS & CLASSROOM PLAN drawing files created must be provided to LEHIGH in .dwg format. If additional original, editable formats exist, these shall be provided to LEHIGH in addition to the final format.

C. Submittal Requirements

1. Drawings shall be submitted in .dwg format only.

- Submittal of AutoCAD drawings (.dwg files) shall also include every external reference file, shape file, image file, font, custom object (ObjectARX), data-link file (Excel, CSV), photometric data link and color-dependent plot style table file used for producing the drawings (see table above).
- Prior to final submittal of as Built drawings, purge all unused and non-standard blocks, layers, linetypes, etc.
- Electronic CAD documents shall reflect “as-built” conditions.
- Drawings shall be zoomed to extents.

D. Electronic Documentation Delivery: All electronic documentation must be sent to the LEHIGH University Project Manager/Building Manager via the Project Manager’s/Building Manager’s University provided email (@LEHIGH.edu) or through a shared folder on Google Drive (<https://drive.google.com/>). If Google Drive is used, the Project Manager/Building Manager must have full editing permissions to all documents in the shared folder.

E. Hard-Copy Documentation Delivery (if necessary)

1. All hard-copy documentation for Campus Planning & Projects must be delivered to:
 LEHIGH University
 Campus Planning and Projects
 461 Webster Street, Annex 3A
 Bethlehem, PA 18015

1.10 Addendum: References and samples


- A: Bookplan – sample PDF (A1 - with .ctb plotting and A2 - with none plot style)
- B: Classroom Map – sample PDF
- C: Egress Map – sample PDF (two floors)
- D: Parts of the Bookplan – PDF
- E: Screen shot of Layers Properties – PDF

.dwg templates can be requested from the Campus Planning department.

Addendum A1: Bookplan



SAMPLE BOOKPLAN
WITH AUTOCAD LAYERS SHOWN

BUILDING SUMMARY	FLOOR SUMMARIES			LEHIGH UNIVERSITY	
		Gross	Net Assn.	STEPS BUILDING 1 WEST PACKER AVE.	
GROSS SQ. FT.:	137,333	17,084	6,987	 BLDG. 009A FIRST FLOOR SCALE: 0 5 10 20 30 FILE: 009A_AI.DWG DATE: 6/3/2014	
NET ASSN. SQ. FT.:	73,443	33,244	18,067		
Constructed:	2010	22,371	13,536		
Architect:	Bohlin, Cywinski, Jackson	22,371	13,688		
		22,371	13,733		
		15,860	7,423		
		4,002	4		

Addendum A2: Bookplan

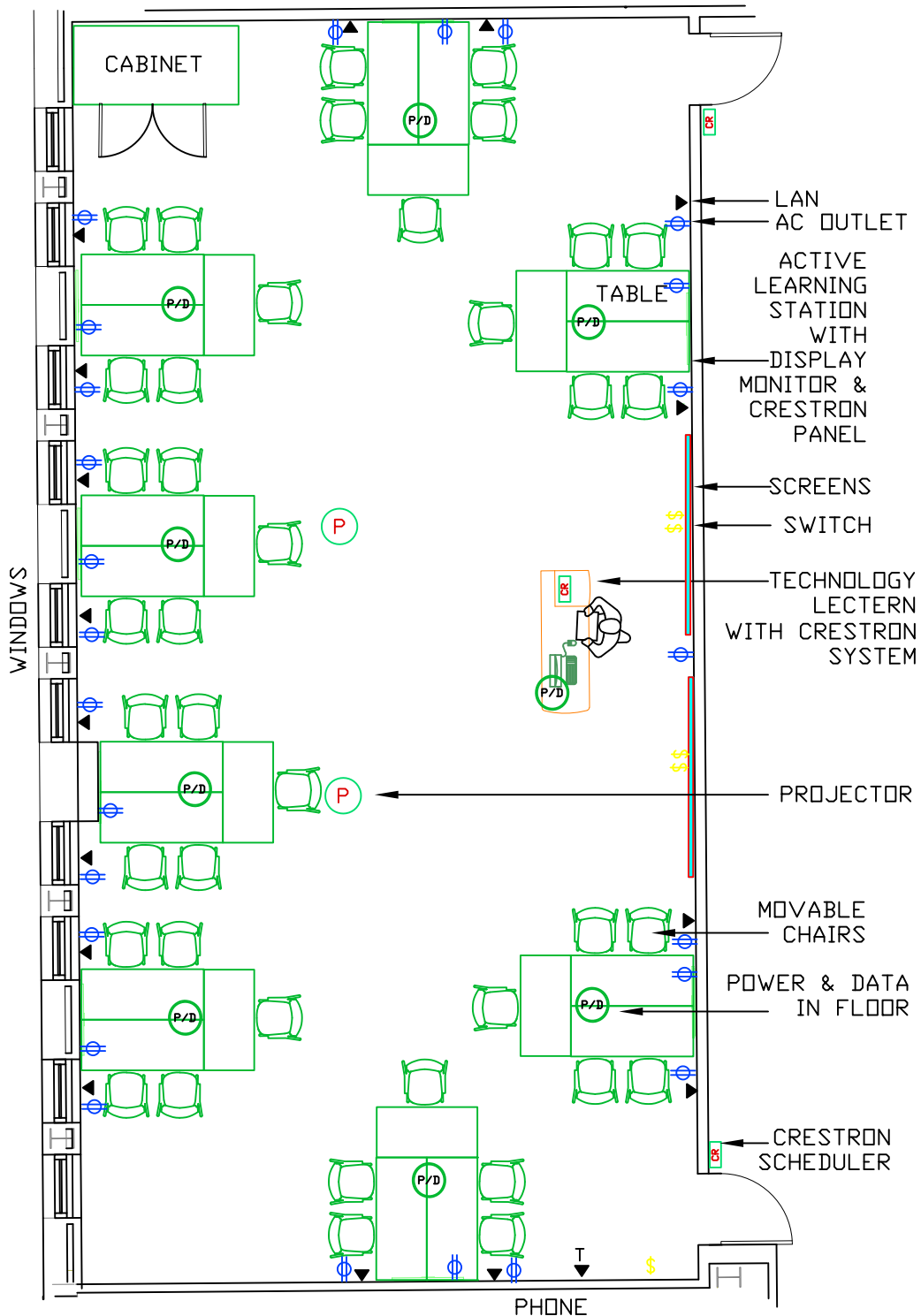


SAMPLE BOOKPLAN
 PLOTTED WITH BOOKPLANS.CTB FILE

BUILDING SUMMARY	FLOOR SUMMARIES			LEHIGH UNIVERSITY
		Gross	Net Assn.	
GROSS SQ. FT.:	137,333	17,084	6,987	STEPS BUILDING I WEST PACKER AVE.
NET ASSN. SQ. FT.:	73,443	33,244	18,067	
Constructed:	2010	22,371	13,538	BLDG. 009A FIRST FLOOR
Architect:	Bohlin, Oywinski, Jackson	22,371	13,688	
		15,860	7,422	SCALE: 0 5 10 20 30
		4,032		
				FILE: 009A_AI.DWG
				DATE: 6/3/2014

BUILDING C #113
113 Research Drive

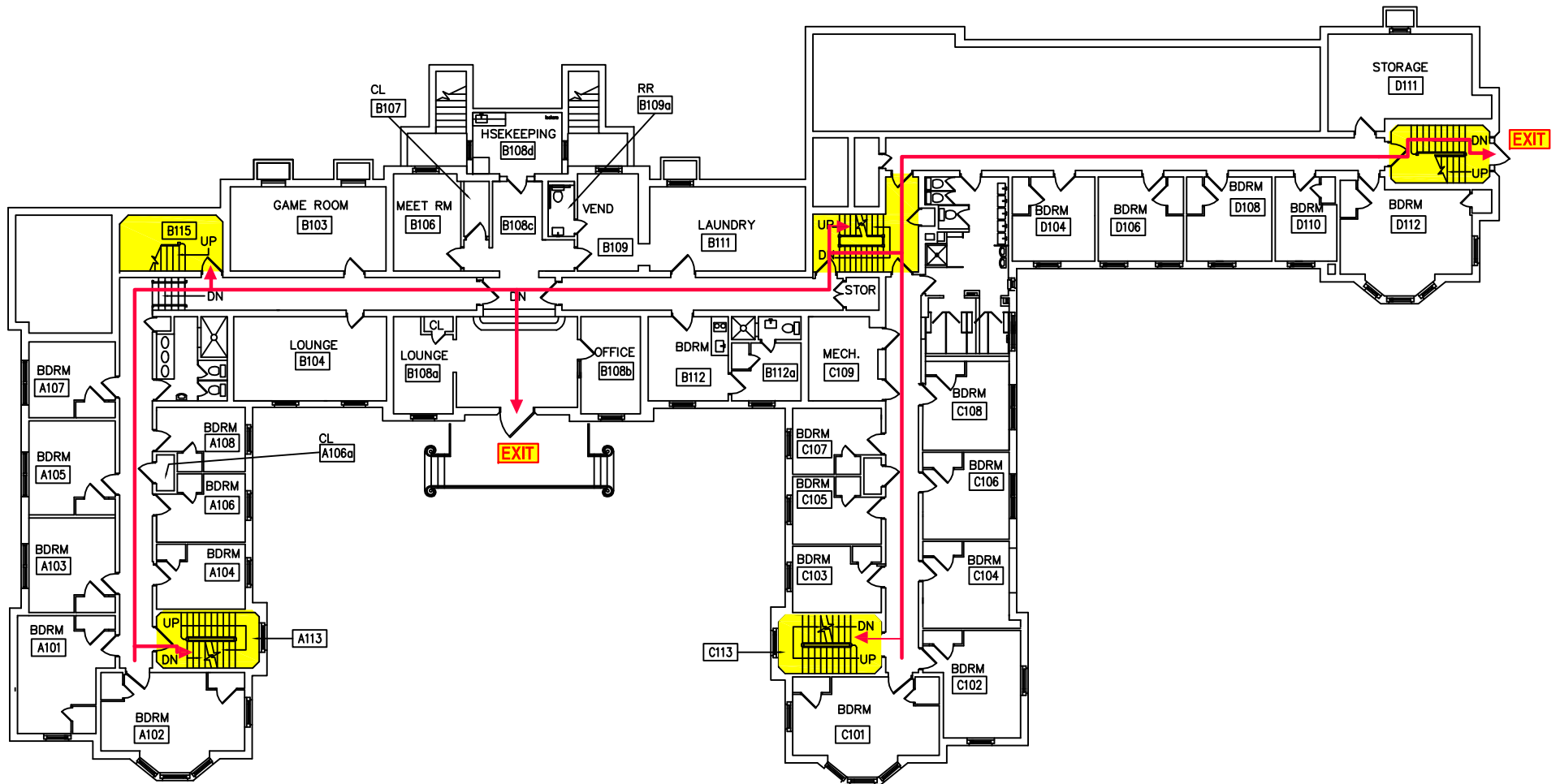
Addendum B: Classroom Map



REGISTRAR SCHEDULED

CLASSROOM # 210
STUDENT CAPACITY:40
DATE: 1/25/18

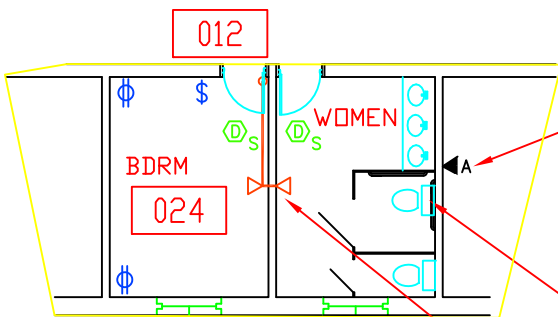
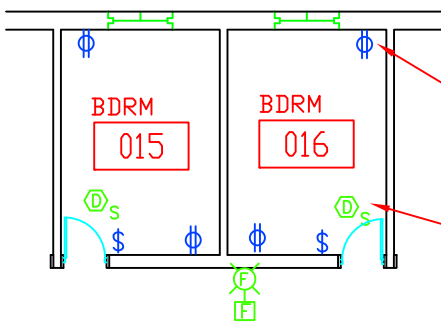
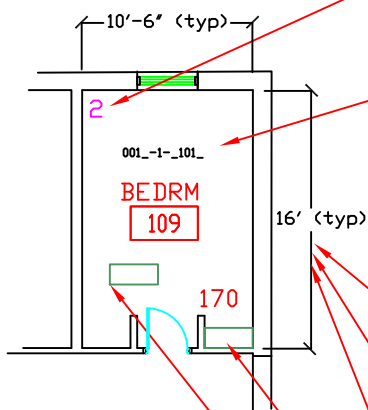
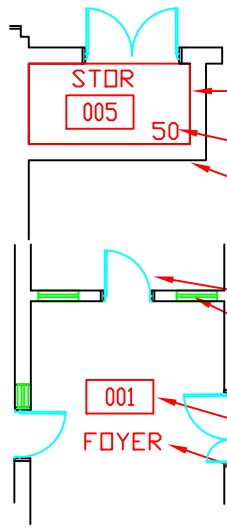
Addendum C: Egress Map



BUILDING SUMMARY	FLOOR SUMMARY	DEPARTMENT LEGEND	LEHIGH UNIVERSITY	
GROSS SQ. FT.: 60,792 NET SQ. FT.: 1947 CONSTR. 1947 ARCHITECT: JENS, FREDRICK, & LARSON	GROSS SQ. FT.: 11,702 NET SQ. FT.:	EMERGENCY EVACUATION PLAN	DRAVO HOUSE 65 QUAD DRIVE	
			BLDG. NO. 065 FIRST FLOOR SCALE:	
			FILE: 065_AI.DWG	DATE: 07/30/2008

STANDARD LEHIGH BOOKPLAN LAYERS

LAYER NAME	DESCRIPTION	REQD. IN BOOKPLAN?
A-Area_poly	Closed polyline around perimeter of room	YES - PRIORITY 1
A-Area_text	Square footage of room is placed in lower right hand corner by using the "insert, field" command.	YES - PRIORITY 1
A-Flr_plan	All interior & exterior walls, columns, & stairs	YES - PRIORITY 1
A-Doors	All interior & exterior doors - blocks must be exploded and replaced on A-Doors layer. All door swings must be 90 degrees.	YES - PRIORITY 1
A-Windows	All window components - blocks must be exploded and replaced on A-Windows layer	YES - PRIORITY 1
A-Room_number	Use block "s-room" or place room number centered inside a rectangle.	YES - PRIORITY 1
A-Room_use	Room Use (ie. OFFICE, OFFSERV)	YES - PRIORITY 1
A-Room_capacity	Room occupancy placed in the upper left hand corner of room	YES - PRIORITY 1
A-SpaceID	Unique space identifier. BuildingNumber-FloorNumber-RoomNumber. (dashes represent letters, such as wings, etc. It must fit inside the A-Area-poly polyline.	YES - PRIORITY 1
A-Notes	Do not use the A-Notes layer for any labels that may be turned on or off for printing or viewing, such as the UP or DN notations for stairs.	YES - PRIORITY 1
D-Dimensions_Web	Dimension layer used for length and width measurements of student's bedrooms. Measurements are rounded off. Plans are on Residence Hall Web	YES - PRIORITY 1
D-Dimensions_CAD	Layer used for measurements calculated by AutoCAD and saved for reference	NO
D-Dimensions_Field	Layer used for field measurements. any measurements taken in the field should be documented for future reference and the cad drawings should be updated when possible.	NO
F-Built_in	Used for built-in furniture	YES - PRIORITY 1
F-Furniture	Used for loose furniture	included in furniture plan
E-Electrical	Electrical layer used for light switches, outlets, etc. See sample classroom plan.	included in classroom plan
E-Fire_alarm	Electrical layer for electrical fire-safety equipment such as pull stations, etc. Typically transferred from engineer's and contractor's drawings. See sample Egress map.\p.	included in egress maps
E-Lighting	Electrical layer for overhead lighting.	NO
E-Rfl_ceiling	Electrical layer for reflected ceiling layout.	NO
E-Telecom	Electrical layer for telecom jacks. labeling starts with A,B,C clockwise from entrance.	NO
M-Duct	Mechanical layer used for duct work	NO
M-HVAC	Mechanical layer for vents, AC, heat etc. label with an "H","R" etc. See sample Classroom map.	included in classroom maps
P-Fixtures	Plumbing layer used for bathroom fixtures	YES - PRIORITY 1
P-Plumbing	Plumbing layer used for piping, etc.	NO
P-Sprinkler	Plumbing layer for fire-safety equipment such as sprinkler, etc. Typically transferred from engineer's and contractor's drawings. Includes waterlines. See sample Egress maps.	included in egress maps
BuildingFloor	Polyline around outside of building. Used for georeferencing.	YES - PRIORITY 1
T-TB_notes	Text notes in the title block.	NO
LS-Evacuation_map	Layer used for the Egress Maps. Arrows are 240-RED and stairs are 50-YELLOW. EXIT signs are both colors. See sample Egress maps.	included for egress maps
X-Viewport	Outside rectangle in paper space used for scaling, printing and viewing model space.	NO
Prepared by MJB; last updated October 2018		



TITLE BLOCK

DEPARTMENT LEGEND	LEHIGH UNIVERSITY	
	SEELEY '00' WOOD	
	6 EAST PACHER AVENUE	
	BLDG. NO. 6 SECOND FLOOR	
SCALE: 1/8" = 1'-0"	FILE: 000_A2.dwg	DATE: 2/27/2003

EXIT

LEHIGH UNIVERSITY AUTOCAD LAYERS

Addendum E: Screenshot of Layer Properties

Filters	Status	Name	On	Freeze	Lock	Color	Linetype	Lineweight	Transparency	Plot Style	Plot	New VP F...	Description
All		0				white	Continuous	Default	0	Color_7			
All Used Layers		A-Area_poly				red	Continuous	Default	0	Color_1			
Unreconciled New Layers		A-Area_text				red	Continuous	Default	0	Color_1			
		A-Doors				cyan	Continuous	Default	0	Color_4			
		A-Doors-outside				130	Continuous	Default	0	Color_130			
		A-Floor_ID				white	Continuous	Default	0	Color_7			
		A-Flr_plan				white	Continuous	Default	0	Color_7			
		A-Notes				red	Continuous	Default	0	Color_1			
		A-Notes-2				red	Continuous	Default	0	Color_1			
		A-Roof				white	Continuous	Default	0	Color_7			
		A-Room_capacity				210	Continuous	Default	0	Color_210			
		A-Room_number				red	Continuous	Default	0	Color_1			
		A-Room_use				red	Continuous	Default	0	Color_1			
		A-Space_ID				white	Continuous	Default	0	Color_7			
		A-Windows				green	Continuous	Default	0	Color_3			
		BuildingFloor				yellow	Continuous	Default	0	Color_2			
		D-Dimensions_CAD				202	Continuous	Default	0	Color_202			
		D-Dimensions_Field				211	Continuous	Default	0	Color_211			
		D-Dimensions_Web				white	Continuous	Default	0	Color_7			
		Defpoints				white	Continuous	Default	0	Color_7			
		E-Electrical				80	Continuous	Default	0	Color_80			
		E-Fire_alarm				80	Continuous	Default	0	Color_80			
		E-Lighting				51	Continuous	Default	0	Color_51			
		E-Rfl_ceiling				white	Continuous	Default	0	Color_7			
		E-Telecom				white	Continuous	Default	0	Color_7			
		F-Builtin				107	Continuous	Default	0	Color_107			
		F-Equipment				white	Continuous	Default	0	Color_7			
		F-Furniture				107	Continuous	Default	0	Color_107			
		L-Centerline				white	CENTER	Default	0	Color_7			
		L-Columnlines				190	CENTER	Default	0	Color_190			
		L-Hidden				blue	HIDDEN	Default	0	Color_5			
		LS-Evacuation_map				240	Continuous	Default	0	Color_240			
		M-Duct				yellow	Continuous	Default	0	Color_2			
		M-HVAC				yellow	Continuous	Default	0	Color_2			
		P-Fixtures				cyan	Continuous	Default	0	Color_4			
		P-Plumbing				cyan	Continuous	Default	0	Color_4			
		P-Sprinkler				240	Continuous	Default	0	Color_240			
		T-FloorSummary				white	Continuous	Default	0	Color_7			
		T-TB_notes				white	Continuous	Default	0	Color_7			
		T-TBlock				white	Continuous	Default	0	Color_7			
		X-Dept_color				white	Continuous	Default	0	Color_7			
		X-no_plot_layer				magenta	Continuous	Default	0	Color_6			
		X-Occupant_name				220	Continuous	Default	0	Color_220			
		X-Proposal				white	Continuous	Default	0	Color_7			
		X-Space_lease				white	Continuous	Default	0	Color_7			
		X-Tunnel				white	Continuous	Default	0	Color_7			tunnel
		X-Vacant				50	Continuous	Default	0	Color_50			
		X-Viewport				magenta	Continuous	Default	0	Color_6			
		Z-CheckLayer				white	Continuous	Default	0	Color_7			