

CAD Policies, Procedures and Standards

CAD Drawing Requirements for Executive Architecture/Engineering Firms Sub-contracted for Services by the Facilities Division, Lawrence Berkeley National Laboratory

Software Requirements

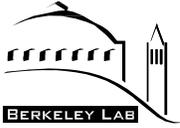
This document outlines the minimum CAD standards that must be met by the A/E for submitting drawing files that are compatible with LBNL's Facilities Division CAD operations.

Facilities Division uses AutoCAD Computer Aided Drafting software from Autodesk, Inc. of Sausalito, California for production and editing of CAD drawing files. All drawing files prepared by the A/E and submitted to LBNL shall be provided in .DWG format directly readable by a MS Windows® version of AutoCAD, Release 2013. Drawing files created on AutoCAD beyond release 2013 are to be converted to release 2013 format prior to submitting them to LBNL. No additional translation, modification, or editing of submitted CAD drawing files shall be necessary by LBNL in order to open, view and edit and plot the submitted drawing files.

Project specific information regarding drawings, which may not be addressed in this document, will be provided by the Facilities Division Project Manager or CAD Coordinator during the course of the project.

Coordination

A/E firms contracted by the Facilities Division will be given electronic copies of project-specific files of the standard drawing files used by LBNL Facilities Division. These include LBNL Facilities Division standard drawing title sheet formats, and special font files. The contracted firm's CAD Manager or individual assigned responsibility to ensure compliance with these standards shall contact the LBNL Facilities Division CAD Coordinator to clarify the requirements contained in this document. This shall be done prior to commencement of the A/E's task and continue throughout the course of the project as necessary. Once the A/E has established a CAD configuration compliant with these standards, a sample drawing file will be submitted to the PM for LBNL review for compliance with these standards prior to the A/E continuing with production of deliverables. If LBNL determines that the submitted file is non-compliant, the A/E will modify all deliverables as needed to meet these requirements.



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Project Border

The standard LBNL project border is provided on the LBNL website in an AutoCAD e-transmit zip file *d_sizeAE.zip*. The included border is ANSI-D sized (34"x22). The border is intended to be used as a template for LBNL project drawings. It is recommended that the file be saved as an AutoCAD .dwt (AutoCAD drawing template) file and used to begin each project drawing. The border contains attributes for the title block information which should be maintained as attributes. The border can be modified with AE and sub consultant information.

Drawing Format

All building information (i.e., floor plans and elevations) and all site information (i.e., maps, utility sheets, etc.) shall be drawn in real world units (full size) using AutoCAD values expressed in feet and inches per requirements outlined in the Dimensioning Section below.

CAD Layers

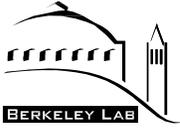
The long format layer naming convention described in the AIA CAD Layer Guidelines: *U.S. National CAD Standard Version 2* published by the American Institute of Architects (AIA) is the basic layer naming convention for drawings submitted to LBNL with the following simplifications:

- Layer names to be all capitols
- Discipline Designator to be single character (Level 1 only) as follows:
 - A- Architectural
 - C- Civil
 - E- ELECTRICAL (includes phone/data, security, fire alarm)
 - F- Furniture and Floating Equipment
 - G- General and Miscellaneous (title sheets)
 - J- Control Systems (EMCS, etc-)
 - L- Landscaping
 - M- Mechanical
 - P- Piping (including Fire Protection & Lab Gasses)
 - S- Structural
 - U- Site Utilities
- Title block and paperspace entities are to be on layers prefaced with a Z-Designator
Examples: Z-TEXT, Z-SHBD, Z-NOTE
- Viewports are to be located on layer DEFPOINTS
- If new construction is to be delineated from existing, it is followed with an -N
Examples: A-WALL-N, E-LITE-N



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- Elevation layers follow the format X-ELEV-XXXX
Examples: A-ELEV-LGHT, E-ELEV-PANL
- Detail layers follow the format X-DETL-XXXX
Examples: A-DETL-LGHT, E-DETL-PANL
- Section layers follow the format X-SECT-XXXX
Examples: A-SECT-BOLD, A-SECT-GRND



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- Detail, Elevation, and Section layers follow the following line weight naming conventions (where NNNN = DETL, ELEV or SECT):
 - X-NNNN = Thin lines (Colors 2, 7, or 12)
 - X-NNNN-LGHT = Light lines (Colors 1, 6, or 11)
 - X-NNNN-MEDM = Medium lines (Colors 3, 8, or 13)
 - X-NNNN-BOLD = Bold lines (Colors 4, 9, or 14)
 - X-NNNN-HEVY = Heavy lines (Colors 5, 10, or 15)



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Plotting/Printing Settings

It is the A/E's responsibility to create documents that are legible and read clearly. Assignments of specific colors to specific layers are to be made by the A/E using the following color to lineweight designations in a manner that results in hardcopy plots or prints of drawing files that meet this responsibility.

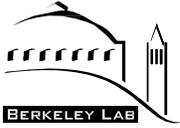
Layer color and linetype on all entities is to be "By layer".

The following color to line widths assignments are to be used for full size plots:

Solid Lines								
Color	Pen	Width	Color	Pen	Width	Color	Pen	Width
1=Red	1	.005 in.	6=Magenta	1	.005 in.	11=Dk Green	1	.005 in.
2=Yellow	1	.010 in.	7=White	1	.010 in.	12=Dk Cyan	1	.010 in.
3=Green	1	.015 in.	8=Dk Gray	1	.015 in.	13=Dk Blue	1	.015 in.
4=Cyan	1	.020 in.	9=Dk Red	1	.020 in.	14=Dk Magenta	1	.020 in.
5=Blue	1	.030 in.	10=Dk Yellow	1	.030 in.	15=Lt Gray	1	.030 in.
Gray Scale Lines (Pen = % Gray)								
Color	Pen	Width	Color	Pen	Width	Color	Pen	Width
31	30	.005 in.	51	50	.005 in.	71	70	.005 in.
32	30	.010 in.	52	50	.010 in.	72	70	.010 in.
33	30	.015 in.	53	50	.015 in.	73	70	.015 in.
34	30	.020 in.	54	50	.020 in.	74	70	.020 in.
35	30	.030 in.	55	50	.030 in.	75	70	.030 in.

and the following color plotted width combinations for half size plotting:

Solid Lines								
Color	Pen	Width	Color	Pen	Width	Color	Pen	Width
1=Red	1	.0025 in.	6=Magenta	1	.0025 in.	11=Dk Green	1	.0025 in.
2=Yellow	1	.005 in.	7=White	1	.005 in.	12=Dk Cyan	1	.005 in.
3=Green	1	.007 in.	8=Dk Gray	1	.007 in.	13=Dk Blue	1	.007 in.
4=Cyan	1	.010 in.	9=Dk Red	1	.010 in.	14=Dk Magenta	1	.010 in.
5=Blue	1	.015 in.	10=Dk Yellow	1	.015 in.	15=Lt Gray	1	.015 in.
Gray Scale Lines (Pen = % Gray)								
Color	Pen	Width	Color	Pen	Width	Color	Pen	Width
31	30	.0025 in.	51	50	.0025 in.	71	70	.0025 in.
32	30	.005 in.	52	50	.005 in.	72	70	.005 in.
33	30	.007 in.	53	50	.007 in.	73	70	.007 in.
34	30	.010 in.	54	50	.010 in.	74	70	.010 in.
35	30	.015 in.	55	50	.015 in.	75	70	.015 in.



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Line weight designations for full size drawings are as follows:

Line Weight	Line Thickness	Usage Example
Solid Lines	(Pen #1)	
Fine	.005 in (.13mm)	Dimensions, hatch patterns
Thin	.010 in (.25mm)	Text, hidden & center lines
Medium	.015 in (.35mm)	Bold text, profile lines, detail bubbles
Bold	.020 in (.50 mm)	Profile lines & section lines
Heavy	.030 in (.70 mm)	Border lines, ground lines
30% Gray	(Pen #30)	
Thin	.010 in (.25mm)	Floor textures
Medium	.015 in (.35mm)	Background items
Bold	.020 in (.50 mm)	Background titles
50% Gray	(Pen #50)	
Thin	.010 in (.25mm)	Detail material hatching
Medium	.015 in (.35mm)	Demolished items
Bold	.020 in (.50 mm)	Demolition titles
70% Gray	(Pen #70)	
Thin	.010 in (.25mm)	Material textures in elevation

Drawing Composition

Title blocks and notation are to be placed in paper space with drawing entities in model space. Viewports are to be sized and zoomed to the appropriate standard architectural or engineering scale.

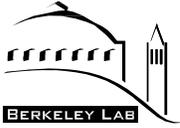
Text Styles and Scale

All submitted drawings shall use native AutoCAD font shape files, unless specifically allowed otherwise or provided by LBNL. The most common fonts used are RomanS and RomanD. Text color and pen mapping is described above.

Dimensioning

Architectural unit values (feet & inches) shall be used exclusively with the appropriate AutoCAD DIMVAR settings. All dimensions shall be associative and located in model space.

Digital Photographs in Drawings



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Use of raster and digital images in CAD drawings is allowed if accepted by the reviewing engineer/architect. These must be inserted using the IMAGE command. Image files are to be provided along with the drawing file and be named with the sheet number as the beginning characters. For example, a series of JPG files used on sheet M3.2 would be named M32-image1.jpg, M32-image2.jpg, M32-image3.jpg, etc.

Tables, Schedules, Charts in Drawings

Schedules, tables and charts will be composed of ACAD entities (lines and text) and are not to be OLE objects.

Usage of Third Party Modules

Third party productivity-enhancing software modules may be used for creating deliverable to LBNL. It is the responsibility of the contracted A/E firm to "strip-out" or otherwise convert any non-generic information or files. The submitted CAD file must be able to be opened by basic AutoCAD without the non-generic shape files, menu files, or font files. All external reference files shall be bound to the drawing as inserted blocks.

Final Submission

All unused blocks, dimension styles, layers, linetypes, shapes, and text styles shall be purged from the final version of the drawing file. All external reference files shall be bound to the drawing file using "Bind" in the XREF command. Electronic drawing files are not to be submitted in lieu of required hard copies.

All submitted electronic media are to be clearly labeled with the A/E firm name, the LBNL project number, the names of the drawing files contained, and the submittal date and purpose (e.g. "Title 2 Bid Drawings", "Final As-Built Record Drawings"). Each set of media is to be accompanied by a transmittal letter listing the media provided, the names of the files on the media, the content of each file (drawing sheet title), and the submittal date. If drawing files have been compressed or zipped, the transmittal will identify the archival file and list the individual drawing files contained in the archive.