

CAD and Drawing Style Guide

0.1.1.8 Rev. 2

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1.0 PURPOSE

This style guide will be used to guide CLS staff in the creation of CAD drawings and 3D models in order to help ensure consistency through standardization.

2.0 SCOPE

This Document Control Procedure for Drawings applies to internally produced and externally supplied drawings used in the business, operational, safety and security related processes and procedures at CLS and the records resulting from them, as defined by CLSI document 10.12.1.1, Quality Manual.

As new drawings are created, and existing ones are revised, they will conform to these procedures.

Appendix A CLSI Documentation Organization Map shows this document in relationship to other relative CLSI documents.

This document does not apply to conceptual drawings and sketches created by CLSI staff to rough out ideas, unless these drawings are then to be used to communicate work request requirements. Such drawings can range from hand drawn sketches using a whiteboard or pen and paper to drawing software programs such as Solidworks, Alibre, Microsoft Visio or Microsoft Paint. These drawings are not to be used directly to give instruction to CLSI work activities that define the business, operational, safety and security related procedures at CLS. Simple examples of these types of procedures include, but are not limited to, drawings for fabrication and installation, wiring and controls and purchased items.

The detailed CAD work processes and procedures using Autodesk software are defined in CLSI Guide to Create CAD Models and Drawing, 0.1.1.42.

The detailed CAD work processes and procedures using EAGLE software are defined in Electronics Development Procedure, 7.1.39.3.

3.0 DEFINITIONS

Autodesk Software: Software mainly used by the CLSI Engineering and CAD group. The software includes the programs AutoCAD and Inventor. AutoCAD is generally used for 2D CAD work. Examples of 2D CAD work include, but not limited to, facility layout drawings, process flow diagrams, ray tracing drawings and wiring diagrams. Inventor is used for 3D modeling and related drawings. Examples of 3D CAD work include, but not limited to, fabrication drawings, assembly drawings and purchase part drawings.

Eagle Software: Software mainly used by the Controls and Instrumentation group for printed circuit board development and schematic capture.

CSA: Canadian Standards Association

ANSI: American National Standards Institute

CAD: Computer-aided Design

CLS: Canadian Light Source, the working name of the facility

PCB: Printed Circuit Board

4.0 AUTHORITY AND RESPONSIBILITY

See Document Control Procedure for Drawings, Document 0.7.1.14, Section 5.0

5.0 STYLE STANDARDS

5.1 GENERAL INFORMATION

- Drawings created by CLSI shall conform to the CLSI style standards. The CLSI style standards are based on the CSA National Standards with the exceptions described in this document. These standards may evolve over time as software changes or as necessary for CLSI to conduct its business.
- Applicable CSA National Standards:
 - CAN3-B78.1-M83 Technical Drawings – General Principles
 - CAN/CSA-B78.2-M91 Dimensioning and Tolerancing of Technical Engineering.
- Mechanical Drawings and 3D Models (Inventor and AutoCAD) Exceptions:
 - Many of the styles set up in the Mechanical drawing and modeling templates are based on the Autodesk ANSI metric styles and standards.
- Electrical/Control Drawings (AutoCAD) Exceptions:
 - Most of the CSA standards do not apply to the content of the CLSI electrical and control drawings. CLSI has developed standards detailed in CLSI document 0.1.1.42, CLSI Guide to Create CAD Models and Drawings.
- PCB Drawings Exceptions:
 - Eagle Software does not support custom settings limiting the ability to customize the style to match AutoCAD or Inventor.
- Each drawing shall utilize a standard sheet layout, title block, and naming/numbering standards.

5.2 DRAWING AND MODEL TEMPLATES

CLSI drawings and models should be created with the templates stored within the CLSI CAD directories. Many of the CLSI drawing styles and standards are preset within these templates.

5.3 DRAWING SHEET SIZES

CLSI drawing sizes may vary and shall be selected from a pool of standard drawing sizes, which will be selected to suit the intended use of the document. CLS drawing sizes are optimized for CLS printers and conform to CAN3-B78.1-M83.

All CLSI drawing sheets are stored within the CLSI CAD directories.

5.4 DRAWING CONTENT

AutoCAD drawings will have all content (i.e. lines, circles, blocks, etc.) drawn at full scale (1:1) using millimeters in Model Space.

Inventor drawings will have all part content modeled in an .ipt file and assembly content modeled in an .iam file.

Eagle drawing content is defined in Electronics Development Procedure, 7.1.39.3.

5.5 DRAWING BORDER AND TITLE BLOCK

All drawings shall have a drawing border with a title block as described in this section.

Drawing borders shall be drawn at full scale (1:1).

AutoCAD drawings will have the borders inserted in Paper Space with the border origin inserted at 0,0.

Inventor drawings will insert the borders in the .idw file.

Eagle drawing border insertion is defined in Electronics Development Procedure, 7.1.39.3.

The drawing borders are basically the same for all drawings with the following exceptions:

- The title blocks differ slightly on different sheet sizes to accommodate for the amount of available space.
- The information contained within Figure 1, Section 9 differs depending on the purpose of the drawing.

The CLS title block contains the following specific sections (Figure 1):

1. Bill of material section (optional) - allows the inclusion of specific quantities of materials contained within the drawing. In general, only the technical facilities drawings would contain information within this section of the title block.
2. Drawing description section - contains the textual description of the drawing contents.
3. Revision section – contains the current revision status of the drawing.
4. Drawing number - is to be assigned to allow for filing, tracking and progress status reporting. Refer to CLSI document 0.7.1.14, Document Control Procedure for Drawings for further information.
5. Identification section - information identifying the people responsible for drafting, designing or checking and approving, plus date of original issue, drawing scale and drawing sheet size is placed within this section of the title block. Inventor drawing title blocks also include part/assembly mass properties.
6. Revision index section - contains specific information relevant to each revision issued. The information includes: revision designation; person responsible for revision issue; brief description of revision and any applicable change tracking numbers such as ECR/ECO, Job Order and MKS; date revision is issued; persons responsible for checking and approving of revised information prior to issue.
7. Drawing reference section - contains references to other drawings which are relevant to this specific drawing.

8. CLS logo - all CLS drawings will contain the CLS logo.
9. Dimension notification - this note is standard on all technical facilities drawings.
 - Fabrication and assembly drawings contain a tolerance note
 - Drawings that do not contain dimensions need not contain this note. Examples include, but not limited to, process flow diagrams and wiring diagrams.
 - PCB drawings created with Eagle software do not contain dimensions. The units for resistors, capacitors, and inductors are given in the title block.
10. Stamp (optional) - this area is reserved for the stamp of the certified professional responsible for the information contained on the drawing.
11. Company identification section (optional) - this area is provided to allow the design consultants to identify their drawings with the company name and logo.
12. EAGLE allows using more than 1 sheet for 1 schematic. There is a sheet number in the title block.

Note: Only the date in the revision index section changes with successive revisions. The original drawing creation date contained within Section 5 does not change with successive revisions.

Figure 1 – Drawing Title Block

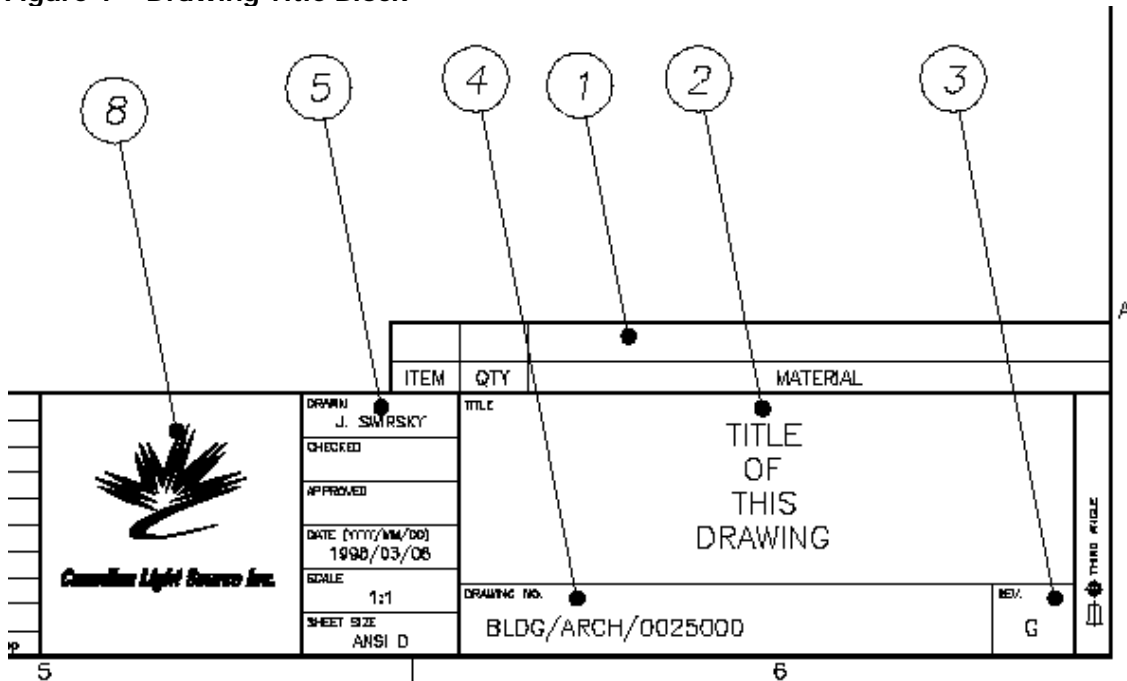
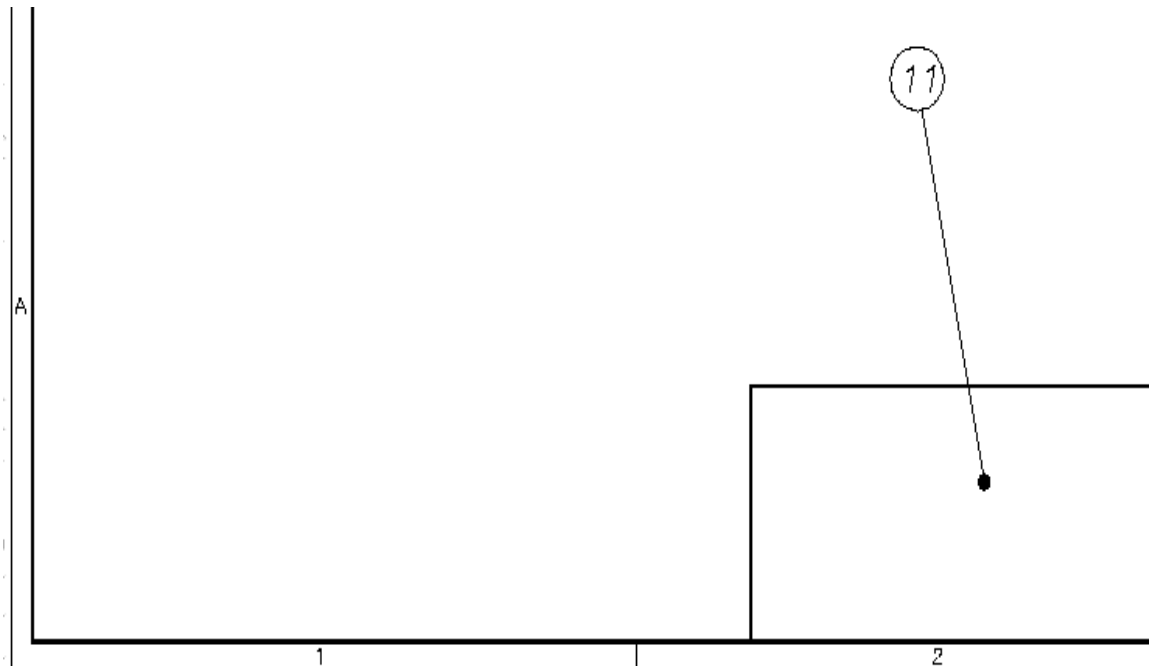


Figure 1 – Drawing Title Block (continued)



5.6 LETTERING

Text that is contained within the drawing content area of a drawing border should be as follows:

Inventor drawings

- Font style: Arial
- Text height: 2.5mm, 3.5mm and 5.0mm
- Text width: 100%

AutoCAD drawings

- Font style: Roman S
- Text height: 1.75, 2.5mm, 3.5mm and 5.0mm
- Text width: 1.0

Known exceptions to these guidelines are:

- The “defunct” and “Work in Progress” blocks
- Text within the CLSI drawing title block
- Extensive drawing notes where space is limited
- Text within some AutoCAD blocks where space is limited

5.7 PLOT STYLES

Plot styles are predefined in the CAD template files. CLSI mainly plots drawings in color using WYSIWYG (what you see is what you get).

5.8 DRAWING SCALES

AutoCAD and Inventor drawing scales should follow table 4 in CAN3-B78.1-M83 whenever possible. Exceptions from these scales are allowed and are left to the discretion of the author, checker and approver.

Eagle drawing content scale is defined in Electronics Development Procedure, 7.1.39.3.

5.9 DRAWING VIEW PROJECTION

Drawing view projection applies only to drawings that use orthogonal projection. CLSI drawings containing orthogonal projection shall use 3rd angle projection.

5.10 DRAWING FEATURES CONTROLLED BY INVENTOR

The following examples are features are controlled by Inventor in the CLS drawing template:

- Section view and section lines
- Section view cross hatching
- Thread representation
- Hole notes
- Detail view indicators
- Weld symbols
- Surface finish
- Geometric tolerances
- Bill of materials and balloons
- Chamfer notes

5.11 DRAWING AND MODEL LAYERS

The CLSI drawing templates contains most of the basic layers.

Any new layer name should be full length, avoiding abbreviations when possible.

The color "yellow" should be avoided since it is not easily seen on white paper.

5.12 BLOCKS (AUTOCAD)

AutoCAD blocks should be created on layer 0 with the color and linetype set to "bylayer".

5.13 DRAWING ORIGINS AND WORLD COORDINATE SYSTEM

The origin and World Coordinate System apply to CLSI drawing which illustrate the building and the technical machine contained within.

- Conventional building origin will have Model space details orientated with the existing linac in East/West direction (XX axis) and the origin 0,0 will be the northwest corner of the original 1964 building.

- Technical building origin will have Model space details orientated with the existing linac in West/East direction (XX axis) and the origin 0,0,0 will be the apparent intersection of the linac and the North/South leg of the linac to booster transport line at linac elevation.

6.0 REFERENCES

- Document Control Procedure for Drawings, 0.7.1.14
- CLSI Guide to Create CAD Models and Drawing, 0.1.1.42
- Electronics Development Procedure, 7.1.39.3

Appendix A – CLS Documentation Organization Map

