Cleveland State University
Office of the University Architect

CAD STANDARDS FOR CONSTRUCTION DOCUMENTS

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Section 1   General Requirements

1.1   **Overview:** These standards are issued to promote the development of CAD drawings suitable for use in the Cleveland State Office of the University Architect's record drawings. Consistency and compatibility with existing Cleveland State CAD documents can only be achieved when these standards are strictly adhered to. Electronic drawings produced and submitted in accordance with these standards have significantly greater value to the university, Architects, Engineers, and Contractors delivering CAD documentation to Cleveland State. Other Cleveland State contracts or construction guidelines may reference this document.

All design and construction drawings submitted to Cleveland State shall follow the CAD standards outlined in this document. Each of the following sections contains the most essential criteria for developing CAD drawings for use at Cleveland State.

CAD Background Disclaimer of Liability: CAD "backgrounds" are provided by CSU for informational purposes only and on an "as is" basis. Cleveland State University does not warrant the accuracy, correctness, reliability, comprehensiveness, or currency of any content. It is the responsibility of the user of this data to verify all information in the field. The recipient of this data shall indemnify, defend and hold harmless Cleveland State University and its officers, directors, partners, agents, members and employees from and against any and all demands, claims, damages to persons or property, losses and liabilities, including reasonable attorneys' fees (collectively "claims") arising out of or caused by the recipient's or its members negligence in connection with the use of this information.

Construction Drawing Disclaimer: All construction documents **must** include the following disclaimer: "Warning: This document may contain sensitive and/or proprietary information and therefore must be treated as a confidential document. Acceptance of this document constitutes an agreement that this document and the information contained herein shall be maintained and transmitted in a confidential manner. No part of this document shall be reproduced, released or distributed without the express written permission of Cleveland State and any distribution to non-CSU entities or persons must be subject to a written confidentiality agreement."

1.2   **Drawing Format:** Only the CAD drawing file formats listed below are acceptable, other formats are not acceptable without the prior consent of the Office of the University Architect.
   - AutoCAD™ **2016 or newer** DWG formats only. (In addition, please submit any REVIT RVT files. **2016 or newer**)
   - AutoCAD™ - DWF format may be requested in addition to the DWG (see Section 1.12)

1.3   **Drawing Composition/Naming**: CAD drawings created outside of Cleveland State sometimes contain more than one drawing sheet per file. While this may facilitate the production of construction documents, it can impede the archival process, and create content discrepancies. To minimize potential problems:
   - Prior to delivery to Cleveland State, CAD files containing multiple drawing sheets shall be broken down into separate drawings containing single sheets.
   - CAD files delivered to Cleveland State shall contain only one drawing and one title block per file.
   - All CAD drawings shall be purged of empty, unused, or non-essential drawing data prior to submittal to Cleveland State. This includes all unused layers, linetypes, blocks, fonts and entities.
   - CAD drawings shall not contain any frozen layers. All unused entities on frozen layers

- should be erased, and the empty layers purged.
  - CAD drawings shall not contain multiple overlaid lines or lines with multiple segments unless the overlaid lines or adjacent line segments are assigned to different layers.
  - Survey data shall be included in the CAD drawings and placed on the appropriate layers (see Section 1.5). Survey data collected and used in designing the project shall be submitted as a text file(s) (e.g. ASCII files).
  - Each drawing shall be named to include the sheet number first, followed by the title of the drawing. (Example: A1.1 First Floor Plan)

1.4 **Drawing Content:** All drawings to Cleveland State must adhere to the following requirements:
  - Finish Legend: So that trades do not have to reference multiple documents, all manufacturer, product, size, color, etc. information shall be listed in the Finish Legend on the drawings.

1.5 **Title Block Information:** Title Blocks for Construction Drawings provided by Consulting architects and engineers must use the Cleveland State title block template or an approved (by CSU PM) modified version. CSU PM to provide consultant with .dwg and .rta versions of the standard title block at the start of the project or upon request by the consultant. Consultants will be given the following file "CSU CAD Title Blocks for Consultants.zip" containing all formats. Title blocks for drawings submitted to Cleveland State must contain the following information:
  - Original issue date - this date should not change once the drawing has been issued.
  - Sheet number.
  - Sheet Description
  - Project Title - description of drawing and location information (as provided by CSU PM)
  - Location information should include all building, floor and room numbers as applicable.
  - Revision history – as applicable.
  - Drawing phase – (SD, DD, CD, BID/ PERMIT) drawings submitted as As-Builts should clearly be marked as such.
  - Cleveland State Project number. LF-#### for locally funded projects and CP-#### for Capital Projects. (To be provide by CSU PM)
  - Two characters building designation. (**SC** – Student Center)
  - A/E/C – Consultant responsible for producing the drawings should be clearly identified.
  - Contractor – As-builts should clearly indicate the general contractor

1.6 **Layering Standards:** The intent of the layering standard is to promote consistency between CAD drawings, and maximize the reusability of drawing data. The effective use of CAD layering standards also facilitates the grouping of shared graphical information for display, editing and plotting purposes. The Cleveland State layering standards are based on the **AIA Standards for layering** (**AIA std**), latest edition, Layering Guidelines. More detailed layering information and helpful background material is available in Section 2 – Layering Standards (General).

All CAD drawings submitted to Cleveland State shall follow the CAD layering standards outlined in this document. CAD layer standards, including layer descriptions, line types, and line colors, are provided in this document. These layering standards must always be followed:
  - Use only **AIA std**, layer names.
  - Use the minimum number of layers necessary to adequately separate entities in each drawing. The number of layers contained in each drawing will vary depending on the scope and complexity of the drawing, however drawings should not contain extraneous, redundant, or overly detailed layer names.

- Purge each drawing of unused layers prior to submittal. The drawing file should contain only those layers necessary for displaying and plotting the information and drawing entities contained in each drawing. To ensure that subsequent prints made from each CAD drawing match the original, unused or unnecessary layers must be purged from the drawing prior to delivery.

The effective use of CAD layering standards should:
- Allow users to isolate systems and drawing elements by controlling the visibility of objects - improving system performance and eliminating visual clutter.
- Expedite the import process and maintenance requirements for each set of drawings.
- Facilitate the sharing of information between drawings and disciplines.
- Allow users to control display and printing characteristics such as color, line type, line weight etc.

1.7 **Entity Properties:** To ensure the integrity of the original drawing when viewing or printing, it's essential that CAD entities are created following these standards:
- Entity colors shall be defined by layer, not by entity.
- Blocks shall be defined (created) on layer 0 (zero).
- All attributes shall be defined on layer 0 (zero).

1.8 **Model and Paper Space Usage:** These guidelines are suggested for using model and paper space effectively:
- Place title blocks, schedules and general notes at full-scale in paper space whenever possible.
- Label scaled viewports with the appropriate scale in model space.
- Do not place or draw model-related blocks, tags and objects in paper space.
- Draw all model space objects at full scale.
- Scale objects using paper space viewports – zoom viewports to the appropriate scale**.**

1.9 **External References - XREF's/ Image Files:** External References (XREF's) contained in CAD drawings created outside of Cleveland State can result in content discrepancies in the delivered drawing set. To ensure the integrity of the drawing set, and minimize potential problems:
- CAD drawings submitted to Cleveland State shall not contain any XREF's.
- XREF's shall not be "bound" to drawings prior to delivery.
- If drawings contain XREF's, they should be inserted as blocks prior to submittal to Cleveland State.
- Layers contained in XREF's inserted as blocks shall conform to Cleveland State standards.
- All images included in a drawing must be cut and pasted into the drawing so that they are embedded within the CAD file. Referenced images will be discarded and therefore might cause incomplete drawings. Please be aware of this when creating your CAD files.

1.10 **CAD Drawing Support Files:** Drawings created using non-standard CAD fonts, linetypes, and hatch patterns can result in content discrepancies in the delivered drawing set. To ensure the integrity of the drawing set, and minimize potential problems:
- Only native CAD fonts, linetypes, and hatch patterns or the CAD Symbology provided by the **AIA Standards**.
- Custom fonts, linetypes, and hatch patterns, including those provided by 3rd party software, shall not be used.
- Only these TrueType fonts shall be used: Arial, Courier New, Times New Roman.
- Postscript fonts shall not be used.

1.11   **File Transmittal:** The content of electronic drawings provided by the A/E must match the delivered original hard copy set as closely as possible, if not exactly. To ensure the integrity of the electronic drawing set upon delivery to Cleveland State:

- Ensure the drawings adhere to the guidelines presented in this document. Review the procedures for preparing drawings for submittal as detailed in the preceding paragraphs.
- Include a hard copy index containing filenames and sheet numbers for each submittal. This ensures the completeness of the drawing set and assists in archival procedures.
- Include a transmittal sheet with all submittals indicating Cleveland State Project number, Cleveland State Project name (if applicable) and complete listing of all materials submitted.
- Include CAD .PC2, .PCP or .CTB plot configuration.
- Include all field survey data as indicated in Section 1.3.
- Submit hard copies of original contractor "red line" plans and specifications.
- Ensure that the PDF files print to match the layer standards of the CAD files. PDF files shall be unlocked and have no editing restrictions.
- When possible CAD files to be processed using AutoCAD™ eTransmit function.

1.12   **Submittal Requirements:** At the end of each design phase (Schematic, Design Development, Construction Document, Bidding, Project Closeout) a **complete** full-size set of drawings and specifications will be provided in hard copy, PDF, and electronic file format. Partial or supplemental sets are **not** acceptable.

All CAD drawings forwarded to Cleveland State shall be submitted in a timely fashion, coinciding with the needs of the project and Cleveland State staff. The delivery of CAD documentation during various project stages (schematic, preliminary and working drawing phases) shall be submitted in the appropriate formats and timed appropriately to ensure that Cleveland State ultimately receives the most accurate information available for review. The receipt of electronic CAD drawings alone does not alleviate the responsibility of the Architect, Engineer or Consultant for providing hard copy documentation to Cleveland State.

For typical capital (CP) and locally funded (LF) campus projects, the A/E is responsible for submitting a complete set of Construction Record Documents, including electronic specifications and updated drawings reflecting revisions issued during construction, in DWG, PDF, and hardcopy formats within 30 days of post substantial completion.

Recognizing the diverse nature of capital and campus projects, A/E's shall meet jointly with the Cleveland State Project Manager to discuss specific CAD requirements for the project at the initial negotiation meeting with the A/E.

The following documentation, including DWG (refer to Section 1.11), PDF, and hardcopy shall be delivered to Cleveland State at the following project milestones:

- **Digital File Submittal No.1**
  <u>Upon completion of the Schematic Design Phase or when the final design scheme has been approved.</u> Provide all sheet files associated with the final and approved design scheme. These files will have all information contained within them. No externally referenced information is required at this stage. These files are to be archived into a ZIP (compressed) file.
  - Naming of this file shall be similar to: *CSU No.-Scheme No.-Date.zip*
  - CSU No. – Cleveland State University Job Number

Scheme No. – SK + the number of the scheme + possible generation letter
> *Example: SK02B: Second generation of Scheme No. 2*

Date – Corresponding date of final approved schematic
> *Example: 04-15-15 (Month – Day – Year)*
> *File Name Example: LF1405-SK02B-04-15-15.zip*

- **Digital File Submittal No.2**

  <u>Upon completion of the approved Design Development Package.</u>
  Provide all sheet files associated with the approved Design Development Package (include all disciplines). These files will have all of the externally referenced information bound, but not exploded, to the sheet file. These files are to be archived into a ZIP (compressed) file.

  Naming of this file shall be: CSU No.-DD.-Date.zip

  CSU No. – Cleveland State University Job Number

  DD – Design Development

  Date – Corresponding date of approved Design Development Package
  > *Example: 01-15-15*
  > *File Name Example: LF1405-DD-04-15-15.zip*

- **Digital File Submittal No.3**

  <u>Upon completion of the Construction Documents, unilateral to issuing for Bidding.</u> Provide all sheet files associated with the approved Construction Document Package (include all disciplines). These files will have all of the externally referenced information bound, but not exploded, to the sheet file. These files are to be archived into a ZIP (compressed) file. Include in this ZIP (compressed) file the final draft of the **specifications** including the front end and cover sheet.

  Naming of this file shall be: CSU No.-BIDSET-Date.zip

  CSU No. – Cleveland State University Job Number

  Date – Issuance date for Bidding of Construction Documents
  > *Example: 04-15-15*
  > *File Name Example: LF1405-BIDSET-04-15-15.zip*

- **Digital File Submittal No.4**

  <u>Upon completion of the Bidding Phase, prior to issuing the Construction Set.</u> Provide all sheet files associated with the Construction Document Package as modified by the Bidding Process (include all disciplines). These files will include ALL addenda and Bidding changes. These files will have all of the externally referenced information bound, but not exploded, to the sheet file. These files are to be archived into a ZIP (compressed) file. Include in this ZIP (compressed) file the final draft of the **specifications** including the front end and cover sheet.

  Naming of this file shall be: CSU No.-BIDSET WITH ADDENDA-Date.zip

  CSU No. – Cleveland State University Job Number

  Date – Issuance date for Bidding of Construction Documents
  > *Example: 04-15-15*
  > *File Name Example: LF1405-BIDSET WITH ADDENDA-04-15-15.zip*

- **Digital File Submittal No.5**

  <u>Upon completion of the Construction Phase, during project close-out procedures</u>. Provide all sheet files associated with the Construction Document Package as modified by the Construction Process (include all disciplines). These files will included ALL RFI, FWO Change Order modifications and will reflect ALL field changes recorded by the contractors. These files will have all of the externally referenced information bound, but not exploded, to the sheet file. These files are to be archived into a ZIP (compressed) file. Include in this ZIP (compressed) file the final draft of the specifications including the front end and cover sheet.
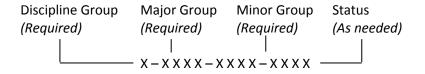
Naming of this file shall be: CSU No.-ASBUILTS-Date. zip
CSU No. – Cleveland State University Job Number
Date – Issuance date for Bidding of Construction Documents
Example: 04-15-15
File Name Example: LF1405-ASBUILTS-04-15-15.zip

Section 2   Layering Standards (General)

2.1   **Layer Name Format:** The layer naming scheme followed by Cleveland State is organized as a hierarchy. This structure is intuitive, easy to use and sort, and allows for expansion and customization. Layer names are defined using characters identifying disciplines, minor groups and modifiers. Disciplines are always identified by a single character, major groups, minor groups, and modifiers are always identified using four characters, and each group is separated by a hyphen.

Discipline Group   Major Group   Minor Group   Status
(Required)   *(Required)*   *(Required)*   *(As needed)*

X – X X X X – X X X X – X X X X

16 major disciplines are defined in these standards:

Discipline Designator			
A	Architectural	**O**	Operations
B	Geotechnical	**P**	Plumbing
C	Civil	**Q**	Equipment
D	Process	**R**	Resource
E	Electrical	**S**	Structural
F	Fire Protection	**T**	Telecommunications
G	General	**U**	
H	Hazardous Materials	**V**	Survey/Mapping
I	Interiors	**X**	Other Disciplines
L	Landscape	**Z**	Contractor / Shop Drawings
M	Mechanical		

Major groups subdivide disciplines based on construction systems or type of information. For *example: A-WALL and C-ANNO*.

Minor groups subdivide major groups to provide additional information about the entities located on the layer. For *example: V-POLE-UTIL* indicates that this layer only includes Utility Poles and was surveyed/mapped.

Modifiers are optional, and further subdivide the minor group when the minor group layer name alone is not descriptive enough. For example: C-STRM-DRAN-IDEN indicates that this layer only includes identifier tags, symbol modifier, and text about stormwater drainage structures. Please refer to the **AIA Standards for layering**, latest edition.

Status modifiers should always be used on drawings where work phases must be separated, for example demo drawings. Drawing entities without status modifiers are assumed to be new. The following table provides two options for adding status modifiers. Either option may be used, but the selection must be consist for all layers contained in the drawing.

2.2 **Layer Standards – Detailed:** Please refer to the **AIA Standards for layering**, Cleveland State requires that all CAD drawings follow the **AIA standard** layer naming convention and recommends that CAD drawings utilize the layer line type, layer color, and layer line weight outlined by the **AIA Standards for layering**. These standards hold true for CAD files exported from BIM software programs as well.

Section 3 Sheet Naming

3.1 **General Requirements:** Cleveland State requires that for each Sheet submitted as a project deliverable there is a corresponding DWG and image file (PDF). The sheet and the digital files all follow the same naming convention.

3.2 **Sheet Identification:** The sheet identification format is a consistent format that contains four alphanumeric characters in a specific sequence conveying meaningful information to both the drawing creator and user. The sheet identifier consists of three components: the discipline designator, the sheet type designator, and the sheet sequence number followed by the drawing extension, i.e. .PDF or .DWG. *Example A-101.dwg*

Discipline Designator - Consists of one alphabetical character and a hyphen. The codes used for the discipline designator are listed in the *Layer Naming Convention Section 2.1*. The discipline designator identifies the sheet as a member of a particular discipline of drawings. Not all type designators are required. The standard also does not prohibit combining different types of drawings onto the same sheet.

Sheet Type Designator – Consists of one numeric character. The sheet type designator refers to the type of information displayed in the drawing.

Sheet Type Designators		
0	General	symbols, legends, notes, etc.
1	Plans	horizontal views
2	Elevations	vertical views
3	Sections	sectional views, wall sections
4	Large-Scale Views	plans, elevations, stair sections, or sections that are not details
5	Details	
6	Schedules and Diagrams	
7	User Defined	
8	User Defined	
9	3D Representation	isometrics, perspectives, photographs

Sheet Sequence Number – Consists of two numeric characters. The sheet sequence number, which is a series of sequential numbers from 01 through 99. The use of 00 is not allowed.

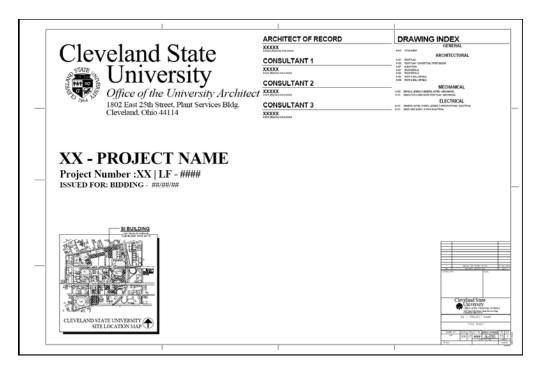## Section 4 Building Information Standards (BIM)

4.1 **General Requirements:** Cleveland State has adopted as a general/ minimal guideline the current version on the State of Ohio Building Information Modeling Protocol avaible at the OFCC website at http://ofcc.ohio.gov. A/E's shall meet with the Cleveland State Project Manager to discuss specific BIM requirements for the project at the initial negotiation meeting with the A/E. Further A/E's shall meet with the Project Manager to discuss and develop a BIM Execution Plan for each project.
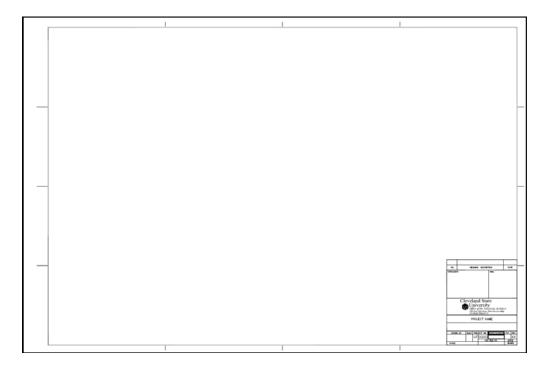
- End of Section -

Appendix A

General: Use 24 x 36 sheet size for small projects, use 30 x 42 sheet size for major renovations, additions and new buildings coordinate with CSU PM. Sheet sizes larger than 30 x 42 are not allowed.

Title Sheet   24 x 36 and 30 x 42 (Typical Sheet Size)

Border Standards   24 x 36 and 30 x 42 (Typical Sheet Size)

Appendix B

Cleveland State University
Department of Facilities and Safety
Office of the University Architect

ELECTRONIC FILE QUALITY ASSURANCE CHECKLIST

CAD drawings, BIM and image (PDF) files delivered at closeout of a project must be accompanied by this checklist. When a checklist has been signed and submitted, the vendor (architect, engineer, contractor, etc.) is assuring that all submitted materials adhere to the standards and guidelines set forth in the Office of the University Architect's CAD Standards.
Final payment to vendor is dependent on acceptance of submitted files by CSU PM.

FILE FORMAT AND SETUP
- □ Electronic File Format
- □ Scale, Units, & Tolerances
- □ Fonts and Text Styles
- □ Blocks
- □ Title Blocks
- □ Policy on Model Space and Paper Space
- □ Policy on External Reference Files/ Image Files (XREFs)

LAYERING
- □ Standard Layer List
- □ Layer Name Formatting
- □ General Rules about Naming and Uses
- □ Layer Attributes (Colors, Pen weights, Linetypes)

CAD & PDF NAMING CONVENTIONS
- □ Building and Floor Identification Codes
- □ Discipline Identification Codes
- □ Drawing Type Codes
- □ Drawing Numbers

_____   _____

Project Number   Project Title

_____

Consultant/ Vendor Name
(Please print)

_____

Name of Accountable Consultant/ Vendor Representative
(Please print)

_____   _____

Signature of Accountable Consultant/ Vendor Representative   Date

Phone number: _____ Email: _____