



CAD Standards Guideline
For
Facility Documentation and Construction Projects

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Planning and Design – Overall Consultant Deliverables

Architects, Engineers, Contractors, and Consultants working for Creighton University must follow the guidelines contained in this document.

A. Software - This section outlines file formats required for any documents submitted to the University. CAD Files. The CAD software employed by Creighton University is AutoCAD 2008.

- All data transferred must be readable using this release. No DXF or PLT files are acceptable.
- Word Processing. Each consultant must deliver text documents in Microsoft Word 2003 or in Adobe PDF format.
- Spread Sheets. Each consultant must deliver spreadsheet documents in Microsoft Excel 2003 or in Adobe PDF format.
- Database. Each consultant must deliver database documents in either Microsoft Access 2003 or XP.
- All images and renderings shall be submitted in either JPEG or TIFF format. The University reserves the right to request the images in their original produced format.

B. CAD Methods - This section details the CAD methodology utilized by the University.

Basics are as follows:

- All plans shall be submitted with ARCHITECTURAL units and direction for angle 0.00 is <270>.
- All entities are assigned color BYLAYER.
- NO PLANS are to be enlarged or reduced by the SCALE command.
- All Polylines for spaces are closed.
- All Drawings in AutoCAD will be delivered in 2D Wireframe format.

1) Layer Standard

- The University conforms to AIA Cad Layer Guidelines 2nd Edition and thereby the U.S. National Cad Standard Version 3.1.
- The AIA layer naming scheme followed by Creighton University is organized as a hierarchy. This structure is intuitive, concise, easy to understand, and allows for expansion and customization. The University requires that all objects in the drawing reside on the correctly named layer. Layer names are defined using characters identifying disciplines, minor groups and modifiers. Disciplines are always identified by a single character. Each group is separated by a hyphen.

Examples: A-WALL-DEMO (Architectural Wall to be Demolished)
E-EMER-LITE (Electrical Emergency Lighting)
M-HVAC-SUPP-IDEN (Mechanical HVAC Supply Duct Identification)
C-SSWR-MNHL (Civil Sanitary Sewer Manhole)

The following discipline characters are defined as followed:

A - Architecture
C - Civil
E - Electrical
F - Fire Protection
G - General
H - Hazardous Material
I - Interiors
L - Landscape
M - Mechanical
P - Plumbing
S - Structural
T - Telecommunications

2) **Font Standard**

- Text styles and fonts may vary, but the use of font ROMANS.shx for most applications is desirable. Special fonts which are not packaged with AutoCAD® are **not** allowed. Dimensions, labels and notes, should be not less than 1/8" height on printed drawings. Plotted Text Size for room names, dimensions, and notes should be 1/8" height. Plot size of text for plan and detail titles should be 1/4" height.
- The University allows the use of only the True Type Fonts that ship with the appropriate release of AutoCAD 2008. A complete listing may be found in AutoCAD's on-line help.
- Text size must be legible and appropriate to the graphic information presented and the intended plotted scale of the drawing. Text must be in all upper case letters throughout a drawing.
- Text usually should not touch other graphic objects, and must be placed with enough space around it to be legible when the drawing is plotted and reproduced.

3) **Line weights**

- a) Line weights will be based on AIA Standard Color.ctb
- b) Line weight uses:
 - Fine: to be used for material indications, surface marks, hatch lines, patterns, etc.
 - Thin: to be used for dimension lines, leaders, extension lines, break lines, hidden objects, dotted lines, setback lines, center lines, grid lines, schedule grid lines, etc.
 - Medium: to be used for object lines, property lines, text, lettering, door and window elevation marks, schedule grid accents, etc.
 - Wide: to be used for titles, edges of interior and exterior elevations, cut lines, property lines, section cuts, drawing block borders, etc.
 - Moderate Bold: to be used for match lines, large titles, title block borders, sheet borders, schedule outlines, etc.
 - Bold: to be used for border sheet outlines and cover sheet line work.

4) External References

- All external references must be attached to the drawings.
- External references must be Bound on 90% Construction Documents and subsequent submittals.
- All external references must be Bound using the INSERT option of the XREF command's BIND option to avoid long, cumbersome layer names and unrecognized paths.
- The University suggests that external references be attached on layers named *-****-XREF-#. (* denotes discipline code, # denotes some designator.)
- When a bound external reference is exploded all individual objects must reside on correct layer.

5) Area Calculation

- A polyline should be drawn around the interior surface of all walls within a given space.
- This polyline should be drawn on layer A-Area and the layer should be set Not to Plot. A corresponding layer A-Area-Iden should be set up to include the Text for the properties of the polyline. The layer A-Area-Iden should be set to print. The standard color for these two layers is GREEN.
- A block should be included in the title block with the cumulative Net S.F. and Gross S.F. for each floor. The following information is required on the cover sheet.

Entire Building

Gross S.F. = _____

Net S.F. = _____

- Each room will have the square feet listed and the text should appear as such: 100 S.F. The following information is required on each floor plan

Floor Plan

Gross S.F. = _____

Net S.F. = _____

6) Blocks

- All blocks must be inserted on the correctly named layer.
- The coloring of entities in blocks should be set to BYLAYER.

7) Dimensions

- All dimensions shown in the project submittals shall be fully associative. Dimension definition points should be located with an appropriate Object Snap (End Point, Mid Point, etc.) or otherwise located precisely on the project geometry. Manual input of dimension text or otherwise over-riding the actual dimensions is NOT acceptable in submittals to the University.

10) Other

- PURGE, AUDIT and ZOOM extents before submittal to the University.
- Save drawings with ACAD as the current menu.
- Room numbers, when appropriate, must be present and correct as identified by the University.
- The University may ask for complete model files for larger floor plans. This would encompass the transmittal of a complete floor plan that has not been "cut-up" for the purpose of display in individual sheets.
- All drawings in Model Space shall be at a 1:1 or full scale unless explicitly explained in the drawing.

11) Drawing Organization

a) Drawing Title

- The A/E title block and name of project shall be in a vertical format down the right-hand side of the drawing, or blocks in the lower right-hand corner are preferred.
- Project Name shall match the title of the project on the project budget analysis sheet.
- Project Number (cross-referenced to budget number).
- Building Name
- Area large enough for A/E's signature and seal.

b) Drawing Numbers

- The A/E shall ask the Project Manager for the building name and number. This number shall be on all drawings. "C" for Civil and Survey work, "A" for architectural, "FS" for food service, "I" for interior design or furniture layout, "LF" for laboratory furniture, "S" for structural, "P" for plumbing, "HVAC" for heating, ventilating, and air conditioning, "M" for

mechanical, if plumbing and HVAC are combined, "FP" for fire protection drawings, "E" for electrical drawings, and "ME" for mechanical and electrical combined.

c) Title Sheet / Cover Sheet

A title sheet shall be included on all projects. Indicate sheet numbers and description. The title sheet shall have the following minimum information (the layout can be altered to best suit the projects needs):

- Project name and location
- Name, address, phone number, fax number, email address of the A/E and any consultants used on the project.
- Index of all drawings included in the Contract Documents, this should include the Creighton Drawing File Number/Sequence number.
- Location map indicating the location of the project on the campus or within the town it is located.
- List of symbols and abbreviations used in the Contract Documents. Abbreviations used on the Drawings must be industry standard recognized abbreviations and must be consistent throughout the construction documents.
- All applicable Code criteria and data.

C. Product Delivery - This section outlines the University's expectations concerning the delivery of construction set submittal.

- 1) **Rights:** Creighton University, for itself and such others as it deems appropriate, will have unlimited rights to all information and materials developed under this contract and furnished to the University. This includes any documentation thereof, reports and listings, and all other items pertaining to the work and services pursuant to the agreement including any copyright. Unlimited

rights under this contract are rights to use, duplicate, modify, or disclose data and information, in whole or in part, in any manner and for any purpose whatsoever without compensation to or approval from the contractor. The University will, at each stage, have the right to inspect the work and will have access to and the right to make copies of the above-mentioned items. All digital files, associated data, and other products generated under the contract shall become the property of Creighton University.

2) **Timely Data Delivery**

- All AutoCAD drawings and supporting documents shall be submitted in a timely fashion, coinciding with the needs of the project and the University.
- The delivery of AutoCAD documentation and supporting documents during various stages project stages shall be timed appropriately to ensure that the University always has the most accurate information.
- The content of electronic drawings and supporting documents must match the delivered original hard copy set and are required at the same time as the hard copy sets.
- Both the hardcopy paper set and the electronic documentation are to be accompanied by a letter of transmittal or e-mail directed to both the Project Manager and the Director of Contracts and Project Management.

3) Transfer Stages

- a) Review and Construction Documents (Design Development, Construction Documents 30%, 60%, and 90%) shall include a complete set of the following:
 - Specifications
 - AutoCAD Drawings in electronic .dwg format
 - Full Size hard copy format (1 set)
 - Renderings
- b) Bid Set/100% - Design drawings used for the bidding process. The submitting of this set shall be as per the Project's Contractual Agreement. All electronic drawings (**AutoCAD 2008**) must have all corresponding signatures attached. Non-signed drawings shall be rejected & must be resubmitted. Include the following items as part of the bid set:
 - Specifications
 - AutoCAD Drawings in electronic .dwg format
 - Full Size hard copy format (2 sets)
 - Renderings
- c) As-Built Set - The marked up **Conforming Set/As-built** created by the General Contractor during the construction process shall be submitted to the A/E. The Record Set shall be made from the updated electronic files reflecting any changes during construction. The submitting of this set shall be as per the Project's Contractual Agreement. All electronic drawings (**AutoCAD 2008**) must have all corresponding signatures attached. Non-signed drawings shall be rejected & must be resubmitted. Include the following items as part of the As-built set:
 - As-built drawings in AutoCAD electronic .dwg format
 - As-built drawings Hardcopy (2 sets)
 - Specification books
 - Operations and Maintenance Manuals (2 sets) – all disciplines
- d) For non-typical delivery requirements, contact the Director of Contracts and Project Management.
- e) CAD standards apply to all stages of document production. All DWG files and CAD drawing entities submitted at the end of a project must be able to be manipulated using standard AutoCAD drafting procedures. Non-compliance with this policy may result in the rejection of CAD files submitted at project closeout in addition to delayed rendering of final project payment. DXF files will not be accepted at project closeout as a substitution for DWG CAD file deliverables.

4) Method of Delivery

- a) All submittals must be delivered on CD-ROM, or sent by e-mail. CD-ROM is preferred on larger sets.
- b) All electronically delivered data sets must be bundled in a WinZip self-extracting file.
- c) Consultants may use the e-transmit command within AutoCAD for all individual or multiple drawing submittals.
- d) Transmittal options within the e-transmit command shall be set to "place all files in one folder" and "include fonts".
- e) E-mail submittals are to be addressed to fangeroth@creighton.edu
- f) All CD-ROM's must be labeled with the following information:
 - DATE: The date when the submittal was delivered.

D. Project Data

1. **SUBMITTAL PHASE:** Indicate the Project submittal phase and date.
2. **BUILDING NAME:** Include Title of Project and University Project number on each sheet.
3. **COMPANY:** The name of the consultant(s) to the campus.
4. **Set Label** (i.e.; disk 1 of 3)
 - A readme file shall be included on disk number 1 that contains the above information along with an index of drawings that include drawing file name, drawing name, drawing number within the set, scale, and drawing date. A hard copy of this readme file shall be delivered with the disks.
5. **Additional Support Files**
 - The University requires that all specifications, word processing, spreadsheets, and databases pertinent to the project accompany each electronic submittal in their original format.
 - Only filename extensions mentioned in this document are authorized and no other forms will be accepted without prior approval from the Director of Contracts and Project Management.
 - Electronic Construction Closeout (ECC) software is not in use nor authorized for submittal by any consultant.

6. File Naming Convention

- Every sheet drawing file name must follow the Guidelines for Sheet File Names as defined in **U.S. National CAD Standard Version 3.1** and the **AIA CAD Layer Guidelines 2nd Edition**.
- No long filenames are allowed. This includes sheet files, model files, external references and all specifications.
- All specification files must be named after the appropriate
- The Construction Specifications Institute Master Format 2004 section.
- For example: 10425.doc.
- Always use the filename extension that is given by default from the application in use. See table below.

Application	Extension
AutoCAD	*.dwg
Microsoft Word	*.doc
WordPerfect	*.wpd
Microsoft Excel	*.xls
Lotus 123	*.wk*
Microsoft Access	*.mdb
Adobe Acrobat	*.pdf
Images	*.jpg or *.tiff

7. Project Retainage Fee

- a. To ensure receipt of the electronic files, the amounts below will be retained until delivery and standards are passed.

Design Documents -	1%	of Total A/E Design Fee.
Construction Documents 30% -	1%	of Total A/E Design Fee
Construction Documents 60% -	1%	of Total A/E Design Fee
Construction Documents 90% -	1%	of Total A/E Design Fee
Bid Set/100%	3%	of Total A/E Design Fee
As-Built Set -	3%	of Total A/E Design Fee

10% Total of Total A/E Design Fee

8. Drawing Review Board

- a. To ensure the accuracy, clarity, and organization of the CAD documents a Drawing Review Board will review the documents and they will be checked against the University's CAD standards.
- b. The University may ask for a re-submittal if deemed necessary.

9. Accuracy

- a. The Primary Consultant is responsible for the accuracy of all CAD drawings delivered to the University.
- b. The Primary Consultant is responsible for all sub-consultants work.
- c. All documents delivered to the University shall be directed through the Primary Consultant.
- d. The Creighton University Facilities Management web site is <http://www2.creighton.edu/adminfinance/facilities/> This site includes dated University standards, e-mail addresses, campus maps, and links to other Creighton Departments.
- e. The University may provide the consultant's with existing CAD drawings for their convenience. However, these drawings shall be used as a reference only.
- f. The Primary Consultant is responsible for field verification of all existing conditions, and ensuring that all electronic documents comply with the Creighton University Planning and Design CAD Standards.

E. CAD Standard Summary of the Creighton University Planning and Design CAD Standards.

- These CAD standards are dependent on disciplines dynamic in nature. Computer Aided Design, Office Productivity Tools, Drafting
- Standards and Electronic Document Management Systems evolve at a rapid pace. Due to this evolution the University expects these
- CAD standards to change. The time period that any set of standards is in effect will vary accordingly.
- These CAD standards are dated. The consultant is responsible for conforming to the CAD standards that were in effect when the contract was signed.
- The University's CAD standards are reasonable and easy to follow.
- Generally, any consultant that employs standard CAD drafting practices, embraces the U.S. National CAD Standard, and uses the University's current version of AutoCAD should encounter very few problems.
- These Standards are not intended to be static or all-inclusive and the University reserves the right to modify these CAD standards at any time.

