

**Description:**

The purpose of the section is to highlight the current UMD Design Standards for Computer Aided Drafting (CAD) at UMD. This section establishes requirements for the preparation and submission of electronic documentation for the UMD Planning and Construction Department.

**Related Sections:**

- TBD

**Effective Date:**

January 1, 2023

**Applicable Standards:**

- TBD

**General Requirements:**

Architectural/Engineering (A/E) firms may use any method of drawing production but, all submitted files must meet the following requirements. The A/E (lead CD designer) is responsible for coordinating/ensuring that any contributing design party (sub-consultant) to the final construction document package meets these requirements.

In addition:

- Template drawings, formatted in accordance with these requirements, are available for use by the A/E.
- The UMD will review and approve the CAD data submitted by the A/E (see Section 4 for the P&C checklist used for this review.) All discrepancies found during this review must be corrected in the next submission. Any discrepancies remaining in the 100% submittals must be corrected and resubmitted within 30 days.
- Costs for re-printing, re-assembly, or project delays due to the A/E's failure to follow these requirements may affect the A/E's fees or reimbursements. The A/E is encouraged to raise any questions or concerns with the UMD PM well in advance of submittal deadlines.

**Access to University CAD Files**

- The A/E, with written approval from associated P&C PM, may request copies of existing UMD CAD files and/or available hard copy drawings from FM Archives. Available CAD files include floor plans, site plans including survey monuments, and topographical contours. Such files are provided only for the convenience of the recipient. The information in these files has been gathered from a variety of sources and may or may not conform to the current requirements specified herein. UMD makes no representation as to the completeness or accuracy of the information contained in any existing drawing reference material. Receipt of any UMD CAD files confirms consultant's acceptance of terms in Electronic File Use Agreement.
- CAD files submitted to UMD by the A/E must be accurate and must conform to these CAD requirements even if using information provided by UMD which is inaccurate or does not conform to these requirements.
- FM Archives will not research and/or compile the necessary drawings needed for a specific project. It is the responsibility of the UMD PM or A/E to coordinate and select the appropriate information and request copies from FM Archives. For any designated project UMD will only provide CAD files or hard copies of documentation to the contract designated A/E or CM only, not to any design sub-consultants.

**File Format**

- All submitted files must be fully compatible with the version of AutoCAD currently being used by UMD. This information will be available from the UMD PM responsible for the project.
- If a program other than AutoCAD is used for drawing production, it is the A/E's responsibility to ensure complete AutoCAD compatibility and data integrity. An A/E using programs other than AutoCAD are encouraged to send translated files for testing prior to submission deadlines.
- DXF files are not acceptable.
- Drawings must open in AutoCAD without errors, AEC objects, font substitution or missing line-type files.

## General Drawing Requirements:

### Best Practices

- With rare exceptions, all object properties should be assigned by layer, not by object.
- All building elements should be drawn to actual, not nominal dimensions.
- Co-terminus lines drawn on the same layer shall be drawn or joined as a single entity.
- No redundant (overlapping) line work is allowed.
- Inserted images should be used only if absolutely necessary. Company logos should be inserted as blocks or drawing elements rather than as images.
- Units shall be set to architectural inches, with a precision no smaller than 1/32". Civil engineering drawing units shall be decimal feet with a precision no smaller than .00.

### Site Plans/Surveys

- Site drawings will be developed in Maryland State Plane coordinates (NAD 83) with a minimum of three survey monuments shown on each site sheet. The drawings will be maintained in the project coordinate system and rotated, if necessary, in paper space viewports.

### Drafting Conversions

- All drafting conventions must comply with the CSI Uniform Drawing System of the National CAD Standard.

### Model/Paper Space

- All building, site and construction detail elements shall be drawn in model space at full scale.
- Text, notes, schedules, dimensions and diagrams may be drawn as preferred by the A/E but must be easily legible when plotted.
- All paper space tabs must be assigned a page setup defining the paper size to match the intended plotted sheet size and plotter set to "none."

### Layers

- All layering shall follow National CAD Standard format (current version).
- Revision clouds and triangles shall be on a separate layer.
- Other than block elements, no objects shall be drawn on Layer 0.
- No objects shall be drawn on the Defpoints layer, including viewports.

### Title Blocks

- Template drawings are available from UM and include title blocks for all approved sheet sizes. These title blocks must be used, even if other templates features are not used.
- All information represented as attributes in all sheet blocks must be entered correctly.
- An A/E working for Design Services (rather than Capital Projects) is required to use the 36 x 22 sheet unless alternate size as approved by UM PM.

### Line type

- Dashed lines shall be drawn with dashed linetypes never as multiple line segments.
- Linetype scale must be set so that each linetype is clearly discernible when plotted.
- Use of AutoCAD standard linetypes is strongly preferred. If custom or complex linetypes are necessary, a .LIN file and associated .SHX and .SHP files must be provided with each submittal.

### Text

- The AutoCAD Standard text style shall not be redefined.
- Only AutoCAD standard SHX fonts, Microsoft standard TTF fonts, Archstyle.shx or Archtext.shx may be used.

## Dimensions

- The AutoCAD Standard dimension style shall not be redefined.
- Dimension text must accurately reflect actual dimension, no manual input of dimension text is allowed for new construction. Manual input of non-dimensional text (e.g. EQ, VIF) is allowed.
- It is always preferable to redraw inaccurate drawings to accurate dimensions. However, if minor inaccuracies are found in UM provided CAD files, dimensions for such areas can be manually inputted. The A/E will be solely responsible for the accuracy of all such dimensions and associated work.
- Dimensions shall never be exploded.
- When dimension text cannot fit within dimension lines, leaders must be part of dimension style, not drawn as separate objects.

## Blocks

- With the exception of details inserted as blocks, all block elements must be drawn on Layer 0.
- Nested blocks are not allowed.

## Hatching

- Hatching should be used as appropriate. Excessive hatching should be avoided but multiple lines, points, symbols, etc. used in place of hatching will not be allowed.
- Hatches are to be associative and should never be exploded.
- Hatches, polylines with width, and/or solids used to represent poche must have defining boundary lines which are on a separate layer.

## Plotting

- All drawing sheets must be formatted to plot from paper space at a scale of 1:1.
- All drawings for a project, including those from sub consultants shall be plotted with a single plot style table.
- The A/E is strongly encouraged to use the CTB file provided with the template drawings. If any other CTB file is used, it must be provided with each submission.

## Submittals:

### Prior to All Submittals:

- Each plotted sheet shall be saved as a separate file.
- File names must include UM project number or QC number and sheet number, e.g.: QC-1000\_A101
- All files are to be thoroughly purged. Purging to include 0 length lines, empty text objects, empty blocks and regapps.
- All files to be audited.
- All files to be zoomed to drawing extents in model space. No objects shall be located outside of hard copy drawing limits.
- All files to be zoomed to drawing extents in paper space. No objects shall be located outside of hard copy drawing limits.
- All viewports are to be locked.
- All layer visibility set to match plotted hard copy.
- All files to be saved so that drawing opens to display intended plot view.
- A/E may use any xref method during production. However, files delivered to UM must have all xrefs bound using the bind/bind method.

### Submissions

- The content of electronic files shall match the delivered hard copy set.
- Electronic files shall be submitted simultaneously with hard copy submissions.
- All CAD submittals shall be saved to disk and include all files required to create plots matching the hard copy submission including plot style tables. E-transmit can ensure this is done properly.
- Default plotter to be set to "none."

- All files shall be submitted on disk or via digital distribution according to direction of the UM PM. A/E is responsible for delivering files from all sub-consultants. Disk label to include:
  - UM Building Name and Number
  - UM Project Name
  - UM Project Number
  - Date
  - Submission Phase
  - Disk Set Number (e.g. 1 of 3)
  - List of all drawing files ordered by sheet number and drawing title, e.g.:
    - QC-1000\_CS001 Cover Sheet
    - QC-1000\_AS101 Site Plan
    - QC-1000\_A101 First Floor Plan
- All CAD submittals shall be accompanied by a letter of transmittal. This transmittal shall be addressed to the appropriate UM PM with a cc to the AutoCAD Systems Manager.
- Letter of transmittal shall include:
  - UM Building Name and Number
  - UM Project Number
  - UM
  - Submission Phase
  - List of all drawing files ordered by sheet number and drawing title, e.g.:
    - QC-1000\_CS001 Cover Sheet
    - QC-1000\_AS101 Site Plan
    - QC-1000\_A101 First Floor Plan
- List of all other files found on disk.
- Matrix of all used layers including: descriptions of each layer, color, line-type, line-weight.

## As-Builts

- The consultant will provide a field survey as built CAD drawing of the total work site including all topographic features and contour drawing with one (1) foot contour intervals and appropriate “spot” elevations. This survey will include all utility structures and text notations of all surface features such as trees, walks, curbs and other significant topographic elements.

## Submission Requirements by Phase

<i>Phase</i>	<i>Files Required For Submission</i>	
	<i>PDF</i>	<i>CAD</i>
<i>Schematic Design</i>	•	
<i>Design Development</i>	•	<i>Architectural/Civil/Structural drawings</i>
<i>50%</i>	•	<i>MEP drawings</i>
<i>95%</i>	•	
<i>100%</i>	•	<i>All disciplines</i>
<i>As-Built</i>	•	<i>All disciplines</i>

## Section Deviations

Questions concerning CAD Standards should be submitted to the University of Maryland Project Manager (UM PM) assigned to the project.

Any proposed modifications or deviations from this standard must be approved in writing by the UMD CAD Systems Manager.

## CAD Review Checklist

### FILE FORMAT

- File format is .dwg and opens without errors, proxy objects, or missing linetypes, xrefs etc....

### BEST PRACTICES

- Object properties assigned by layer
- No extraneous linework

### SITE DRAWINGS

- Uses Maryland State Plane coordinates (NAD 83)
- Three survey monuments shown on each site sheet

### MODEL/PAPER SPACE

- All model elements drawn at full scale
- All text legible
- Page set up indicates intended plot size

### LAYERS

- Layering per National Cad Standard format
- Revision clouds/ triangles on separate layer
- No objects on Layer 0 or defpoints

### TITLE BLOCKS

- Uses standard sheet sizes and title blocks (36 x 22 for CAMP)

### LINETYPES

- Dashed lines drawn with dashed linetypes and display accurately in Paper Space

### TEXT

- Only standard ACAD, Microsoft or Archstyle.shx, Architext.shx fonts used

### DIMENSIONS

- No exploded dimension
- No manual input of dimension

### HATCHING

- Hatching is associative
- Poche has boundary lines on separate layer

### PLOTTING

- Plot from paper space at 1:1
- All dwgs use single plot style table

### SUBMITTALS

- Each sheet saved as file
- File names are correct
- Drawings purged with no 0 length lines, empty text objects, empty blocks and regapps
- All Xrefs bound using bind/bind
- Layer visibility matches hard copy.
- No objects outside hard copy drawing limits

### Disk includes:

- UM Building Name and Number
- UM Project Name and Number
- Date and Submission Phase
- Set Number (e.g. 1 of 3)
- Text file listing all files contained on disk

**Electronic File Use Agreement:**

This

Agreement is entered into this \_\_\_\_ day of \_\_\_\_\_, **202**,  
by the University of Maryland through its Facilities Management Dept. (UM FM) and

\_\_\_\_\_ (Consultant).

UM FM and Consultant agree as follows:

1. Consultant will use digital information for reference only and agrees not to disseminate or disclose said information for other purposes.
2. Consultant will take necessary and reasonable steps to prevent this information from being disclosed to unauthorized persons.
3. Consultant understands and agrees that UM FM makes no representation and extends no warranty to it or to anyone else as to the accuracy or completeness of the information contained in digital data but rather provides said data in an "as is" condition. Consultant agrees and does hereby waive any and all claims under any theory of law or damages or injuries against University of Maryland that may arise from the furnishing by UM FM of said data to Consultant.

Consent to the above terms as indicated by signature below:

Agree to on behalf of:

University of Maryland  
Facilities Management Department

Provided by:

\_\_\_\_\_

Authorized by:

\_\_\_\_\_

Date:

\_\_\_\_\_

Description of Data:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Consultant: \_\_\_\_\_

Signature:

\_\_\_\_\_

Date:

\_\_\_\_\_

Company:

\_\_\_\_\_

Project No.:

\_\_\_\_\_