
UNDERSTANDING DRAWING REQUIREMENTS

These standards have been developed to assist Consultants and user's, by providing consistent data, which meets the Authority's requirements. These standards include drawing set-up, title blocks and other pertinent data. Deviation from these Standards must be approved in writing by the Graphic Resource Center (GRC.) Before proceeding with any work that contradicts these Standards. You will receive a MPA Standards CD from the MPA Project Manager at first project meeting.

A. Standards for Drawing Layouts

The Authority has the following requirements for drawing layouts:

1. Materials/Standards: All original design drawings and record drawings must be on 3- to 4-mil-thick, double-matted Mylar. The Authority will not accept substitutes, such as sepia, sepia Mylar, vellum or cloth. Drawings must also be provided in electronic format. (See Paragraph B.1, Design Document Submittals.)
2. Size/Margins: The outside dimensions of both preliminary and final working drawings must be either 24 x 36 inches or 30 x 42 inches. The Project Manager will designate the appropriate drawing size. Within these dimensions, drawings must have a ½ -inch border on the top, bottom, and right sides, and a 1-inch border on the left side, as shown in Exhibit 10.
3. Lettering: A minimum letter size of 1/8 inch for notes and 1/4 inch for titles must be used to allow them to be reproduced in one-half of their size. All lettering must be in vertical capitals. Text font is Roman S for notes and Roman D for titles.
4. Legibility: Drawings must be clear and legible.
5. Title Sheet: A title sheet must accompany each set of drawings, unless The Authority waives this requirement. The title sheet should contain a proper and accurate indexed list of applicable drawings. Exhibit 11 presents a sample title sheet.
6. Index: All drawing sets must include a complete index on the cover sheet that lists individual sheet titles and numbers for all disciplines in the set.
7. Title Block: The title block for each drawing must conform to the sample shown in Exhibit 12.

8. A/E Seal: Every sheet, including the title sheet, must include the applicable stamp of a Registered Professional Engineer and/or Architect licensed in the Commonwealth of Massachusetts, with the Engineer or Architect of Record's (Prime Consultant and all Sub-Consultants) signature over the seal. Both the seal and signature must be readable when reproduced. The Authority suggests that you use black indelible ink. The Authority will not accept a facsimile signature stamp.
9. Key Plan: A key plan must be shown in the lower right-hand corner of all sheets having floor plans, elevations and building sections. The plan must identify the area depicted on the sheet. The key plan orientation must be the same as the floor plan orientation on the same sheet.
10. Plan Views: All drawings in a set must be oriented in the same general direction.
11. Scales: The scale of the drawings must be shown on each plan, elevation, section and detail. Each drawing must include graphic scales. The following designated scales are required as a minimum:

Floor Plans	1/8"=1'0"
Mechanical/Toilet Rooms	1/4"=1'0"
Elevations	1/8"=1'0"
Building Sections	1/8"=1'0"
Refl. Ceiling Plans	1/8"=1'0"
Wall Sections	3/8", 1/2" or 3/4=1'0"
Roof Plans	1/16, 1/8"=1'0"
Site/Civil Plans	1 = 1
12. North Arrow: An arrow indicating north must be shown at the upper left-hand side of the drawing of all floor plans, including site/civil, architectural, structural, plumbing, fire protection, mechanical and electrical drawings.
13. Sequence: The numbering and sequence of project drawings will be in accordance with AIA'S latest standards

Legends, graphic symbols, and general notes must appear on the first sheet of each discipline's set of drawings.
14. Drawing Revisions: All drawing revisions must be identified in one of the following two ways:
 - ◆ Encircling the area to be clarified on the back of the drawing, and indicating the appropriate revision number.
 - ◆ Recording the revision number, date, and general description of the change(s) in the space provided above the title block.
15. Clearances: Mechanical Room drawings must graphically show access door swings on A/C equipment and coil filter removal clearances.
16. Building Area & Volume: Drawings must show accurate building areas and volumes to foster accurate comparisons of the project areas and volumes compatible with construction industry standards. The Authority will review the criteria to be used. Exhibit 13 must be filed with all project files, and the building areas must be recorded on the Architectural Drawings.

B. Standards for AutoCAD

The Authority maintains design drawings, and Record Drawings in AutoCAD format for coordination of MPA Contracts and for interfacing with other MPA AutoCAD users, e.g., GIS. These standards have been developed to assist Consultants and user's, by providing consistent data, which meets the Authority's requirements. These standards include drawing set-up, title blocks and other pertinent data.

1. AutoCAD Drawing Version: Drawings shall be done in AutoCAD Version 2007 or later.
2. Authority Provided Drawing Data: The Consultant shall use all the Authority provided drawings, blocks, and set up files for each Contract. Upon completion of the contract, the Consultant shall provide, to The Authority, one (1) set of all symbols, blocks, font files and any other electronic data not provided by the Authority, which were used to perform the drawing tasks. The Consultant shall also provide an index of all drawing file names.
3. Drawing Setup Files: The Authority will provide, in electronic format, the appropriate drawing setup files. These files include the title sheet, border, title blocks and site/civil layers and blocks.
4. Title Block: The title block for each drawing must conform to the sample shown in Exhibit 12. The Consultant must also use title blocks with embedded attribute fields. These title blocks will be on MPA Standards CD obtained from the MPA Project Manager.
5. Layer List: In order to standardize layers for all record drawings, the Authority is using the "CAD Layer Guidelines", prepared by The American Institute of Architects, as its layering convention. The exception to the above is Site/Civil layering. Site/Civil layer designations are unique to The Authority's GIS system. The Site/Civil layering list is included with the drawing setup files.

The Authority currently has separate AutoCAD layering standards for site/civil drawings. These layers are listed within the drawing named "MPA-SITE-CIVIL-LAYERS.dwg". Layers created that have additions, deletions or enhancements should be named with the appropriate prefix added to the Authority's existing site/civil layering standards. Separate text layers must also be created for any new text added to the drawing.

The following is a list of prefixes:

- ◆ Y – survey information
- ◆ ASB – as built information
- ◆ DES – design or proposed information
- ◆ DEMO – demolished information
- ◆ ABD – abandoned information
- ◆ *Existing information uses the Authority's Site/Civil/Utility layering standards without a prefix*

An index that lists and briefly describes any new layers created by the consultant that are not covered by the Authority's layering standards should be included with the 30% AutoCAD Design drawings presented to the Authority by the

consultant. Any future drawings presented to the Authority by the consultant should include an updated index of any additional layers added to the AutoCAD drawing.

6. Block Guidelines: The Authority uses standard engineering symbols as blocks for Record Drawings, and will provide copies of these blocks on the drawing setup file. The blocks include manholes, hydrants and other data. If the Authority does not have a particular block, the Consultant may use its symbol as the "block". However, the Consultant must provide all symbols used to create the drawings to the Authority in AutoCAD format. An index, in electronic and hard copy format, shall also be provided listing the block names and contents.
7. Abbreviations: The Utility Abbreviation List was developed to standardize the use of terminology for the Utility System and the Tank Management System attribute data as well as the CAD drawings. Examples would be CB for catch basin, EMH for electrical manhole, LV for low voltage and TK for tanks. (See Exhibit 14).
8. Project Limits: Each Project will require a layer called "CAD-PROJECT-LIMITS-L", which will be drawn around all project work areas.
9. Model Space: All drawings are to be created in model space with true scale.
10. Paper Space: Plotting of drawings shall be in paper space. Insert title block and border in paper space. Paper space scale is 1 = 1
11. CTB (color dependent plot style tables): CTB files are to be included with each drawing submission.
12. Site/Civil Drawing Coordinate System: AutoCAD site/civil basemaps supplied by the Authority are created in relation to its geographic location. The insert base point (0, 0) can be related to a control network of other nearby sites. The horizontal control network of the basemap uses the Massachusetts Mainland State Plane Coordinate System (Zone 2001), as referenced to the North American Datum of 1983 (NAD83). The vertical component of the network is referenced to the National Geodetic Vertical Datum of 1988 (NAVD88).

Site/Civil Basemaps should **NEVER** be moved or rotated in a manner that removes the drawing from the control network. If the orientation of the basemap needs to be changed, the use of Paper Space with a User Coordinate System should be used to rotate the perspective of the basemaps. Decimal units are used for all Authority site/civil/utility basemaps.

13. Utility Line Data: Utility lines SHOULD NOT be broken for the purpose of annotation. Utility lines should run continuously from structure to structure. Lines should be annotated above or below the line.
14. AutoCAD File Naming Format: Each AutoCAD file should represent only one drawing. The naming of the AutoCAD file shall be comprised of the MPA project number followed by the drawing number.

Example:

L404C01 -A100.DWG

MPA Project No. Dash Drawing No.

15. AutoCAD Drawing Submittals: When submitting AutoCAD drawings, make certain that the following files reside within the same directory as the drawings:
 - ◆ Xrefs (external reference files) –Xrefs should only be attached and not bound to the submitted drawings.
 - ◆ CTB files (color dependent plot style tables)
 - ◆ Non-standard AutoCAD font files

Using the AutoCAD Tools ETransmit command is one way of ensuring that all the associated files for the submitted drawings are included. When using the ETransmit command, make sure the “Place all files in one folder” option is checked in the Transmittal Options area of the Modify Transmittal Setup dialog box.

C. Standards for All Electronic Files

1. Electronic File Naming Format: The naming of TIFF, PDF, and Word files shall be comprised of the MPA project number followed by the drawing number.

Example:

L404C01 – A100.TIF

MPA Project No. Dash Drawing No.

2. Mylars will be scanned in TIFF format at 200DPI
3. Scanned Drawings will be rotated with title block on bottom right corner
4. Construction Digital Photographs will be in .JPG or .TIF Format
5. Microsoft Excel file will be populated using template created by GRC Unit

D. Standards for Submittals

The Consultant shall submit the following documents and files. The Authority will return all inappropriate submissions to the Consultant to be resubmitted according to these standards.

1. 30% Design Document Submittals
 - ◆ AutoCAD files (See section B)
2. Final Design Document Submittals
 - ◆ Mylars (See section A)
 - ◆ AutoCAD files (See section B)
 - ◆ Scanned Drawings (See section C)
 - ◆ Digital Construction Photographs (See section C)
 - ◆ One Excel Spreadsheet of all Project Sheet information. The Excel Spreadsheet template file will be provided by the Authority.

3. As built Record Document Submittals
Refer to Chapter V: Completing the Project, Section 1, Paragraph B, Submitting As built (Record) Drawings.
- ◆ Mylars (See section A)
 - ◆ AutoCAD files (See section B)
 - ◆ Scanned Drawings (See section C)
 - ◆ Digital Construction Photographs (See section C)
 - ◆ One Excel Spreadsheet of all Project Sheet information. The Excel Spreadsheet template file will be provided by the Authority.