

CITY UTILITIES DESIGN STANDARDS MANUAL

**Book 6
CADD Standards (CADD)
CADD4 Organization**

June 2015

CADD4.01 Purpose

This Chapter establishes the minimum standards for file, sheet, and drawing set organization as related to Computer Aided Design and Drafting (CADD) work performed by or for City Utilities Engineering (CUE).

Sheet and Drawing Set Organization requirements set by this Chapter build on and conform to the organization standards, tools and guidelines of the United States National CAD Standard (NCS) Version 5 (UDS modules 0.0, 1.0 and 2.0).

CADD4.02 File Organization

1. Default Origin

The Autodesk AutoCAD (ACAD) origin of a 2D drawing file shall be 0,0 (corresponding to X,Y Cartesian coordinates). For 3D drawing files, it shall be 0,0,0 (corresponding to X,Y,Z Cartesian coordinates). However, the z-origin may be set to allow for elevations below zero.

2. Model Files

- Shall have graphics created at their “real-world” size in their “real-world” units and coordinates, unless otherwise authorized.
- Shall not contain layouts (paper space) except for the ACAD default and may only contain drawing objects, symbols and text within the ACAD model space and not within ACAD paper space.
- Shall always be referenced by other sheet or model files.

3. Sheet Files

- Shall use the default origin for all reference model files.
- Shall only contain one layout (paper space) per file and result in one sheet per drawing file.
- Shall consist of different model files and data objects referenced into ACAD model space (i.e. via the ACAD external referencing method) to create a new “ready-to-plot” DWG file.
- Shall contain the project border and title block model file in ACAD paper space.
- May also contain sheet-specific drawing objects, symbols, and text within ACAD paper space.
- Shall never be referenced by other sheet or model files.

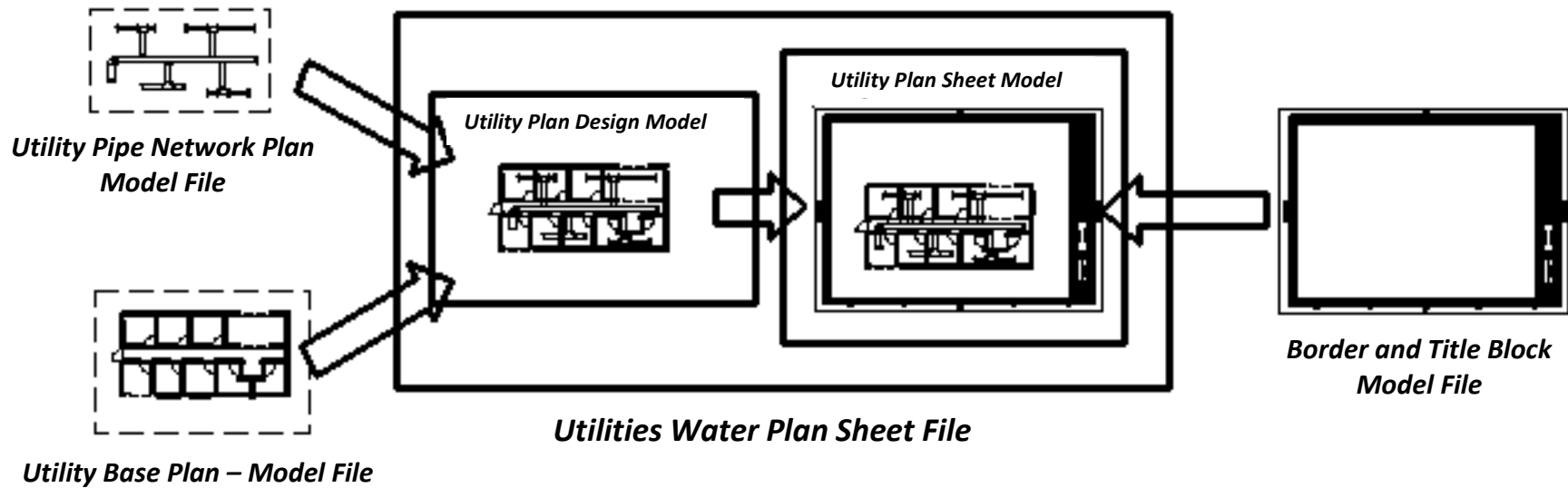


Figure CADD4.1 How different model files are referenced in to create a sheet file

CADD4.03 Sheet Assembly

Sheet assembly consists of using a model file (ACAD model space) to reference in all other necessary model files, data object references necessary for the desired graphic display, and a sheet file (ACAD paper space) to reference the project border and title block model file. The sheet file also generally contains at least one viewport which references the objects and graphics within the model space and displays the desired portion at a standard scale. The result should be a “ready-to-plot” sheet file. Figure CADD4.1 illustrates the sheet assembly process.

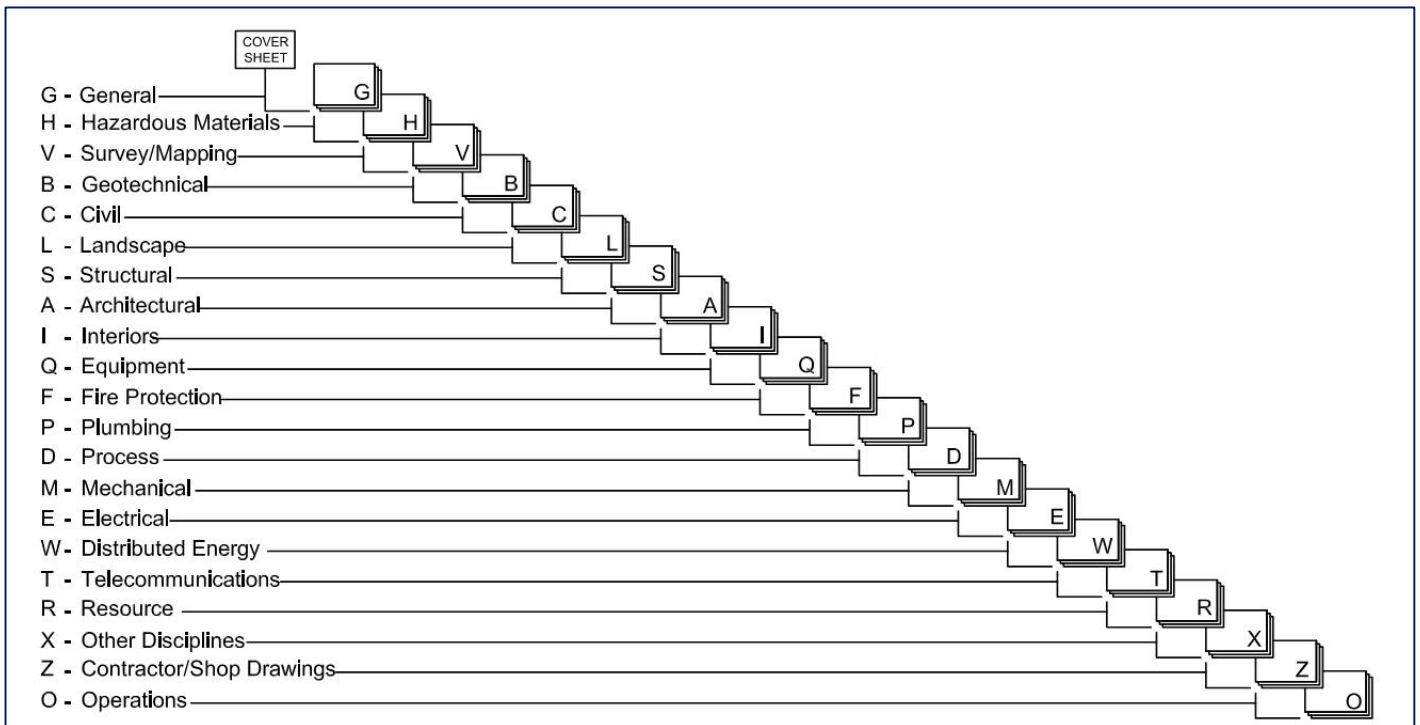
Nested referenced border and title block sheet model files are not allowed.

CADD4.04 Drawing Set Organization

1. Sheet Order

The order of sheets shall follow NCS guidelines. Figure CADD4.2 shows the sheet order to follow to create a CUE project drawing set. The first sheet file shall be the Cover or Title Sheet and other sheets shall follow within their respective (discipline) subset as shown in the following figure. Some (discipline) subsets may not be used in certain projects due to scope and or the size of the project. In other cases, additional subsets not shown may have to be created.

Figure CADD4.2 Sheet Order



2. File Naming

- A. Model file naming shall follow NCS guidelines except for detail files and consist of the following five required components:
- Project Work Order Number Designator (WO): Five numeric characters designating the project work order number.
 - Discipline Designator (DD): One (Level 1 discipline) alphabetical character identifying the (discipline) subset. Refer to Figure CADD4.5 for a list of DD.
 - Model Type Designator (MT): Two alphabetical characters designating the type of model. A list of approved MT is shown as Figure CADD4.6.
 - Data Object Designator (DO): Two alphanumeric characters designating the Data Object Type represented within the model file. See Figure CADD4.7 for a list of DO designators.
 - Sequence Number (SN): Two numeric characters representing the model file sequence number. It shall numbered sequentially between 01 and 99.
 - File extension preceded by a period

Figure CADD4.3 shows the application of WO, DD, MT, and DO for a Civil project model file naming syntax.

Figure CADD4.3 Model File Naming Syntax and Example

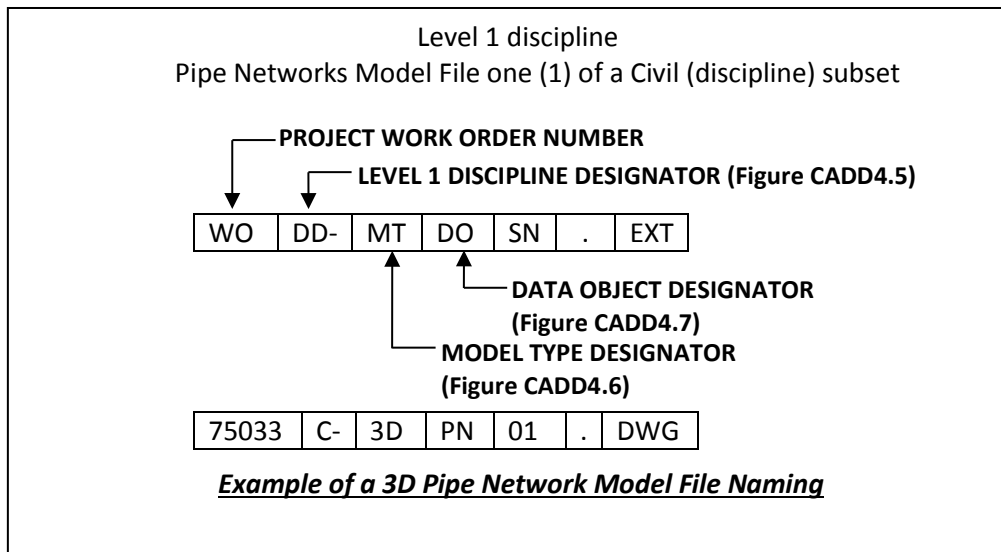


Figure CADD4.4 Model File Naming Examples

Model File	(WO) Varies	(DD) Varies	(MT) Constant	(DO) Constant	(SN) Varies	(EXT) Constant	Result
Base	#####	V-	XP	BS	01	.DWG	#####V-XPBS01.DWG
Topography	#####	V-	XP	TP	01	.DWG	#####V-XPTP01.DWG
Topography	#####	V-	XP	TP	02	.DWG	#####V-XPTP02.DWG
Surface	#####	C-	3D	SF	01	.DWG	#####C-3DSF01.DWG
Alignment	#####	C-	GP	AL	01	.DWG	#####C-GPAL01.DWG
Profiles	#####	C-	3D	PR	01	.DWG	#####C-3DPR01.DWG
Cross Section	#####	C-	3D	XS	01	.DWG	#####C-3DXS01.DWG
Pipe Network	#####	C-	3D	PN	01	.DWG	#####C-3DPN01.DWG
Corridor	#####	C-	3D	CR	01	.DWG	#####C-3DCR01.DWG
General Plan	#####	C-	GP	MS	01	.DWG	#####C-GPMS01.DWG
Schematic	#####	E-	DG	MS	01	.DWG	#####E-DGMS01.DWG
Power Plan	#####	E-	GP	PW	01	.DWG	#####E-GPPW01.DWG
One-Line	#####	E-	DG	PW	01	.DWG	#####E-DGPW01.DWG
Lighting Plan	#####	E-	GP	LT	01	.DWG	#####E-GPLT01.DWG
Equipment Plan	#####	E-	GP	QP	01	.DWG	#####E-GPQP01.DWG
Grounding Plan	#####	E-	GP	GR	01	.DWG	#####E-GPGR01.DWG

Figure CADD4.5 Common Level 1 Discipline Designators

Designator Level 1	Description of Suggested Names	Content
G	General	<ul style="list-style-type: none"> • Phasing, schedules, contractor staging areas, fencing, haul routes, temporary and special requirements • List of sheets and symbols, code summary, symbol & linetype legend, orientation maps • Photographs, soil borings
V	Survey/Mapping	<ul style="list-style-type: none"> • Aerial surveyed points and features • Computed points and features • Field surveyed points and features • Digitized points and features • Node points and features • Staked Points and features

C	Civil	<ul style="list-style-type: none"> • Structure removal and site clearing • Excavating, grading, drainage, erosion control • Pavers, flagstone, exterior tile, furnishings, retaining walls, and water features • Roads, driveways, parking lots • Plats, dimension control • Waterways, wharves, docks, trams, railways, people movers • Water, sanitary sewer, storm sewer, power, communications, fiber optic, telephone, cable television, natural gas, and steam systems • Symbol and Linetype Legend
E	Electrical	<ul style="list-style-type: none"> • Protection, termination, and removal • Controls, relays, instrumentation, and measurement devices • Utility tunnels, site lighting • Telephone, network, voice, and data cables • Alarms, nurse call, security, CCTV, PA, music, clock, and program
R	Resource	<ul style="list-style-type: none"> • Existing facility architectural drawings • Surveyor's information and existing civil drawings • Existing facility electrical drawings • Existing facility mechanical drawings • Real Estate Drawings • Existing facility structural drawings

Figure CADD4.6 Model File Type Designators

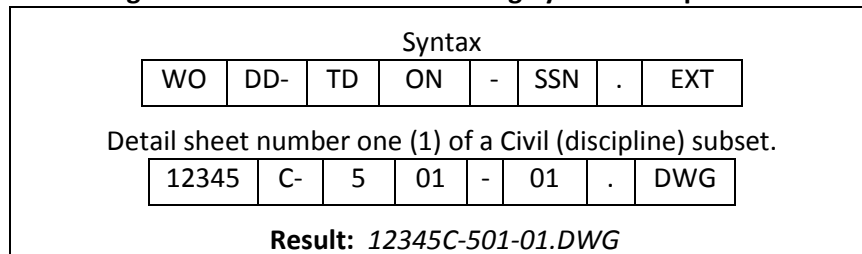
Model File Types (MT)	
FP	Floor Plan
DP	Demolition Plan
XP	Existing Plan
GP	General Plan
EL	Elevation
SC	Section
SH	Schedules
3D	Isometric/3D
DG	Diagrams

Figure CADD4.7 Data Object Designators

First Two Characters of Data Object Designators (DO)	
BS	Base Drawing
TP	Topography Drawing
SF	Surfaces Drawing
AL	Alignments Drawing
PN	Pipe Networks Drawing
PR	Profiles Drawing
XS	Cross Sections Drawing
CR	Corridors Drawing
PW	Power Drawing
LT	Lighting Drawing
QP	Equipment Drawing
MS	Miscellaneous Drawing

- B. Sheet file naming shall be consistent with the format for the sheet identification as explained in Section CADD4.04, Item 3. The sheet identification should be preceded by the work order number and followed with a period and file type extension. Also refer to Figure CADD4.8 for an example of sheet file naming syntax.

Figure CADD4.8 Sheet File Naming Syntax Example



- C. Published plot file naming shall be consistent with the format for the Sheet File naming as explained in Section CADD4.04, Item 2.B. For example: **83131C-107-03.DWF** (For an Autodesk Design Review file). Also refer to Figure CADD4.8 for an example of sheet file naming syntax.

In the case where all sheets for the entire project are published, the published plot files shall use the same name as the CADD 2.1 "Project Root Folder Structure" (Work Order Number – Official Project Name) with the percentage of submittal completion appended. For Example: **83131 – Dwight Ave Drainage Improvements (95%).PDF** (For an Adobe Portable Document File).

3. Sheet Identification

Sheet identification shall follow the guidelines as shown in Figure CADD4.9.

Figure CADD4.9 Sheet Identification Syntax Examples

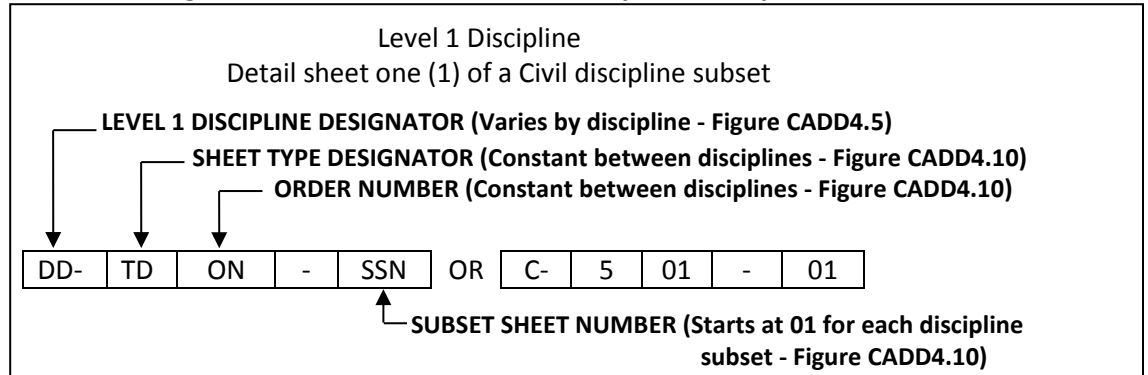


Figure CADD4.10 Sheet Identification Examples

Sheet	(DD)	(TD)	(ON)	(SSN)	Result
Title or Cover	G-	0	01	-01	G-001-01
General Notes	G-	0	02	-02	G-002-02
Layout Index	C-	1	01	-01	C-101-01
Survey Control	C-	1	02	-02	C-102-02
Erosion Control	C-	1	03	-03	C-103-03
Traffic Control	C-	1	04	-04	C-104-04
Demolition	C-	1	05	-05	C-105-05
Restoration	C-	1	06	-06	C-106-06
Plan	C-	1	07	-07	C-107-07
Plan and Profile	C-	1	08	-08	C-108-08
Pavement Markings and Signage	C-	1	09	-09	C-109-09
Easements	C-	1	10	-10	C-110-10
Sections	C-	3	01	-11	C-301-11
Large Scale View	C-	4	01	-12	C-401-12
Details	C-	5	01	-13	C-501-13
Schedules and Diagrams	C-	6	01	-14	C-601-14
3D Representations	C-	9	01	-15	C-901-15
Power Plan	E-	1	07	-01	E-107-01
Lighting Plan	E-	1	07	-02	E-107-02
One-Line Diagram	E-	6	01	-03	E-601-03

Sheet identification shall follow NCS guidelines for Level 1 discipline designator and sheet type designator. Sheet identification shall consist of the following four required components:

- Discipline Designator (DD): One (Level 1 discipline) alphanumeric character identifying the sheet as part of a (discipline) subset. For a list of Level 1 Discipline Designators refer to Figure CADD4.5.
- Sheet Type Designator (TD): One alphanumeric character identifying the type of information on the sheet. Figure CADD4.10 shows a summary of TD.
- Order Number (ON): CUE projects drawings shall follow the plan sheet identification sequence presented on Figure CADD4.10.
- Subset Sheet Number (SSN): Two numerical characters, starting with 01, designating the sheet number within the (discipline) subset. Sheets of the same discipline/design content shall be numbered sequentially with the characters 01, 02, etc. including as many drawings as required.
- Figure CADD4.9 shows the application of DD, TD, ON and SSN for a Civil project sheet identification. Refer to Figure CADD4.11 for an example of a sheet index demonstrating the approved sheet identification plan sheet order sequence.

Figure CADD4.11 Sheet Index Example

SHEET INDEX			
NO.	SHEET ID NO.	DESCRIPTION	REMARKS
1	G-001-01	Title Sheet	
2	G-002-02	General Notes	
3	C-101-01	Layout Index	
4	C-102-02	Survey Control	
5	C-103-03	Erosion Control	
6	C-104-04	Traffic Control	
7	C-105-05	Demolition	
8	C-106-06	Restoration	
9	C-107-07	Plan - Water	Alignment A
10	C-108-08	Plan and Profile - Sanitary	Alignment A
11	C-108-09	Plan and Profile - Sanitary	Alignment B
12	C-108-10	Plan and Profile - Storm	Alignment A
13	C-108-11	Plan and Profile - Storm	Alignment B
14	C-109-12	Pavement Markings and Signage	
15	C-301-13	Cross Sections	
16	C-401-14	Large Scale Views	Valve Vault
17	C-501-15	Details	
18	C-501-16	Details	
19	C-601-17	Structure Data Schedules	
20	C-901-18	3D Representations	Lift Station Telemetry/Photos

Figure CADD4.12 Sheet Type Designators

Sheet Type Designators		
0	General	(Title Sheet, Symbols & legend, notes, etc.)
1	Plans	(horizontal views, plan and profile, closely associated schedules)
2	Elevations	(vertical views)
3	Sections	(sectional views, wall sections, civil cross sections)
4	Large-Scale Views	(plans, elevations, stair sections, or sections that are not details)
5	Details	(details)
6	Schedules and Diagrams	(schedules and diagrams)
7	User Defined	(for types that do not fall in other categories, including typical detail sheets)
8	User Defined	(for types that do not fall in other categories)
9	3D Representations	3D Representations, 3D Models

4. Layout Tab Naming

Layouts within DWG drawings shall be named to show the intended sheet size followed by the type of sheet. All text shall be capitalized. For example: 24X36 TITLE, 24X36 PLAN, 24X36 P&P, 24X36 X-SECT, 8.5X11 EASE, 8.5X11 DET, ect...

5. Sheet Set Naming

Sheetsets shall use the same naming convention as the CADD 2.1 "Project Root Folder Structure" (Work Order Number – Official Project Name). The sheetset file (AutoCAD sheetset file extension .dst) shall be located in the *Sheet Set* folder as outlined in CADD2.1 (See Exhibit CADD2-1).

For Example: **83131 – Dwight Ave Drainage Improvements.dst**

Sheets within the sheetset as it is displayed in the Sheetset Manager shall be named in the following format: Sheet Number – Sheet Identification – Sheet Layout Name. For Example: **1 – C-107 – 01 – 24 X 36 PLAN.**

CADD4.05 Drawing Sheet Organization

1. Sheet Sizes

Typical architecture, engineering, and construction (A/E/C) projects shall be prepared on standard Architectural D size sheets unless otherwise authorized. Figure CADD4.13 shows a summary of standards sheet sizes and typical applications.

Figure CADD4.13 Standard Sheet Sizes and their Typical Uses

Sheet Sizes				
Architectural		ANSI		Typical Uses
Standard	Size (inches)	Standard	Size (inches)	
A	9 x 12	A	8.5 x 11	Project specification book, Details, Supplemental drawings.
B	12 x 18	B	11 x 17	Reduced drawings from "D" size and "A1" size originals. Supplemental drawings.
C	18 x 24	C	17 x 22	Small projects accommodating preferred plan scale.
D	24 x 36	D	22 x 34	Projects accommodating preferred plan scale. Government projects.
E	36 x 48	E	34 x 44	Large projects accommodating preferred plan scale. Mapping and GIS.
F	30 x 42	N/A	N/A	Alternate size for projects accommodating preferred plan scale.

2. Sheet Layout

The main components of sheet layout that shall be used on all construction drawing sheets are drawing area, production data area, title block area, and border.

Plan, detail, general, and cross section sheets shall include all the layout components including module lines.

On plan and profile (P&P) sheets and cross section sheets module lines shall be turned off. P&P sheets shall be split between a plan view area on the top half and a profile view area on the bottom half of the drawing area. Cross section sheets shall only have section view area(s).

All plan view areas shall include a plan viewport to show a plan view of the model file (model space) at the accommodating preferred scale.

All profile view areas shall include a profile viewport to show a profile view of the model file (model space) at the accommodating preferred scale.

The components and sheet layout requirements, including layers, text styles and sizes, border, modules, and other components are pre-built into CUE AutoCAD/Civil 3D AutoCAD drawing templates (DWT) and

AutoCAD Drawing (DWG) templates. Refer to Figure CADD4.14 for a summary of construction drawing sheet layout components.

3. Drawing Area

The drawing area shall contain all graphics, notes, text, schedules, etc... It shall be divided into modules with alphanumeric and numeric coordinates to aid in placing details and objects within sheets. Module lines and coordinates shall not be plotted.

The module column closest to the title block shall be used for notes (keynotes, general notes, etc.) beginning at the top of the column. When a key plan is used, it shall be located in the lowest module of the notes block.

4. Production Data Area

The Production Data Area shall consist of the sheet file saved path and name, including the file (DWG) extension. Print, date, title, and time shall be located on the lower-left and upper-left margin reading vertically as included in CUE AutoCAD/Civil 3D DWT and DWG Templates.

5. Title Block Area

The Title Block Area shall contain all items shown and shall be filled in completely with project and sheet specific information. Figure CADD4.15 shows the title block area components.

6. Standard Details and Drawings

The components and sheet layout requirements for standard details and drawings (details), including layers, text styles and sizes, border, modules, and other components are pre-built into CUE AutoCAD/Civil 3D AutoCAD drawing templates (DWT) and AutoCAD Drawing (DWG) templates. In general, standard details and drawings (details) are not drawn to scale and should be denoted as N.T.S. within the CUE-provided Detail Title Block. All objects shall be placed in model space. All notes shall be located at the bottom of the page/detail drawing and be bottom-left justified. All text shall be capitalized. Fractions shall be diagonal; not horizontal. All fields of the sheet title block shall be populated appropriately.

CADD4.06 Schedules

Schedules summarize pertinent information for different civil project design elements. Schedules shall consist of at least a heading and a minimum of three columns of related information. The columns shall at a minimum be for the Mark, Item Description, and Distinguishable Feature. A Notes column may also be used. Typical schedules for civil project include structure data, approach tables, and erosion control summary tables. Additional requirements for schedules will be discussed in [Chapter CADD5 - Drafting Conventions](#).

Schedules shall use consistent terms, abbreviations, and format throughout the project.

Schedules shall be placed on the same sheet as the subject matter, items or information that makes up the schedule. If the schedule is too big and there is not enough space on the sheet drawing area, it shall be placed on a separate sheet at the end of the corresponding (discipline) subset.

Data within schedules shall be linked between the drawing file and the data source. The data source file shall be saved within the project folder structure for archiving purposes. An example would be a schedule created from a Microsoft Excel spreadsheet.

Example Schedule templates will either be pre-built into CUE AutoCAD/Civil 3D DWT and DWG templates or supplied in electronic format by CUE.

Figure CADD4.14 Sheet Layout Components

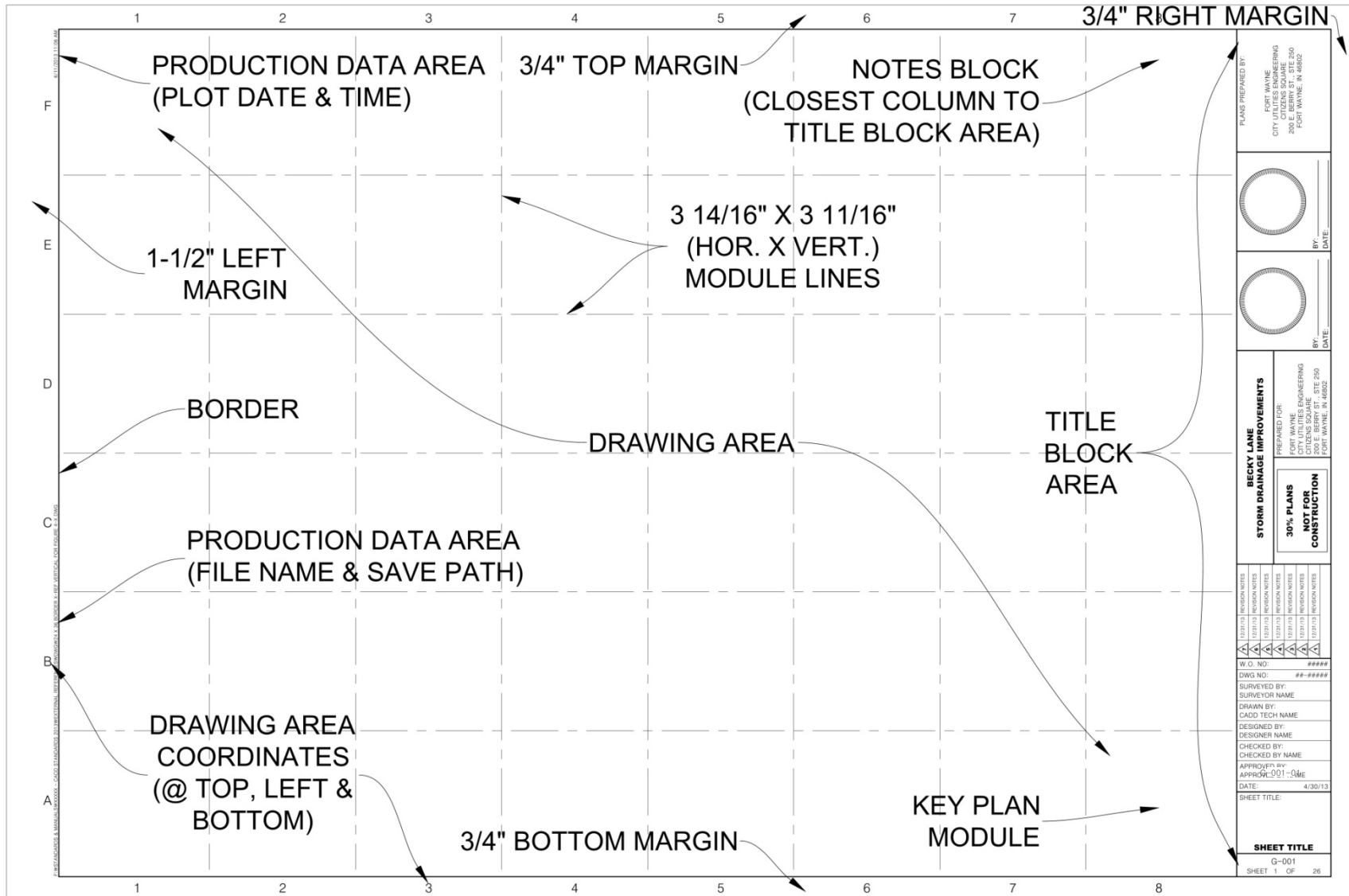


Figure CADD4.15 Title Block Area Components

