

WATER AGENCIES' STANDARDS

Design Guidelines for Water and Sewer Facilities

SECTION 1.2 AUTOCAD GUIDELINES

1.2.1 PURPOSE

This section provides guidelines for in-house staff and design consultants in preparing plans, sketches, maps, exhibits, and etcetera using the most current supported version of AutoCAD and concentrates on the software's capabilities.

Design consultants may have developed their own internal guidelines for preparing plans however, a level of uniformity in the design and file structure of the documents is crucial in the ability to: work with; integrate; and file documents created by different design consultants, along with those created in-house. These standards are not intended to limit the creativity of the design consultant or to reduce the quality of the design.

1.2.2 GENERAL

It is the responsibility of the user of these documents to make reference to and/or utilize industry standards not otherwise directly referenced within this document. The Engineer of Work may not deviate from the criteria presented in this section without prior written approval of the Agency's Engineer.

1.2.3 PROJECT SETUP

Projects shall be setup in accordance with Section 1.1 and as follows:

- A. All drawings shall be tied to the Horizontal Datum of the California State Plane Coordinate System Zone VI (NAD83) and to the North American Vertical Datum (NAVD 88) or as approved by the Agency. Units of measure shall be in English units unless otherwise directed by the Agency.
- B. The naming convention to be used for each project drawing shall be as follows:
 1. A directory with the applicable agency's project name and or number and a short description of the project will be set up to save drawings to.
 2. Inside the project directory the naming convention for drawings shall include project name or number and sheet designation as follows:
 - a. An example of sheet numbering is as follows: 8337_T1.dwg in which 8337 reflects the Agency's project number or name, T1 reflects the sheet designation and sheet number as described in Section 1.1 and .dwg reflects the file extension required for all AutoCAD drawings.
 - b. Multiple Sheets: Projects that require multiple sheets shall follow the naming convention mentioned herein and be numbered sequentially to reflect multiple sheets. An example of a project with eight (8) civil sheets would be shown thus: 8337_C1.dwg through 8337_C8.dwg.
 - c. Each sheet in a drawing set will contain a "plot stamp" on the lower left corner listing the file name, date, time and path in which the electronic file can be found.

- d. For information regarding plan organization and a listing of sheet designations, refer to Section 1.1.

1.2.4 CONSULTANT PACKAGE

A compact disc (CD-ROM) containing electronic files of borders, standard blocks, dimension styles, text styles, line types, some core layers and other settings will be provided by the Agency. This will aid the designer in adhering to the guidelines provided in the WASDG and improve efficiency.

1.2.5 LAYER NAMING

A standard naming convention for AutoCAD drawing layers has been established for use in assembly of project plans. This naming convention allows for some flexibility in layer naming, but the important point to remember is to use the same layering structure throughout the plan set.

Layer names are constructed of components as shown in Table 1. Each component is formatted to build upon the previous component. When naming layers, use dashes only to separate components.

**Table 1
Layer Naming Structure Components**

Object Modifier	Facility Service	Facility Type	Object Category
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- A. First Component – Object Modifier: The first component in the layer naming convention is the Object Modifier and it describes the plan layer. Table 2 lists the layer name abbreviations as they relate to the Object Modifier.

**Table 2
Object Modifier Name Abbreviations**

Name	Object Modifier
AB	Abandoned
DM	Demolish
EX	Existing
FT	Future
PR	Proposed

- B. Second Component – Facility Service: The second component in the layer naming convention is the Facility Service and describes the type of service (i.e. potable water, recycled water or sanitary sewer). Table 3 lists layer name abbreviations as they relate to the Facility Service.

**Table 3
Facility Service Name Abbreviations**

Name	Facility Service
PW	Potable Water
RW	Recycled Water
SS	Sanitary Sewer
UT	Utilities

- C. Third Component – Facility Type: The third component in the layer naming convention is the Facility Type and describes the actual facility related to the project (i.e.. pipeline, pump station, etc.) Table 4 lists layer name abbreviations as they relate to the Facility Type.

**Table 4
Facility Type Name Abbreviations**

Name	Facility Type
PL	Pipe Line
PS	Pump Station
PR	Pressure Reducing Station
DIS	Disinfection Facility
RES	Reservoir

- D. Fourth Component – Object Category Names: The fourth component in the layer naming convention is the Object Category and it describes the facility or feature depicted on the plan layer. Table 5 lists layer name abbreviations as they relate to the object category.

**Table 5
Object Category Names**

APN	Assessor Parcel Numbers
BLDG	Building
BRDR	Border
BDRY	Boundary
BRDG	Bridge
BRKLN	Breakline
CATV	Cable Television
CL	Center Line
CONC	Concrete
CONT	Contour
CRB	Curb
CTRL	Control
DATA	Data Tables
DIM	Dimensions
DRNG	Drainage
ELEC	Electric
ESMT	Easement
FLW	Flow Lines
FLD	# Year Flood
FNC	Fence
LOT	Lot Lines
GAS	Natural Gas
GR	Grading
HA	Hatch
HVAC	Heating, Vent, Air Conditioning
ICONT	Intermediate Contours
IRR	Irrigation
MEDN	Median
NEW	New
PCONT	Primary Contours
PL	Property Line
PRO	Profile

PTS	Points
PVMT	Pavement
ROS	Record of Survey
RS	Road Survey
ROW	Right of Way
RAMP	Ramps
RR	Railroad
SD	Storm Drain
SPOT	Spot Elevation
STR	Street Names
STC	Structure
STLT	Street Lights
STREAM	Streams
SVM	Survey Monuments
SWK	Sidewalk/Walkway
TELE	Telephone
TOPO	Topography
TRAF	Traffic
TRSIG	Traffic Signal
TREE	Trees
TXT	Text
UT	Utilities
WALL	Walls

**Table 6
Layer Name Examples**

Layer Name	Object Modifier	Facility Service	Facility type	Object Category
EX-PW-PS-BLDG	Existing	Potable Water	Pump Station	Building
PR-RW-PL	Proposed	Recycled Water	Pipeline	
DM-PW-DIS-STC	Demolish	Potable Water	Disinfection	Structure
PR-PW-RES-TOPO	Proposed	Potable Water	Reservoir	Topography

- E. For a core list of layer names refer to Table 7. Layer names not listed shall be named as described above.

Not all layers will contain each and every one of the naming components in the structure. The object is to maintain layers in clusters such as existing, proposed etc. so that they are easy to find in alpha sequence and easy to identify in the drawing.

**Table 7
Layer Name Examples**

AB-BLDG	ABANDONDED BULDING	1/RED	DASHED
AB-DIS	ABANDONDED DISINFECTION FACILITY	1/RED	DASHED
AB-DRNG DRAIN	ABANDONDED DRAINAGE	151/BLUE	STORM
AB-GAS	ABONDONDED GAS	51/YELLOW	GAS
AB-LSVC	ABONDONDED LATERAL SERVICE	51/YELLOW	DASHED
AB-PS	ABONDONDED PUMP STATION	1/RED	DASHED
AB-PW-PL	ABANDONDED POTABLE WATER PIPE LINE	151/BLUE	WATER
AB-RW-PL WATER	ABANDONDED RECYCLED WATER PIPE LINE	201/PURPLE	RECY
AB-SD DRAIN	ABANDONDED STORM DRAIN	151/BLUE	STORM
AB-SS SEWER	ABANDONDED SANITARY SEWER	61/GREEN	SANITARY
AB-STC	ABANDONDED STRUCTURE	1/RED	DASHED
BDRY BORDER	BOUNDARY BORDER	2/YELLOW 3/BLUE	PHANTOM CONTINOUS
DAYSTAMP	DAYSTAMP	1/RED	CONTINOUS
DIM	DIMENSIONS	2/YELLOW	CONTINOUS
EX-BLDG	EXISTING BUILDING	1/RED	DASHED
EX-BM	EXISTING BENCH MARK	171/BLUE	CONTINOUS
EX-CATV	EXISTING CABLE TELEVISION	30/ORANGE	CABLE
EX-CL	EXISTING CENTER LINE	1/RED	CENTER LINE
EX-CULV	EXISTING CULVERT	151/BLUE	DASHED
EX-DIS	EXISTING DISINFECTION FACILITY	1/RED	DASHED
EX-DRNG	EXISTING DRAINAGE	151/BLUE	DASHED
EX-ELEC	EXISTING ELECTRIC	1/RED	ELECTRIC
EX-ESMT	EXISTING EASEMENT	51/YELLOW	DASHED
EX-FNC	EXISTING FENCE	61/GREEN	FENCE
EX-GAS	EXISTING GAS	51/YELLOW	GAS
EX-ICONT	EXISTING INTERMEDIATE CONTOURS	254/GREY	CONTINOUS
EX-LOT	EXISTING LOT LINES	1/RED	PHANTOM
EX-LSVC	EXISTING LATERAL SERVICE	1/RED	DASHED
EX-MED	EXISTING MEDIAN	191/PURPLE	DASHED
EX-PCONT	EXISTING PRIMARY CONTOURS	252/GREY	CONTINOUS
EX-PP	EXISTING POWER POLE	1/RED	CONTINOUS

EX-PR	EXISTING PRESSURE REDUCIN STATION	1/RED	DASHED
EX-PS	EXISTING PUMP STATION	1/RED	DASHED
EX-PTS	EXISTING POINTS	191/PURPLE	CONTINUOUS
EX-PW-PL	EXISTING POTABLE WATER PIPELINE	151/BLUE	WATER
EX-RAMP	EXISTING RAMP	112/GREEN	DASHED
EX-RES	EXISTING RESERVOIR	151/BLUE	DASHED
EX-ROW	EXISTING RIGHT OF WAY	3/GREEN	RW
EX-RW-PL	EXISTING RECYCLED WATER PIPELINE	201/PURPLE	RECYCLED
EX-SD	EXISTING STORM DRAIN	151/BLUE	STORM
EX-SGN	EXISTING SIGN	191/PURPLE	CONTINUOUS
EX-SS	EXISTING SANITARY SEWER	61/GREEN	SEWER
EX-STC	EXISTING STRUCTURE	1/RED	DASHED
EX-STLT	EXISTING STREET LIGHT	191/PURPLE	CONTINUOUS
EX-STREAM	EXISTING STREAM	112/GREEN	DASHED
EX-SVY	EXISTING SURVEY MONUMENTS	191/PURPLE	CONTINUOUS
EX-SWK	EXISTING SIDEWALK	51/YELLOW	DASHED
EX-TELE	EXISTING TELEPHONE	30/ORANGE	TELE
EX-TOB	EXISTING TOP OF BERM	1/RED	DASHED
EX-TOC	EXISTING TOP OF CURB	1/RED	DASHED
EX-TOP	EXISTING TOP OF PIPE	1/RED	DASHED
EX-TOPO	EXISTING TOPOGRAPHY	252/GREY	CONTINUOUS
EX-TRSIG	EXISTING TRAFFIC SIGNAL	191/PURPLE	CONTINUOUS
EX-VLT	EXISTING VAULT	151/BLUE	DASHED
EX-VEG	EXISTING VEGETATION	1/RED	CONTINUOUS
EX-WALL	EXISTING WALL (RETAINING)	1/RED	DASHED
HA	HATCH	1/RED	CONTINUOUS
HGRID	HORIZONTAL GRID	254/GREY	PROFILE
IMAG	IMAGES	7/WHITE	CONTINUOUS
NARROW	NORTH ARROW	7/WHITE	CONTINUOUS
PR-CONST-EMST	PROPOSED CONSTRUCTION EASEMENT	3/GREEN	DASHED
PR-DIS	PROPOSED DISINFECTION FACILITY	5/BLUE	CONTINUOUS
PR-ESMT	PROPOSED EASEMENT	3/GREEN	DASHED
PR-FNC	PROPOSED FENCE	2/YELLOW	FENCE
PR-ICONT	PROPOSED INTERMEDIATE CONTOURS	1/RED	CONTINUOUS
PR-LSVC	PROPOSED LATERAL SERVICE	2/YELLOW	CONTINUOUS
PR-MED	PROPOSED MEDIAN	2/YELLOW	CONTINUOUS
PR-PCONT	PROPOSED PRIMARY CONTOURS	3/GREEN	CONTINUOUS
PR-PERM-ESMT	PROPOSED PERMANENT EASEMENT	3/GREEN	PHANTOM
PR-PR	PROPOSED PRESSURE REDUCING STATION	5/BLUE	CONTINUOUS
PR-PS	PROPOSED PUMP STATION	5/BLUE	CONTINUOUS
PR-PTS	PROPOSED POINTS	2/YELLOW	CONTINUOUS
PR-PW-PL	PROPOSED POTABLE WATER PIPELINE	6/MAGENTA	CONTINUOUS
PR-RAMP	PROPOSED RAMP	2/YELLOW	CONTINUOUS
PR-RES	PROPOSED RESERVOIR	5/BLUE	CONTINUOUS
PR-ROW	PROPOSED RIGHT OF WAY	3/GREEN	PHANTOM
PR-RW-PL	PROPOSED RECYCLED WATER PIPELINE	6/MAGENTA	CONTINUOUS
PR-SD	PROPOSED STORM DRAIN	6/MAGENTA	CONTINUOUS
PR-SGN	PROPOSED SIGN	2/YELLOW	CONTINUOUS
PR-SS	PROPOSED SANITARY SEWER	6/MAGENTA	CONTINUOUS
PR-STC	PROPOSED STRUCTURE	5/BLUE	CONTINUOUS
PR-SWK	PROPOSED SIDEWALK	2/YELLOW	CONTINUOUS
PR-VEG	PROPOSED VEGETATION	2/YELLOW	CONTINUOUS
PR-WALL	PROPOSED WALL	3/GREEN	CONTINUOUS
TXT-L	LARGE TEXT	6/MAGENTA	CONTINUOUS
TXT-M	MEDIUM TEXT	3/GREEN	CONTINUOUS
TXT-S	SMALL TEXT	2/YELLOW	CONTINUOUS
VGRID	VERTICAL GRID	254/GREY	PROFILE
VPORT	VIEWPORT	7/WHITE	CONTINUOUS

1.2.6 COLORS IN AUTOCAD TO PLOTTED PEN WIDTHS

- A. Exhibit A (sheets 1-6) lists the association of the AutoCAD color palette, the percentage of screening and the assigned pen weights. The agency of jurisdiction will provide plot styles named "mono-full.ctb" and "color-full.ctb." to assist the designer in plotting and adhering to CAD standards.
- B. Using the Color Palette: Pens 1 through 10 are to be used as the main colors. Pen 2 being the main pen used for text throughout the projects. (See layering section for further description of colors and use) Pens 11 through 99 are screened colors, starting with 10% screening on pens 11 through 19, 20% on pens 21 through 29 etc. Pens 100 through 251 are all 100% screened with the weights rotating in the same increments as pens 1 through 10. Pens 252 through 255 are screened and are to be used for shading.
- C. See Exhibit A, for examples of the Mono-full.ctb and Color-full.ctb plot styles for use in plan sets.

1.2.7 LINE WEIGHTS AND TYPES

Line Weights: Line weights should vary to distinguish certain features on project drawings as described in Section 1.1 with the main pen numbers indicated in Table 8.

Table 8
Line Weights

Line Weights	Pen Number
Extra Heavy Lines	008
Heavy Weight Lines	005 or 006
Medium Weight Lines	003 or 004
Fine Lines	001 or 002
Extra Fine Lines	001
Topography	Screened Lines

- A. Line Types: Line types should vary to distinguish certain features on project drawings such as existing utilities, berms, daylight, etc. Line types shall be as illustrated in Exhibit B (sheets 1 thru 3).
 - 1. A CD-ROM will be provided by each agency containing special and utility line types for use throughout the drawing set. The file will contain variations of the included line types for use with different scales as necessary.
 - 2. Colors of all existing utility lines shall be consistent with the "DIG ALERT" colors.

1.2.8 TEXT

Maintaining text sizes, fonts and alignment are important to maintain consistency throughout the project drawings. Text used for notes, dimensions, titles and headings used for project plan sheets have been consolidated and standardized for CAD usage. The fonts, height and plotting weights have been selected for easy use in both full-scale plots and half-scale plots. All text shall be in upper case and without embellishments.

- A. Size: Text sizes and use shall be in accordance with Section 1.1 and as shown below.

- B. Fonts: AutoCAD fonts shall be (simplex.shx) with text style names as shown below. The following shall be used predominantly throughout the plan set.

Layer Prefix	Description	Style Name	Text Height	Pen/Color	Usage (refer to Section 1.1)
TXTEX	Existing Text	L80	0.08	001/red	existing utilities, callouts and notes
TXTS	Small Text	L125	0.125	002/yellow & call outs	proposed general notes
TXTM	Medium Text	L156	0.156	003/green	caution boxes, detail names
TXTL	Large Text	L250	0.25	004/cyan	plan name & titles

- C. Fonts and Formatting of Title sheets shall be left up to the discretion of each agency. Table 9 lists the special characters that are available within the simplex.shx AutoCAD font.

**Table 9
Special Symbols Available**

Enter	For Symbol
%%o	Overscore
%%u	Underscore
%%d	Degrees
%%c	Diameter
%%p	Plus or Minus
%%%	Percent Sign

- D. Text Alignment and Placement: Proper alignment and placement of text shall be in accordance with Section 1.1 and the following:
1. Text justification in AutoCAD shall be left justified.
 2. When writing multiple lines of text, the Mtext command shall be used to facilitate the editing and moving of text groups.
- E. Abbreviations: Abbreviations are typically used when necessary to save space or to avoid excessive clutter. Abbreviations must be clear, easily understood and consistent throughout the plan set. Standard abbreviations shall be per Water Agencies' Standards (WAS) Specification Section 01070.
- F. Phrases and Call Outs: Phrases and call outs shall be used in accordance with Section 1.1.

1.2.9 STANDARD SYMBOLS

Standard Symbols shall be used to reduce drafting time, increase legibility and conserve space. Symbols must be consistent throughout the plan set in accordance with WAS Standard Drawings WI-06 and SI-01 and shown in a legend on the plans.

- A. Existing symbols shall be the same as proposed symbols but drawn with a fine line in accordance with this section under Line Weights and Types.

- B. Standard symbols can be provided electronically by contacting the Agency of Jurisdiction.

1.2.10 HATCH AND PATTERNS

Hatching and patterning shall be used to illustrate types of materials used and/or to delineate types of surfaces in accordance with Section 1.1 and the following:

- A. Use only typical AutoCAD hatch Patterns for standard items available through the AutoCAD hatch menu. Do not create any custom hatch patterns that would otherwise not be available to the common AutoCAD user through the standard AutoCAD hatch menus.

1.2.11 ELECTRONIC SUBMITTAL REQUIREMENTS

- A. All maps and associated improvement plans shall be submitted on computer disk (CD ROM) in digital format and in Mylar plotted format. Digital submittals shall be submitted after the agency of jurisdiction has requested the Mylar submittal and shall conform to the following:
 - 1. Electronic files shall be submitted in the most current supported version of AutoCAD format or as approved by the Agency.
 - 2. Electronic submittals shall use CD-ROMs, zip disk or super disk (per agency requirement). Each disk should be labeled with the project name, project number and consultant's name and telephone number.
 - 3. The name and a brief description of all files should be submitted in MS Word format or a printed report off the AutoCAD software.
 - 4. All files pertinent to the project must be included. Remember to include all external references, font files, and plot files. (i.e. AutoCad's Pack n Go).
 - 5. Files can be zipped to conserve storage space; however, only self extracting zip file formats will be accepted (i.e. winzip, zipit, pkzip in format)
- B. Self Extracting Files: A self-extracting file is an executable program file that includes the data and software to extract or "uncompress" the contents of the file. Users can run a self-extracting file just as they would run any other program.

1.2.12 REFERENCE

- A. Should the reader have any suggestions or questions concerning the material in this section, contact one of the member agencies listed.
- B. The publications listed below form a part of this section to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said publications unless otherwise called for. The following list of publications, as directly referenced within the body of this document, has been provided for the users convenience. It is the responsibility of the user of these documents to make reference to and/or utilize industry standards not otherwise directly referenced within this document.
 - 1. Water Agencies' Standards (WAS):
 - a. Design Guidelines
 - 1. Section 1.1, Drafting Guidelines

- b. Standard Specifications:
 - 1. Section 01070, Abbreviations
- c. Standard Drawings:
 - 1. WI-06, Standard Symbols for Water Construction Drawings
 - 2. SI-01, Standard Symbols for Sewer Construction Drawings

END OF SECTION