

WATER AGENCIES' STANDARDS

Design Guidelines for Water and Sewer Facilities

SECTION 1.1 DRAFTING GUIDELINES

1.1.1 PURPOSE

The purpose of this section is to provide established standard criteria regarding the preparation of plans, sketches, maps, and exhibits in a uniform and consistent manner. This guideline is universal between hand drawn and electronically prepared plats and drawings.

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.

Although these guidelines are intended to cover all drafting situations in the preparation of drawings, it is recognized that this may not be so. The design consultant should use good professional judgment in applying and using industry standards so that drawings produced are clear and concise.

1.1.2 STANDARD TERMS AND DEFINITIONS

Wherever technical terms occur in these guidelines or in related documents, the intent and meaning shall be interpreted as described in Standard Terms and Definitions.

1.1.3 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.

1.1.4 DRAWING ASSEMBLY GENERAL GUIDELINES

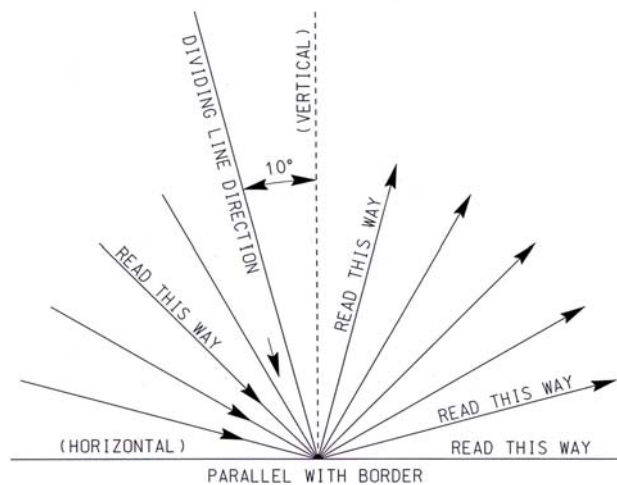
Drawings are intended to communicate the intent of the design to the contractor in a clear and concise manner as well as be technically complete and correct. The drawings must promote specific and clear interpretation. Drawings must be uncluttered, legible, and easy to understand and have a high degree of uniformity.

- A. Eliminate Repetitive Details: When several items have common details, show the common detail once.
- B. Eliminate Unnecessary Lines: Only those lines necessary to convey the design should be used. For example, closely spaced parallel lines to depict curbs are superfluous: one line will suffice.
- C. Use of Abbreviations: Use abbreviations only when necessary to save space or to avoid excessive clutter. Abbreviations must be clear, easily understood and consistent throughout the plan set.

1. Standard abbreviations shall be per WAS Standard Specification Section 01070.
- D. Use of Phrases or Words: In order to avoid confusion or misinterpretation use phrases or words that specify such as: By Others, Construct Pavement or Pavement to be Constructed.
- Do not use vague or ambiguous phrases or words that can be interpreted such as: suitable, appropriate, in a workman like manner.
- E. Use of Symbols: Use symbols to reduce drafting time, increase legibility, and conserve space. Symbols must be consistent throughout the plan set.
1. Standard symbols shall be per WAS Standard Drawings WI-06 and SI-01 and shown in a legend on the plans.
 2. Standard symbols can be provided electronically by contacting the Agency.
- F. Line Work: Lines and lettering must be of adequate size and weight to produce legible half-size reproductions. Lines shall be sufficiently thick to print well and make readable photocopies. Line work must be smooth, firm, uniform weight and density throughout the drawings and ends should be clearly defined. Line widths should vary to distinguish certain features as follows:
1. Extra heavy lines should be used for drawing borders.
 2. Heavy lines should be used for emphasis of proposed features of the new facilities. Examples are proposed water mains, sewer mains and outline of objects.
 3. Medium weight lines should be used for right of way, match lines and single line drawings.
 4. Fine lines should be used for topography, outline of existing and future facilities and other less important details. Note: The final product shall represent the topographic lines as screened elements.
 5. Extra fine lines should be used for centerlines, phantom lines, dimension lines, and leader lines.
- G. Hatch and Patterns: Hatching and patterning shall be used to illustrate types of materials used and/or to delineate types of surfaces.
1. The use of hatching and patterns in CAD shall be in accordance with AutoCAD, Section 1.2 or MicroStation, Section 1.3.
 2. Do not render, hatch, shadow or draw all bricks or shingles. A small area of texture or hatching at corners or a simple detail showing pattern and direction tells everything necessary. Cross-hatching need not cover the entire area or wall.
 3. For an example of hatch patterns and its usage see Exhibit A.
- H. Use of Tables and Notes: Tables and notes shall be used when necessary to achieve clarity. Examples would include: utility line tables, curve data tables, coordinate tables, thrust and anchor block sizes, parts list, and notes that would otherwise create clutter at a specified point.
- I. Text Size and Alignment: Maintaining text sizes and alignments are important to maintain consistency throughout the drawings.

1. Text fonts for use in CAD shall be in accordance with AutoCAD, Section 1.2 or MicroStation, Section 1.3.
2. Text Size: All text shall be in upper case and without embellishments. The following sizes of text shall be predominant throughout the plan set.
 - a. Extra small text shall have a height of 5/64" (0.08) and used for all existing utility callouts and notes.
 - b. Small text shall have a height of 1/8" (0.125) and be used for all general notes and call outs.
 - c. Medium text shall have a height of 5/32" (0.156) and be used for caution boxes, detail names and match lines.
 - d. Large text shall have a height of 1/4" (0.25) and be used for street names and titles.
3. Text Alignment: All text will be read from either the bottom or right edge of the sheet. When necessary the rotation angle will be ten degrees (10°) past vertical. (See Figure 1 below)

Figure 1
Text Alignment

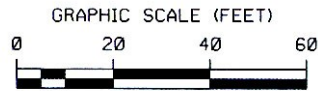


4. Text Placement: Text shall be placed in a clear open space of the drawing such that the text will not cross other drawing features, leader lines, and other text.
5. Decimals:
 - a. Use decimal of a foot measurements when dimensioning civil sheets. (i.e. 5.50', 12.53', 5.57')
 - b. Use feet and inches when dimensioning structural and architectural plan and sections, piping details and mechanical plans.
 - c. Fractions are to be stacked with diagonal setting. (i.e. 1/2", 1/4")
- J. Leader Lines: Leader Lines shall be used for associating text to an object such as notes, call outs, stationing and details associated with the object.

1. Leader lines shall be as consistent as possible throughout each drawing of the plan set.
 - a. Either arc'd or three (3) point leaders will be allowed.
 - b. Leader arrows shall be large enough to clearly show on the final product. Leader arrows shall be of adequate size to be legible at half-sized reproductions. Generally leader arrows shall be 1 ½ times the font size. It is important to maintain consistency throughout the plan set.
 - c. Leaders shall always touch the object being called out.
 - d. If an object has a dimension, which is too long to be shown at scale, the leader should be broken and indicated to be a continuation line, by two arrowheads at the end of line.
 - e. Leader lines shall not:
 1. Cross each other.
 2. Cross other dimensions.
 3. Be overtly long.
 4. Be the same angle as hatch patterns.
 2. Refer to Exhibit B for examples of proper techniques for placement of leaders.
- K. Horizontal and Vertical Control: The basis for horizontal and vertical control shall be established before a survey is performed. All civil plans shall incorporate the NAD83 Coordinate system. The basis for horizontal control shall relate to the surrounding streets and the boundary or property line. Coordinates shall generally be indicated as follows:
1. On beginning and ending of pipelines, pipe deflections (BC and EC of alignment), manholes, vaults and other appurtenances as needed to fix their location. Coordinates shall be located on appurtenance's centerline or center point.
 2. Grading control points, top and/or bottom of slope with the rate of slope, and other control points to provide sufficient staking to control the contractor's grading tolerances.
- L. Drawing Scale: Drawing scales shall be used to maintain clarity when notes and dimensions are added to the drawing. Maintain legibility when drawings are reduced to half scale. Maintain readability when drawings are scanned or microfilmed for archival purposes.
1. Allowable drawing scales are as follows:
 - a. Civil Drawings: Civil drawings shall generally have a scale of 1 inch = 40 feet for pipe lines over 1000' and a scale of 1 inch = 20 feet for pipelines less than 1000', unless otherwise approved by the Agency Engineer. Other scales are acceptable only with prior approval.

For maintaining legibility when drawings are reduced to half scale a graphic scale shall be used. (See Figure 2 below)

Figure 2
Graphic Scale



- b. Profile Views: Civil drawings shall generally have a vertical scale of 1 inch = 1 foot, 1 inch = 4 feet or 1 inch = 8 feet. A vertical scale of 1 inch = 8 feet shall be reserved for steep terrain only. Changing the scale to avoid break lines is not acceptable.

Profile scales shall always reflect the same horizontal scale used in the plan view.

Plan view and profile shall be aligned on the same sheet and include storm, water, sewer and recycled water with the profile above the plan view.

- c. Sections and Details: Sections and details should incorporate a scale. Use of other scales to improve clarity or fit into plan sheets will be allowed as directed by the District. Scales are available as follows:

| | |
|-------------------|------------------------------|
| 1 inch = 10 feet | $\frac{3}{4}$ inch = 1 foot |
| 1 inch = 5 feet | $\frac{1}{2}$ inch = 1 foot |
| 1 inch = 4 feet | $\frac{1}{4}$ inch = 1 foot |
| 1 inch = 2 feet | $\frac{3}{8}$ inch = 1 foot |
| 1 inch = 1 foot | $\frac{1}{8}$ inch = 1 foot |
| 3 inches = 1 foot | $\frac{1}{16}$ inch = 1 foot |

- d. Scale Annotation: All drawings, plats, sections, and details shall indicate a scale.
 1. The notation "NTS" (not to scale) should be avoided when detail is critical. All drawings, sections and details should be drawn to true scale and depicted with a workable scale. "NTS" should be reserved for specific dimensions within the drawing that are not to scale. Exhibits, images and scanned drawings or other images used could also indicate "NTS".
 2. When multiple views on a drawing are not to the same scale, the appropriate scale shall be centered under the title of the view. The scale shall be indicated next to the north arrow were applicable. The title block scale should indicate "As Shown".
 3. When the entire drawing is to the same scale, the scale shall be listed in the title block and indicated next to the north arrow were applicable.

- M. Drawing Changes: The drawing status block on the border is intended for formal changes made by addendum during the bid phase and for recording changes made during construction. Changes made to drawings during design do not require revision notations on the border.

A change is noted by describing it in the revision block, circling (clouding) the revised area on the drawing, and placing the revision letter or number in a triangle inside the circled (clouded) area.

- N. Details and Sections: Details should be specific to the job only. Detail and section callouts shall be as shown in Exhibit C with the following clarifications:
1. Do not divide different details on a sheet using dividing lines or a grid pattern. (Do not “box in” details)
 2. Details shall be shown in numerical order (1, 2, 3...).
 3. Section cuts shall be shown in alphabetical order (A-A,B-B,C-C...).
 4. Detail callouts and section cuts shall indicate the sheet where the detail can be found. The detail shall indicate where, in the drawings, the detailed item originated. A dash shown in the area representing the sheet number indicates the detail as being shown on the same sheet.
 5. Arrange sections and details in sequential order, from left to right across the sheet.
 6. Use consecutive numbers and letters on each sheet of the plan set. Do not repeat a detail or section callout more than once on a plan set. (i.e. a plan set shall have only one Detail “1”)
 7. Section cuts should point to the top, left or right, but never to the bottom. Use arrowheads to indicate the direction of the cut.

1.1.5 PLAN ORGANIZATION AND ASSEMBLY

- A. Sheet Size: The border should measure 22” x 34” on a 24” x 36” sheet. Standard sheets, blocks and standard symbols will be provided electronically by contacting the Agency.
- B. Easement Plats: Easement plat shall be drawn to a scale on 11” x 17” or 8.5” x 11” sheets with the supplied Agency standard border.
- C. Sheet Designations: Plan sheets shall have a corresponding abbreviated designation to illustrate the type of drawing. The types of drawings listed in Table 1 are in the order that shall appear in a plan set.

Table 1
Sheet Designation and Drawing Order

| Type of Drawing | Sheet Designations |
|--|--------------------|
| Title | T |
| General | G |
| Demolition | D |
| Civil | C |
| Landscape/Irrigation | L |
| Architectural | A |
| Structural | S |
| Mechanical, Heating, Ventilation and Air Conditioning | M |
| Plumbing | P |
| Cathodic Protection | CP |
| Electrical | E |
| Instrumentation & Controls | I |
| Traffic Control | TC |
| Environmental | EN |

- D. Drawing Orientation: All plan views must contain a North Arrow as illustrated in Figure 3 below.

Figure 3
North Arrow



1. Plans shall generally be oriented north, with the North Arrow pointing upward or to the right of the sheet. The North Arrow will govern the orientation of sheet layout in plan view not stationing.
 2. The North Arrow shall be placed along the right of the plan sheet, typical.
 3. The North Arrow shall always indicate the scale of the view.
 4. The orientation of building plans shall be identical.
 5. The orientation of site plans shall be identical.
- E. Stationing:
1. Stationing shall generally start with Station 10+00 and go from left to the right, for plan and profile, across the sheet.
 2. Station along horizontal alignment with one hundred foot (100') stations including angle points, appurtenances, inlets and outlets.
 3. When installation consists of more than one utility (potable water, recycled water or sewer) or is associated with street improvements, road centerline stationing shall be used for all improvements. A distance left or right from road centerline shall be used.
 4. When installation consists of one utility (potable water, recycled water or sewer) only, stationing shall be centered on the utility.
 5. All potable water, recycled water and sewer pipe appurtenances shall be stationed.
- F. Match Line and Sheet Call outs:
1. Match Lines shall be used to indicate a break in the alignment that continues on another sheet.
 2. Sheet Call Outs shall be used to indicate a reference to another sheet or a continuation of alignment on another sheet. (MATCH LINE, SEE SHEET 3)

- G. Title Sheet: Title Sheets shall be as shown in Exhibit D. (This exhibit is intended to provide an example of a cover sheet). The title sheet shall include, but not limited to the following information:
1. Project Name and Description.
 2. Vicinity Map showing:
 - a. Project Site(s).
 - b. Major Streets.
 - c. North Arrow.
 - d. Drawing Scale.
 - e. Thomas Brothers Map page number and grid number.
 3. Key Map(s)
 - a. Large enough (minimum 100 foot scale) to clearly show all required information.
 - b. Show existing potable, recycled and/or sewer mains with drawing numbers and proposed pipelines.
 - c. Legend.
 - d. Drawing scale.
 - e. North arrow.
 - f. Project Sheet layout.
 - g. Street Names.
 4. Sheet Index with sheet reference and sheet description.
 5. General Notes (related to the overall project, not to any single discipline including City or County requirements).
 6. Water Agencies Notes (Standard Water and Sewer Notes).
 7. Dig Alert Symbol and current 1-800-phone number.
 8. Legend (project related only).
 9. Benchmark references.
- Additional information may be required specific to developer projects, beyond what is shown above, as called for in Section 2.2.
- H. General Sheet: General Sheets may not be needed depending on the size and/or type of project. Information shall be shown on the cover sheet if the general sheet is not required by the Agency Engineer. The general sheet, if required, shall include, but not limited to the following information:
1. General Notes (related to the overall project, not to any single discipline including City or County requirements).

2. Standard Water and Sewer Notes.
 3. Dig Alert Symbol and current 1-800-phone number.
 4. Legend (project related only).
 5. Benchmark references.
- I. Plan and Profile Sheet(s): Plan and profile sheets shall be as shown in Exhibit E. (This exhibit is intended to provide an example of a plan and profile sheet). The plan and profile sheets shall include, but not limited to the following information:
1. Profile view shall include but not limited to the following:
 - a. Existing ground line.
 - b. New/proposed ground line.
 - c. Bottom of pipe elevations for potable and recycled water mains. Bottom and top of pipe elevations on mains sixteen inch (16") and larger.
 - d. Flow line or invert elevations of pipe for sewer mains.
 - e. Utility crossings. Indicate size, type and elevation of existing and proposed utilities identified.
 - f. Vertical angle points and vertical curve data.
 - g. Sewer slopes represented as percent of grade of proposed utilities. Water mains shall be labeled when the water main differs from the new/proposed ground line.
 - h. Type, size and stationing of pipe appurtenances.
 - i. Size, class, and type of proposed pipe.
 - j. Match lines and other sheet references.
 - k. Horizontal and vertical scale.
 - l. Depth from new/proposed ground line to top of pipe.

Additional information may be required specific to developer projects, beyond what is shown above, as called for in Section 2.2.

2. Plan view shall include, but not limited to the following information:
 - a. Appurtenances such as air valves, blowoff valves, water and sewer laterals, manholes, valves, test station, angle points, inlets, and any other items for the purpose of providing valuable information. Show type, size and stationing of appurtenances.
 - b. Concrete encasements, where needed.
 - c. Casings and casing data, where needed.
 - d. Size, class, and type of proposed pipe.
 - e. Match lines and other sheet references.

- f. Show existing utilities with light line weights. Indicate size and type of utilities identified.
- g. Show streets/easements with dimensions including distances to and between utilities.
- h. All Street Names.
- i. Drawing scale.
- j. North arrow.
- k. Coordinates.
- l. Bearing and Distances.
- m. Angle points, curve data, BC's, EC's.
- n. Thrust blocks and size in square feet of bearing area.
- o. Anchor blocks and size in cubic yards.
- p. Benchmark datum.

Additional information may be required specific to developer projects, beyond what is shown above, as called for in Section 2.2

- I. Detail Sheet(s): Detail sheets shall be as shown in Exhibit F. (This exhibit is intended to provide an example of a detail sheet).
 - 1. The detail sheet shall include details and sections specific to the job only.
 - 2. Provide only the kinds of information, which relate clearly to the job details. Designate items by generic names, not trade names.
 - 3. If standard drawings are to be used, simply refer to them and their location rather than copying them onto a detail sheet. (Example: 6" Fire Hydrant Assembly, see WAS Standard Drawing WF-01)
 - 4. Avoid repeating street names, numbers or material identification on the same sheet.
 - 5. Do not repeat dimensions except as necessary to relate one drawing or view clearly to another and only if there is no other way to identify location or orientation.
 - 6. Information included with a detail, such as materials, should not be repeated in the callout. Use material tables where possible to avoid repeated callouts and to provide clarity to the detail.
- J. Seals/Signatures: All sheets of the plan set, when issued for bidding, will require the stamp of a California registered professional engineer, his or her signature, and the date below the seal. Revisions to the plans that have been stamped by a registered professional engineer must be initialed and dated below the stamp or in the revision block column designated for the initials by the same engineer who signed the original work. If this cannot be done, another registered professional engineer can affix his seal to the plans (or enter his registration number), and enter his signature and the date, noting that his seal covers only the specific revisions. All seals must include the license expiration date. Only permanent stamps are acceptable, "Sticky Back" attachments are not. Note: The cover of the job specifications shall also have the stamp of the engineer of work.

1.1.6 DELIVERABLES

District supplied preprinted mylars (for use with hand drawn plans) and or electronic blocks, standard drawings and symbols will be supplied by contacting the Agency. A fee may be charged for Agency supplied materials.

Record Drawings: Record Drawings shall be prepared and supplied to the District as Described in Section 1.7.

When plans are prepared on District title block, the District is to receive the original mylars.

Electronic Drawings: Electronic Submittals and media to be used shall be in accordance with Section 1.2 or 1.3.

1.1.7 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 1.2, AutoCAD Guidelines
 - 2. Section 1.3, MiroStation Guidelines
 - 3. Section 1.7, Record Drawing Guidelines
 - 4. Section 2.2, Development Plan and Permit Processing Procedures
 - 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