



**SWEETWATER AUTHORITY
DESIGN STANDARDS**

Revised December 2021

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SWEETWATER AUTHORITY
DESIGN STANDARDS MANUAL

I. DESIGN CRITERIA

A. Water Mains

It is the intent of Sweetwater Authority (Authority) to use Polyvinyl Chloride (PVC) pipe for the installation and replacement of water mains four (4) through eighteen (18) inches in diameter and steel for mains greater than eighteen (18) inches.

PVC pipes four (4) through twenty-four (24) inches in diameter shall conform to American Water Works Association (AWWA) C900-16 (*AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 60 In. (100 mm through 1,500 mm)*).

Water mains less than or equal to twenty-four (24) inches in diameter shall be constructed of Class 235 (DR 18) PVC pipe, except four (4) inch pipe, which shall be Class 305 (DR 14) PVC pipe. Class 305 (DR 14) PVC pipe is acceptable for water mains for six (6) inches through twelve (12) inches in diameter. In some cases, where strength or ductility is needed due to shallow cover or unstable soil conditions, steel pipe may be allowed or required. This allowance will be granted on a case-by-case basis by the Authority's Director of Engineering (Engineer).

Water mains eighteen (18) through twenty-four (24) inches in diameter shall be constructed using PVC or steel pipe. The pipe shall be a minimum Class 235 for PVC and Class 150 for steel. Changes in pipe classification will only be allowed with the approval of the Engineer. PVC pipe fittings shall be ductile-iron in accordance with ANSI/AWWA C153/A21.53 and may have either flange or mechanical joint ends. All ductile iron fittings shall be cement lined with an asphalt seal coat and factory-coated with an asphaltic seal

coat per ANSI/AWWA C104/A21.4 (*American National Standard for Ductile-Iron and Grey Iron Fittings, 3 In. through 48 In.*) and wrapped with High-Density Polyethylene (HDPE) film per AWWA C105, (*American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems*). HDPE film wrap shall be a minimum of six (6)-mils thick, overlap joint edges by twelve (12) inches, and be secured with two (2)-inch-wide, ten (10)-mil black polyethylene adhesive tape.

No bending of PVC pipe is permitted. All changes in direction for PVC pipe will be at pipe bells, couplings, and fittings per the Authority's Standard Specifications for Construction of Water Facilities and manufacturer's recommendations.

Water mains larger than twenty-four (24) inches in diameter shall be constructed of fabricated steel. Steel pipe shall be designed per the "*AWWA Manual of Water Supply Practices, Steel Pipe - A Guide for Design and Installation, M-11*" and applicable AWWA Standards. The pipe wall thickness shall be 0.25 inch minimum, and shall be designed to withstand internal pressures and surge pressures, and external live and dead loads. Protective coatings shall consist of 3/8-inch cement mortar lining and 3/4-inch minimum cement mortar coating, and comply with AWWA C205. Tape wrap shall also be provided in accordance with AWWA's 209, Table 2, Spec 209, with a minimum tape thickness of eighty (80) mils. Steel pipe openings (e.g., tees, wyes, nozzle outlets, etc). shall be reinforced in accordance with AWWA M-11 and applicable standards.

All steel pipe joints shall be full welded and provide continuity to maintain cathodic protection. Cathodic protection shall be designed in accordance with applicable AWWA Standards.

Requests for the use of pipeline materials other than those included in this specification, such as high density polyethylene (HDPE) pipe, must be submitted with supporting documentation, for approval by the Engineer.

- B. Location of Water Mains: Water mains shall be located five (5) feet from the face of curb on the north or east side of the street. The parallel distance (offset) from street centerline to the pipeline (water main) alignment shall be consistent throughout the project length. Horizontal offsets less than two (2) feet shall be made with PVC High Deflection (HD) couplings. Horizontal offsets greater than two (2) feet shall be made using ductile-iron bends as required. The depth of water mains shall be a minimum of thirty-six (36) inches and a maximum of sixty (60) inches to the top of pipe. Water mains located in an easement shall be centered within the easement boundaries to provide maximum access. Proposed pipeline alignments not meeting the above location requirements shall be submitted to the Engineer for approval.

- C. Required Water Facilities Clearances:

From Dry Utilities:

All parallel dry utilities shall have a minimum five (5)-foot separation from water mains and service laterals. Utility power poles and guy wires shall maintain a minimum of 5-foot of separation from edge of water facility trench to pole or guy wire, and pull boxes and enclosures shall maintain a minimum of 3-foot of separation from water facility appurtenances. Dry utilities crossing perpendicular to the Authority's water mains shall maintain a minimum six (6)-inch vertical separation.

From Sewer:

A minimum distance of ten (10) feet, from pipe edge to edge, shall be maintained between parallel sewer and water pipelines. When a water pipeline crosses over an existing sewer main, the design shall include a

continuous pipeline with no joints within 8-feet of the sewer main (pipeline edge to edge). When a water pipeline crosses under an existing sewer main, the design shall include a continuous pipeline with no joints within 10-feet of the sewer main. Required vertical clearance shall be 1 foot. Water pipelines shall cross sewer pipelines perpendicularly, but at no less than 45°. See Standard Drawing 14-A.

From Storm Drain Facilities:

A minimum distance of five (5) feet, from pipe edge to edge of storm drain facilities, shall be maintained between parallel storm facilities and water pipelines. When a water pipeline crosses over an existing storm drain, the design shall include a continuous pipeline with no joints permitted within 4-feet of the storm drain. When a water pipeline crosses under an existing storm drain, the Contractor shall ensure the installation of a continuous pipeline with no joints within 5-feet of the storm drain. Required vertical clearance shall be 1 foot. Water pipelines shall cross storm drains perpendicularly, but at no less than 45°.

The State Water Resource Control Board, Division of Drinking Water, provides standards for the relationship between water mains, sewer mains, and storm drains. The proposed locations of water mains must adhere to the Division of Drinking Water standards.

Water facilities shall maintain a minimum separation of 5 feet from trees, tree grates, or permanent above grade planters.

- D. Valves: Valves shall be placed on branches of crosses and tees, unless otherwise directed by the Engineer. Valve spacing in residential areas is not to exceed seven hundred fifty (750) feet or one (1) street block. Valve spacing in commercial areas is not to exceed five hundred (500) feet or one (1) street block. Valve spacing for transmission mains is not to exceed two

thousand (2,000) feet. Valve placement shall be incorporated into the design to ensure that no more than two (2) fire hydrants or fire services, or a combination thereof, are out of service when a valve is closed. Resilient-seated gate valves shall be used on water mains eight (8) inches or smaller, and butterfly valves shall be used on water mains ten (10) inches or larger.

- E. Fire Hydrants and Fire Services: The fire department having jurisdiction in the area of the proposed fire hydrant and/or fire service shall provide the location(s) of fire hydrant(s), required fire flow in gallons per minute (gpm), and hydrant outlet size and configuration for all residential, commercial, or industrial locations. Fire hydrants are to be located in the public right-of-way or in an Authority easement. Hydrant spacing shall be no more than six hundred (600) feet in single-family residential areas and three hundred (300) feet in multi-family residential, commercial, or industrial areas. Fire hydrants in the middle of blocks are to be located at lot lines. Fire service lateral locations must be clear of driveways and allow the Authority to access the backflow protection assembly for inspection and maintenance. Where the fire department requires a 3-port hydrant, the Authority shall analyze its distribution system's ability to support a 3-port hydrant at the specified location without adversely affecting system pressures and velocities. The Authority's fire service lateral ownership and responsibility terminates at the property owner's backflow prevention device; edge of the public right-of-way; or edge of the Authority's easement, whichever is closest to the Authority's water main. Fire hydrants and fire services must be installed perpendicular to the water main and shall include a service valve. Service taps are not allowed on fire hydrant or fire service laterals.

Fire hydrants can be used as manual air valves in lieu of blow-off assemblies with written permission from the Engineer.

F. Combination Air Valves (CAV): CAVs shall be designed per the AWWA Manual of Water Supply Practices, Air-Release, Air/Vacuum and Combination Air Valves, M-51. CAVs should be installed at the high point (HP) of the pipelines to provide venting or vacuum relief during filling, draining, and normal operation of the pipelines. A CAV should also be installed on the down slope or low side of transmission mainline valves when closure of the valve creates a localized HP will require a CAV. Each pipeline is to be evaluated individually for the need of a CAV. The minimum CAV size shall be as follows:

1. One (1)-inch CAV assemblies shall be installed on pipelines four (4) through twelve (12) inches in diameter.
2. Two (2)-inch CAV assemblies shall be installed on pipelines fourteen (14) through sixteen (16) inches in diameter.
3. Four (4)-inch CAV assemblies shall be installed on pipelines greater than sixteen (16) inches in diameter.

In certain cases, written permission may be granted by the Engineer to use fire hydrants as manual air valves in CAV design.

G. Blow-Off Assemblies: End line or inline blow-off (BO) assemblies shall be installed in low points (LP), dead ends, and the up slope or high side of transmission mainline valves when closure of the valve creates a localized LP. The BO shall be installed perpendicular to the water main, and the discharge point extend to a location below finished grade within a Gate Well located in the public right-of-way or an Authority easement. Safety, water discharge, and access to the BO shall be considered in the design. Each pipeline is to be evaluated individually for the need for BO assemblies. The minimum BO sizes shall be as follows:

1. Two (2)-inch BO assemblies shall be installed on pipelines four (4) through sixteen (16) inches in diameter.
2. Six (6)-inch BO assemblies shall be installed on pipelines greater than sixteen (16) inches in diameter.

Fire hydrants can be used as manual air valves in lieu of blow-off assemblies with written permission from the Engineer.

- H. Services: Water services and meter boxes shall be installed within the public right-of-way or an Authority easement. Service lateral sizes shall be one (1) inch, one and one-half (1-1/2) inches, and two (2) inches. Service laterals larger than two inches shall be six (6)-inches or greater. Water services shall be connected to water mains only, installed perpendicular to the water main. Service saddles 2-inch and less shall be located a minimum of twenty-four (24) inches from other service saddles, and at a staggered thirty (30) degrees. Service connected to steel water mains using welded couplings may be located closer than twenty-four (24) inches apart with the written permission of the Engineer. Service laterals shall be installed at a minimum depth of thirty (30) inches.

Service laterals 6-inch and larger shall be installed perpendicular to the water main and include a service valve equal to the size of the service. When tapping a service lateral 6-inch and larger, a full seal stainless steel tapping sleeve shall be used for AC water mains, a tapping saddle or sleeve for PVC water mains, and a CL 150 WS nipple and flange with a 0.25-inch collar for WS water mains. When tapping AC or PVC water mains, the tap locations shall be minimum 5 feet from the edge of pipe, services, and fittings.

Water services shall not be connected to new or existing water service laterals, fire hydrant laterals, or fire service laterals.

Meters larger than two (2) inches shall be approved by the Engineer on a case by case basis.

- Meters, that include a strainer, shall be placed in a precast vault with a traffic rated lid capable of H-20 loads. The vault shall be located in public right-of-way, or an Authority owned easement.
- The lid shall be aluminum diamond plate, double leaf, spring assisted, and include pedestrian anti-slip protection. Hardware for vault shall be 316 stainless steel.
- Interior of vault is shallow, with a maximum depth of 3 feet set on and filled with minimum 2 feet of 3/4-inch gravel.
- Design shall include pipeline offset and shallow protection.
- Due to shallow placement of the pipeline, butterfly valves shall be used as isolation valves.
- Service lateral size is minimum 6-inch, which can be reduced to 4-inch, or 3-inch post BFV.
- 2-inch copper bypass includes a hose bibb protected by a shutoff valve and backflow prevention device (check valve).
- The Authority will provide a water meter with a touch read device at the developer's costs. Specifications for the water meter will be provided by the Authority.

When a water main is replaced and a service lateral reconnection is required, reconnections shall be performed using copper pipe of the same size and in no case be less than one (1)-inch in diameter. Where an existing copper service lateral pipe is three-quarter (3/4)-inch in diameter, the new one (1)-inch pipe shall be joined using a three-quarter (3/4)-inch x one (1)-inch, three (3)-piece adapter coupling. PVC service laterals greater than two (2) inch in diameter shall be reconnected with PVC of the same size and in no case be less than the original service lateral size.

Water Services serving public right-of-way shall be limited to serving the right-of-way only, with an allowable range of no more than one street block, or maximum 1,000 feet, whichever is less.

- I. Pump Stations: Pump stations shall be designed to the capacities determined by the Engineer under all system conditions. Pumps must be designed to deliver the maximum daily demands of the pressure system served, and fire demands. Generally, each pump station shall consist of multiple pump units designed to supply the system or storage tank with the required demands. The pump stations shall be designed to include sufficient duty pumps to meet the required demands, plus a spare pump.

Generally, pumps shall be vertical turbine pumps and shall be selected to provide a minimum pump station efficiency of seventy (70) percent. System analysis shall be performed to confirm optimal pump operation across the anticipated pump station operating range. Steeper pump curves are generally preferred, so as to limit flow variations under varying system head. Pump station hydraulic conditions (e.g., suction inlet) shall comply with Hydraulic Institute Standards.

Pumps shall be driven by NEMA premium efficiency motors. The pump station shall be equipped with pump control valves, flow and pressure monitoring, and shall include protective features to include phase and power failure relay and high and low voltage cutoff. The motor control center shall be equipped with a main shutoff switch and provisions for standby power shall be provided as determined by the Engineer. Pump station controls and telemetry shall be incorporated into the Authority's SCADA system.

The pump station shall be housed in a secured building constructed of concrete block and reinforced concrete unless other housing requirements are established by the Engineer. The Authority's standard building

configuration and style shall be provided by the Authority's Engineering Department.

- J. Hydropneumatic Pump Stations: Hydropneumatic pump stations will be designed on the basis of pumping one hundred ten percent (110%) of peak hourly demands, plus fire flow demands. System demands shall be met by the required number of pumps and fire flow demand shall be met by a dedicated pump.

Hydropneumatic tanks shall be designed based upon four (4) to six (6) pump cycles per hour. The tank low water level shall not be less than ten percent (10%) of the tank.

The pump station shall be equipped with a tank having an external sight gauge, one to two duty pumps and one standby pump, air compressor, emergency generator, fuel tank (with spill containment features) for generator, and motor control center. The motor control center shall be equipped with high-low voltage cutoffs, phase and power failure relays, and control system integrated into the Authority's SCADA system.

- K. Tanks: System storage tanks shall be designed the storage equivalent of the maximum day demand, plus fire storage. The tanks shall be equipped with an exterior and interior ladder, and both ladders shall be equipped with safety climbing devices. The interior ladder shall be constructed of stainless steel. Tank manways, 36-inch minimum in diameter, shall be provided on opposite sides of the tank and roof access hatches shall be provided above the interior ladder and at other locations established by the Engineer. When multiple tanks provide service to a pressure zone, each tank shall be equipped with an altitude valve. Shell penetrations for tank level probes shall be provided. Level monitoring and telemetry shall be incorporated into the Authority's SCADA system.

Cathodic protection systems employing the use of sacrificial anodes shall be incorporated into the design of steel tanks.

II. MATERIALS

All fittings, pipe, valves, and other materials shall be new and unused, of the make and type that have been tested and approved by the Authority. The Authority's Standard Specifications for Construction of Water Facilities includes an Approved Materials List, and can be found at: www.sweetwater.org.

For consideration of new materials not on the Authority's Approved Materials List, the steps outlined in paragraph 1-06 of the Sweetwater Authority Standard Specifications for Construction of Water Facilities shall be followed.

III. PAVEMENT DESIGN

The agency having jurisdiction over the roadways, where paving is to be placed, shall determine the type and thickness of pavement and the required structural section.

In easements, or on Authority or private property, pavement shall be designed and installed in accordance with the most current edition of the Standard Specifications for Public Works Construction (Green Book) and Section 15 of the Sweetwater Authority Standard Specifications for Construction of Water Facilities. Designs shall be submitted to the Authority's Engineering Department for approval.

IV. THRUST BLOCKS

Thrust blocks shall be installed where the pipeline changes direction (e.g., tees, bends, and crosses), changes size (e.g., reducers), at dead ends, or anywhere thrust is expected to develop (e.g., valves).

Thrust blocks shall be designed to transmit the forces to the surrounding soil. The passive resistance of soils and bearing capacity shall be determined by soil analysis.

Where vertical thrust is encountered, an anchor block shall be designed so that the concrete dead weight will resist vertical thrust forces.

No concrete shall be placed over PVC pipe, pipe bells, or nuts and bolts. Should additional pipe be needed, a length of steel pipe may be added to the fitting to accommodate the block.

On welded steel pipelines, the frictional resistance of the pipe may be used to reduce the size or eliminate thrust blocks.

V. PRESSURES

The minimum pressure to be provided to Authority consumers is forty (40) pounds per square inch (psi) while the maximum allowable pressure is one hundred twenty (120) psi. Where pressures exceed eighty (80) psi, the water service shall be equipped with a pressure reducing valve per the California Plumbing Code.

Water mains shall be designed to provide design flows with maximum velocities of five (5) feet per second, or ten (10) feet per second with fire demands. Under the maximum day demand condition plus fire flow, the water pressure at the point of fire flow shall be twenty (20) psi or higher.

VI. EASEMENTS

The minimum width of Authority easements for pipelines up to twelve (12) inches in diameter shall be twenty (20) feet and forty (40) feet for pipelines greater than twelve (12) inches in diameter, unless otherwise approved by the Engineer. In some cases, circumstances may dictate the requirement for a wider easement.

Easement plats shall have a scale of one (1) inch = one hundred (100) feet. Closures and traverses shall have a combined error of closure of no greater than 1:5000. The easement plat shall be prepared under the responsible charge of a Registered Land Surveyor or a Civil Engineer authorized to practice land surveying. A current lot book guarantee issued by a title company and a copy of the grant deed, as proof of ownership, is required.

One (1) copy of the draft easement document, plat, and the legal description shall be submitted to the Authority for review. After final approval, the Authority will record the original signed easement document and return a copy of the document to the grantor.

During a subdivision process, easements granted to the Authority shall be recorded prior to, an included in, the recordation of a Parcel Map.

VII. PLANNING METHODS

The water distribution system has been planned in accordance with the Authority's Water Distribution System Master Plan (Master Plan). The Master Plan presents future demand projections and an evaluation of the transmission, pumping, storage and distribution pipeline network, and recommends additions and/or replacement of facilities to meet anticipated demands through the next twenty-five (25) years.

Water system analysis is accomplished using the Authority's geographic information system and water distribution network modeling and management software. The planning and modeling approach includes projected water demands due to population growth and proposed land use according to current general plans of the cities of Chula Vista and National City, the Sweetwater Community Plan of the County of San Diego, and San Diego Association of Governments (SANDAG) regional growth forecasts.

New water facilities shall be sized according to the following:

A. Residential Demands:

Residential demands in gallons per day shall be estimated based on the most recent Capacity Fee Study, as identified in the current Supplement to the Rates and Rules. The demands as of the date of this revision to the Design Standards are listed below:

Category	Gallons per Day
a. Single-Family	297
b. Mobile Home	107
c. Apartment/Multi-Family	165
d. Commercial/Landscape	297

B. Commercial Demands:

Commercial water and irrigation demands shall be determined by a study of the proposed land and building use. The study shall provide the Authority the estimated water usage in gallons per day.

C. Fire Protection Demands:

The fire department having jurisdiction in the area of the project site shall provide the location(s) of fire hydrant(s) and the required water flow in gallons per minute (gpm) to the project site.

Based upon the applicable combination of the new water demands listed above, the Authority requires submittal of the proposed distribution system design in Autodesk (.dwg) or ESRI (.shp) formats. Upon submittal, the Authority will insert the proposed design, with proposed demands, into its water distribution model and perform Hydraulic Network Analysis (HNA). The HNA model scenarios are specified in Section VIII below. All water modeling shall be at performed by the Authority at the developer's expense.

In planning, the installation or replacement of facilities, pipelines, and/or mains shall be sized to accommodate domestic peak hourly demands, plus fire demands.

VIII. HYDRAULIC NETWORK ANALYSIS

Node demands for a HNA should be developed using both the Authority's Master Plan and the combination of applicable demands stated in Section VII.

An average day and maximum day HNA shall be performed. Water pressure should indicate the network analysis nodes will have a minimum of forty (40) psi of water pressure during maximum day conditions. The maximum velocity allowed on distribution and transmission pipelines is five (5) feet per second.

After the average day and maximum day HNAs have been completed, fire demands shall be added to assure they can be delivered without exceeding pipeline velocities of ten (10) feet per second, and maintaining a minimum pressure of twenty (20) psi.

IX. FLOW TESTING

A. Simulated Flow Tests: During a water alert stage, as determined by activation of the Authority's Drought Response Plan, it is recommended flow testing be accomplished through simulation using the Authority's distribution system computer model (HNA). Fire hydrants may be flow tested upon approval by the Engineer.

B. Fire Hydrants: When approved, fire hydrants may be flow tested to determine the available flow rate at twenty (20) psi residual pressure. During this test, the following information shall be obtained:

1. Diameter of fire hydrant port to be flowed (flow hydrant).
2. Pilot gauge pressure reading at the flow hydrant port.
3. Location where residual pressure is to be taken (test hydrant) while flow hydrant is being flowed.
4. Static pressure at the test hydrant.

5. Residual pressure at the test hydrant. The residual pressure reading must be a minimum of ten (10) psi less than the static pressure reading or additional fire hydrants ports must be flowed and pitot gauge pressures recorded until this condition is reached.
6. Compute total flow from flow hydrant(s) based on pitot gauge pressure reading(s).
7. Compute flow available at test hydrant at twenty (20) psi residual pressure.

Computer simulations for flow demands and fire hydrant flows can be requested in accordance with the Authority's Supplement to the Rates and Rules. Historical hydraulic analyses and hydrant flow information can be provided by the Authority's Engineering Department.

X. CATHODIC PROTECTION

All metallic water mains or appurtenances shall be protected from corrosion by the use of sacrificial anodes or impressed current systems. The method of protecting the metallic pipes or appurtenances shall be considered individually, depending on the environment and facility design conditions.

The systems shall be designed by a professional or a technical professional that has a certified background in the design of cathodic protection systems for water facilities. The final design of cathodic protection systems shall be approved by the Engineer.

XI. METER SIZING

Most manufacturers of water meters rate the flow capacities of their domestic water meters at a pressure of forty (40) psi. The following are allowable flow capacities for select meter sizes.

Meter Size (inches)	Capacity (gpm)
5/8	15
1	30
1-1/2	60
2	100
>2	See Engineering Dept.

The Authority shall determine the water meter type and verify the size that will meet the needs of both the customer and the Authority.

The California Plumbing Code (CPC) and AWWA Manual M22 both provide a listing of water demands needed for various types of plumbing fixtures. By applying the demands determined from the fixture unit count, the appropriate meter size can be determined.

The minimum meter size for a service lateral providing fire protection is one (1) inch and rated to provide fire protection and domestic service.

XII. AUTHORITY FACILITY LANDSCAPING

All Authority facilities, except water mains and appurtenances, shall be landscaped with plants, trees, or ground cover that will enhance the structure, and provide a pleasing environmental appearance to the public. A landscape architect may be used to design the landscaping using drought-resistant plants and using water efficient landscaping irrigation methods. The final landscape plan shall be submitted for approval to the Engineer, prior to implementation.

XIII. AUTHORITY FACILITY IRRIGATION

All Authority facilities, where landscaping is to be placed, shall have an irrigation system installed with a State approved back-flow prevention device. The irrigation system may use either drip or bubbler type heads and its design shall be approved by the Engineer, prior to its installation.

XIV. HAZARDOUS MATERIALS

The handling or disposing of all hazardous materials shall be in conformance with state law, and the rules and regulations of the San Diego County Hazardous Materials Division.

XV. SURVEYING

The general survey and drafting requirements shall include all described in the Design Survey Requirements listed below, and be drawn to include the drafting conventions supplied by the Authority, which includes symbols, line types, text, styles, and layering conventions.

XVI. DESIGN SURVEY REQUIREMENTS

A. Project Control

1. All pipeline alignments shall be based on street centerline with calculated horizontal offsets at the beginning of pipe run, angles, water appurtenances, and end of the pipe run. Alignments for fabricated steel water mains, and water mains to be located in easements, will be based on the proposed pipe run. The pipe run shall be clearly defined with a calculated street centerline offset equation and/or coordinate at the beginning and end of the pipe run.
2. Surveys shall be based on California Coordinate System NAD 83 (HPGN 1991.35 Epoch), Zone 6, US Foot.
3. Elevations shall be based on National Geodetic Vertical Datum of 1929 (NGVD 1929).
4. Surveys shall tie into a local benchmark in the proximity of each site.

5. All stationing shall be set left to right, as project Universal Coordinate System is to be bearing north and up.
6. Painted marks shall be at fifty (50)-foot stations in tangent sections, twenty-five (25)-foot stations in curved sections, station at the beginning and end of intersections, cross-street intersections, and including all points of curvature and angle points.
7. “Nail and shiners” shall be set at one hundred (100)-foot stations.
8. Project stationing shall start at 10+00. Starting point shall be verified with the Authority’s Engineering Department.
9. Painted stationing on all centerline points in the street for the Authority’s review.

B. Project Topography

Street or easement surveys shall include:

1. Fire hydrants and fire hydrant valves.
2. Air/vacuum relief valves, blow-offs, cathodic protection facilities, and water quality test stations.
3. Traffic control loops.
4. Valves.
5. Sewer and storm drain manholes and invert elevations.
6. Trees and overhangs within five (5) feet of existing water system appurtenances.
7. Fences/walls.
8. Cross gutters, edge of pavement, top of curb, back of sidewalk, and driveways (all shall be clearly defined).
9. Culverts and headwalls or inlet/outlet structures.

10. Water meters (survey one point at center of box).
11. All visible underground and overhead utility structures, including, but not limited to, telephone, gas, electric, cable TV, power poles, and street lights.
12. Benchmarks.
13. Beginning and ending intersections, as well as cross-street connections, shall include topography fifty (50) feet beyond all point of curb returns.
14. Cross-sections of street at twenty-five (25)-foot intervals with appropriate survey observations to compile a Triangulated Irregular Network (TIN) of the project and eventual contours. This data will be developed by the surveyor and placed as a Surface into the drawing. The limit of the surface will be all right-of-way and terminate at record property lines, or as directed by the Engineer.
15. Record lot lines.
16. Railroad tracks, signaling, and crossing appurtenances.

C. AutoDesk Drawing File

An Autodesk base drawing using the latest version of AutoDesk will be compiled from the field survey. Upon approval from the Authority, an earlier version of Autodesk may be used. In addition to showing all items mentioned above, the base drawing shall include the following:

1. All street dimensions shall be shown to include width of street, sidewalk width, size and type of curb, gutter width, and parkway width.
2. Concrete sidewalk, driveways, and cross gutters shall be hatched per Authority standards.

3. An Autodesk Alignment to include centerline data and horizontal curve information (curves shall be clearly defined).
4. An Autodesk Surface
5. Basis of bearings for each site.
6. Local Benchmark for each site.
7. Property lines shall be shown accurately using Record Data.
8. Power poles.
9. Authority's layers to be set and assigned to the survey drawing.

D. Autodesk Drawing Deliverable

The survey base drawing shall include all items from B and C above, including AutoCAD® Civil 3D® alignment(s) and existing grade surface(s). The drawing, shall be accompanied by an .xml file containing the Civil 3D® items and shall be delivered to the Authority electronically, or portable device.

XVII. ENVIRONMENTAL COMPLIANCE

Environmental processing on projects, where the Authority is the lead agency, shall be accomplished in accordance with the most current edition of Sweetwater Authority's Local Guidelines for Implementing the California Environmental Quality Act.

XVIII. BACKFLOW PREVENTION DEVICES

Backflow prevention devices shall be installed on facilities as required by "Regulations Relating to Cross-Connections" defined in Title 17, Sections 7583-7622 of the California Administrative Code and with the Authority's Cross-Connection Control and Backflow Prevention Program. The Authority's Standard Specification for Construction of Water Facilities, Section 17, contains the Backflow Prevention Program and is available at: www.sweetwater.org.

XIX. DRAFTING STANDARDS

Requirements for improvement plans:

The general drafting requirements shall include all described in the Design Survey Requirements previously listed and shall follow the drafting conventions supplied by the Authority which includes symbols, line types, text styles, and layering conventions. An Autodesk drawing containing the Authority's drafting conventions is available upon requests from the Engineering Department.

The following represents the Authority's requirements for the preparation of improvement plans:

- A. General: A hard copy of the approved design shall be provided, plotted on four (4)-mil DBL matte Mylar sheets using non-erasable ink. The design shall also be provided electronically as an Autodesk drawing file and an Adobe® print file.
- B. Sheet Size: The sheet size shall be North American Architectural Size D, twenty-four (24) inch x thirty-six (36) inch. A twenty-two (22) x thirty-four (34) inch border is permissible when using an Architectural Size D sheet.
- C. Scale: The plan portion of the improvement plan shall have a scale of 1 inch = 40 feet.

The profile portion of the improvement plan shall have the same horizontal scale as the plan. A vertical scale of 1 inch = 4 feet is required. Even numbered stations shall occur on main vertical dividing lines.

Changes in these scales shall be made only upon approval by the Engineer.

- D. Stationing: All water main stationing will be based on street centerline with calculated horizontal offsets at the beginning, end, angles, and all water

appurtenances of the pipe run. Stationing for fabricated steel water mains and water mains to be located in easements shall be based on the proposed center of the water main. Coordinates shall be provided at the beginning and end of the pipe run.

- E. Call-Outs: All fittings including the type (i.e., flanged, mechanical joint, etc.) shall be called out on the plan view or referenced in a detail of the design. All water main connections shall be shown in detail with parts called out. Water main vertical offsets shall be shown in a detail and profile view.
- F. Location Map: A 1-inch = 4,000-foot scale vicinity map of the development or improvements will be required on the first sheet, including pertinent notes and sheet reference numbers.

XX. DESIGN PROCESS

Please refer to the Authority's Design Convention Standards available as a drawing, upon requests from the Engineering department. Pipeline installations and replacements, performed by a consultant, normally follow these steps:

- A. Pre-design meeting with the Authority's Project Manager to select project design order and scope of work.
- B. Consultant to acquire project record maps, existing utility information from utility companies, and city or county record information.
- C. Survey project per the Authority's Design Survey Requirements.
- D. Draft existing condition plans to include record lot lines, all utility information, and proposed alignment.
- E. Submit plans with all existing utilities and proposed alignments.
- F. Walk site with plans and consultant.
- G. The Authority shall select a final alignment.
- H. Submit fifty (50) percent plans with existing conditions and the proposed Authority selected alignment for approval with plan and profile views.
- I. Fifty (50) percent review with the Authority.

- J. Submit ninety (90) percent plans for approval with plan and profile.
- K. Ninety (90) percent review with Authority/City comments.
- L. Submit final draft.
- M. Approve for Mylar and signatures.

The above steps provide the typical process for a PVC water main replacement. Depending on the magnitude of the job and responsibilities of the consultant, the Authority may add or subtract from the above-listed items.

All existing utilities shall be delineated and clearly plotted on the plan and profile so the pipeline alignment, which has the least impact on other utilities, can be selected. The Engineer will approve the final alignment selection.

Large diameter welded steel pipe will have more steps, to assure quality control and ease of construction in the field.

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