



**SWEETWATER AUTHORITY
DESIGN STANDARDS**

Revised January 2011

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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 twelve (12) inches in diameter shall conform to American Water Works Association (AWWA) C900 (*AWWA Standard for PVC Pressure Pipe, 4 In. through 12 In. for Water Distribution*).

PVC pipes fourteen (14) through twenty-four (24) inches in diameter used for transmission purposes shall conform to AWWA C905 (*AWWA Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. through 48 In.*).

Water mains 18 inches in diameter or smaller shall be constructed of PVC pipe. PVC pipe shall be a minimum of Class 150 for twelve (12)-inch and smaller, and Class 165 for pipe greater than twelve (12) inches. In some cases, where strength or ductility is needed due to shallow cover or unstable soil conditions, steel pipe will be permitted or required. This permission will be given on a case-by-case basis by the Authority's Director of Engineering.

Water mains greater than eighteen (18) through twenty-four (24) inches shall be constructed from 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 Authority's Director of

Engineering. PVC pipe fittings shall be ductile-iron and may have either flange or mechanical joint ends. All ductile fittings shall be factory-coated with a bituminous material, in accordance with AWWA C110 (*American National Standard Institute (ANSI) 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*). The HDPE film wrap shall be a minimum six (6)-mil thick, overlapped by twelve (12) inches at joints, and secured with two (2)-inch-wide, ten (10)-mil black polyethylene adhesive tape.

No bending of PVC pipe will be permitted. All changes in direction for PVC pipe will be at pipe bells, couplings, and fittings per manufacturer's recommendations.

Water mains larger than twenty-four (24) inches in diameter shall be constructed of steel, with three-eighths (3/8)-inch mortar lining. Steel pipe shall be designed per the "*AWWA Manual of Water Supply Practices, Steel Pipe - A Guide for Design and Installation, M-11.*" The pipe wall thickness shall be a minimum thickness of ten (10) gauge and shall be designed to withstand internal pressures and surge pressures, and external live and dead loads. Pipe design and coatings shall be designed in accordance with applicable AWWA Standards. The mortar coating shall be three-quarter (3/4)-inch minimum thickness over the steel shell. Tape wrap shall be in accordance with AWWA's Table 2, Spec 209, with a minimum of eighty (80) mils of thickness. Tees and wyes shall be equipped with crotch-plated or wrapper plates, as determined by applicable AWWA Standards.

All steel water mains shall have full welded joints to allow the main to be cathodic-protected.

Pipeline material other than those mentioned above, such as HDPE pipe, must be submitted, in writing, for approval by the Authority's Director of Engineering.

- 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 or changes in parallel distance for alignments less than two (2) feet shall be made with PVC High Deflection (HD) couplings. Parallel changes in alignment greater than two (2) feet shall be made using ductile-iron bends as required. Depth for water mains shall be a minimum of thirty-six (36) inches. Water mains located in an easement shall be centered from the easement edge to allow maximum access for maintenance. If the water main alignments are to be located other than standard, as mentioned above, the change shall be submitted to the Authority's Director of Engineering for approval.

- C. Required Clearance: All utilities shall have a minimum five (5)-foot parallel separation from the water main. Utilities crossing perpendicular to the Authority's water main shall maintain a minimum four (4)-inch separation. A minimum distance of ten (10) feet shall be maintained between parallel sewer and water facilities, and five (5) feet between storm drain and water facilities, except as provided in Standard Drawings 14, 14A, and 14B. The State of California, Department of Health Services, has standards for the relationship between water mains, sewer mains, and storm drains, as well as its laterals, and these standards must be adhered to.

- D. Valves: Valves shall be placed on branches of crosses and tees, unless otherwise directed by the Director of Engineering. Valve spacing for

residential areas is not to exceed seven hundred fifty (750) feet or one (1) block. Valve spacing for commercial areas is not to exceed five hundred (500) feet or one (1) 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 less, and butterfly valves on water mains ten (10) inches or larger in accordance with the Authority's Approved Materials List.

- 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) or required water flow in gallons per minute (gpm) to the project site, including the hydrant outlet size and configuration type, whether residential, commercial, or industrial. Fire hydrants are to be located in the public right-of-way or an Authority easement at no more than six hundred (600) feet apart in single-family residential areas; nor more than three hundred (300) feet apart 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. In a case where the fire department having jurisdiction requires the installation of a 3-port hydrant, the Authority shall review, using distribution system hydraulic modeling, the system's ability to support the 3-port hydrant without adversely affecting the distribution system (i.e. high velocities and low pressure). The Authority's fire service lateral ownership and responsibility terminates at the edge of the public right-of-way or Authority easement. Fire hydrants and fire services must be installed perpendicular to the water main. Service taps are not allowed off the fire hydrant or fire service

lateral. Fire hydrants can be used as manual air valves in lieu of a blow-off assembly.

F. Combination Air Valves (CAV): The CAV shall be designed per the AWWA Manual of Water Supply Practices, Air-Release, Air/Vacuum and Combination Air Valves, M-51. A CAV should be installed at the High Point (HP) of the pipeline to provide venting while the pipeline is filling, during normal operation of the pipeline, and for inflow and vacuum protection while the pipe is draining. 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. HP on vertical offsets and transmission mains, "Pockets" with elevation change greater than two (2) feet from any direction or perpendicular pipeline 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 pipeline four (4) through eight (8) inches in diameter.
2. Two (2)-inch CAV assemblies shall be installed on pipeline twelve (12) through sixteen (16) inches in diameter.
3. Four (4)-inch CAV assemblies shall be installed on pipeline greater than sixteen (16) inches in diameter.

Hydrants can be used as manual air valves and should be considered in the design of the CAV.

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, below finished grade in a Gate Well, in the public right-of-way, or an Authority

easement. Safety, 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 assembly shall be installed on pipeline four (4) through twelve (12) inches in diameter.
2. Four (4)-inch CAV assemblies shall be installed on pipeline greater than twelve (12) inches in diameter.

Hydrants can be used as a BO and should be considered in lieu of the design of a BO assembly.

- H. Services: Water services and meter boxes shall be installed within the public right-of-way or an Authority easement. Water services shall be connected to water mains only, installed perpendicular to the water main, and located a minimum of twenty-four (24) inches clear from pipe ends, joints, or fittings. Service saddles shall be located a minimum of twenty-four (24) inches from other service saddles, and at a staggered thirty (30) degrees. Service saddles or welded couplings connected to steel water mains may be located closer than twenty-four (24) inches apart with the written permission of the Director of Engineering. Water services shall not be connected to new or existing water service laterals, fire hydrant laterals, or fire service laterals. The minimum lateral pipe depth is thirty (30) inches. The minimum large service lateral size is six (6)-inch.

When a water main is replaced and the water service is to remain, reconnect to the existing service lateral with the original size or minimum one (1)-inch copper lateral. Existing pipe shall be joined using a three (3)-piece compression coupling. Where existing service lateral pipe is three-quarter (3/4)-inch, the new one (1)-inch lateral pipe shall be joined

using a three-quarter (3/4)-inch x one (1)-inch, three (3)-piece adapter coupling.

- I. Pump Stations: Pump stations shall be designed to the capacities, as determined by the Authority's Director of Engineering. Pumps must be designed to deliver the maximum daily demands of the system, plus any deficit storage or fire demands. Generally, each system shall have a dual pump station designed to supply the system or storage tank with the required demands. The pump stations shall be designed so that sufficient units meet the required demands, plus a spare unit.

Generally, system pumps shall be vertical turbine pumps and shall be designed to a total plant efficiency of seventy (70) percent. The pump station shall be equipped with pump control valves to reduce surging. Flow recorders and telemetering shall also be provided. The pump station shall be housed in a secured building constructed of concrete block and reinforced concrete. The Authority's standard building configuration and style may be obtained from the Authority's Engineering Department.

The vertical turbine pumps shall be designed so that multiple-bowls are used to meet the demands and pressures required to meet system needs. Steeper pump curves are generally preferred.

The pumps shall be equipped with phase and power failure relay. They shall also have a high and low voltage cutoff, and the motor control center shall be equipped with a main cutoff.

The pump suction line shall be sized to reduce line losses to a minimum. Generally, the suction line will be one (1) size larger than the discharge line.

- J. Hydro-Pneumatic Pump Stations: Pump stations will be designed on the basis of pumping one hundred ten percent (110%) of peak hourly

demands, plus fire flow demands. The system pumping will be sized to meet the peak hourly flows, plus ten percent (10%), and a separate pump unit will be constructed which will be sized to meet fire demands.

Tanks shall be designed based upon a maximum of six (6) and a minimum of four (4) pump cycles per hour. The tank low water level shall not be less than ten percent (10%) of the tank.

The station will be equipped with a tank having an external sight gauge, pumps (generally, one [1] or two [2] on-line with one [1] reserve), air compressor, emergency generator, fuel tank (with spill containment curbs) for generator, and motor control center. The motor control center shall be equipped with high-low voltage cutoffs, phase failure-power, failure relay, and automatic controlling devices. A strip tape flow recorder must be provided on the discharge side of the installation.

- K. Tanks: System storage tanks shall be designed on the general criteria of one (1) maximum day, plus fire storage. The tanks shall be equipped with an exterior and interior ladder. The exterior ladder shall have a safety cage, and both ladders shall be equipped with safety climbing devices. The interior ladder shall be constructed of stainless steel. A manway and manhole shall be provided on opposite sides of the tank. The Authority's Director of Engineering will determine whether the tank will have a knuckle or conical style of roof. Should more than one (1) tank provide service to a pressure zone, then all tanks shall be equipped with altitude valves. Each tank shall be equipped with a gauge board with increments indicated in one-tenth (1/10) of a foot. The operating probe locations, both horizontal and vertical for telemetering, will be located by the Authority's Director of Engineering.

II. MATERIALS

All fittings, pipe, valves, and other materials shall be of the make and type that have been tested and approved by the Authority. Copies of the Authority's Approved Materials List may be obtained from the Authority's Engineering Department at 505 Garrett Avenue, Chula Vista, CA 91910.

All materials utilized shall be new and unused, of the quality defined in the Sweetwater Authority Standard Specifications for Construction of Water Facilities, as shown on the Authority's Approved Materials List, and as approved by the Authority's Director of Engineering. 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 surfacing 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 Standard Specifications for Public Works Construction (Green Book) Current Edition and with 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 wherever the pipeline changes direction (as at tees, bends, and crosses), changes size (as at reducers), dead ends, or anywhere thrusts are expected to develop (such as valves).

The thrust blocks shall be designed to transmit the forces to the surrounding earth. Passive resistance of soils shall be determined by soil analysis.

Where vertical thrusts are encountered, the thrust block shall be designed so that the concrete dead weight will withstand the forces.

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

On large diameter steel mains, the frictional resistance of the pipe (if joints are welded) may be used to reduce the size or eliminate the thrust block.

Thrust blocks and anchor blocks may be eliminated in locations where thrust-restraining fittings (including flanged fittings) are utilized along with thrust-restraining pipe joints. The Engineer of work who is responsible must provide thrust restraint design calculations in accordance with the manufacturer's instructions for approval by the Director of Engineering. Thrust restraint systems, location, and design criteria are to be shown on the Approved Plans.

V. PRESSURES

The minimum pressure to be provided to Authority consumers is forty (40) pounds per square inch (psi) under a maximum hour condition, while the maximum allowable pressure is one hundred twenty (120) psi. Where pressures exceed eighty (80) psi, the consumer's residence shall be equipped with a pressure reduction valve per the Uniform Plumbing Code.

Generally, the existing systems have been designed so that a maximum of one hundred (100) psi pressure is provided to the distribution system.

Water mains shall be designed to provide their maximum design flows with maximum velocities of five (5) feet per second on average days, or ten (10) feet per second on maximum days with fire demands. Under the maximum day conditions plus fire demands, the water pressure at the point of fire flow shall have a residual pressure of twenty (20) psi or better.

VI. EASEMENTS

The minimum width of Authority easements is twenty (20) feet, unless otherwise approved by the Authority's Director of Engineering. In some cases, circumstances may dictate the requirement for a wider easement.

All easement drawings 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 stamped by a Registered Land Surveyor or a Civil Engineer who specialize in 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.

VII. PLANNING METHODS

The Authority system has been planned using the "Water Duty" method. Existing systems and water facilities have been analyzed, as well as facilities needed, to meet Authority requirements to the year 2030.

While the present analysis was accomplished using the "Water Duty" method, the system must also be analyzed by the "Population" method and a comparison

made between the two methods to assure facilities are properly planned to accommodate the demands of the year 2030.

New water facilities will be sized based upon the results of a combination of these methods and upon completion of a Hydraulic Network Analysis. The Hydraulic Network Analysis and constraints required to be used during this process are specified in Section VIII.

In planning, the 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 Hydraulic Network Analysis should be developed using both the “Water Duty” and “Population” methods. Both methods have built-in variables and change constantly. Therefore, a cross-check of both methods can produce a more accurate insight into demands.

An average day and maximum day analysis should be performed. Water pressure should indicate the nodes will have a minimum of forty (40) psi of water pressure during maximum day conditions. The maximum velocity allowed on pipelines is ten (10) feet per second.

After the average day and maximum day runs have been completed, then runs with selected fire demands can be made to assure fire demands can be met. At the selected fire demand point, water pressure shall not be less than twenty (20) psi under the fire demand condition.

IX. FLOW TESTING

A. Water Conservation: During a water alert stage, as determined by the Authority, fire hydrants may be flow tested only after all other avenues of design have been exhausted.

B. Fire Hydrants: Fire hydrants shall be flow tested, to determine the approximate delivery rate, at twenty (20) psi residual pressure. During this test, the following must be determined:

1. Diameter of port to be flowed.
2. Pilot gauge pressure reading while flowing the hydrant port.
3. Static water pressure at fire hydrant.
4. Location where residual pressure is to be taken while fire hydrant is being flowed.
5. Static pressure at residual pressure location. The residual pressure reading must be a minimum of ten (10) psi less than the static pressure reading or additional fire hydrants or ports must be flowed until this condition is reached.
6. Compute flow from fire hydrant at hydrant residual pressure.
7. Compute flow from fire hydrant at twenty (20) psi residual water pressure.

Fire hydrant flow calculation sheets are available from 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. The method of protecting the metallic pipes or appurtenances shall be considered individually, depending on the environment.

The systems shall be designed by a professional or a technical professional that has a certified background in cathodic protection, and the analysis, including calculations, shall be approved by the Authority's Director of Engineering.

XI. DOMESTIC METER SIZING

Most manufacturers of water meters rate the flow capacities of their domestic water meters at forty (40) psi water pressure. The following are general rated flow capacities for the meter sizes shown:

Meter Size (inches)	Rated Capacity (gpm)
5/8	20
1	50
1-1/2	100
2	160

Because the Authority's system is designed to provide a reasonable supply of water to each consumer, the Authority shall determine the water meter size that will meet the needs of both the consumer and the Authority.

The Uniform Plumbing Code (UPC) and Manual 22 of the AWWA both provide a listing of demands needed for various types of plumbing fixtures. By applying the demands determined from the fixture unit count, a demand for the meter can be determined.

In some cases, it may not be desirable to anticipate that all domestic needs may be available at one time, such as during a peak water use period. In this situation, the use of irrigation systems may be required during an off peak period if the needs of all consumers within a pressure zone are to be met.

The meter sizing requirement for the various structures within the Authority's service area will be determined by the Authority's Director of Engineering.

XII. 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 shall design the landscaping using drought-resistant plants.

The final landscape plan shall be submitted for approval to the Authority's Director of Engineering, prior to implementation.

XIII. IRRIGATION

All facilities, where landscaping is to be placed, shall have an irrigation system installed. The irrigation system may use either drip or bubbler type heads and its design shall be approved by the Authority's Director of Engineering, prior to its installation.

XIV. HAZARDOUS MATERIALS

The handling or disposing of all hazardous materials shall be in conformance with state law, and the San Diego County Health Department's rules and regulations.

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 water main alignments shall be based on street centerline with calculated horizontal offsets at the beginning, 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 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 Project Manager.
9. Painted stationing on all centerline points in the street for the Authority's review.

B. Project Topography

Street or easement survey shall include:

1. Fire hydrants and fire hydrant valves.
2. Air vacs, blow-offs, cathodic, and water quality test stations.
3. Traffic control loops.
4. Gate 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 consultant and placed in drawing. The limit of the TIN will be record property line.
15. Record lot lines.
16. Railroad tracks, signaling, and crossing appurtenances.

C. Drawing File

An Autodesk 2008 base drawing will be compiled from the field survey. Upon approval from the Authority, an earlier version of Autodesk

(i.e., 2004) may be used. In addition to showing all items mentioned above, the 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. All horizontal curve information (curves shall be clearly defined).
4. Basis of bearings for each site.
5. Local Benchmark for each site.
6. Property lines shall be shown accurately using Record Data.
7. Power poles.
8. Authority's layers to be set and assigned to the survey drawing.

XVII. ENVIRONMENTAL

Environmental processing on projects, where the Authority is the lead agency, shall be accomplished in accordance with the Sweetwater Authority Guidelines Implementing California Environmental Quality Act (current edition) as amended.

XVIII. BACKFLOW DEVICES

Backflow devices shall be installed on all 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 is available in the Engineering Department of Sweetwater Authority, 505 Garrett Avenue, Chula Vista, CA 91910.

XIX. DRAFTING STANDARDS

Requirements for improvement plans:

The general drafting requirements shall include all described in the Design Survey Requirements previously listed and shall be drawn to include the drafting conventions supplied by the Authority which includes symbols, line types, text styles, and layering conventions. The Sweetwater Authority Drafting Convention compact disc is available at the Authority's Administration office, 505 Garrett Avenue, Chula Vista, CA 91910.

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

- A. General: The design drawings or plans shall be prepared on four (4)-mil DBL matte Mylar sheets using ink. A compact disc, with Autodesk .dwg files and .pdf plot files, shall be submitted to the Authority for its records, along with the plans or drawings when they are submitted for final approval.
- B. Sheet Size: The sheet size shall be twenty-four (24) inches x thirty-six (36) inches.
- 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 of the Authority's Director of Engineering.

- 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 “detail” in plan 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.

On Authority contract projects, a location map and vicinity map showing the location of the project will be required on the first sheet of the improvement plans, along with pertinent notes and sheet reference numbers.

XX. DESIGN PROCESS

Please refer to the Authority's Design Convention Standards on compact disc, available at the Engineering Department of Sweetwater Authority, 505 Garrett Avenue, Chula Vista, CA 91910. Water main replacements, conducted 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 alignment.
- H. Submit fifty (50) percent plans with existing conditions and the proposed Authority selected alignment for approval with plan view only.
- 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 is typical of replacement with eight (8)-inch PVC pipe. Depending on the magnitude of the job and responsibilities of the consultant, the Authority may add or subtract from the above-listed items.

All utilities shall be delineated on a plan and an alignment, then selected, depending on which has the least impact on other utilities, yet meeting the requirements of the Authority for future maintenance. The Authority's Director of Engineering 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.