

DIVISION FOUR - DESIGN CRITERIA

SECTION 401 DESIGN CRITERIA

Section 401.01 General

All Soquel Creek Water District projects shall be designed in accordance with these design criteria and Standard Specifications. Each design shall be project specific and may be required to meet criteria not provided for elsewhere herein. Special criteria will be issued by the Engineer at pre-design meetings.

Designs not in accordance with the Standard Specifications and the directions of the Engineer will not be acceptable to the District. Modifications will be required to meet engineer’s satisfaction.

Section 401.02 Design Flows

All water system improvements shall be designed to accommodate the following hydraulic flows:

| Table 1: UNIT DEMANDS FOR FUTURE LAND USE | | | |
|--------------------------------------------------|----------------------|-------------------------|-------------------------|
| Land Use Type | Average Daily Demand | Ratio Peak Day/Avg. Day | Ratio Peak Hr./Peak Day |
| Single-Family Residential | 0.20 gpm/meter | 2.50 | 1.65 |
| Multi-Family Residential | 0.16 gpm/meter | 2.00 | 1.65 |
| Commercial/Industrial | 0.40 gpm/meter | 1.35 | 1.65 |
| Institutional | 1.06 gpm/ac | 1.35 | 1.65 |
| Parks/Recreational | 0.32 gpm/ac | 2.85 | 1.65 |

Section 401.03 Fire Flows

Fire flow requirements will be set by the fire agency having jurisdiction over the project location. Distribution systems shall be designed to provide the following minimum fire flows:

| Table 2: MINIMUM FIRE FLOW DEMANDS FOR FUTURE LAND USE | |
|---------------------------------------------------------------|------------------|
| Land Use Type | Fire Flow Demand |
| Single-Family Residential | 1,500 gpm |
| Multi-Family Residential | 2,000 gpm |
| Commercial/Industrial | 2,000 gpm |
| Institutional | 2,000 gpm |
| Mountain Residential | 1,000 gpm |

Fire flows may be calculated using more than one hydrant, provided that such calculations are permitted by the fire agency.

Section 401.04 Operating Pressure Requirements

All areas within the distribution system shall be designed to provide a minimum static head of 100-feet (43 psi) and a

maximum static head of 210-feet (90 psi). Distribution systems shall be designed to maintain a minimum residual pressure of 20-psi during required fire flow and a minimum of 40-psi residual during peak hour flows. The maximum drop from static pressure during fire flow or peak hour flow shall be 30-psi.

Section 401.05 Fire Hydrant Spacing

Fire hydrants shall be spaced in accordance with the fire agency having jurisdiction over the project. All fire hydrants shall be located at property corners, when in mid-block and at curb return points (or their projections) at intersections. Where directed by the Engineer, hydrants shall be protected with steel pipe bollards. All fire hydrant installations shall be in accordance with Standard Plan No. S-9, " FIRE HYDRANT ASSEMBLY ".

Specific locations of fire hydrants shall be reviewed with the Engineer prior to incorporation into the project plans.

Section 401.06 Private Fire Services

Private fire services shall be sized in accordance with the requirements of the fire agency of jurisdiction and these Standard Specifications. All private fire services shall be installed in accordance with Standard Plan No. S-17, " 2" FIRE SERVICE INSTALLATION ", Standard Plan No. S-16, " 4" AND LARGER FIRE SERVICE AND BACKFLOW PREVENTION ASSEMBLY".

No taps or services of any kind will be allowed on the District maintained side of such private fire services.

Section 401.07 Combination Fire and Domestic Services

Where directed by the fire agency of jurisdiction, combination services shall be installed in accordance with Standard Plan No. S-20, " 2" FIRE AND DOMESTIC COMBINED SERVICE INSTALLATION ".

The property owner of record shall be responsible for the installation and maintenance of all piping and appurtenances on the property side of the meter assemblies as provided for in said Standard Plan.

With the exception of the domestic service tap shown thereon, no taps of any kind will be permitted on the District maintained side of such combination fire and domestic services.

Section 401.08 Non-Domestic Services

All services supplying water for irrigation, commercial, and industrial uses, and those connecting to private systems simultaneously served in whole or in part by sources other than the Soquel Creek Water District shall be installed in accordance with the provisions shown on the Standard Plans Cross-connection control shall be in accordance with Section 401.17, "Cross-Connection Control" of these Standard Specifications.

Section 401.09 Distribution System Layout

All pipe lines within the distribution shall be constructed at the locations provided for on the approved improvement plans. Except as expressly permitted by the Engineer, all new pipelines shall be installed in the public right-of-way. In the absence of public right-of-way within the project limits, pipelines shall be installed in private right-of-ways. Where it is impractical to install pipelines within right-of-ways as provided for herein, every effort shall be made to install pipelines in areas providing the greatest potential for access for future system operations. The actual location of the pipelines shall be approved by the Engineer prior to issuing the plans for construction. All pipelines and appurtenances shall have the proper easements to enable full access by the District for future maintenance operations.

Insofar as practical, dead-end subsystems shall be minimized. All systems and subsystems shall be designed as looped systems whenever possible. If looping requirements exceed the project limits, provision shall be made to extend the system into a looped network at some future date by the use of fittings and valves. Except as directed by the Engineer, all subsystems shall be designed to provide the hydraulic capacity required for the current project without the consideration of future network looping.

Exceptions to the looping requirements herein shall only be for those pipelines serving cul-de-sac streets and dead-end streets that can never be extended into a loop due to topography or property ownership. Dead-end pipelines shall be designed to provide full hydraulic capacity as provided for herein and shall include either a blow-off or fire hydrant at the terminus to permit flushing operations.

All pipelines shall extend to the property boundaries of the project or the projections thereof and completely across the frontage of all single parcels within the project.

Section 401.10 Minimum Pipe Size

The minimum pipe size shall be 6 inches in inside diameter for all pipelines to be dedicated to the District for ownership and operation.

Section 401.11 Valve Type and Spacing

All valves smaller than 10-inch shall be resilient seat type gate valves. All valves 10-inch and larger shall be butterfly type. Valves shall be spaced at intervals not exceeding 500 feet in all distribution systems. Where a continuous run of pipe does not exceed 600 feet, an intermediate valve will not be required. Valves on continuous runs of pipe shall be located at the projection of property lines and at intervals that divide the total length as evenly as possible.

Valves shall be located on each branch of a three-way and four-way intersection, at each fire hydrant, at each blow-off assembly, at each private fire service, and where directed by the Engineer. Valves shall be installed on the fitting at the main pipeline in each instance.

Valves shall also be located at each end of pipelines crossing private property through easements, casings, major stream or channel crossings, and at the projected property lines of hospitals, schools, and major industrial users.

Section 401.12 Air and Vacuum Valves

Combination air and vacuum release valves shall be installed at each high point in the pipeline where air can be trapped during filling of the pipeline. All combination air and vacuum release valves shall be installed in accordance with Standard Plan No. S-11, "1" AIR AND VACUUM RELEASE VALVE".

Section 401.13 Blow-Off Valves

Blow-off valves shall be installed at each low point in the pipeline to facilitate flushing of the pipeline. Blow-off valves shall also be installed at the terminus of all temporary and permanent dead ends not provided with a fire hydrant. All blow-off valves shall be installed in accordance with Standard Plan No. S-12, "BLOW-OFF ASSEMBLY".

Section 401.14 Hydraulic Design

All pipelines shall be designed to have a maximum velocity of 10 feet per second during the maximum design flow, including fire and peak day domestic demand. Pipe velocity and discharge shall be calculated using the following Hazen-Williams friction coefficients:

Table 3: HYDRAULIC DESIGN PROPERTIES OF WATERLINES

| Pipe Size (Inside Diameter) | Pipe Material | Hazen-Williams Friction Coefficient | Maximum Head Loss per 1000 Linear Feet |
|--------------------------------|---------------------------------|---------------------------------------------------------------------|----------------------------------------------|
| Smaller than 6 inches | Asbestos Cement | C = 100 | As Directed |
| | Steel | C = 80 (less than 10 years old) C = 60 (Over 10 years old) | As Directed |
| 6 inch to 10 inch | New Ductile Iron (AWWA C151) | C = 110 | 2-feet |
| | Old Cast Iron | C = 90 | 2-feet |
| | Old Steel | C = 85 | 2-feet |
| | Asbestos Cement | C = 100 | 2-feet |
| | PVC (AWWA C900) | C = 130 | 2-feet |
| 12 inch to 16 inch | New Ductile Iron (AWWA C151) | C = 120 | 2-feet |
| | Old Cast Iron | C = 95 | 2-feet |
| | Old Steel | C = 90 | 2-feet |
| | Asbestos Cement | C = 100 | 2-feet |
| | PVC (AWWA C900) | C = 130 | 2-feet |
| Over 16 inch | ALL | As Directed | As Directed |

When the design requires the inclusion of older, small diameter lines in the calculations, the Engineer will assist the designer in determining the assumptions upon which to base the design. In the absence of such assistance, the designer shall use the values provided herein in his calculations.

Section 401.15 Minimum Trench Dimensions

All pipelines shall be designed for a minimum pipe coverage based on the following:

| Table 4: MINIMUM TRENCH DIMENSIONS | | |
|------------------------------------|--------------|------------|
| Pipe Diameter | Trench Width | Pipe Cover |
| 6-inch | 18 inches | 36 inches |
| 8-inch | 20 inches | 42 inches |
| 10-inch | 22 inches | 42 inches |
| 12-inch | 24 inches | 42 inches |

All pipelines shall be designed to be constructed at the minimum depth wherever possible. Any deviation from minimum depth shall be done as gradually as possible with the minimum of fittings and approved by the Engineer.

Section 401.16 Service Connections

All service connections shall be made in accordance with these Standard Specifications and Standard Plans and the direction of the Engineer. Multiple services from one connection to the pipeline must be approved by the Engineer during design review. Normally, the District will furnish and install the meter. All customer side plumbing shall be the responsibility of the property owner. All piping and appurtenances from the pipeline to the meter shall be installed by the pipeline contractor unless otherwise approved. All parcels fronting the improvements shall have a service installed to the meter and sized for the anticipated use of the parcel. The size of the service shall be approved by the Engineer prior to soliciting proposals for construction.

Section 401.17 Cross-Connection Control

Section 401.17.01 General

Each service connecting to the Soquel Creek Water District distribution system shall be subject to a review of that service's potential for cross connection of non-potable water in accordance with the requirements of Title 17 of the State of California Administrative Code. All services for the purpose of supplying water for uses other than domestic potable supply including but not limited to, fire protection, irrigation, industrial processes, and those having an alternate source of water on-site shall be subject to this review.

All assemblies shall become the property of the owner of the parcel being served. Such owner shall maintain the assembly in accordance with the current provisions of the District Cross-Connection Policy and Procedures (Appendix "A" herein.)

Section 401.17.02 Cross-Connection Control Materials

All materials for use in back-flow prevention assemblies shall be in accordance with these Standard Specifications and the current requirements of the Soquel Creek Water District Cross-Connection Control Policy and Procedures.

Reduced pressure principle back-flow prevention assemblies shall be on the current list of approved devices published by the University of Southern California Foundation for Cross-Connection and Hydraulic Research and shall be testable and serviceable in-situ. Each assembly shall be equipped with 2 shut-off valves tapped for testing and a means of locking the valves to prevent tampering. Test cocks shall be so located as to permit testing and sampling on the supply and service sides of the assembly and each element thereof.

Section 401.17.03 Cross-Connection Control Construction

Each reduced pressure principle back-flow prevention assembly shall be located as close as practicable to the meter serving it. All construction shall be in accordance with the following Standard Plans of these Standard Specifications:

- S-16: 4-INCH AND LARGER FIRE SERVICE AND DETECTOR CHECK ASSEMBLY
- S-17: 2-INCH FIRE SERVICE INSTALLATION
- S-19: 1/2-INCH to 2-INCH REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION INSTALLATION
- S-20: 2-INCH FIRE AND DOMESTIC COMBINED SERVICE INSTALLATION

Section 401.17.04 Testing, Inspection, and Maintenance

Upon completion of construction and prior to activating the service, all reduced pressure assemblies shall be tested and inspected by the District Cross-Connection Control Program Specialist.

The owner of the assembly shall have the assembly inspected and tested by a qualified technician approved by the District. Such inspection and testing shall be conducted at the frequency required by the District and in no case less than once annually. A report of each such test and inspection and a record of all maintenance work shall be submitted to the District Cross-Connection Control Department within 10 working days of completion of the inspection or maintenance.

The owner of the assembly shall be responsible for all costs associated with such inspection and any required maintenance determined by such inspection and testing.

Failure on the part of the owner to submit the required testing reports and to perform all maintenance required to maintain the assembly in proper working order shall be cause for discontinuation of service and the assignment of all penalties under the law.

SECTION 402 PREPARATION OF PLANS AND SPECIFICATIONS

Section 402.01 General

Plans, engineering calculations, diagrams, and other data pertinent to the project shall be submitted with each application. A minimum of 2 sets of drawings will be required for review. All plans, computations, and specifications shall be prepared by a Registered Civil Engineer, currently licensed to practice in the State of California.

All construction plans and specifications will be checked prior to approval by the Engineer. This approval shall be for conformance of the plans, calculations, diagrams, specifications, and other pertinent data with these Standard Specifications, Standard Plans, and project specific directions of the Engineer. The responsibility for the adequacy and sufficiency of the design shall remain with the design professional, hereinafter referred to as the *Engineer of Record*.

Upon completion of his review, the Engineer will return 1 print to the *Engineer of Record* with comments for correction. Upon completing the required revisions, the *Engineer of Record* shall submit a minimum of 2 sets of blue-line prints of the revised plan as well as the check print for the Engineer's review. This procedure shall be repeated until such time as the Engineer determines that all requirements of the District have been met. The District reserves the right to charge the applicant for all direct and chargeable expenses incurred in subsequent reviews beyond that for the first returned set.

Upon final approval by the Engineer, the *Engineer of Record* shall submit 6 prints of the original drawings for the Engineer's signature. The Engineer's approval of the plans shall be only for conformance with the requirements of the District and no other responsibility or liability, expressed or implied, will be assumed thereby.

Following signature by the Engineer, 2 copies of the plans, specifications, diagrams, and pertinent data will be returned to the *Engineer of Record* for use during construction of the improvements. Copies of the approved plans, specifications, diagrams, and pertinent data shall be kept on the job site at all times during construction and kept up to date constantly. Should circumstances warrant changes to such plans, specifications, diagrams, and pertinent data, such changes shall be promptly be brought to the attention of the Engineer for his approval prior to commencing work on such changes. All such changes shall be noted on the plans submitted to the Engineer at the completion with the work in accordance with Section 402.06, "Record Drawings" of these Standard Specifications.

Section 402.02 Plan Requirements

Section 402.02.01 General

All plans shall be drawn at a scale sufficient to ensure clarity in the presentation of the intent of the plans. Normally, the minimum scale shall be 1 inch on the plan equals 40 feet of horizontal measurement on the ground. Larger scales may be required for areas with significant utility congestion or small areas of work.

Whenever practical, the plans shall be prepared using computer-aided design and drafting (CADD) software that will be compatible with the AutoCAD software used by the District. Record drawings shall include a CADD version as provided for in Section 402.06, "Record Drawings" of these Standard Specifications.

Section 402.02.02 Cover Sheet

Each set of construction plans shall have a cover sheet that shall include but not be limited to, the following information:

1. Project title;

2. Vicinity map;
3. Location map;
4. Name of the *Engineer of Record*;
5. Stamp, signature, and expiration date of the *Engineer of Record*;
6. Approval block;
7. Owner of the project;
8. Sheet or drawing index;
9. Legend;
10. Abbreviations;
11. Table of Major Quantities.

When multiple plan sheets are necessary due to the scope of work proposed, the *Engineer of Record* shall also include on the cover sheet an overall or summary plan of the work showing the major streets involved, the major topographic features, a schematic drawing of the proposed improvements, and any additional data unique to the project as a whole.

Section 402.02.03 Plan Information

All plan sheets shall include, but not be limited to, the following information:

1. Title block with the name of the *Engineer of Record*, the name of the owner, project title, and project address;
2. North arrow;
3. Scale (horizontal and vertical as appropriate) and a bar scale;
4. Property lines and right-of-way lines;
5. Permanent and construction easements with recording data and dimensions;
6. Property addresses and assessor's parcel numbers;
7. Street names;
8. All existing utilities;
9. All proposed improvements with size and type of improvement, dimensions, location references, and other relevant data;
10. Enlarged details of each intersection, connection to the existing system, and unique condition such as a sewer conflict;
11. Profiles and/or spot elevations of improvements, existing utilities, and topography that enhance the clarity of the presentation of information.
12. Centerline stationing with tick marks at each full and half station;
13. Typical cross sections;
14. Enlarged details of specialty items;
15. Schematic diagrams including but not limited to, process and instrumentation diagrams, mechanical and electrical operation diagrams, wiring diagrams, ladder diagrams, logic diagrams, and other relevant data.

The list contained herein shall not be considered all inclusive. The *Engineer of Record* shall provide all information necessary to construct the improvements in accordance with these Standard Specifications, Standard Plans, and the directions of the Engineer. Lack of comment by the Engineer in his review regarding the inclusion or omission of any data shall not relieve the *Engineer of Record* of his responsibility to convey the information necessary to construct the work in accordance with all requirements of the District and other lawful agencies.

Section 402.02.04 Notes

A list of notes shall be shown on the first plan sheet in the set. The notes related to waterworks shall be separate and distinct from those for other work. The first note for waterworks shall read as follows:

" All waterworks related construction shall be performed in accordance with the Standard Specifications and Standard Plans, and the directions of the Chief Engineer of the Soquel Creek Water District. A copy of the Soquel Creek Water District Standard Specifications and Standard Plans shall be available on the job site at all times. Copies may be obtained at the office of the Soquel Creek Water District, 5180 Soquel Drive, Soquel, CA 95073."

The second note shall read as follows;

" The Contractor shall notify the Chief Engineer of the Soquel Creek Water District a minimum of 2 working days prior to commencing work. The Contractor shall schedule all inspections with the Soquel Creek Water District a minimum of 24 hours in advance of needing such inspection. All valves shall only be operated by the personnel of the Soquel Creek Water District. System shutdowns for the interconnection of new improvements to the existing system shall be scheduled with the Soquel Creek Water District a minimum of 3 working days in advance for residential areas and 5 working days in advance for commercial and industrial areas."

Additional notes to clarify the work, in addition to that information available in these Standard Specifications and Standard Plans, necessary and unique to the specific project, shall be included in the notes for waterworks.

Section 402.03 Existing Utilities

Insofar as practical, all existing utilities shall be shown accurately in their location relative to the waterworks improvements proposed, including but not limited to, size and type of utility, offsets, depths. The Contractor shall be made responsible for notifying all utilities prior to commencing work and for locating or causing to be located, all existing utilities and for taking all reasonable precautions to protect such existing utilities in the prosecution of his work.

Whenever deemed necessary and appropriate by the Engineer, enlarged details shall be provided to better describe the work to be done relative to existing utilities and in accordance with Section 402.04, "Construction Details" of these Standard Specifications.

Section 402.04 Construction Details

The plan set shall include one or more sheets as necessary for the presentation of Standard Plans and special details relevant to the proposed work. All Standard Plans required by the work shall be reproduced in their entirety. Construction details shall be required for complex installations including but not limited to, all intersections, system connections, special routing such as to avoid utility conflicts, special equipment such as pumps and control valves, vaults, and such other instances where the requisite information, in the opinion of the Engineer, cannot be adequately conveyed on the full scale plan.

All details for buried or partially buried improvements shall include distances from at least two permanent features such as but not limited to, curb returns, property corners, and permanent structures such as bridge abutments, that will enable the recovery of the improvements at a future point in time.

Each detail shall identify the materials used by size and type, dimensions, depths, deflections, offsets from other utilities, and any other information beneficial in the construction and operation of the improvements.

Section 402.05 Project Specifications

Contract Documents prepared for work to be constructed under contract to the District shall be prepared in the District standard format as Division 5, Project Special Provisions, unless other formats have been reviewed and approved by the Engineer prior to commencing work on the design. Each item provided for in the Project Special Provisions shall be divided into at least four basic sections. The first section shall describe the work in general terms; the second section shall specify the materials to be used; the third section shall specify any particular construction problems, and the fourth section shall describe the method of measurement and payment. Each set of Contract Documents shall include the documents provided for in Section 205.02, "Contract Documents" of these Standard Specifications, except that these Standard Specifications and Standard Plans and those of other agencies may be included by reference. Each set of *Contract Documents* shall be unique to the project for which they are prepared.

The *Engineer of Record* shall provide the Engineer with copies of all design calculations, a written basis of design, process and instrumentation diagrams, logic diagrams, and other like information that will aid the Engineer in the review of the Contract Documents, inspection of construction, and the operation and maintenance of the improvements upon completion.

Specific requirements for the preparation of *Contract Documents* will be issued in a *Request for Proposals* for the specific project.

Section 402.06 Record Drawings

The *Engineer of Record* shall compile a record of all changes made in the construction of improvements and shall provide the District with a final set of plans conspicuously marked "RECORD DRAWINGS", dated and signed by the *Engineer of Record*. This set of record drawings shall be submitted to the Engineer on polyethylene sheets (mylars), 4 mil thickness, double mat reversed, 24 inch by 36 inch outside dimension. The *Engineer of Record* shall also provide the Engineer with a DOS computer file of the record drawings on a 3-1/2 inch transfer disc compatible with the AutoCAD engineering software.