



City of Sunnyvale

Potable Water Design Guidelines

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POTABLE WATER SYSTEM – DESIGN GUIDELINES

1. PURPOSE

The purpose of this document is to provide guidelines for the design of new and redevelopment water utility projects and thereby reduce the time required for processing the plans. These guidelines do not include, but may reference, additional conditions which may be promulgated by all other pertinent ordinances, codes, and official policy set forth by the Department of Public Works, other departments of the City of Sunnyvale, or other government agencies. These guidelines establish minimum acceptable design criteria. More stringent requirements may be imposed by the City based on specific project conditions.

Portions of these guidelines apply to fire systems, both public and private, and are intended as general reference to aid in the design of the public water system. Final designs of fire systems are subject to approval of the fire code official.

It is the responsibility of the design engineer to initiate written requests to the City Engineer for approval of any design concepts that differ from these criteria, verify additional requirements imposed, perform any necessary calculations or studies, and resolve specific design problems with the appropriate agency, department, or division.

2. CURRENT STANDARDS

Pertinent and current requirements of the following agencies or standards shall be complied with. In case of conflict the design criteria of the City of Sunnyvale, as established herein, shall govern.

- a) American Water Works Association (AWWA).
- b) American Society for Testing and Materials (ASTM).
- c) Environmental Protection Agency (EPA) Drinking Water Regulations.
- d) City of Sunnyvale, Current City Water Model
- e) City of Sunnyvale Standard Details and Standard Specifications
- f) Laws and Standards per the State Water Resources Control Board relating to domestic water supply.
- g) Title 17, Chapter V, Sections 7583-7622, California Administrative Code regarding cross-connections and backflow prevention.
- h) Title 22, Chapter XVI, Article 4, Materials and Installation of Water Mains and Appurtenances.
- i) California Fire Code (CFC) as amended by Sunnyvale Municipal Code (SMC).
- j) California Plumbing Code as amended by SMC.
- k) California Building Code (CBC) as amended by SMC.
- l) USC University of Southern California Foundation for Cross-Connection Control and Hydraulic Research.
- m) City of Sunnyvale Environmental Services Department Cross-Connection Control Program Policies and Regulations.

3. GENERAL

- a) Water facilities shall be designed in accordance with accepted engineering principles and shall conform to these Design Guidelines and the City Standard Specifications and Details.
- b) All materials shall conform to current American Water Works Association Standards.
- c) Conform to the latest edition of the State Water Resources Control Board Water-Related Regulations found in the California Code of Regulations, Title 17 and Title 22 (http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.shtml).
- d) The City's Water System Hydraulic Model shall be used to determine the adequacy of the City's existing water system to deliver water service sufficient for the needs of all proposed projects that fall under the criteria listed below.
 - i) Projects where the water service(s) is/are proposing to connect to dead-end water mains of any size;
 - ii) Projects proposing to connect to water distribution pipelines smaller than 6-inches in size; and/or
 - iii) Projects where a separate fire service, or a combined fire and domestic service are proposed to provide service.
- e) Hydraulic Modeling Fire Flow Analysis Criteria:
 - i) The model shall be run assuming maximum day demand plus fire flow requirements.
 - ii) The model shall limit system velocities in affected pipelines to below 15 fps.
 - iii) The model shall maintain minimum residual pressure of 20 psi throughout the affected area.
- f) Hydraulic Model Report
 - i) The model results shall be submitted in a technical report documenting how the project's domestic and fire flow requirements will be met. At a minimum, the technical report shall include:
 - 1) Current and proposed water system performance;
 - 2) Projected project water demands based on data provided by the City;
 - 3) Document that State Fire Code requirements will be met;
 - 4) Document that City of Sunnyvale fire flow requirements will be met
 - 5) Document that main and service pipeline flow velocities will be below 15 psi; and
 - 6) Document that all impacted pipelines maintain a minimum residual pressure of 20 psi.
- g) For system reliability, and to protect public health and safety by ensuring adequate and continuous domestic and fire supply, the following design guidelines are for water service line connections of various types of land development projects. The City may have additional or alternative requirements as needed based upon project specifics.
 - i) At all new domestic water meters 3" and larger, a mainline isolation valve shall be installed on each side of the lateral (3 valves connected to the tee) unless otherwise directed by the City.
 - ii) All non-residential projects with independent buildings (commercial/retail, hotel, industrial, office/RD, restaurant, school/institution, etc.) shall have one service line connection for each

building per City standard details 4B and 4B-1. Additional requirements may apply to critical facilities such as hospitals, jails, and elderly care facilities under Section 12.

- iii) For mixed-use projects, separate water service connections are required for each of the residential, commercial/retail and office cluster respectively, and in accordance with items i) and ii) above.
- iv) For office/RD projects in a campus setting, a separate dedicated line for on-site fire hydrants with dual points of connection to the street main is required by the Department of Public Safety/Fire Protection, in addition to item ii) above. If project is at a corner lot, divert service connections to each of the two streets.
- v) For restaurant within a retail building as a tenant space, the property owner can choose to pay for the entire retail building with restaurant usage rate, or re-plumb the water system to add a new separate public water meter for the restaurant.
- h) For purposes of leak detection and maintenance access, no reinforced concrete may be designed parallel and directly over publicly maintained water facilities. Unreinforced concrete shall be allowed under special circumstances such as crosswalks or rail crossings. In these cases, an AWWA and/or City Engineer approved pipe casing shall be used and installed as recommended by manufacturer.
- i) The extent of water main improvements shall be as follows:
 - i) Any offsite water main improvements needed to serve the project shall be shown on the improvement plans, including upgrades to existing mains that may be required as a result of a flow analysis or modeling effort. All existing public water assets at street grade such as meter vaults, hydrants, valve pots, ARVs, sample stations etc. that are disturbed shall be upgraded to current city specification.
 - ii) In general, water mains must be designed at least across one-half of the property frontage or to the last service connection, whichever is greater; or
 - iii) Where the project is required to provide new street improvements over the water main alignment and the water main shall serve properties beyond the project limits, the water main shall be designed to cross the full property frontage or to the limits of the street improvements, whichever is greater.

4. CONNECTION TO AN EXISTING PUBLIC WATER MAIN

- a) Indicate a “hot tap” for connection of service laterals 12-inch diameter and smaller.
- b) Connections shall be by hot tap where field conditions allow.
- c) All “hot tap” connections to existing mains shall be performed by the City. Based on field conditions, if a hot tap cannot be performed, the City shall install a cut-in tee. The Contractor shall pay cut-in-tee fee and prepare the site and have the main exposed for City crews to perform the cut-in tee.
- d) Additional valves may be required by the City as needed to further enhance system reliability. Design a cut-in tee/cross if additional valves are required on the existing main. If the new main/lateral is larger than the existing main, the tee/cross and main/lateral valve shall be the size of the existing main unless it is hydraulically necessary to increase the tee and valve to the size of the new main/lateral.
- e) All tie-ins to the existing water system shall be performed by the City, and the improvement plans must be so annotated.
- f) In most major streets, or where the street surface is less than five years old, installation methods other than open cutting may be required. The City Engineer shall determine the requirements in accordance with the City’s street moratorium policy and based on the condition of the existing street.

5. ALIGNMENT

- a) Vertical Alignment
 - i) Conform to the latest edition of the State Water Resources Control Board Drinking Water-Related Regulations found in the California Code of Regulations, Title 17 and Title 22 (http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.shtml).
- b) Horizontal Alignment
 - i) Conform to the latest edition of the State Water Resources Control Board Drinking Water-Related Regulations found in the California Code of Regulations, Title 17 and Title 22 (http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.shtml).
 - ii) The minimum horizontal separation from gas, electrical, and telephone lines shall be per individual utility company requirements, but not less than noted above or as approved by the City Engineer.
 - iii) The minimum horizontal separation from a metallic pipeline with an induced current or from an anode field shall be 5-feet. Where the new water main will be in proximity to an anode field, special design and insulation shall be required for approval by the City Engineer.
 - iv) All public water mains must be designed a minimum of 5-feet from all structures, such as manholes or drop inlets. Provide a minimum of 3-feet from the lip of gutter for service connections and repairs. The City Engineer may approve exceptions as necessary.
 - v) All water main trenches that are parallel to and deeper than the footing of any adjacent structure shall be designed at least forty-five degrees from the footing as required in the California Plumbing Code (CPC). Any exceptions must be approved in writing by the City Engineer.
 - vi) Where a separate fire protection lateral is required parallel to the domestic water service lateral, a minimum 5-foot horizontal separation shall be maintained.

6. MAIN SIZING CRITERIA

- a) Public water mains shall be a minimum of 6-inches and shall be sized to meet minimum Fire Code requirements in addition to domestic and irrigation demands. Private fire protection mains shall be sized to meet minimum Fire Code requirements.
- b) Public water main sizing shall be verified using the City's Water System Hydraulic Model.
- c) Analysis and design of water systems shall be based upon the criteria listed in the City's Potable Water System Preliminary Design Study where applicable. The City Engineer may require increased pipe size for overall system benefit.
- d) Maximum flow velocity for new public water mains shall not exceed 7 feet per second (fps) during peak day demand and 15 fps during fire flow demands.

7. MAIN/LATERAL COVER

- a) Cover is the distance from the top of the pipe to finished grade measured directly above the pipe.
- b) Typically, the minimum standard depths of cover for new public water mains and private fire protection mains are:

Pipe Size	4"	6"	8"	10"	12"	16" or Larger
Cover (in.)	42"	42"	42"	42"	42"	48"

- c) Where minimum cover is less than standard or greater than eight (8) feet, additional mitigation measures for the variance may be considered. Variances must be approved by the City Engineer. .
- d) Where standard cover cannot be maintained, such as at the crossing of a water main with a sewer main or any other utility, either an undercrossing or overcrossing shall be chosen based upon the evaluation by the designing engineer. Evaluation shall include the need for higher class pipe, change in pipe materials, use of controlled density backfill installation with an AWWA and/or City approved pipe casing, the ability to meet SWRCD criteria for separation of water mains and non-potable pipelines, and the resulting need for air release valves and blow-offs. This evaluation shall be submitted to the City Engineer for review and approval during the design.
- e) Where standard cover is not attainable, existing utilities shall be potholed or located to the extent feasible prior to detailed design by the design engineer. The design engineer shall determine the appropriate minimum cover and mitigating measures for the variance and submit for review and approval by the City Engineer prior to construction.
- f) The minimum cover for service laterals shall be as shown on the City's Standard Details. Where service laterals have conflicts with other facilities, a detail or profile must be shown on the plans or the plans shall be sufficiently annotated to give clear direction for the installation.
- g) When designing a cut-in tee for a main connection that is larger than the existing main, the new assembly must be shown at a depth sufficient to allow the valves to remain below the street subgrade, which may necessitate lowering the existing main.

8. MATERIALS

- a) At no point shall dissimilar metals be directly connected to each other.
- b) Service laterals 1" and 2" shall be coated or sleeved Type K copper. 1" copper shall be installed with no splices. 2" copper shall only be spliced via brass compression fittings, with continuous sleeve covering the entire length. Solder is never allowed along water laterals. Laterals 4" and larger shall be C900 DR-14 polyvinyl chloride (PVC), or ductile iron pipe Class 51 (DIP) or thicker, per applicable City Standards.
- c) Mains shall be AWWA C900/C905 DR14 PVC or AWWA C-151/A21.51 DIP. All DIP shall be polyethylene wrapped and taped to City standards and have an interior mortar coating in accordance with AWWA standards C-104/A21.4. Class of pipe shall be determined using AWWA C-150/A21.50.
- d) Other materials for mains shall be considered on a case by case basis with the written approval of the City Engineer. Design engineer shall submit calculations justifying pipe class and material. Asbestos cement pipe will not be allowed under any circumstance.
- e) Where cathodic protection is to be installed, it shall be designed by a qualified corrosion protection engineer.
- f) All valves and fittings shall be fusion epoxy coated and lined.

9. FITTINGS

- a) Fittings shall be mechanical or flanged joints, Class 125, conforming to AWWA C110, "Ductile-Iron and Gray-Iron 3-inch through 48-inch for Water and Other Liquids," or AWWA C153 "Ductile-Iron Compact Fittings, 3-inch through 24-inch for water and other liquids," and AWWA C104, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water." All fittings shall be marked in accordance with Section 10-11 of AWWA C110.
 - i) Flanged bolts and hex nuts shall be Tripac blue or approved equal.
 - ii) Mechanical joint T-bolts and hex nuts shall conform to AWWA C111 and shall be Tripac blue or approved equal.

- iii) Mechanical joint fittings shall be Series 1100 Megalug restraints as produced by EBAA Iron, Inc. or approved equal that has a pressure rating suitable for the thickness of pipe specified by the manufacturer.
- iv) In addition, to provision of mechanical joint restraints, all fittings and bends shall be restrained by poured in-place concrete thrust blocks per City Standard Details. Nuts, bolts and joints are to remain free of concrete.
- b) DIP, fittings, and valve encasements shall be polyethylene wrapped and taped conforming to AWWA C105 "Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids".
- c) Maximum joint deflection in constructed pipeline shall not exceed 50 percent of the manufacturer's recommended maximum deflections.

10. VALVING

- a) Valve manufacturers shall be in accordance with City Standard Specifications and Details or as approved by the City Engineer.
- b) Gate valves shall be used on 12-inch and smaller diameter lines. Butterfly valves shall be used on 14-inch and larger diameter lines. All valve operating nuts shall be centered in a one piece PVC riser stock, 8-inch minimum diameter, with the use of a riser liner or equal. Operator nut shall be within 40-inches of the surface. All valve boxes in the street and other traffic areas shall be of an H-20 loading capacity.
- c) Valves 4-inches and larger shall be supplied with a 2-inch nut square wrench nut as required in AWWA C509.
- d) A minimum of 3 mainline valves are required for "T" intersections and 4 valves are required for cross intersections. Design valves to connect directly to "T" and cross interconnections.
- e) All hydrants and service laterals shall be independently valved per City Standard Details.
- f) Water mains shall have an isolation valve at approximately 1,000-foot intervals or as required by the City Engineer.
- g) Water mains shall be valved on each side of railroad, freeway, creek, expressway and canal right-of-way crossings.
- h) Water main valves must be designed outside of concrete areas wherever possible to facilitate replacements and repairs.
- i) All valves shall open counterclockwise (left).

11. TRACING WIRE AND WARNING TAPE

- a) Tracer wire shall be used on all non-metallic water service piping.
- b) 10-gauge, solid core blue insulated tracing wire shall be applied to mains and service lines. Tracer wire shall be suitable for direct burial and wet conditions.
- c) Tracer wire shall be continuous and splices shall be made with two copper or brass split bolt fasteners. All exposed metal at fasteners shall be polywrapped and taped. Proof of continuity testing shall be submitted to the City in a written format.
- d) Wire shall be installed per the City Standard Details between main line valve boxes, tees, crosses and fire hydrants.
- e) Tracing wire through valve boxes shall be placed outside of riser but inside box.
- f) All pipe greater than 2-inches shall have a blue, plastic non-metallic backfill tape marked "BURIED WATER MAIN BELOW" placed in trench. Tape coverage shall equal the full width of the pipe, span the

full length of the pipe, and be placed at a depth of 1-foot above top of pipe.

- g) Mains in unpaved areas shall be marked every 150-feet minimum with a blue 5'-6" fiberglass composite utility marker with UV resistance and anchor barbs. The marker shall be labeled "CAUTION WATER PIPELINE". Marker shall be centered over the pipe.

12. SERVICE LATERALS AND METERS FOR DOMESTIC AND IRRIGATION SERVICE

- a) For developments, existing domestic and irrigation laterals, water meters, and backflow preventers (BFPs) shall be abandoned unless they meet current City standards with regard to materials, corrosion protection, and cross connection protection.
- b) Developments shall be provided City domestic and/or irrigation service via water meters located behind the curb of the public street and shall not be on private property. Meters shall be installed in accordance with City Standard Details.
- c) Residential water meters shall be provided in accordance with the following table:

Application	Residential Water Meter Requirement
Single Family Detached Dwellings	Public Streets – One public meter for each residence
	Private Streets – Public master meter entering complex, plus private individual meters for each residence.
Single Family w/ "Accessory Living Unit"	One public meter, plus one optional private meter.
Single Family Attached Dwelling, with Individual Lots Associated with Each Dwelling (Townhomes, zero lot-line homes, etc.)	Public Streets – One public meter for each unit. Separate public meter for irrigation (reclaimed water) system. Separate meter for each ancillary building.
	Private Streets – Master meter entering complex plus separate public meter for irrigation (reclaimed water) system, plus private individual meters for each residence. Separate private meter for each ancillary building.
Multi-Unit Condominium Buildings with Shared Use of Common Land	Public Streets – One public meter per building. Separate, public meter for irrigation (reclaimed water) system. Separate private meters for individual units. Separate private meter for each ancillary building.
	Private Streets – Master public meter(s) entering complex, plus separate public meter for irrigation (reclaimed water) system, plus individual private meters for each building. Separate private meter for each ancillary building.
Multi-Unit Apartment Building with Shared Use of Common Land	Public Streets – One public meter per building. (Apartment owner could elect to install separate private sub-meters within buildings). Separate public meter for irrigation (reclaimed water) system.
	Private Streets – Master public meter entering complex (complex owner could elect to install separate private sub-meters within buildings). Separate public meter for irrigation (reclaimed water) system.

Mobile Home Park	Master public meter entering property (private sub-meters required to be installed by park owner, including separate private meter for each ancillary building). Separate public meter for irrigation (reclaimed water) system. Does not apply to existing mobile home parks.
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- d) Meter boxes for meters 2" and smaller shall be placed 3" behind back of curb. Meter boxes for meters 3" and larger shall be placed 6" behind back of curb. Design meter boxes a minimum of 10-feet from street trees whenever possible and 5-feet from a driveway approach. Meter boxes located where there is a rolled curb or no curb are required to be traffic rated
- e) Base any required hydraulic calculations for the water meter and service lateral sizes on criteria from AWWA Manual M22 and submit to the City for approval. Water meter and service lateral sizes are subject to enlargement if a fire protection system is required for the property. Water meter and service lateral sizes in these cases shall be sized per fire protection system hydraulic calculations and per approval of fire code official.
- f) Maximum flow velocity for new public service laterals shall be in accordance with the following:
 - i) Domestic/irrigation service laterals shall have a maximum flow velocity not exceeding ten (10) feet per second.
 - ii) Fire line/combination service laterals minimum flow velocity shall be governed by California Fire Code, and flow velocity shall not exceed twenty (20) feet per second.
- g) Maintain a minimum 10-foot horizontal clearance between water and sewer laterals, unless otherwise approved by the City Engineer.
- h) Meter manifolds other than those shown in the City Standard Details shall be detailed on the plans and approved by the City Engineer.
- i) Mixed residential and commercial uses must have separate meters.
- j) Commercial
 - i) See City's Water Efficient Landscape Ordinance (Municipal Code Section 19.37) for irrigation meter requirements for any landscaped or common areas.
 - ii) Separate meters shall be provided for domestic, irrigation (landscaping over 1,000 feet), and fire services. A minimum 1-inch domestic service lateral is required for commercial use.
 - iii) Critical uses such as hospitals, jails, elderly care facilities, and others as determined by the City, require at least two separate water services for domestic use that must be connected to separately valved sections of the public water main.
 - iv) Each building shall have a separate public water service and meter for domestic use.
- k) Combination Services for Private Hydrants with Domestic and/or Irrigation Service
 - i) Combination laterals must be sized appropriately and shall not exceed the size of the water main. Separate meters shall be provided for domestic, irrigation (landscaping over 1,000 feet), and fire services.
 - ii) The combination service lateral must equal or exceed the size of the required fire line and must be hydraulically sized to provide adequately combined domestic, irrigation, and fire flows without exceeding allowable velocities.
 - iii) A minimum 8-inch combination service lateral or equivalent is required for lots with unknown commercial, multi-family, industrial, and shopping centers uses where on-site hydrants are not likely to be required for development.

- iv) A minimum 12-inch combination service lateral or equivalent is required for lots with unknown commercial, multi-family, industrial, and shopping centers uses where on-site hydrants are likely to be required for development.
- l) Irrigation
 - i) For all development projects, provide separate irrigation service lines and meters.
 - ii) Provide reduced pressure backflow devices and lockable, protective cage mounted to a concrete pad (per City Standard Detail) for all irrigation services.
 - iii) Backflow devices must be specified on the irrigation plan and must conform to City Standards and Details, current USC Approved List of Devices, and the City's Cross-Connection Control Program Policies and Regulations.
 - iv) Sizing of irrigation meters shall be approved by the City Engineer after reviewing the landscape plans. Irrigation meter size shall be determined by the maximum flow required at the meter and shall be based on AWWA criteria for meter sizing. Landscaping shall be designed in accordance with the City's Water Efficient Landscape Ordinance (Municipal Code Section 19.37).

13. PUBLIC IMPROVEMENTS FOR PRIVATE FIRE SYSTEMS

- a) For developments, the existing fire service lateral and backflow preventer (BFP) shall be abandoned unless they meet current City standards with regard to materials, corrosion protection, and cross connection protection.
- b) Design Plans showing private fire systems must be submitted to the appropriate Fire and/or Building jurisdiction for approval and: (1) may be included with the Public Improvement Plans for the project; or (2) copies of the approved plans may be submitted to the City prior to requesting a meter set and activating the fire system.
- c) Generally, the lateral size shall be designed the same size or larger than the size required for the sprinkler system and/or the private hydrant system. Caution – onsite fire system design may necessitate changes to pre-approved public improvements. The hydraulic calculations for laterals serving private fire systems shall be based on the required fire flow or the fire sprinkler demand, whichever is greater, combined with the peak domestic flow.
- d) All private fire systems that only serve onsite hydrants require above-ground reduced pressure detector assemblies (RPDA) in accordance with the City Standard Details.
- e) The use of a RPDA shall be based on the current Cross-Connection Control Program Policies and Regulations and in accordance with City Standard Details.
- f) RPDA assemblies shall be required on all properties, including, any property with an auxiliary water supply system, without exception. Examples of known hazards that typically exist on properties:
 - i) All connection serving fire sprinklers.
 - ii) Any property with multiple fire service connections.
 - iii) Any fire suppression system using chemical additives such as antifreeze or fire suppressants; or
 - iv) Any building where an extreme hazard exists, as determined by the City.
 - v) Any fire line connection to properties with an auxiliary water supply system.
 - vi) Where the fire system does not circulate water with the domestic supply reduced pressure backflow assemblies are required to protect the public water supply and must be located in the public right-of-way or the P.U.E adjacent to the right-of-way as close as possible to the meter, as approved by the City's Cross-Connection Control Specialist.

- vii) Where a fire sprinkler system is to be installed in a one-or two-family dwelling, design the service lateral from the street main to the water meter and the water meter to be one inch minimum. Larger size laterals and meters may be permitted where hydraulic calculations indicate the need.
- g) Where a fire sprinkler system is to be installed in a one-or two-family dwelling, design the service lateral from the street main to the water meter and the water meter to be one inch minimum. Larger size laterals and meters may be permitted where hydraulic calculations indicate the need
- h) The location of any Fire Department connection must be approved by the fire code official.
- i) Critical uses such as hospitals, jails, residential care facilities for the elderly, and others as determined by the fire code official, require at least two fire line service connections to separately valved sections of the public water main, so that service can be maintained in the event of a main line or service lateral shutdown. Installation of additional valves may be called upon by the City as needed to further enhance system reliability.

14. FIRE HYDRANTS

- a) For development, existing fire hydrant (FH) laterals along the property frontage shall be replaced, unless the City determines that they were installed per current standards regarding materials and corrosion protection.
- b) For development, existing fire hydrant barrels shall be replaced unless the City determines that they meet current standards with regard to model of hydrant and condition.
- c) Fire hydrants required on private property will be privately maintained and painted yellow in color.
- d) City Standard Detail shall be followed for installation of all fire hydrants
- e) Design of hydrant locations must meet the Fire Code requirements and be approved by the fire code official for logistics and by the City for maintainability. On streets with raised medians or with four or more travel lanes, design hydrants on both sides of the street with 300-foot maximum spacing each side, or per fire code official requirements.
- f) Each hydrant must be separately valved and able to be isolated as needed without affecting any other service.
- g) Whenever possible, locate hydrants near street intersections, and they shall be painted white.
- h) If it is not possible to locate near an intersection, locate the hydrant between property lines or where it will minimize interference with property use including affecting on-street parking.
- i) Locate hydrants a minimum of 10-feet from driveway approaches for commercial or multi-family sites and 5-feet from residential driveways. Protective bollards in accordance with CFC Section 312 are required if minimum distance cannot be obtained.
- j) Minimum fire hydrant spacing requirements at all hydrants:
 - i) Design hydrants with a maximum of 300-feet of spacing, or as approved by the fire code official.
 - ii) Generally, design hydrants at intersections and then evenly distribute hydrants throughout the project.
 - iii) An upsized hydrant may be required upon review by the fire code official.
- k) Minimum fire flow requirements at all hydrants shall be in accordance with CFC Appendix B as amended by Sunnyvale Municipal Code.

- i) Upon installation, a fire flow test must be performed to AWWA and City standards prior to acceptance. All data collected shall be turn over to the City for record keeping.

15. BACKFLOW DEVICES (EXCEPT FOR FIRE LINES)

- a) Backflow devices are required to be designed in accordance with California Administrative Code regarding cross-connections and backflow prevention Title 17 and Title 22, the City's Cross-Connection Control Program Policies and Regulations Handbook, and current City Standard Details. All devices must be on the approved backflow prevention device list, located on the State Water Resources Control Board's website or listed on the current USC Approved List of Devices.
- b) Backflow preventers shall be designed and located in accordance with the City's Cross-Connection Control Program Policies and Regulations Handbook and the City Standard Details.
- c) For all backflow prevention devices smaller than 3-inch, a sleeve shall be required by the City from the meter to the backflow prevention assembly in order to prevent cross-connections in accordance with the City Standard Details, without exception.
- d) All backflow devices, including fire services, must be tested and meet the Cross-Connection Control Program Policies and Regulations Handbook prior to being turned on. A backflow device test form, which shows that the device has passed and meets the City Standard Details must be submitted within 5-days to the Cross-Connection Control Program either electronically, by hardcopy, or by mail.
- e) All backflow prevention devices and components must be field inspected and approved by the Water Division.

16. PRESSURE

- a) To obtain water system flow and pressure data (fire hydrant data) for flow calculations, send an email to fireflowdata@sunnyvale.ca.gov and include the site address. Where a new fire hydrant flow test is required, fees will be assessed per the current Fee Schedule.
- b) The minimum allowable static pressure in the system is 20 psi. The maximum allowable static pressure in the system is 120 psi. A privately maintained pressure reducing device may be required at the meter when system pressures exceed what is safe for appliances and water heaters.

17. SPECIALTY VALVES AND WATER SAMPLING STATIONS

- a) Specific locations shall be reviewed for each project by the City.
- b) Air release and vacuum relief valves are required at substantial high points in the system such as over a hilltop at the upper end of a dead end main or as specified by the City Engineer.
- c) Blowoffs shall be installed in accordance with Drawing 3B in locations specified in drawings or as specified by City Engineer.
- d) Design pressure reducing valves to maintain overall system balance and to maintain service pressure levels within the parameters established within these system design guidelines.
- e) Typically surge or pressure relief valves are to be designed near the low points of any high level pressure zone where discharge shall be directed to an approved disposal system. The disposal system must be approved by the City Engineer.
- f) Water sampling stations are required to provide representative sampling within each pressure zone. At a minimum, one water sample station is required in each pressure zone, at each reservoir and at pump stations. Refer to the City's Bacteriological Sample Site Plan for additional requirements.

18. EASEMENTS

- a) An easement must be provided over any public water system when it is installed outside of a public right-of-way.
- b) Water easements shall be created by the developer. Securing of the easements shall be determined on a case by case basis by the City. Easements shall be dedicated to the City and maintained by the Property Owner.
- c) All water mains not located within the public right-of-way shall be provided with a minimum 15-foot wide water easement. In some special cases, a wider easement may be required; the City shall determine size. All easements shall at all times be easily accessible to the City's maintenance equipment. No trees or structures or building overhang are allowed within the City easements. When easements are located on private properties, the property owner shall keep the easement free and clear of weeds and debris. An all-weather access road shall be required as approved by the City. The access road shall be 3-inches of asphalt concrete over 6-inches of aggregate base and a minimum of 12-feet wide.
- d) Where water and sewer mains are located within the same easement, the minimum jurisdictional width shall be 30-feet wide. All easements shall at all times be easily accessible to the City's maintenance equipment with all-weather access roadways. No trees or structures or building overhang are allowed within the City easements. When easements are located on private properties, the property owner shall keep the easement free and clear of weeds and debris. An access road shall be built as approved by the City. The access road shall be 3-inches of asphalt concrete over 6-inches of aggregate base and a minimum of 12-feet wide.

19. ABANDONMENT OF WATER MAINS AND SERVICES

1. City Valves: Contractor shall not open, close, or in any way adjust any City valves including but not limited to valves on mains, laterals, and water meters. Valve operation shall only be performed by City crews.

2. Backflow Preventers (BFPs): Contractor shall not remove or relocate any BFPs without first obtaining a Backflow Installation, Removal, and Relocation Permit (Backflow Permit) from the Utility Billing office, City Hall Annex, 650 W. Olive Avenue (408-730-7400). This permit will provide required steps for BFP removal. After removal of an underground BFP, Contractor shall remove the vault and backfill the trench

3. Water Meters (WMs): Contractor shall not remove any WMs. Removal of WM shall only be performed by City crews. After WM removal by City, Contractor shall dispose of WM box/vault, backfill trench, and restore surface per City standards and requirements.

4. Service Interruption: Prior to abandonment, Contractor shall coordinate with the Dept of Public Works (DPW) Inspector to schedule the water shutdown. The Contractor shall submit a draft service interruption notification for Inspector review. After approval, the Contractor shall distribute the notification to all affected customers within the shutdown area as defined by the Inspector.

5. Lateral Connections at Mains: Contractor shall not remove any tapping saddles or tees from public mains. This task will only be done by City crews. At these locations, Contractor shall excavate access trench to the dimensions required by the DPW Inspector and shall install shoring for all such trenches, including trenches less than 5 feet deep. DPW Inspector will arrange for City crews to perform disconnection and restoration of the main. After City completes its work, Contractor shall remove any abandoned pipe within 3 horizontal feet of the main and backfill the trench.

6. Fire Hydrants: After lateral abandonment, remove the hydrant bury and any other pipe features to minimum 24-inches below grade. Deliver hydrant barrel to the City's Corp Yard at 221 Commercial St. Contact the DPW Inspector for drop-off coordination.

7. Mains and Laterals: Pipes may be abandoned in place or removed. Pipes 4" and larger to be abandoned in place shall be filled with lightweight cellular concrete (LCC) of 28-day compressive strength between 50 and 200 psi. LCC installer must first be approved by the DPW Inspector. Smaller pipe may be left in place empty

GENERAL:

1. Contractor is responsible for verifying the location of all existing utilities.
2. Contact the City or other utility owners as needed for removal, abandonment, or relocation of their facilities.
3. Upon discovery of any unidentified utilities, coordinate with the DPW Inspector for direction.
4. See demolition plans for removal of on-site improvements.
5. Abandonment of all pipes and features shall be shown in the Contractor's detailed redlines. These redlines shall be provided to the engineer of record for the preparation of accurate Record Drawings.

End of Potable Water Design Guidelines