Section 5
Design Criteria
Domestic Water Facilities

5.1 Background

The CVWD Domestic Water System is comprised of 30 pressure zones supplied by wells which withdraw water from the Whitewater River Subbasin and the Mission Creek Subbasin. The CVWD Domestic Water Service Area Map is located in Appendix H. Most pressure zones include reservoir storage. There are pressure booster pump stations and pressure regulating valve (PRV) stations that transfer water between zones. The only treatment for the majority of the wells is chlorination to ensure disinfection throughout the water distribution system. Three ion exchange treatment facilities provide arsenic removal in the Mecca, Thermal and Oasis area. A future source of supply may include treated Colorado River water from the Coachella Canal. Domestic Water System statistics can be found in the most recent edition of CVWD’s Annual Report.

The Domestic Water System design/construction standards and regulations for service are governed by the following documents:

- Regulations Governing Domestic Water Service-Appendix H
- Domestic Water Standard Specifications-Appendix H
- Domestic Water General Drawing Notes-Appendix H
- Green Book
- AWWA Standards
- Title 22, California Code of Regulations California Regulations Related to Drinking Water

CVWD has developed a Domestic Water System Hydraulic Model of the entire water supply and distribution system. This model will be utilized by CVWD staff and/or a CVWD consultant to size the domestic water system facilities required for each development at the developers cost.

5.2 Demand Criteria

CVWD requires new developments to install domestic water system infrastructure that supports CVWD’s Domestic Water System Master Plan. On-site and off-site domestic water infrastructure shall be sized to meet the Peak Daily Demand (PDD) of the proposed development in accordance with the following design criteria.
### Table 5.1 Domestic Water Pipeline Design Criteria

<table>
<thead>
<tr>
<th>Design Parameter</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD</td>
<td>0.50 gpm/unit (720 gpd/unit)</td>
</tr>
<tr>
<td>PDD</td>
<td>1.00 gpm/unit (1,440 gpd/unit)</td>
</tr>
<tr>
<td>PHD</td>
<td>1.50 gpm/unit (2,550 gpd/unit)</td>
</tr>
<tr>
<td>PDD/ADD</td>
<td>2.0</td>
</tr>
<tr>
<td>PHD/ADD</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**Storage Volume**

\[
V = [0.5 \times \text{PDD (Diurnal)} + 0.5 \times \text{PDD (Emergency)}] \times \text{no. of units} \times 1,440 \text{ min/day} + \text{Fire Flow}
\]

- **PDD** = 1.00 gpm/unit
- **Fire Flow** = \( ____ \text{ gpm} \times ____ \text{ hours} \times 60 \text{ min/hour} \)
  (determined by Fire Marshall)

**Pipelines**

Designed to transmit the greater of the following:
1. Peak Hourly Demand (PHD)
2. Peak Day Demand (PDD) + Fire Flow

12” and smaller: Max velocity = 5 ft/sec
18” and larger: Max HL = 1 psi /1,000 feet of pipeline

**Pump Stations**

PDD w/ largest unit out of service
Hydropneumatic systems include fire flow

**PRVs**

PDD w/ largest unit out of service

**Treatment Facilities**

PDD w/ largest unit out of service

**Well Capacity**

\[
\text{No. of Wells} = (1.00 \text{ gpm/well} \times \text{no. of units} \times 1.2) / 1,800 \text{ gpm/well}
\]

- average well capacity = 1,800 gpm
- 1.2 Factor of Safety = for maintenance or emergency
- approximately one well for every 1,500 units

**Well Sites**

<table>
<thead>
<tr>
<th>Less than 90 acres</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 90 acres</td>
<td>1 per 90 acres or major portion thereof, major portion being 45 or more acres.</td>
</tr>
</tbody>
</table>

CVWD is located in a hot desert environment and peak demands are significant. CVWD utilizes a PDD allowance of 1.00 gpm per dwelling unit to ensure adequate service during the hot
summer months. CVWD may adjust this factor depending on the location of the project, type of development and proposed landscaping.

### 5.3 Pressure Zones

CVWD Domestic Water System includes approximately 30 operating pressure zones. These zones operate nominally within a static pressure range between 60 to 100 pounds per square inch (psi). Figure 5.1 schematically depicts a major pressure zone representing elevated storage. Individual single family homes connecting to pressure below 60 psi will require a “Low Pressure Agreement” as shown in Appendix H. If static pressure exceeds 80 psi, an individual PRV is required (see Sect. 5.18). Water pressure zone information is available from the Engineering Department. The domestic water drawings must identify the existing or proposed pressure zone(s) serving the development and the static water pressure.

### 5.4 Pipeline Requirements

The CVWD Domestic Water System provides potable water for industrial, commercial and residential use and fire protection. For some projects, a detailed analysis of domestic and fire flow demands utilizing CVWD’s Domestic Water System Hydraulic Model may be required to properly define requirements for system design.

Domestic Water System design requirements may include installing pipelines along the frontage(s) of a development for pipeline looping purposes (peak daily demands, fire flow and water quality requirements) and/or for future system expansion purposes. For example, when an area outside the development can logically be served by a future extension of a proposed domestic water pipeline, CVWD may require the pipeline be extended to the tract boundary or to the end of a paved street in a manner to facilitate the future extension. Oversizing may be required where such pipelines can logically serve an upstream area for future use (See Section 1.4.3 for additional information on Oversizing).

#### 5.4.1 Pipeline Sizing Criteria

Table 5.1 provides the domestic water pipeline design criteria to be utilized for all hydraulic analyses.

<table>
<thead>
<tr>
<th>Design Criteria</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Velocity</strong></td>
<td></td>
</tr>
<tr>
<td>12 inch and smaller</td>
<td>5 ft/sec</td>
</tr>
<tr>
<td>Cul-de-sac/dead end pipelines</td>
<td>10 ft/sec</td>
</tr>
<tr>
<td><strong>Maximum Head loss</strong></td>
<td></td>
</tr>
<tr>
<td>18” and larger</td>
<td>1 psi /1,000 feet of pipeline</td>
</tr>
<tr>
<td><strong>Minimum Pressure</strong></td>
<td></td>
</tr>
</tbody>
</table>
Pipelines shall be 8, 12, 18, 24, 30, 36 or 42 inches in diameter. Pipelines larger than 30 inches in diameter may be required for projects with high demand requirements. No pipe smaller than 8 inches in diameter shall be permitted except for blow-off assemblies, meter manifolds, services and appurtenances.

A Hazen-Williams Coefficient (C) for new CML ductile iron shall be $C = 110$. For all older pipe, C shall be based on the age of the pipe for hydraulic analysis.

### 5.4.2 Pipeline Location and Horizontal Separation

Domestic water pipelines shall be located within public right-of-way (ROW), easements dedicated by tract map or specific easements or fee title land granted to CVWD. The design shall be adjusted to take into consideration utility conflicts, soils, groundwater and any other factors. Table 5.3 represents the minimum horizontal separation of domestic water pipelines from other infrastructure by pipeline size.

#### Table 5.3 Minimum Horizontal Separation – Domestic Water Pipeline

<table>
<thead>
<tr>
<th>Horizontal Separation from Domestic Water Pipeline</th>
<th>Minimum Separation (Outside to Outside)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewer Pipeline¹</td>
<td>10 feet</td>
</tr>
<tr>
<td>Sanitation landfill, wastewater disposal pond, hazardous waste disposal site.</td>
<td>100 feet</td>
</tr>
<tr>
<td>Cesspool, Septic Tank, sewage leach field, seepage pit, underground hazardous material storage tank, or groundwater recharge project site</td>
<td>25 feet</td>
</tr>
<tr>
<td>Non-Potable Pipeline¹</td>
<td>10 feet</td>
</tr>
<tr>
<td>Storm Water Pipeline¹</td>
<td>10 feet</td>
</tr>
<tr>
<td>Curb (Lip of gutter)/Edge of Pavement 12 inch and Smaller Domestic Water Pipelines</td>
<td>3 feet</td>
</tr>
<tr>
<td>Curb (Lip of gutter)/Edge of Pavement 18 inch and Larger Domestic Water Pipelines</td>
<td>6 feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Horizontal Separation from Domestic Water Service Line</th>
<th>Minimum Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewer Laterals</td>
<td>10 feet</td>
</tr>
<tr>
<td>Sewer Manhole</td>
<td>10 feet</td>
</tr>
<tr>
<td>Domestic Water Main Fittings and Bends</td>
<td>2 feet</td>
</tr>
<tr>
<td>Fire Hydrant Run</td>
<td>4 feet</td>
</tr>
</tbody>
</table>
The 10’ separating distance is measured between the outside edge (including bells) of the pipes. If the sum of the inside diameters of the two pipes is 24” or less, then the centerline (CL) distance between the two pipes shall be 12’. This will aid in layout and plan checking. If the sum of the diameters is greater than 24”, then the separating distance between the outside edge (including bells) shall be 10’.

Note: This is not an all inclusive list, see Title 22 Code of Regulation, Section §64572 Water Main Separation.

No deflection shall be allowed off any flanges. Table 5.4 shows the Maximum Deflection of full length pipe by pipe joint type and size.

**Table 5.4 CVWD Maximum Deflection DIP**

<table>
<thead>
<tr>
<th>Type of Pipe Joint</th>
<th>Pipe Size- Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Push-On</td>
<td>2.5°</td>
</tr>
<tr>
<td>Mechanical Joint</td>
<td>2.5°</td>
</tr>
<tr>
<td>Restricted Joint</td>
<td>2°</td>
</tr>
</tbody>
</table>

* The “Design” deflections shown are 50 percent of the maximum value allowed by the Ductile Iron Pipe Research Association (DIPRA). This table supersedes the 2005 Domestic Standard Specifications in Appendix H.

### 5.4.3 Pipeline Cover and Vertical Separation

Table 5.5 shows the minimum cover for various pipeline sizes.

**Table 5.5 Pipeline Cover**

<table>
<thead>
<tr>
<th>Pipe Size or Development Type</th>
<th>Minimum Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 inch and smaller</td>
<td>36 inches</td>
</tr>
<tr>
<td>18 inch and larger</td>
<td>48 inches</td>
</tr>
<tr>
<td>18 inch (in residential development w/curb and Gutter)</td>
<td>36 inches</td>
</tr>
<tr>
<td>Unimproved areas or parking lots</td>
<td>48 inches</td>
</tr>
</tbody>
</table>

The cover for pipelines in shopping centers and commercial complexes shall be 48 inches and all pipelines shall be located in driving aisles. No pipelines or appurtenances shall be located under parking spaces or islands.

Water and sewer crossings and associated separations shall be in accordance with CVWD Standard Drawing Nos. W-1/S-3 and W-2/S-4 (see Domestic Water Standard Specifications in Appendix H).
5.5 Connection to CVWD Domestic Water System

All connections to the existing CVWD domestic water system will be made by CVWD at the Developer’s expense. The Contractor may connect to an existing valve when approved by CVWD under CVWD inspection.
5.6  Well Site and Well Pumping Plant Criteria

There are two well criteria---well sites and sites with installed pumping plant. The number of well sites is based on the acreage of the development. The number of these well sites to include an active pumping plant is based on the water demands of the development.

5.6.1 Well Sites

The number of well sites is based on the following in accordance with Table 5.6.

Table 5.6 Well Sites

<table>
<thead>
<tr>
<th>Development Size (Acreage)</th>
<th>Number of Well Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 90 acres</td>
<td>None</td>
</tr>
<tr>
<td>Greater than 90 acres</td>
<td>1 per 90 acres or major portion thereof, major portion being 45 or more acres.</td>
</tr>
</tbody>
</table>

Well sites shall be a minimum of 150 feet by 150 feet in dimension (0.50 acres) in cases where the blow-off water is discharged to an approved off-site location. For situations where the blow-off water is discharged to an on-site detention basin system, the well site shall be a minimum of 0.75 acres. The Detention Basin System shall be designed to accept 2 hours of well discharge at 2,000gpm. CVWD reserves the right to require larger sites in special cases.

The Developer will be required to design and construct well site improvements including; (1) grading, (2) block walls, (3) water pipeline stubs, (4) power, (5) driveway and gates, (6) blow-off structure and piping and (7) detention basin (See Appendix E, CVWD Well Site Check List).

5.6.2 Well Sites With Pumping Plant

The number of well sites (as determined in 5.6.1) to be outfitted with a well and a pumping plant is generally one well for every 1,500 units and based on the following formula:

\[
\text{No. of Wells W/Pumping Plant} = \frac{(\text{PDD} \times \text{no. of units} \times 1.2 \text{ FS})}{1,800 \text{ gpm/well}}
\]

1.2 Factor of Safety = for maintenance or emergency (one well for every 1,500 units)

5.6.3 Well Site Separation

Well sites can be located within a development or at an approved off-site location within the same water pressure zone as the development. Wells shall be sited according to the minimum separating distances depicted in Table 5.7.
Table 5.7 Well Site Separation

<table>
<thead>
<tr>
<th>Horizontal Separation from Well Site</th>
<th>Minimum Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base of Mountain</td>
<td>4,000 feet</td>
</tr>
<tr>
<td>Existing Well Site</td>
<td>1,000 feet</td>
</tr>
<tr>
<td>Seepage pit, Cesspool, Leach Line or Tank</td>
<td>150 feet</td>
</tr>
<tr>
<td>Sewer Pipeline or Sewer Lateral</td>
<td>50 feet</td>
</tr>
<tr>
<td>Sewer Manhole or Sewer Lift Station</td>
<td>100 feet</td>
</tr>
</tbody>
</table>

Note: This is not an all inclusive list, see CDPH Requirements for New Well dated November 1981, Guidelines for the Protection of Public Domestic Water Supply Wells from Sources Of Contamination or Pollution dated March, 1986, Table 1 Minimum Horizontal Distance and California Well Standards Bulletin 74-90.

5.7 Reservoir Storage

Generally, reservoir storage is required for developments with 1,200 units or more. However, if there is limited or no existing storage in the pressure zone or a new pressure zone is being created due to the development, then reservoir storage is required even if the development is less than 1,200 units. Figure 5.1 schematically shows a major pressure zone representing elevated storage.

5.7.1 Storage Calculations

Reservoir storage includes three components—Peak Daily Demand (PDD) (Diurnal), Fire Flow and Emergency Storage. The specific requirements include:

\[ V = [0.50 \times \text{PDD (Diurnal)} + 0.5 \times \text{PDD (Emergency)}] \times \text{no. of units} \times 1,440 \text{ min/day} + \text{Fire Flow} \]

**PDD = 1.00 gpm/unit**

**Fire Flow = ____ gpm x ____ hours x 60 min/hr (determined by Fire Marshall)**

5.7.2 Location (Base Elevation)

The location of a reservoir is dictated by the hydraulic gradeline (feet above MSL) of the pressure zone when the reservoir is empty (base elevation). CVWD requires a minimum static pressure of 60 psi at all points within the development based on the base elevation of the reservoir. Reservoir heights are generally 24 or 32 feet.
Figure 5.1  Typical Pressure Zone/Reservoir Configuration  
(Pressures have been rounded)
5.8 Booster Pump Stations and Pressure Reducing Valve (PRV) Stations

5.8.1 Booster Pump Station Types

In general, booster pump station types shall be defined as open systems or closed systems. It is the responsibility of the design engineer to select the appropriate booster pump station design, consideration shall be given as to location, service area, pressure zone, flow rate required, operation, power supply backup and such other criteria to provide reliability to the system. The design engineer is required to meet and confer with CVWD Engineering staff on preliminary design requirements prior to plan submission.

A booster pump station (BPS) is required if a development is located at an elevation that does not allow a minimum pressure of 60 psi or at the boundary of two pressure zones whereby the BPS pumps from the lower pressure zone to the higher pressure zone. The booster pump station also provides a backup source of water during high demands or in the case of an emergency.

5.8.2 Booster Pump Stations – Open System

An open system booster pump station is one which transfers water to a higher pressure zone that is governed by an atmospheric storage reservoir (water surface open to atmosphere - See Figure 5.2a). A typical example of this type of booster pump station pumping operation is:

The booster pump station pumps out of an atmospheric storage reservoir or from a lower distribution system into a separate distribution system with higher atmospheric reservoir storage. Typical pump operation is controlled by water surface elevation in the higher storage reservoir.

5.8.3 Booster Pump Stations – Closed Systems

A closed system booster pump station is one which transfers water to a higher pressure zone closed to the atmosphere (See Figure 5.2b). A closed system (or hydropneumatic system) may be allowed in areas where it is not feasible to install a gravity storage reservoir and there is less than 100 units within the pressure zone. This system generally consists of a ground storage tank, booster pump station with at least two domestic water pumps and a high demand pump. A typical example of this type of booster pump station pumping operation is:

Pump operation is typically controlled by pre-set discharge pressure settings. Normally, at least one pump is continuously in service. System over-pressurization and/or pump damage is avoided with the installation of a pressure relief valve/control valve. The pressure relief valve/control valve maintains a constant pressure and can return a portion of the pump discharge to a lower “open” pressure zone system.
5.8.4 Booster Pump Station General Design Criteria

The total capacity of the booster pumping station (or stations) must be sized to provide the water demand for the service area planned. Total capacity shall include:

- Open System - PDD with the largest pump unit out of service
- Closed System – PHD with the largest pump unit out of service

All piping within the pumping station shall be sized for total water demand at planned build-out for the water service area. Space shall be reserved along the manifold and ground at the pumping station site, with blind flanged lateral(s) provided, for future pump additions anticipated to meet total water demand at planned build-out of the area.

In general, booster pump stations are located adjacent to storage reservoirs. In special cases, approved by CVWD, offsite booster pump station sites shall be a minimum of 150 feet by 150 feet. CVWD reserves the right to require larger sites in special cases.

The typical type of pump shall be vertical turbine can pump or horizontal centrifugal pump.

A minimum of two (2) domestic booster pumps and one (1) high demand pump shall be provided to meet the design capacity.

The booster pumps shall be designed to insure that total dynamic head and flow for the system curve can be obtained by all combinations and VFD’s.

Pump sizing shall not exceed capacity of the suction line or the NPSH requirements of the pumps.

On site pipelines for the pumping station shall be sized at five (5) feet per second maximum velocity for discharge piping, three (3) feet per second maximum for suction piping, based upon total station capacity.

Since the service area of booster pump station is dependent upon the continuous operation of the booster pump station for its source of water supply and pressure, emergency standby power facilities must be provided. Back-up power in these cases shall be operated to start the moment that the utility power is interrupted. See Section 5.9 for more details on emergency standby power requirements.

5.8.5 Pressure Reducing Valve (PRV) Stations

A pressure reducing valve station (PRV) is required if a project is located at the boundary between two pressure zones whereby the PRV provides water from the higher pressure zone to the lower pressure zone. The PRV provides a backup source of water during high demands or in the case of an emergency.
CVWD shall make the determination of the water demand data to be used, which may include the development project’s demands, existing and future, as the basis for sizing of the PRV and associated piping.

Velocity shall not exceed five (5) feet per second in the supply and discharge piping. Reducers and increasers shall be used to connect the typically large onsite supply and discharge piping to meet pipeline velocity requirements before and after the pressure reducing valve. PRV’s may be downsized from the inlet and outlet pipeline sizes to which they are connected, provided the velocity across the valve does not exceed the valve manufacture’s specifications.

PRV’s shall be Cla-Val or approved equal and shall be furnished with Viton liner and stainless steel trim.

All PRV stations shall be so equipped with pressure controls that allow the adjusting of pressure settings.

PRV stations that serve as the supplement or back up source of water supply for meeting peaking or fire flow demand shall be set slightly below the high-pressure setting (i.e. 10 ± psi below normal operating pressure).

A PRV station shall have two pressure regulating valves installed in parallel, to provide reliability during maintenance periods or failure of components.

Each PRV and lateral piping shall be sized to independently accommodate the full flow of the pressure reducing station.

PRV station sites shall be a minimum of 100 feet by 100 feet. CVWD reserves the right to require larger sites in special cases.
Figure 5.2  Typical Booster/PRV System Configurations

Figure 5.2a  OPEN SYSTEM

Figure 5.2b  CLOSED SYSTEM
5.9 Emergency Standby Power Facilities

The project site shall provide adequate space for a diesel fueled standby generator in a recessed concrete structure. The generator shall be sized to operate at connected load (full site load) of the designed station. The standby power project fees shall include applicable Air Quality Management application fees, one-full fuel tank, sound attenuation enclosure testing and installation of CVWD’s specified equipment.

The concrete recessed structure (approximately 32 feet x 18 feet) shall include but is not limited to exterior lighting, receptacles, safety rails, stairs, drain sump pumps, automatic sump pump controls and drain filtration system (manufactured to control infiltration of oils and other contaminates from entering the ground water system). The recessed structure shall provide reduced viewable generator height from the public. Vehicle access (20-feet) shall be available on the longer side of the recessed structure.

In order for the internal combustion engine to operate the electric generator, a permit to construct and operate must be obtained from the Air Quality Management District having jurisdiction. Permitting fees and engine procurement are greater if the project site is within 1,000-feet of an existing school.

The internal combustion engine operated generator shall be enclosed in a weather resistant sound attenuated metal enclosure. The metal enclosure shall reduce the engine noise to 75-dBA at 23-feet from the generator when operating at full load in all directions from the generator. When a block building is constructed to house the booster pumps and other equipment, the generator shall be incorporated inside the block building.

The generator shall be equipped with a fuel tank mounted on the same base rails as the generator and its metal enclosure. The fuel tank shall be sized to allow full load operating condition for a period not less than 12-hours minimum.

5.10 Fire Systems/Backflow Requirements

All developer plans showing fire system connections shall provide information on the type of fire system that is being installed for the development (e.g. wet-pipe fire sprinkler systems, deluge fire sprinkler systems and dry pipe and preaction fire systems). The developer’s engineer shall fill out and check the appropriate fire system box on the CVWD Plan Check checklist for domestic water. Upon request for additional information on the fire system, the fire system plans shall be submitted to CVWD to review the complexity and type of proposed fire system so the degree of hazard can be assessed. The level of protection given to each fire system connection shall be in accordance with criteria listed below and the Manual of Cross-Connection Control, tenth edition, Chapter 7 Fire Systems, as published by the University of Southern California and AWWA Manual M14, third edition, Chapter 5 “Typical Hazards.”

Since a fire system design can vary, the level of backflow protection will be based on the type of potential cross-connection and the degree of hazard. The three types of backflow protection that will be considered are: (1) Single (lead free) Detector Check, below ground installation. (2)
Double Check Detector Assembly (DCDA), above ground installation. (3) Reduced Pressure Detector Assembly (RPDA), above ground installation.

5.10.1 Wet-Pipe Fire Sprinkler Systems

Wet-pipe systems are the most common type of fire sprinkler systems. A wet-pipe system is one in which the fire sprinkler piping is constantly charged by a direct connection to the public water supply. When a fire sprinkler activates, water is immediately discharged. A Single (lead free) Detector Check shall be installed unless a hazard such as those mentioned in section 5.10.5 “Other Fire System Hazards Requiring Backflow Protection” are present.

5.10.2 Deluge Fire Sprinkler Systems

Deluge fire sprinkler system (system) is a dry-pipe non-pressurized fire suppression system. These systems are open to atmosphere and a Single (lead free) Detector Check shall be installed. Additional backflow protection is not required unless chemicals will be added when water flows, in which case, a RPDA will be installed.

5.10.3 Dry Pipe and Preaction Fire Sprinkler Systems

Dry pipe and preaction fire sprinkler systems are similar in design. A dry-pipe pressurized system is typically pressurized with air or nitrogen, whereas a preaction system may or may not be pressurized. In either case, a DCDA shall be installed unless there is a risk of a high hazard (e.g. chemicals), in which a RPDA will be installed.

5.10.4 Residential Fire Systems

See Section 5.13.

5.10.5 Other Fire System Hazards Requiring Backflow Protection

- DCDA shall be installed if the private fire system has a looped system (multiple connections), a private fire main with multiple (3 or more) on-site private hydrants, elevated storage tanks, pumps pumping from above-ground covered reservoirs or tanks, an auxiliary water supply on or available to the premises, or an auxiliary water supply located within 1,700 feet of the pumper connection.

- RPDA shall be installed if the fire system has an interconnection with auxiliary supplies, such as pumps pumping from reservoirs exposed to contamination, rivers, ponds, wells or industrial water systems, or where antifreeze or other additives are used.

5.11 Fire Flow Calculations + Hydraulic Modeling
CVWD has a hydraulic model of the existing domestic water system. The domestic water daily demands and fire flow requirements must be verified by the hydraulic model by coordinating with the CVWD Engineering Department. Please refer to the Hydraulic Modeling checklist in Appendix E.

5.12 Fire Hydrants

5.12.1 Fire Hydrant Location

Fire hydrants shall be placed per Fire Department requirements or, approximately every 330 feet in locations that minimize damage by traffic. Fire hydrant runs or valves shall be installed outside decorative paving areas wherever possible. The minimum distance between a block wall and a fire hydrant shall be 6 feet. Bends and water service connections are prohibited on hydrant runs. All hydrant runs shall use restrained joint piping and a thrust block at the hydrant.

5.12.2 Fire Hydrant Type

All fire hydrants shall be of wet barrel type.

Fire hydrants in shopping centers and commercial complexes shall be of the three nozzle (two 2-1/2-inch and one 4-inch) wet barrel type.

5.13 Services and Meters

Effective January 1, 2011, Residential Fire Sprinkler Systems are required by California Residential Code, Title 24, Part 2.5. A single permanent service connection shall provide water service for both the domestic water and residential fire sprinkler portions of the customer service line. The customer will provide CVWD with the required domestic water and residential fire sprinkler water demands and minimum pressures at the time of application for service. See Appendix H, Domestic Water Service Request Application. CVWD will size the single permanent service connection to meet these demands and pressure requirements.

A single service connection to each individually owned premise is required. Mobile home developments are included in this requirement. CVWD owns, operates and maintains the portion of the service connection from the pipeline to the downstream side of the shut-off valve on the property owner’s side of the meter—-with the customer owning the remaining portion of the service line to the building.

A backflow prevention device will be required on all services that represent a potential or real hazard to the CVWD domestic water system. See Appendix H, Regulations Governing Domestic Water Service for a partial listing of the type of services requiring protection and the level of protection required.

The developer’s contractor shall install the service and meter box and shall maintain both until meter installation. CVWD will install the meter and backflow prevention device.
5.13.1 Service Lines

Service connections to single-family residences shall be a minimum of 1 inch in diameter and in accordance with the Domestic Water Standard Specifications.

A single service connection may be installed to each suite within a commercial/industrial building.

A single service connection may be installed to each building within a commercial/industrial complex.

Services or service lines shall be installed outside decorative paving areas whenever possible.

Service connections shall be installed perpendicular to the pipelines unless prior approval is obtained from CVWD.

Service connections shall be installed according to the following chart, unless otherwise approved by CVWD. The drawings shall be so noted.

<table>
<thead>
<tr>
<th>Table 5.13.1 Service Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct Service Tap</strong></td>
</tr>
<tr>
<td>Size of Service (Inches)</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1, 1 ½</td>
</tr>
<tr>
<td>1, 1 ½, 2</td>
</tr>
</tbody>
</table>

5.13.2 Meters

The normal maximum meter size is 2-inch. Multiple 2-inch meters may be used if the demand exceeds the allowable flow rate. Meters larger than 2 inches will be permitted in special cases.
Table 5.13.2 Meter Sizing

<table>
<thead>
<tr>
<th>Meter (Inches)</th>
<th>Maximum Velocity</th>
<th>Maximum Flow Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾</td>
<td>10fps</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>10fps</td>
<td>50</td>
</tr>
<tr>
<td>1-1/2</td>
<td>10fps</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>10fps</td>
<td>150</td>
</tr>
<tr>
<td>4, 6 and 8</td>
<td>10fps</td>
<td>Case by case</td>
</tr>
</tbody>
</table>

*Meters shall be sized to allow the above flow rates.

All irrigation meters are sized by CVWD’s Water Management Division in accordance with CVWD’s Landscape Ordinance.

5.14 Pipe Material

Piping and appurtenances used in the domestic water system shall comply with the following general material requirements:

- Pipelines shall be cement-mortar lined (CML) ductile iron pipe
- Fittings shall be CML ductile iron
- Fire hydrant runs and detector check runs shall be CML ductile iron pipe
- All pipelines, fire hydrant runs, detector check runs, service line runs shall have polyethylene encasement

Under certain circumstances, the construction of the domestic water system shall comply with the following special requirements in addition to the general requirements listed above:

- In locations where the domestic water system is to be installed in unimproved areas or parking lots, pipelines shall be CML ductile iron pipe with restrained joints.
- Pipelines in shopping centers and commercial complexes shall be CML ductile iron pipe with restrained joints.
- In locations where the pipeline will be located under decorative paving, the pipe shall be CML ductile iron pipe with restrained joints. Valves, hydrants and fittings shall be located outside of this area, wherever possible (CVWD is not responsible for the repair or replacement of decorative pavement).
• In locations where the water pressure is or will be 110 psi or greater, the class of the pipe will be determined by CVWD.

• In locations where the pipeline will not be located under a paved street, the pipeline shall be CML ductile iron pipe with restrained joints with 48 inches of cover at final grade. Final grade shall be established prior to installation of pipeline.

Please see documents in Appendix N for reference (Pipe Materials for Non-Pressurized Pipeline Projects and Pipe Materials for Pressurized Pipeline Projects).

5.14.1 Pipe Backfill and Bedding

Backfill and bedding zones shall be as shown on CVWD Standard Drawing W-3 in Appendix H unless special consideration is required.

Special consideration shall be applied to the design of pipe bedding and backfill where soil conditions, or a high groundwater table or other factors warrant additional analysis. The developer and its engineer shall be solely responsible for determining the appropriateness of CVWD Standard Drawing W-3 for the project and for determining whether special consideration is required, and shall provide supporting calculations upon request.

5.15 Valves

Three valves are required on tees or wyes and four valves are required on crosses, excluding fire hydrant, detector check or meter manifold runs. Tees and valves at new points of connection shall match the pipe size of the new connection.

Valve size shall equal fitting diameter. If a reducer is required, the reducer shall be installed after the valve for change of pipe size.

Marker posts are required if valves or blow-offs are to be installed outside of paved areas.

Valves shall be installed outside decorative paving areas, whenever possible.

All valves shall be installed perpendicular to final grade.

No run of pipe shall exceed 1,320 feet in length without an in-line valve installed of the same diameter as the pipe for diameters less than 24 inches. For pipeline diameters 24 inches and larger the valve spacing shall be at CVWD’s recommendation.

5.16 Combination Air-release and Air/Vacuum Valves

Combination air-release and air/vacuum valves shall be installed at all high points in the pipeline where air is isolated and as specified by CVWD. The size of the combination air-release and
air/vacuum valve to be installed shall conform to the chart below unless otherwise approved by CVWD.
Table 5.14 Combination Air-release and Air/Vacuum Valves

<table>
<thead>
<tr>
<th>Size of Pipeline (Inches)</th>
<th>Size of Combination Valve (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>30 and larger</td>
<td>4 or as required</td>
</tr>
</tbody>
</table>

5.17 Blow-Off Assembly

A blow-off assembly shall be provided to facilitate draining and flushing of the pipeline where it dead-ends. A fire hydrant assembly can be utilized as a blow-off for pipelines 8 inches in diameter or larger. The blow-off shall be located in a paved street a minimum of 3 feet from the curb within a minimum of 6 feet between the gate valve and the bend. The size of the blow-off to be installed shall conform to the chart below unless otherwise approved by CVWD.

Table 5.15 Blow-Off Assembly Sizing

<table>
<thead>
<tr>
<th>Size of Pipeline (Inches)</th>
<th>Size of Vacuum Relief Valve (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>24</td>
<td>CVWD to determine</td>
</tr>
<tr>
<td>30</td>
<td>CVWD to determine</td>
</tr>
</tbody>
</table>

Marker posts are required if blow-offs are to be installed outside of paving areas.

5.18 Customer Pressure Reducing Valves

Pressure reducing valves shall be installed on the customer side of the meter and are the responsibility of the customer to maintain. Pressure reducing valves shall comply with the Uniform Plumbing Code, Section 608 “Water Pressure, Pressure Regulators, Pressure Relief Valves and Vacuum Relief Valves.”