# 3.0 Design Criteria for Water Facilities

The following sections are design criteria to be used in the design of proposed domestic water systems. The developer and their engineer shall be responsible to ensure that the designs that are submitted are consistent with PWD's Standards, and generally accepted standards of good engineering practice.

## 3.1 Standard Requirements

The design and construction of all water system facilities to be owned, operated, and maintained by PWD shall be in accordance with the latest editions of PWD Standard Drawings and List of Approved Materials, California Waterworks Standards (Title 22, California Code of Regulations, Chapter 16), PWD Standard Specifications and Details, as well as requirements from the Los Angeles County Fire Department.

### 3.1.1 Hydraulic Analysis

The PWD will determine on a case-by-case basis if a hydraulic analysis will be required for any proposed water infrastructure improvements. The purpose of this analysis will be to demonstrate fire flow, domestic, and irrigation capacity is met and is concurrent with PWD's infrastructure. In addition, an analysis regarding fire will be subject to fire flow requirements established by Los Angeles County Fire Prevention. The Fire Flow Availability Form will only be issued if all requirements are met per Los Angeles County Fire Prevention.

## 3.2 NPDES Requirements

The contractor is required to adhere to the provisions of the Federal Clean Water Act as regulated by the U.S. Environmental Protection Agency, Code 40, Code of Federal Regulations (CFR) Parts 122, 123, 124, the Porter-Cologne Act (California Water Code), the Water Discharge Requirements for Municipal Storm Water Discharges (MS-4 Permit) and the City of Palmdale Municipal Code.

## 3.3 Water System Master Plan

All domestic water system design, including water demands, pressure zones, and system elements, shall be in accordance with the improvements identified in PWD Water System Master Plan, and all other supplements and revisions thereto.

## 3.4 Water Plans Drawing Format

### 3.4.1 Drawings - General

PWD performs water plan checks using the Water Improvement Plan Checklist as a guide. Please refer to that document for all required information and call outs necessary for PWD Engineering Department to approve water plans.

All plans submitted to PWD Engineering for plan checking and approval of water facilities shall be submitted either electronically in PDF format, CAD format, or dropped off to the Engineering Department. All plans shall conform to the PWD CAD Standard template. The plans shall also contain the information detailed in the following subsections. Use the following information as a checklist for plan preparation.

The format for Water Improvement Plans shall be in the same format as shown on the PWD Engineering Services website under "Water System Improvement Example Plans."

### 3.4.2 Sheet Layout

All drawings shall be twenty-four inches by thirty-six inches (24" x 36") in size. Plans should be drawing to a reasonable scale to convey information clearly for plan-checking and construction purposes.

A north arrow shall be clearly shown on all sheets of plans. Indicate sheet number and total sheets on the drawings at the bottom right corner, e.g., Sheet 1 of 3. Each sheet shall have a Standard Title Block including the following: revision block, signature approval, block showing firm name, address, phone number and contact person of firm responsible for work, PWD approval block, PWD logo and address block, block showing project title and sheet name, and block showing drawing number, and sheet number, date, and project number. The plans shall clearly identify the PWD tract number/parcel map number or project name, developer information (name, address, and telephone number).

Provide detail sections for special assemblies and complex connections. The detail shall be drawn to an appropriate scale showing pipe size and shall clearly and fully identify all the parts in the detail.

The engineer shall identify all connections to existing PWD facilities on the drawings.

### 3.4.3 Title Sheet

The first sheet is the "Title Sheet". The complete list of required information for this sheet is located in the General Plan Check Comments and Criteria Checklist.

1. **Bench Mark:** Bench Mark number, description, elevation, quad, and adjustment year.
2. **Name, address, and telephone number of Engineer and Developer**
3. **Legend**
4. **Vicinity Map**
5. **One Inch=200 Feet Map**: Include all items per **section 1-06, 1), C) of PWD Standard Specifications for Water Distribution System Construction.** (Oversize valve and fire hydrant symbols so they are easily discernable)
6. **General Notes**: Refer to *General Notes for Water System Improvement Plans* and for additional notes refer to *General Construction Notes for Water System Improvement Plans* under the Engineering Services tab on the PWD website.

7. **Additional Notes**
8. **List of Materials**: List of materials must include material item number, description, quantity of each item per sheet, total quantity of each item, and units. (Refer to PWD General Plan Check Comments and Criteria Checklist)
9. **Sidewalk Detail**: A plan view detail showing the back of sidewalk transitioning to provide the required ADA clearance around fire hydrant riser in accordance with COP Std. No. C-6 must be shown on the cover sheet.

### 3.4.4 Plan and Profile Sheets

Plan and Profile Sheet(s) shall immediately follow the Title sheet. See PWD Plan Check Comments and Criteria Checklist for list of information that should be included at a minimum.

#### 3.4.4.1 Plan View

Plan view sheets shall have a horizontal scale of one inch (1") equals forty feet (40'). All proposed facilities shall be called out in large bold font with type and size of facilities. All existing and proposed utilities (i.e. water, sewer, gas, storm drain, etc.) contained within the public right-of-way of all streets depicted on each sheet. All existing and proposed improvements (i.e.: curb and gutter, sidewalk, cross gutters, structures, etc.) contained within or attached to the public right-of-way of all streets depicted on each sheet.

All driveways, streetlights, storm drains, sewer lines, sewer laterals, sewer manholes, lot lines, lot numbers, street names, street centerlines, street right-of-way, dimensions, identification for all utilities from the title sheet, labelling of valves, stationing, material numbers, join numbers, joint notes, abandonment numbers, abandonment notes, and leaders shall be identified on the sheets.

All connection points, crossings, and appurtenances shall be called out by stationing. Restrained joints shall be clearly marked with stationing.

Easements shall be identified on all plan and profile sheets. All easements shall be clearly depicted and dimensioned.

#### 3.4.4.2 Profile View

Profile view sheets shall have a horizontal scale of one inch (1") equals forty feet (40'), and a vertical scale of one inch (1") inch equals four feet (4'). Profile view(s) shall be included for Water Improvement Plans, or unless otherwise directed by PWD. Profile view(s) shall show all existing and proposed surfaces and utility crossings over or under proposed facility. Profile view(s) shall align with plan view stationing directly above plan view(s), whenever possible. Stationing shall be shown along bottom of profile at 100-foot intervals and elevations shall be clearly shown on both ends of profile sheet.

All profile types shall show slope of pipeline, restrained joints, stationing of appurtenances and connection points with reference drawings called out.

### 3.4.5 Detail Sheets

Detail sheet(s) shall follow Plan and Profile sheet(s). See PWD Plan Check Comments and Criteria Checklist for a complete list of information required on Detail sheet(s).

All details shall be accurately scaled when feasible and appropriately cross-referenced to other drawing(s) on the plans. When applicable, PWD Standard Specifications and Drawings shall be included on Detail sheet(s) or referenced appropriately and accurately. The latest edition of the PWD Standard Specifications and Drawings is located on the PWD website.

### 3.4.6 Required Easements

All easement documents are to be prepared and submitted on the District's approved format and provided along with plans submitted for plan check review.

Prior to the approval of water system plans, the easement documents must be approved as to form. Grant Deeds for easements are required to be executed by the grantor, re-submitted to the District, and have the Affidavit of Acceptance by the District attached to same prior to the tie-in of the water system.

All required easements will be recorded and a Title Insurance Policy for same in the minimum amount of $25,000.00 provided to the District prior to issuance of the Fire System Activation Letter.

If an easement to PWD is required for maintenance and/or replacement of water facilities, the minimum easement width shall be twenty feet (20') for domestic water facilities not within a casing. Deep water lines (deeper than 60 inches or 5 feet of cover) will require wider easements and be determined by doubling the depth from finished ground or finished surface. Easements shall be contained in single lots and shall not straddle lot lines.

#### 3.4.6.1 Easements for Tracts

Easements over lots within proposed tracts are required to allow water mains within cul-de-sacs to loop or connect to water mains within other streets. Please refer to PWD Rules and Regulations for more details regarding Easement requirements to maintain a circulating water system.

One easement sideline shall be coincident with the lot line of the lot or lots traversed by easement. All water mains must be centered within the dedicated easement.

Easements over property adjacent to proposed tracts are required to allow water mains within streets, which end at the tract boundaries, to loop or connect to water mains within other streets.

Alignments shall be determined on a case-by-case basis.

Easements shall be twice as wide as the depth to the bottom of the main at the deepest point within the easement but no less than ten feet (10') overall.
Cross slopes within easements shall not exceed five percent (5%) .

Drainage swales of parallel construction must be located a minimum of five feet (5') from the center of the easement.

#### 3.4.6.2 Easements for Commercial Projects

Easements within project sites to accommodate meters and vaults are required for proposed commercial projects having private on-site systems.

Easement width must abut right-of-way. Easement length must be oriented perpendicular to street centerline.

Easement dimensions must be at least one foot (1') greater than the outside dimensions of the proposed vault.

Drainage and irrigation must be directed away from easement.

One (1) copy of the easement legal descriptions with accompanying sketch or plot and a survey closure report shall be prepared by the developer's State of California licensed surveyor, and submitted with required fees to PWD for review. After review of the submittals mentioned above, PWD Engineering will provide an electronic template in word document of the Grant of Easement title report that is to be included with the easement legal descriptions and survey closure report. Once satisfactory review by PWD has been completed, the developer's project manager shall submit two (2) hard copies of the signed, dated, and notarized Grant of Easement title report, easement legal descriptions, and survey closure report, to be signed and dated by PWD. Easements for facilities that will be transferred to PWD may be shown on the tract or parcel map with the correct certificates for PWD acceptance. The legal description for the easements shall be in a form acceptable to PWD and must be accompanied by a current title report to be checked by the PWD's Engineering Department for accuracy. Dedicated easements must also be shown on the construction plans and the index map, without exception. Improvement plans for PWD facilities will not be approved until all required easements have been dedicated to PWD along with any necessary re-conveyances or subordination agreements.

Easements twenty feet (20') wide and extending a radius of five feet (5') beyond all fire hydrants, water meter locations will be required unless waived by PWD.

### 3.4.7 Digital Submission Requirements

All design engineers preparing water improvement plans shall submit drawings in both DWG (drawing) and PDF formats after the design drawings have been approved and signed by the appropriate agencies.

The data will be layered as a minimum into the following features:

A. Existing water lines and appurtenances
B. Proposed water lines and appurtenances
C. Other existing utilities
D. Easement lines, right-of-way lines, and boundary data (boundary and lot lines)
E. Street centerlines and street names
F. Construction notes and labels (callouts)

The coordinate system of data shall be the California State Plane Coordinate System (NAD 83).
Digital files shall be submitted through email, CD, or thumb drive to the PWD Engineering Department.

## 3.5 Water Improvement Plans-General Criteria

Refer to PWD's Standard Specification for additional information.

1. Water Improvement Plans shall be submitted to PWD in digital format, see Section 3.4 for requirements.
2. Substantiating engineering calculations for demands and pressures shall be provided, if requested by the PWD Engineering Department.
3. Water Improvement Plans shall be prepared in accordance with PWD Standards Specifications, PWD General Plan Check Comments and Criteria, and Section 3 for requirements. The following additional requirements shall be met:
    a. The contractor shall obtain all City and/or County permits prior to the start of construction.
    b. Water mains shall be staked for line and grade and shall be installed subsequent to the installation of the curbs and gutters but prior to surfacing and paving of the streets.
    c. Water Mains shall be ten feet (10') from curb of face, five feet (5') horizontal, and one foot (1') vertical separation from other utilities. For sewer, see PWD Standard Drawing W-10.

d. Project shall have two (2) points of connection/sources of supply.
e. All water mains must loop (no dead ends).
f. Valves shall be located at right-of-way and property line prolongations.
g. All easement lines shall be valved at both ends, have no service connection, and must be ductile iron pipe.
h. No valve shall be located within a gutter or other concrete drainage device.
i. High points shall have air/vacuum release valves.
j. No fittings closer than six feet (6') from curb face.
k. All systems will require retaining glands with mechanical joints.
l. No facility is to be backfilled until inspected by the PWD Inspector.
m. Shut down of existing water lines to facilitate connection to existing facilities shall be requested through the PWD Inspector. The shutdown shall be coordinated with the PWD Inspector and conducted exclusively by the PWD crews. No connections to the be PWD existing water system shall be made until the new facilities have been successfully tested, flushed, disinfected, and passed bacteriological testing. All connections to the PWD water system shall be made in the presence of the PWD Inspector.
n. Water services shall be installed behind the curb prior to paving of the street. The services shall be extended to their final location by the developer at a time prior to pressure testing of the water system. Each service will be installed per PWD Standard Detail No. W-1, W-1A, or W-1B.
o. Backflow devices shall be installed for all commercial, industrial, dedicated irrigation and residential services where non-potable water may also be available.
p. Meter boxes shall be installed directly behind the curb whether sidewalk is directly behind the curb or not. Meter boxes installed behind rolled curb shall have traffic lids. No meter boxes shall be permitted within driveways. Refer to PWD Standard Detail No. W-1, W-1A, or W-1B for details.
q. The developer/contractor shall raise all valve boxes to the finished pavement grade upon completion of the pavement. If the surface course of pavement is not completed within a reasonable amount of time after the base course of pavement is completed, the developer/contractor shall raise the valve boxes to the finished grade of the base course so that PWD may operate the valves. The developer shall then raise all valve boxes to final finished grade of the pavement upon completion of the surface course pavement. **All valves and appurtenances must be accessible to PWD staff at all times.**

r. Hot taps on existing mains shall be approved on a case-by-case basis by the PWD Engineering Department.
s. Plan/project number designated on drawings to be assigned by PWD.
t. Fire hydrants to be located on the same side of the street as the main wherever possible. Blue dots to be placed six inches (6") from centerline toward fire hydrant.

## 3.6 Pressure Zones

The PWD distribution consists of ten (10) pressure zones. PWD reserves the right to change said pressure zone on the Water Improvement Plans before approving the final design drawings.

## 3.7 Reservoir Storage

If additional reservoir storage is required for tract developments, refer to the PWD Water Mater Plan for more detailed requirements. Additional storage requirements are based on the maximum day demand (MDD), maximum month demand, and fire flow including maintain required minimum pressure. The minimum volume of required water storage within a pressure zone is the sum of operational or daily storage, fire flow storage, and emergency storage components.

The location of the reservoir storage will be at the sole discretion of PWD. The location of a reservoir is dictated by the hydraulic grade line (HGL) of the pressure zone when the reservoir is empty (base elevation). PWD requires a minimum static pressure of 40 PSI and a maximum static pressure of 100 psi at all points within the development; additionally, PWD requires a minimum static pressure of 20 psi at all points within the PWD service area at the required fire flow for the fire hydrant locations throughout the development.

## 3.8 Booster Pump Stations

A booster pump station shall be required if a development cannot achieve a minimum of 40 psi static pressure or at the boundary of two (2) pressure zones in which case to pump water from the low pressure zone to the high pressure zone. The booster pump station shall also provide an emergency backup source of water in cases of unexpected booster station outages.

Construction of the booster pump stations shall only move forward once the PWD Engineering Department has approved and signed off on the final design drawings. The PWD Inspectors shall have access to the construction site at all times to verify the project is proceeding per plan. Refer to Chapter 4 for Inspection requirements.

### 3.8.1 Booster Pump Station Design Criteria

It is the responsibility of the developers' design engineer to submit an appropriate booster station design for approval by the PWD Engineering Department based on location, service area, pressure zone, flow rate and pressure requirements, and operation.

All piping within the pump station shall be sized for total water demand based on total build out capacity for the water service area.

## 3.9 Pressure Regulating Stations

A pressure regulating station is required if a project is located at the boundary line between two different pressure zones. The pressure regulating station will serve as a backup source of water in case of high demands because of an emergency.

Pressure regulating stations will be site specific. The pressure regulating station design shall be coordinated with the PWD Engineering Department and terms included in the Water Agreement.

## 3.10 Design System Pressures

The following criteria shall be met for all domestic water systems unless otherwise approved or specified by PWD:

A. Minimum residual pressure at any point in the system shall be 20 psi at maximum day plus design fire flow demands.
B. PWD supplies water at pressure ranging between 40 psi (minimum) to 100 psi (maximum). The owner is solely responsible for regulating the pressure on the customer side of the water meter, (i.e., either decreasing or increasing the pressure to the customer's required level)

## 3.11 Pipeline Requirements

Water mains shall be installed per the provisions described in the Development Services Procedural Guidelines, PWD Standard Specifications for Water Distribution System Construction and AWWA standards as reference.

No connections to the PWD existing water system shall be made without approved set of plans by PWD Engineering, payment of applicable fees, and pre-construction meeting.

### 3.11.1 Main Line Sizes

Water mains twelve inches (12") and below shall be Class 350; water mains above twelve inches (12") must be Class 250.

Transmission Mains- The size of a transmission main shall be a minimum of twelve inches (12") in diameter. Transmission mains shall be sized based on a maximum head loss of three feet (3') or less per one thousand linear feet (1,000') of pipe, and in no case shall the design head loss exceed five feet (5') per one thousand linear feet (1,000') of pipe unless specifically approved by the PWD Engineer. All water mains shall have a profile shown on the improvement plans.

Distribution Mains- The minimum size distribution main shall be eight inches (8") in diameter. For distribution mains, the maximum allowable design velocity shall be seven feet (7') per second. New distribution mains will not be allowed to connect to existing transmission mains.

No 10-inch or 14-inch diameter mains will be allowed without specific approval of the PWD Engineering Manager. Unless otherwise specified herein or approved by the PWD Engineering Manager, all water mains must be looped.

Dead-end Mains- No dead-end lines shall be permitted, except at the discretion of the Engineering Manager, and in cased where circulation lines are necessary, they shall be designed and installed by the District as part of the cost of the main extension in accordance with District policy regarding circulating water system set forth in Article 11.02 of the PWD Rules and Regulations.

### 3.11.2 Design Flows

Design flows shall be based on a demand of an average of 714 gallons per day (gpd) per connection which is referenced in the latest PWD Water System Master Plan. Commercial/Industrial flows shall be calculated based on the developers estimated water demands for the proposed development. The calculation for design flows is used for determining instantaneous water supply and not related to water budgets.

### 3.11.3 Depth of Cover

Minimum cover (from top of curb) for all water mains shall be forty-two inches (42"). Any cover more than 42-inches shall be approved by PWD Engineering.

### 3.11.4 Standard Location

Domestic water mains shall be located within public right-of-way or easements dedicated to PWD. Domestic water mains shall be ten feet (10') from curb face per PWD Standard Specifications.

### 3.11.5 Horizontal Separation Requirements

There shall be a minimum of five feet (5') horizontal separation is required from the outside edge of the water main to the outside edge of any utility parallel construction other than sewer. For separation from sewer see PWD Standard Drawing W-10. Separation other than the Health Department minimums must be approved by PWD.

Pipe joints must be located at least four feet (4') from any crossing utility, edge of gutter (including cross gutters), back of sidewalk, etc. For crossing sewer, see PWD Standard Drawing W-10.

Where water main transitions under a crossing utility, the edges of the closest transition fittings must be no less than five feet (5') from the outside edge of the crossing utility.

### 3.11.6 Vertical Separation Requirements

There shall be a one foot (1') minimum vertical separation required from outside edge of water main to the outside edge of any utility crossing the water main. For crossing sewer, see PWD Standard Drawing W-10.

### 3.11.7 Looped System Requirements

Each project or development shall have at least two (2) connections to water lines in different streets to form a looped water system. Non-looped systems will not be permitted unless specific written authorization in writing is granted by the PWD Engineering Manager. Refer to PWD's Rules and Regulations for further requirements.

## 3.12 Pipe Material and Appurtenances

A. All public water mains shall be ductile iron pipe unless directed by PWD staff. For large services and fire services, cement mortar lined and coated (CMLC) steel pipe shall be used. A list of manufacturers can be found in the PWD List of Approved Materials.
B. Thrust blocks shall conform to PWD Standard Drawing No. W-4.
C. Restrained joints shall be designed based on the PWD Standard Specifications and Details. Restrained joints shall be approved case-by-case basis by PWD Engineering Manager.

Refer to PWD Standard Specifications for further details and additional requirements.

## 3.13 Fire Flow Requirements

Fire flow requirements will be determined by Los Angeles County Fire Department. Any plan submitted for plan check must have been reviewed by the Fire Department.

### 3.13.1 Reduced Pressure Principle Detector Assembly (RPDA)

A fire service must have a Reduced Pressure Principle Detector Assembly (RPDA) with bypass meter shown on PWD Standard Drawing W-24.

## 3.14 Fire Hydrants

Fire hydrants shall be installed in accordance with PWD's Standard Drawing Nos. W-2, W-2A, W-3, W-3A and the following requirements.

### 3.14.1 Types of Fire Hydrants

All fire hydrant assemblies shall be wet barrel and be six (6") x four (4") inches by two and one-half inches (2-1/2"). Types and configurations are specified in PWD's Standard Specifications for Water Distribution System Construction and "List of Approved Materials", both documents can be found on PWD's website.

### 3.14.2 Location of Fire Hydrants

Locations of fire hydrants in public right-of-way shall be to the satisfaction of PWD, Los Angeles County Fire Prevention, City of Palmdale, and shall be accessible at all times. Fire hydrant standards shall conform to the following criteria:

A. On distribution mains rather than transmission mains unless otherwise specified or approved by PWD.
B. On the side of the main nearest to the street right-of-way line, subject to approval by PWD.
C. Five feet (5') from the beginning of the curb return at intersections.
D. On the prolongation of a lot line, but a minimum of five feet (5') from the edge of any driveway, streetlight, underground utility vaults or other similar obstructions.
E. A minimum horizontal clearance of 24-inches from the face of curb, with the four inch (4") pumper outlet perpendicular to the curb face.
F. A minimum horizontal and vertical clearance of thirty-six inches (36") around operating nuts and protective caps, with the hydrant flange mounted at least 4 inches above finished grade.
G. Any hydrant located behind the sidewalk shall be set in a three feet by three feet by six inch (3' x 3' x 6") concrete pad. Where a curb is not present, barricades will be required.
H. Any hydrant shall be in locations that minimize damage from traffic.

### 3.14.3 Spacing of Fire Hydrants

The required spacing of fire hydrants in public right-of-way shall be subject to the approval of the Fire Department. Spacing in private water systems shall be subject to the approval of the Los Angeles County Fire Prevention. The following guidelines for maximum spacing of hydrants are presented for normal installations:

All on-site fire hydrants and fire protection supply mains for commercial/industrial developments shall be private and shall be owned, operated, and maintained by the property owner.

## 3.15 Water Services and Meters

In general, a single domestic service connection to each individual parcel is required. Commercial and multi-family are able to obtain large meters but must be approved by the PWD Engineering Department. This includes apartment buildings within an apartment complex, condominiums, commercial/industrial buildings.

The size of service shall be determined by the developer's engineer and approved by PWD Engineering Department. The location of service shall be on the address side of the street.

For any construction project, the duration for a temporary fire hydrant meter shall be limited to six (6) months. If the duration exceeds the 6-month limit, a permanent metered service shall be required. Unless requested in writing to exceed six (6) months.

### 3.15.1 Water Service and Location of Service Lines

Water services shall be installed in accordance with the latest PWD's Standard Drawings and the following requirements:

A. All service lines shall be in accordance with PWD Standard Drawing Nos. W-1, W-1A, and W-1B.
B. All commercial, irrigation, and industrial water services shall be submitted to PWD for review and approval. Plans shall be submitted in accordance with PWD Standard Drawings.

### 3.15.2 Water Meters

Every service connection shall be metered. All water meters shall be purchased from PWD, subsequent to payment of applicable fees. Water meters shall be installed by developer's representative under PWD Inspection.

## 3.16 Water Valves

Valves shall be installed per PWD Specifications and Standard Drawings, and American Water Works Association (AWWA) Standards. Refer to PWD Standard Specifications for installation details.

### 3.16.1 Types of Valves

Unless otherwise specified, no gate valves larger than ten inches (10") shall be used. All main line water valves shall be resilient wedge gate valves. Gate valves shall conform to the "*AWWA Standard for Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service*" ANSI/AWWA C509. Valves supplied shall be resilient seated wedge, with O-ring seals, non-rising stems, two-inch (2") operation nut, opening left.

Valve ends shall conform to AWWA standard; flanged ends per AWWA C110/A21.10-12, Ductile Iron and Gray Iron Fittings of latest revision, as required for steel pipe; or mechanical joints as required for ductile iron and polyvinyl chloride (PVC) pipe.

Valves shall be suitable for buried service and horizontal mounting. Valves shall be adequately anchored for thrust in accordance with the requirements of these specifications and as shown in the Standard Drawing W-4.

Valves twelve inches (12") and larger shall be butterfly type in accordance with PWD Standard Specifications. Butterfly valves, if shown on the plans, shall meet AWWA C504-15, Rubber-Seated Butterfly Valves of latest revision for rubber seated, tight closing valves. Valves shall be flanged-pattern short body, and shall be cast iron, shaft, or stainless steel 18-8 Type 304, disc of Ni-Resist Type 1. They shall be Class 150 unless noted on the plans. Valve operators shall be waterproof, suitable for buried service and equipped with a two inch (2") square operating nut.

Approved valve manufacturers are specified in the PWD "List of Approved Materials"

### 3.16.2 Location of Valves

There shall be at least three (3) valves at a 3-way intersection of any water mains; at least four (4) valves at the 4-way intersection of any water mains. Valves on distribution mains all be spaced a maximum of 1,000 feet apart so that no more than three fire hydrants would be taken out of service at one time. Unless specifically approved by PWD, the maximum allowable spacing for intermediate valves on transmission mains is 1,200 feet.

In no event shall any valve be installed within a gutter or other concrete draining device.

All fire hydrant laterals shall have an isolation valve. The isolation valves at all intersections as described herein shall be flanged to the main line tee or cross unless otherwise approved by PWD.

The final determination of the locations of all valves shall be subject to the approval of PWD.

## 3.17 Blow-offs and Combination Air and Vacuum Relief Valves

Blow-offs shall be installed at any point along the main where either the flow velocity or the slope of the main cause sediment to settle. Blow-offs shall normally be installed at all low points in transmission mains. Blow-offs shall be installed at any other location specified by PWD to assure the capability of complete flushing of a main. Size recommendations for blow-off assembles shall be designed per PWD Standard Specifications.

Combination air and vacuum relief valves shall be installed at all high points in water mains and at siphon-type crossings where air is isolated. Recommended sizing for combination air and vacuum relief valves shall be designed per PWD Standard Specifications.

## 3.18 Cross-Connection Regulations

Refer to PWD's Standard Specifications, PWD's Rules and Regulations or the Cross-Connection page on our website.