WATER UTILITIES

INTRODUCTION

Although water covers about two thirds of the earth's surface, it is still necessary to deliver water to residential, commercial, and industrial customers to sustain the common necessities of life. Unfortunately, the presence of calamities such as earthquakes, fires, building collapse, and common problems such as broken water pipes and activated sprinklers often result in the need to quickly control the flow of water. It is the uncontrolled flow of water that often requires the action of fire service personnel to abate this type of hazard in a timely and professional manner.

TRANSMISSION

As water is the lifeblood of every community, it is necessary to supply water for domestic usage and fire protection considerations. This is accomplished through a combination of supply and distribution systems.

SUPPLY SYSTEMS

The supply systems supply water to the distribution systems. Supply systems are gravity or pump or a combination of both.

Gravity Systems

Gravity systems use a source of water (such as lakes and reservoirs) that is at a higher elevation than a municipality. The pressure of the water delivered into a distribution system is determined by the elevation of the source above the area of usage. As an example, a height of 100 feet will create a pressure of 43 psi (.433 psi per foot of elevation X 100 feet = 43 psi).

Pump Systems

When a source of water is below or at the same elevation as a municipality, or cannot naturally provide sufficient pressure through adequate elevation, pumps are used to supply water at the proper pressure into a distribution system.

Combination Systems

Water is initially supplied into a distribution system by a combination of pumps and/or gravity. Reservoirs and/or elevated tanks are located at strategic locations within the system to provide a source of reserve water if necessary. The City of Los Angeles uses a combination system to supply an average of 600 million gallons of water per day to 4 million people. Water is supplied to
Los Angeles City from the following sources:

- 75% from two aqueducts from the Sierra Nevada.
- 15% from wells within the San Fernando Valley.
- 10% from the Metropolitan Water District (MWD) which supplies water from the Colorado River and State Water Project (Sacramento and Feather Rivers).

DISTRIBUTION SYSTEMS

Water is delivered throughout Los Angeles City by a distribution system of pipes, valves, check valves, and water meters, and is normally cross connected at specific intervals to supply water to areas that can be affected by repairs, breakage, and other similar problems. Pipelines within a distribution system can be classified as trunk lines, mains, service and customer lines.

Trunk Lines

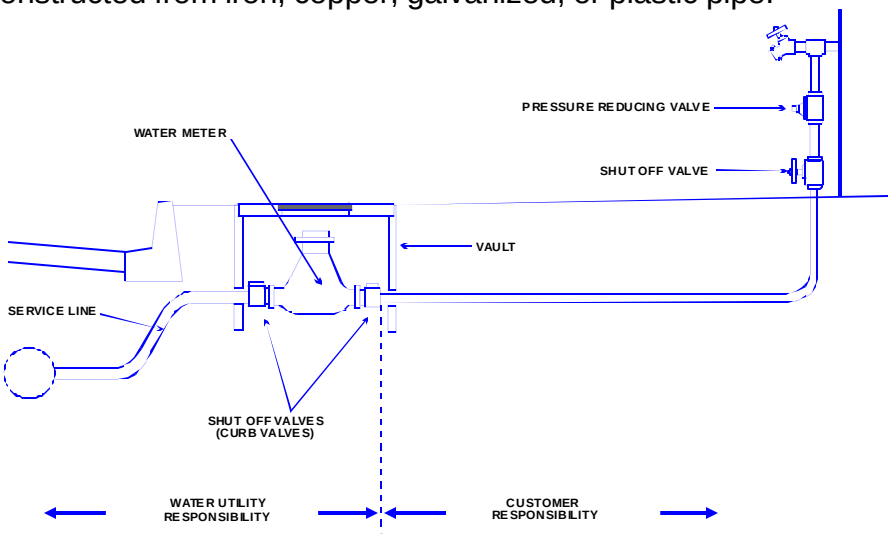
Trunk lines carry water from a primary source (reservoirs, pumps, etc.) to mains within a distribution system. Trunk lines can vary from 36 inches to 10 feet in size, and are constructed from iron or concrete.

Mains

Mains normally run beneath a street and parallel to a curb, can vary from 2 to 72 inches in size, and are constructed from iron pipe. Mains can be cross connected to form loops that allow shutting down a specific main within a distribution system for repairs, etc.

Service and Customer Lines

Water is delivered to individual structures by a combination of service and customer lines. Service lines run between a main and a water meter, can vary from ½ inch to 12 inches, and are constructed from iron, copper, or galvanized pipe. Customer lines run between a water meter and a structure, can vary from ½ inch to 12 inches, and are constructed from iron, copper, galvanized, or plastic pipe.



Water utility companies are normally responsible for maintenance and repair of a water distribution system, including:

- Water metering device.

- Shut-off valves on either side of a water metering device.

Building owners are normally responsible for maintenance and repair of:

- Plumbing from the shut-off valve (on the output side of a water metering device), and into a structure.

- All plumbing inside a structure.

SERVICE

The type and size of water service to a structure is determined by a combination of applicable plumbing code requirements and water consumption needs that result in the following types of water service configurations:

- Domestic water only.

- Domestic water and water for fire protection through a single service.

- Domestic water and water for fire protection through separate services.

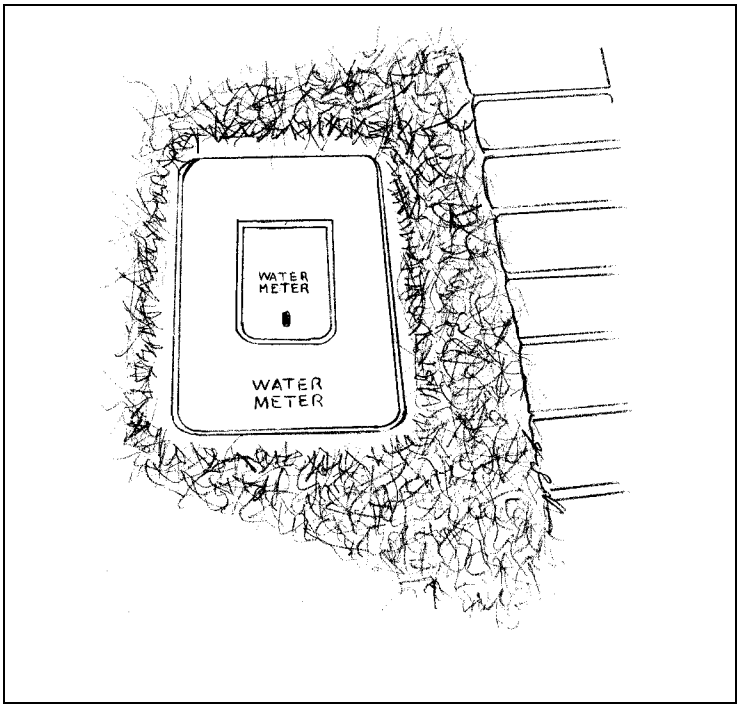
COMPONENTS

Water service systems are comprised of shut-off valves, water meters and detector check valves, and pressure reducing valves.

Access

A meter box, vault, or manhole often has a centerpiece or lid with a hole that can be

utilized to remove the cover. The centerpiece or lid normally identifies the type of utility with the word(s) "WATER," "DWP," "L.A. Water," "LA DWP WATER," or "CITY WATER METER," and are often marked with blue paint.



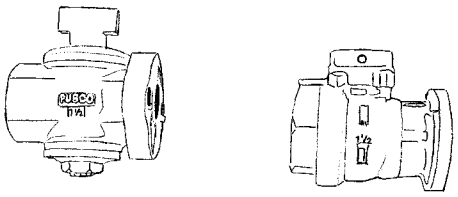
Shut-off Valves

Shut-off valves (or service valves, curb valves, etc.) provide a means for controlling the flow of water through service and customer lines. Two types of shut-off valves are commonly utilized:

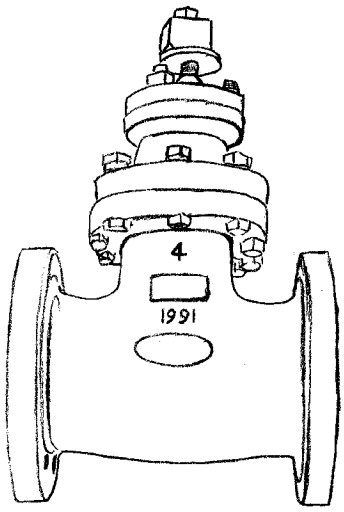
Non-Indicating Valves.

- These valves do not indicate an open or closed position and are characterized by ball or cone valves and gate valves.

- A ball or cone valve has a rectangular valve-nut attachment on the top of the valve. When the valve is closed, the valve-nut is perpendicular to the valve.



A gate valve is a non-rising stem valve that has a square valve-nut attachment at the top of the valve stem.

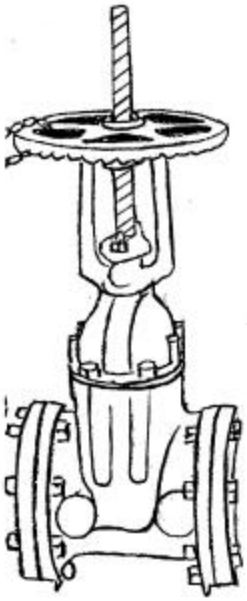


Indicating Type Valve.

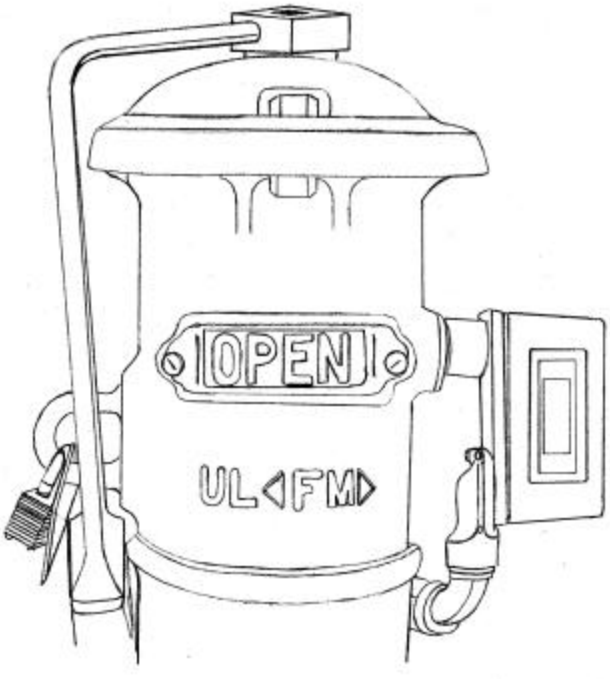
These valves indicate an open or closed position and are characterized by outside

stem and yoke (OS&Y) valves and post indicator valves (PIV).

An OS&Y valve has a rising stem type valve.



A PIV is connected to an underground gate valve.

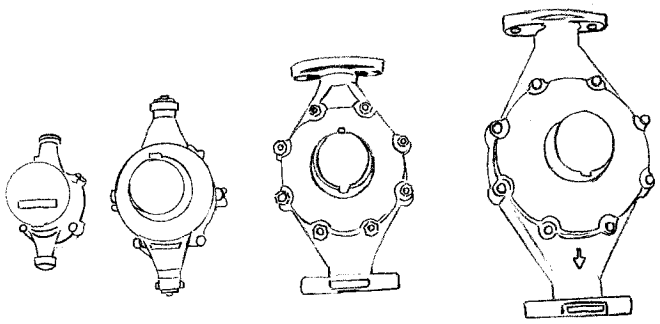


Water Meters and Detector Check Valves

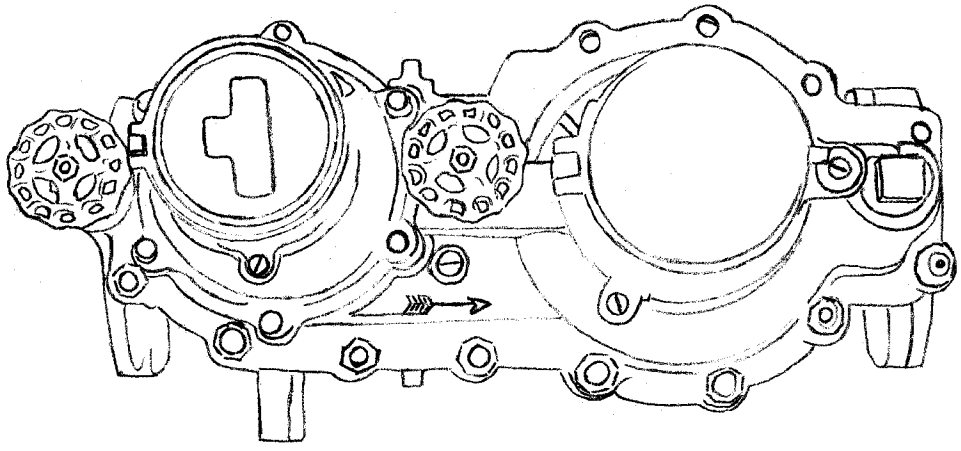
Water meters are used to calculate water usage and check valves are utilized to

allow the flow of water in one direction only. The type of meter and/or check valve is dependent on the type of water service as follows:

- Water Meter is used to calculate water usage for a domestic water service. Water meters are normally directly adjacent to shut-off valves and vary in size from ½ to 10 inches (inlet-outlet size).

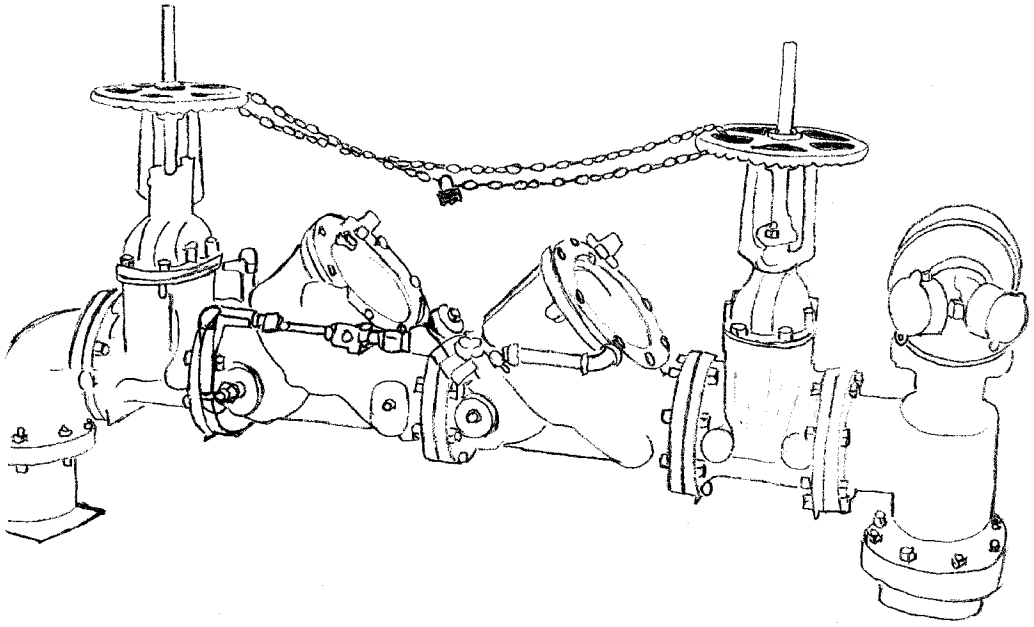


- Compound Meter is used to calculate water usage for domestic water services that can use low and high water flows. During low water flows, a compound meter operates as a standard water meter. However, if high flows are necessary, a check valve opens and allows the passage of large flows that are metered separately. Compound meters are 4 inches or larger and are normally found directly adjacent to shut-off valves.



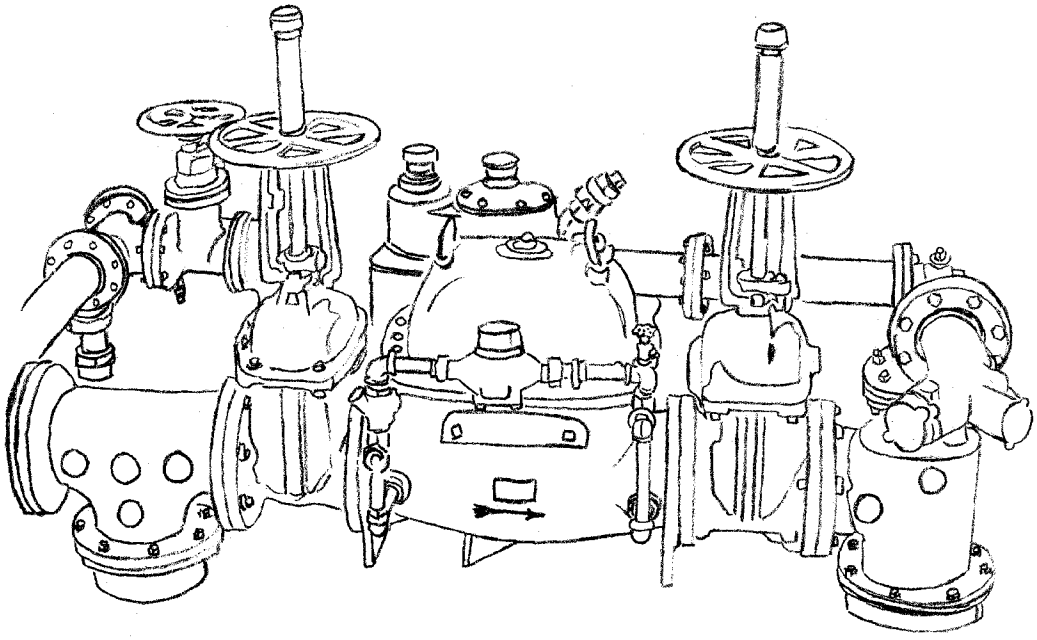
- Detector Check Valve with By-Pass Meter. Used to supply water for a closed fire protection system. When necessary, a check valve opens and allows water to flow straight through unmetered. In the closed position, the check valve

prevents water from flowing back into a water distribution system (i.e. from Fire Department apparatus pumping into a standpipe inlet). Most detector check valves will use a small water meter in parallel with the check valve(s) to detect leaks and the unauthorized use of water. Detector check valves can vary in size from 2 to 10-inches.



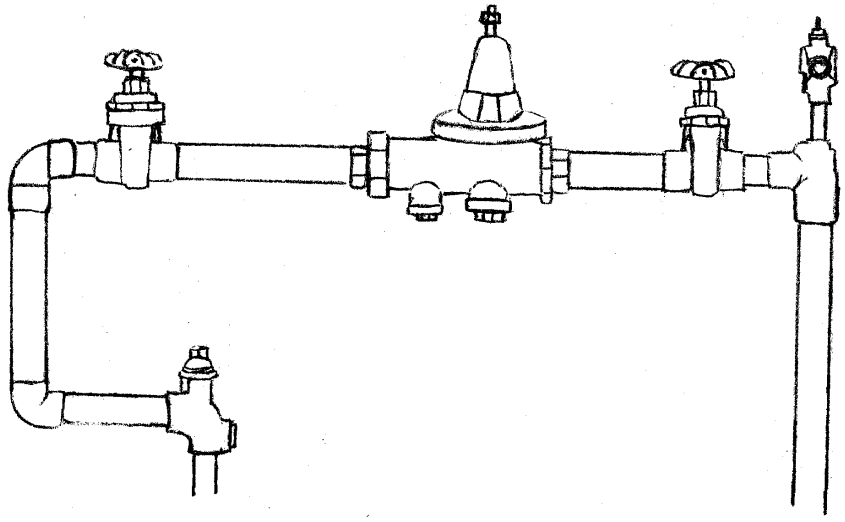
Combination Water Service. A domestic water meter and detector check valve providing separate water services. A water meter and check valve may be located in the same vault or separated in adjacent

vaults.



Pressure Reducing Valves

Pressure Reducing Valves are normally used in domestic services to reduce high water pressures to an acceptable level inside a structure (i.e., dwellings commonly use 40 to 80 psi). Pressure reducing valves are not normally utilized in fire protection services.



LOCATION

The order of placement for water system components between a main and structure

can vary. A typical domestic water service normally consists of piping, a water meter, shut-off valve(s), a pressure reducing valve, and a typical fire protection service normally consists of piping, detector check valves, and shut-off valves.

In warm climates, water meters can be placed just below grade level, and pressure reducing valves, shut-off valves, and detector check valves can be located above or below grade level (i.e., L.A. City).

The following are general considerations for single family dwellings, apartments, hotels, commercials, and high rises:

Single Family Dwelling

Domestic water services will normally consist of a ½ to 2 inch single water meter with shut-off valve on one or both sides of a meter. A customer line runs underground from the meter to a vertical riser that enters a structure on the exterior or in a basement. A pressure reducing valve can be located near the meter or structure. Water service for a domestic sprinkler system will normally be a 2 inch detector check valve that is located in a separate vault.

Hotels

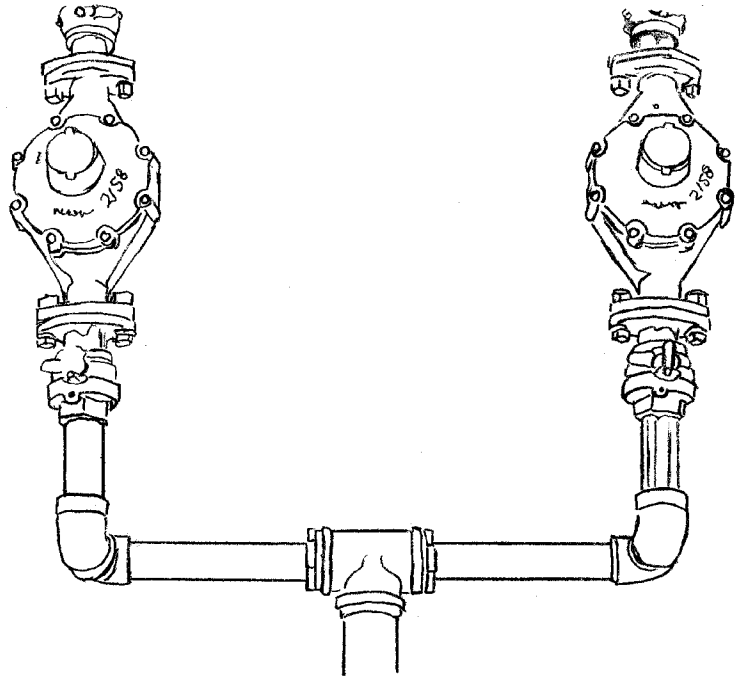
Domestic water and fire protection services are provided by a combination water service that provides domestic water with a 4 to 6 inch water meter and water for fire protection with a 4 to 8 inch detector check valve. Shut-off valves are normally adjacent to the water meter and detector check valves, and a post-indicator valve is normally present between the detector check valves and structure. The water meter and detector check valves can be in the same vault, separate vaults, or above ground.

Apartments

Domestic water service will normally consist of 1 to 3 inch customer lines and a single 1 to 3 inch water meter with a shut-off valve on one or both sides of a meter. Similar to single family dwellings, and depending on water requirements, a customer line runs underground from a water meter to a vertical riser that enters a structure on the exterior or interior. A pressure reducing valve can be located near the water meter or structure. Water service for fire protection will vary between 2 to 4 inches.

The water services for domestic water and fire protection are in separate below ground vaults or located above ground. A common alternative to a single 1 to 3 inch water meter is a 3 inch equivalent water service. This system consists of two 2 inch water meters in adjacent vaults that are connected to a single 3 inch

customer line that enters a structure on the exterior or basement. In this configuration, the pressure reducing valve is located near the structure.

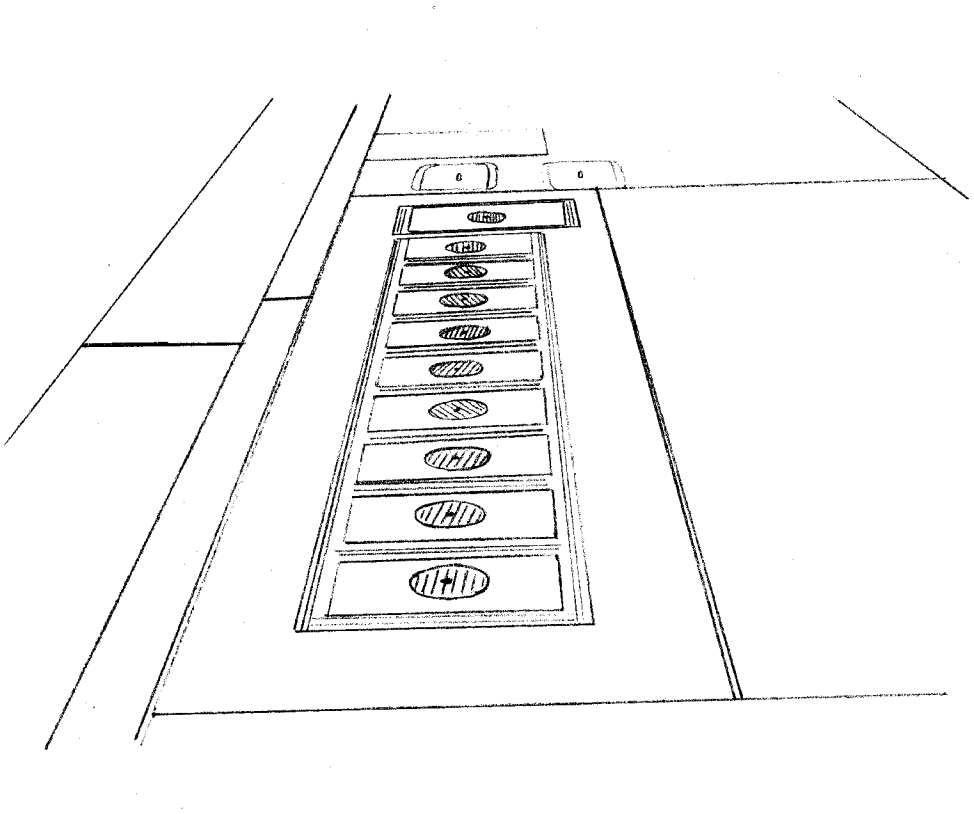


Note: If a structure has Dorothy Mae Sprinklers, a separate 2 inch fire service vault is used.

Commercial

Water services to these types of structures are not primarily based on the size of a structure but will depend on the water requirements of a structure. As an example, a large warehouse with a small office area and large storage area can have a large (4 to 10 inch) water service for fire protection and a small
(1 to 2 inch) water service for a domestic water system. Conversely, a moderate size commercial occupancy can have a 2 to 4 inch service for fire protection and a large (4 to 8 inch) domestic water service for specific requirements. Common applications are as follows:

- A commercial occupancy with multiple occupancies (such as mini-malls), can be serviced with water for a domestic water service by a single water meter for an entire building or, by multiple, 1 to 2 inch water meters in separate vaults, which can supply each individual occupancy (referred to as a battery).



- 1 to 2 inch water meter for domestic water service, and 2 to 4 inch detector check valves for fire protection in separate vaults. Shut-off valves are normally adjacent to a water meter. Detector check valves, and a post indicator valve should be present between the detector check valves and structure.

- Combination water service with a 4 to 8 inch water meter for domestic water service, and 4 to 10 inch detector check valves for fire protection in the same vault. This configuration is used for large water volumes. Shut-off valves are normally adjacent to a water meter and detector check valves and a post-indicator valve should be present between the detector check valves and structure.

- Shut-off valves are normally adjacent to water meters in separate vaults or a single meter that serves an entire building. Water for fire protection can be provided by detector check valves in a separate vault, or in a common vault with a water meter that serves an entire building. Shut-off valves are normally adjacent to detector check valves and a post indicator valve may be present between the detector check valves and structure.

<u>High Rise</u>

Domestic water and fire protection service is provided by a combination water service that consists of a 4 to 10 inch water meter for domestic water and

4 to 12 inch detector check valves for fire protection in the same vault. Above ground risers may be present for domestic and fire protection services. Shut-off valves are normally adjacent to water meters and detector check valves in this type of configuration. Post-indicator valves are normally present between the detector check valves and structure.

FIRE PROTECTION SYSTEMS

Fire protection is provided by sprinkler systems and standpipe systems.

Sprinkler Systems

- Automatic Wet Pipe System. The pipes in this system are filled with water at all times. When a head is activated, water immediately flows from activated heads. Water is supplied to this system by either gravity tank, pressure tank, automatic fire pump, or a water service system.

- Automatic Dry Pipe System. The pipes are filled with compressed air. When a head is activated, air is immediately released from activated heads. This causes a drop in air pressure, which allows water to enter the system and flow from activated heads. Water is supplied to this system by a gravity tank, pressure tank, automatic fire pump, or a water service system.

- Non-Automatic System. Pipes are maintained dry. To charge this system with water, it is necessary for fire department apparatus to pump into the fire department connection to supply water to activated heads.

- Deluge System. Sprinklers may be open or closed and are supplied with water by a heat actuated valve. Water is supplied to this system by a gravity tank, pressure tank, automatic fire pump, or a water service system.

Standpipe Systems

- Dry Standpipe. Dry standpipes consist of a siamese connection, piping, and 2½ inch outlets on each floor (stairway and/or fire escape balcony) and roof. Water is supplied to this system by fire department apparatus.

- Wet Standpipe. Designed for occupant use and consists of 100' of 1½" unlined singled jacketed hose with a ½" straight tip with no shut-off.

OPERATIONAL GUIDELINES

DOMESTIC SERVICES

- For leaks outside a structure, use multiple personnel to locate the appropriate shut-off location (one person may not find the correct location in the least amount of time).

- For leaks inside a structure, use multiple personnel to simultaneously investigate the interior and exterior of a structure to locate the most appropriate shut-off location. This approach will enhance the ability of personnel to locate the appropriate shut-off location in a timely manner.

- Occasionally a shut-off valve may be encountered with a sign as follows: "LIFE SUPPORT MACHINE IN AREA" or "SHUT GATE SYSTEM DIVIDE." DO NOT turn these valves off unless appropriate approval is obtained.

- When closing a ball, cone, or gate valves that are 3 inches or larger, it may be necessary to exercise a valve to completely eliminate the flow of water as valves can become encrusted with rust and scale. When a stubborn cone valve is encountered, slightly loosen the nut on the bottom of the valve (if accessible) and strike the threaded shaft with a hammer. This will drive the shaft into the valve and free the valve. The valve may now be shut off. Ball and cone valves can be identified by the lack or presence of a nut on the bottom of a valve. Ball valves do not have a nut on the bottom of a valve, and cone valves do.

- All shut-off valves should be slowly closed and opened to avoid water hammer.

Outside

Shutting off water leaks that are located outside of structures are normally limited to leaks in mains, service lines, or customer lines and are normally handled by utility company personnel. Leaks in customer lines (between a water meter, detector check valve, and structure) are normally handled by fire service personnel as follows:

- 3/4 to 1 inch service:

A shut-off valve (ball or cone valve) is normally located adjacent to a water meter and may be located above ground or underground. If the valve is underground and not in a meter box, it may be necessary to dig down outside a meter box to access the valve. Turning these valves 90 degrees will eliminate the flow of water.

- 1 to 3 inch equivalent service:

A shut-off valve (ball or cone valve) is normally located on both sides of a water meter. Remove both vault covers to access the meter valves. It is necessary to shut off a valve in **both** vaults to completely eliminate the flow of water past this service configuration.

- 4 inch and larger:

Gate valves are located on both sides of a water meter. When closing these valves, remember it may be necessary to exercise a valve to completely eliminate the flow of water. Large above ground or underground installations may consist of back flow valves that are inline with the water meter and multiple OS&Y or gate valves. Due to the size of these water services and the possibility of damage to building heating, cooling, and other similar systems, personnel should not close these valves unless absolutely necessary. Normally, the DWP should be requested to handle these systems.

Inside

Shutting off water leaks that are located inside of structures can be accomplished as follows:

- Depending on the type of leak, closing accessible shut-off valves near a water meter or the globe valve that can normally be found on the vertical riser that enters a structure will quickly eliminate the water service to the interior of a structure until an interior leak is located and repaired.

- Broken Pipes. Broken pipes in walls normally require shutting off the flow of water to a structure using exterior shut-off valves near a water meter, etc.

- Toilets. Toilets are found in two configurations, residential and commercial. Leaks from residential toilets can be easily eliminated by shutting off the angle valve at the wall near the toilet. In these applications, plastic tubing has replaced metal tubing and is more susceptible to splitting due to hardening. Leaks from commercial toilets can be eliminated by removing a cap over the relief valve and using a slot-head screwdriver to turn the relief valve screw outward. This will let the valve seat and stop the flow of water to the toilet.

- Urinals. Leaks from commercial urinals can be eliminated by removing a cap over the relief valve and using a slot-head screwdriver to turn the relief valve screw outward.

- Sinks and Residential Appliances. Leaks from sinks and other types of residential appliances can normally be eliminated by shutting off the angle valve(s) at the wall near the sink or appliance.

- Manufacturing Process. Leaks from a manufacturing process that utilizes water will often have readily available shut-off valves near the process. If these types of valves are not readily found, using exterior shut-off valves may be necessary to eliminate the flow of water.

- Hot water leaks can normally be eliminated by shutting off the appropriate valve at a water heater or boiler. However, remember to shut off the gas or electricity to the heater to prevent a possible rupture due to expanding water in the heater.

FIRE PROTECTION SERVICES

Depending upon the buildings system a partial system shut down or full system shut down will control the water.

- Sectional shut-off or Zone values. Sprinklers can be controlled by using the appropriate sprinkler shut-off tool, then look for sectional shut-off or zone values instead of shutting off the whole system. This will cause less disruption of the system and speed up the draining process.

- 2 inch service:

A shut-off valve (ball or cone valve) is normally located adjacent to a detector check valve. Turning this valve 90 degrees will eliminate the flow of water past this service.

- 4 inch and larger service:

Indicating valves (post-indicator valve) can be used to eliminate the flow of water past these valves. Post-indicator valves are located outside of structures, are connected to an underground gate valve, and have a handle or wrench to operate the valve. To operate a post-indicator valve remove any padlocks or chains securing the control valve. Turn valve in clockwise direction to close the valve. The valve will visually indicate the position of the valve by an arrow or display which states “OPEN” OR “SHUT.”

- OS&Y valves that are normally located directly adjacent to detector check valves on 4 inch and larger fire services are not normally used to eliminate the flow of water past these valves. However, a gate valve should be turned clockwise to stop the flow of water past this service. OS&Y valves are turned clockwise (so the stem is not visible) to stop the flow of water.

SHEARED HYDRANT

Placement of apparatus for the protection of members is paramount. To insure protection against injuries caused by debris being thrown into the air, the use of protective clothing is recommended (helmet, goggles, turnouts, or rain gear).

Location

The fire hydrant gate valve is normally found in direct line with the fire hydrant and perpendicular to the curb. A six inch diameter cap (usually painted blue) covers access to the gate valve. Some gate valve locations are indicated by arrows etched on the adjacent curb.

Operation

Remove gate valve cap. Place hydrant shut-off tool on gate valve stem. Turn in a clockwise direction to close valve (your initial attempt should begin with a clockwise rotation). Close the gate valve slowly to reduce the possibility of water hammer. Two members applying moderate pressure to the gate key should be adequate when closing the valve (fire hydrant gate valves may require 18 to 26 full turns to complete a shutdown). If the gate valve will not turn in a clockwise direction, attempt to close the valve in a counterclockwise direction. Caution must be taken, as excessive force will cause damage or break the gate valve stem.

NOTE: Although approximately 98% of all fire hydrant gate valves close in a clockwise direction, a member must recognize those instances when a counterclockwise rotation is necessary to close the valve.

As the gate valve is operated, you will hear and feel the vibration of the valve as it closes. If there is no decrease in the amount of water flow, you may be operating the wrong valve or the valve may be broken. If it has been determined the wrong gate valve has been closed, return the valve to its original position. Always count the number of full turns when closing fire hydrant gate valves.

NOTE: Fire hydrant gate valves should only be operated to shutdown sheared hydrants. For leaking fire hydrants, follow procedures described in the Manual of Operation, Volume 2, 4/2-34.59 (J).

The sheared off hydrant should be secured in a safe location.

Communication

When notifying OCD of a sheared off fire hydrant, include the following:

- Fire hydrant location.

- State if fire hydrant has been shut-off.

- The number of valves operated.

OCD will notify the DWP Water Operating Trouble Board and advise them of your actions. The DWP will then dispatch necessary resources to the location.

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