Fire Hydrant Operation and Inspection

What is in this Lesson?

1. Classification of fire hydrants
2. Nomenclature of major hydrant components
3. Operation of compression hydrants
4. Operation of toggle hydrants
5. Operational considerations for use of fire hydrants including; marking inoperable hydrants, color coding hydrants, and managing the use of hydrants.
6. Lubrication of dry barrel hydrants
7. Typical fire hydrant inspection for dry and wet barrel hydrants
8. Speciality items used with fire hydrants including; markers, Hydra-Styorz®, spray nozzles, and nozzle savers
9. Common hydrant problems and solutions
10. Typical hydrant record keeping recommendations

Key Words

- Auxiliary Valve
- Base
- Bonnet
- Bury
- Bury Section
- Carrier
- Compression Hydrant
- Deflector
- Drain Valve
- Dry Barrel Hydrant
- Dry Top Hydrant
- Flush Hydrant
- Frost Jacket Hydrant
- High Pressure Hydrant
- Hydrant Barrel
- Hydrant Head
- Hose Outlet Nozzle
- Inlet Connection
- Lateral Line
- Lead Line
- Lower Barrel
- Lower Bury Ell
- Main Valve
- Main Valve Opening
- Nozzle Section
- Operating Nut
- Post Hydrant
- Pumper Outlet Nozzle
- Recreation
- Riser
- Routine Inspection
- Slide Gate Hydrant
- Spanner Wrench
- Top Section
- Toggle Hydrant
- Traffic Model Hydrant

- Upper Barrel
- Watering Point
- Wet Top Hydrant
- Washer
- Wet Barrel Hydrant

Fire Hydrant Operation and Inspection

Introduction

Content

The materials in this lesson were designed for the most common brands of hydrants found on the west coast of the US. While some of the material is generic in nature, it in no way should be considered as comprehensive.

Purpose and Uses of Fire Hydrants

Fire Suppression

Although fire hydrants are often used for other purposes, their primary function is for the supply of water for fire protection. Any other use is considered of secondary importance and should be controlled rigorously.

Line Flushing

The fire hydrant's ease of operation and high flow capabilities make it a natural for use in flushing distribution system main lines. When line flushing is done in conjunction with systematic hydrant inspection, the primary function of the fire hydrant is kept in proper perspective.

Testing System

The owners and operators of the water system often use the fire hydrant as a means of testing the hydraulic capabilities of the distribution system. These tests, like the line flushing, should be conducted in conjunction with the need to test the distribution system flow in accordance with fire flow requirements. This allows for considerations of both fire flow requirements and customer flow and pressure needs.

Other Uses

Other common uses of the fire hydrant include a water source for street cleaning, sewer cleaning, commercial construction, street construction, **recreation**[1] and a **watering point**[2] for spray applicators used by farmers, street crews, highway maintenance personnel, and commercial applicators. One of the most common conflicts between local government crews has to do with the use and control of water from fire hydrants. AWWA, through its fire hydrants standards committee, has taken the stand that any use of the fire hydrant for purposes other than fire protection and fire fighting should be carefully controlled and regulated.

Ownership & Responsibility

AWWA has also taken the stand that the fire hydrant, like all other appurtenances attached to the water distribution system, should be the property and

[1] **Recreation** - The use of fire hydrants for recreation is discouraged by many water utilities. However, in some locations a systematic controlled use of hydrants for recreation is common during the summer months.

[2] **Watering Point** - When using a fire hydrant for these purposes an approved backflow protection system must be installed.

responsibility of the water system owner. However, they realize that in some jurisdictions, individuals and local entities other than the water utility use and maintain the fire hydrants. Therefore, they have taken the position that when the responsibility to operate and maintain the hydrant has been transferred to someone other than the water utility, there should be a detailed written agreement governing this transfer of responsibility. It should be pointed out that even when there is a written agreement between the water utility and another party, the utility still maintains the responsibility to see that the proper maintenance is performed on the hydrants.

Hydrant Types

General Divisions

Hydrants manufactured in the United States can be divided into two categories: **wet barrel**[3] and **dry barrel hydrants**[4]**.** These categories are further divided. Hydrants that are designed with the entire operating unit placed underground and covered with a lid at ground level are called **flush hydrants**[5]**.** The flush hydrant is not very common in the United States. It is used on bridges and in airports or other situations where it would be dangerous for the hydrant to extend above the ground. The other category are those hydrants designed to extend above the ground, commonly referred to as **post hydrants**[6]**.**

Wet Barrel Hydrants

Wet barrel hydrants are manufactured in accordance with AWWA Standard C-503. A wet barrel hydrant has a **main valve**[7] located on each outlet nozzle. The entire hydrant is full of water at all times.

Dry Barrel Hydrants

Dry barrel hydrants are manufactured in accordance with AWWA Standard C-502. Dry barrel hydrants have the main valve located below ground and the section that extends above ground is void of water except during operation. These hydrants are also equipped with **drain valves**[8], which allow the entire portion of the hydrant that extends above the main valve to be automatically drained when the hydrant is not in use.

High Pressure Hydrants

Special hydrants not covered by either of the above standards are manufactured to meet high pressure requirements by communities. Both wet and dry barrel **high pressure hydrants**[9] are manufactured. High pressure means that the hydrant was designed to be used when the normal distribution system operating pressure is above 150 psi.

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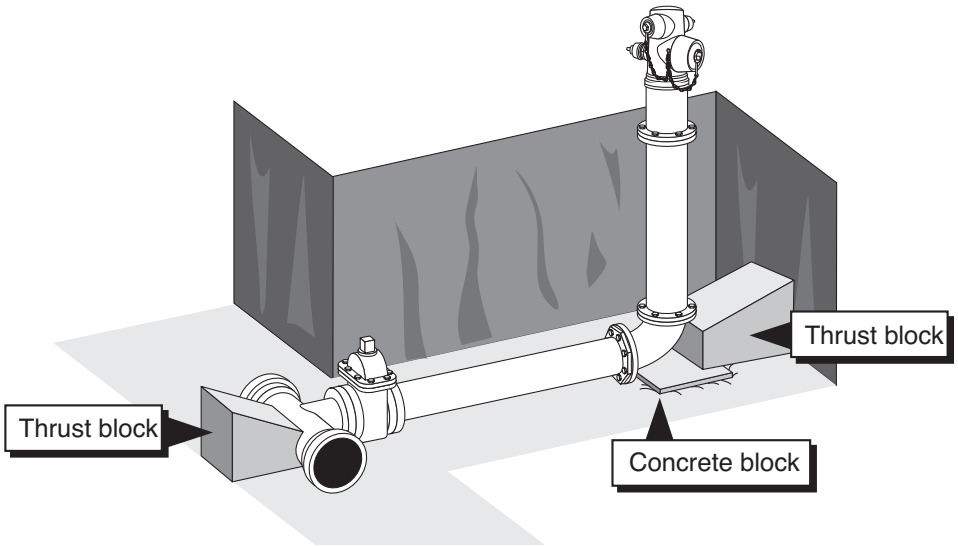
[3] **Wet Barrel Hydrant** - A hydrant designed with the operating mechanism above the ground. The hydrant sections are charged with water at all times.
[4] **Dry Barrel Hydrant** - A hydrant designed with the operating mechanism located below the ground and with a drain valve that allows the barrel section to drain automatically.
[5] **Flush Hydrant** - A hydrant designed so that the outlet connections are below the ground line.
[6] **Post Hydrant** - A wet or dry barrel hydrant that is designed to extend above the ground. The outlet connections are commonly 24 inches above the ground line.
[7] **Main Valve** - A part made of rubber, leather or similar resilient material that is forced against a seat to form a watertight seal when the hydrant is closed.
[8] **Drain Valve** - A valve located at or adjacent to the valve seat ring, which opens automatically when the main valve is closed and allows water to drain from the barrel to the ground.
[9] **High Pressure Hydrant** - A hydrant designed to operate at pressures above 150 psi.

Wet Barrel Hydrant Description

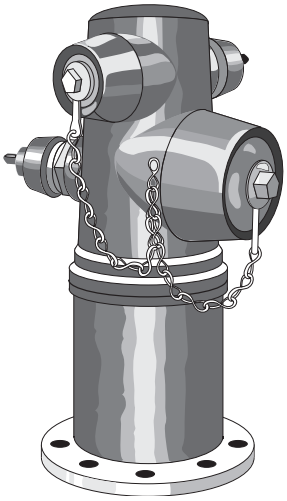
Connection to the Main

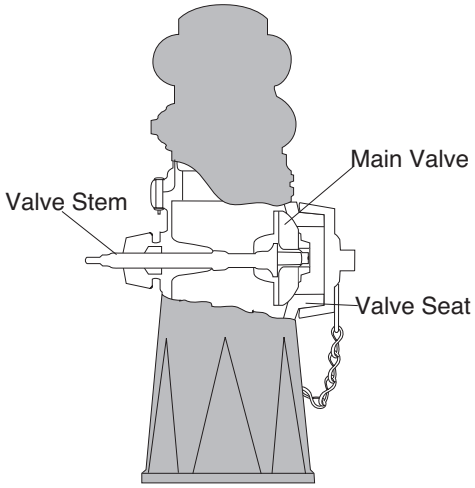
The wet barrel hydrant is connected to the distribution system main through a tee placed in the line. The line leading from the main to the hydrant is called the **lateral line**[10] and is normally 6 inches or larger. A valve is commonly located in the lateral between the hydrant and the main. This valve allows the operator to shut off the water during repair of the hydrant.



Outlet Connections

The valves used to control the hydrant flow are located in the top portion of the hydrant. The hydrant can be equipped with either two **hose outlet nozzles**[11], which are commonly 2 1/2 inches, or two hose outlet nozzles and one **pumper outlet nozzle**[12]. The pumper outlet nozzle is normally 4 inches or larger.





[10] **Lateral Line** - The line leading between the main and the hydrant. Also called a lead, branch, or auxiliary line.
[11] **Hose Outlet Nozzle** - An outlet nozzle having an opening smaller than 3 1/2 inches in diameter and suitable for attachment of 2 1/2-inch or 3-inch fire hose.
[12] **Pumper Outlet Nozzle** - An outlet nozzle having an opening at least 3 1/2 inches in diameter and suitable for attachment of 3 1/2-inch or larger fire hose.

Advantage of Wet Barrel

The primary advantage to the wet barrel hydrant is the ease at which a fire company can connect a second hose to the hydrant when the hydrant is in use. This is because each outlet nozzle is independently valved.

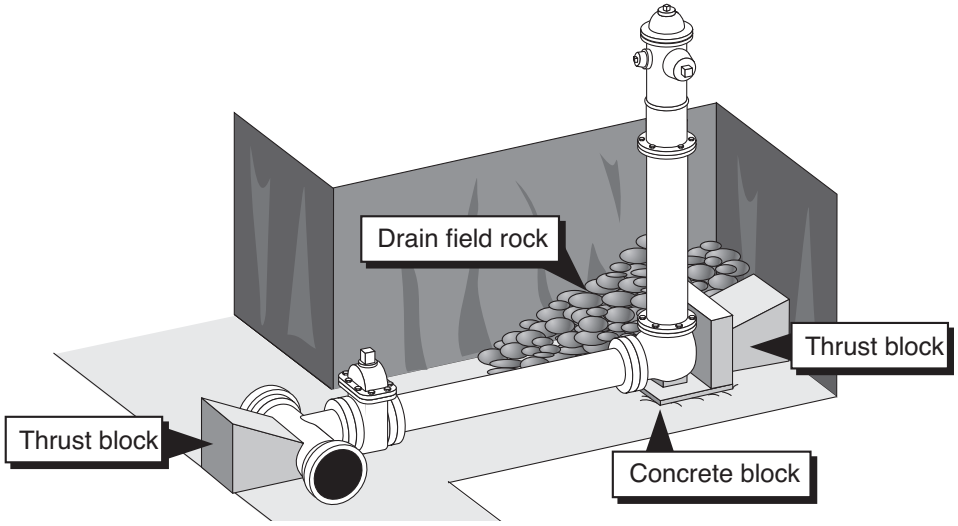
Disadvantage Wet Barrel

The major disadvantage is the obvious freezing problem and the fact that when these hydrants are knocked over by a vehicle, they leak water. This is the type of hydrant that is depicted in the movies, showing water squirting into the air after being struck by an automobile.

Dry Barrel Hydrant Description

Connection to Main

The dry barrel hydrant is connected to the distribution system main through a tee in the main line. The line leading from the tee to the hydrant is called the lateral line and is normally 6 inches in diameter or larger. A valve is commonly placed in the lateral line. This valve allows the operator to shut off the water to the hydrant during hydrant repair. The valve is commonly placed as close as possible to the main line. This gives the greatest protection should a leak or break occur in the lateral.



General Operation

There are three major styles of dry barrel hydrants, and in each case, the operating valve, called the main valve, is located in the bottom section of the hydrant close to the inlet from the lateral. The main valve may operate either horizontally or vertically, depending on the style of hydrant. A drain valve is located so that when the main valve is closed, the drain valve will open and drain the interior portion of the hydrant. The drain valve is closed during normal flow from the hydrant. This drain valve is automatically opened and closed when the hydrant is opened and closed.

Advantage - Dry Barrel

The major advantage that dry barrel hydrants have over wet barrel hydrants is the reduction in the potential for

freezing during cold weather. Their other advantage is that they can be manufactured so that when hit by traffic they break at a designed point, reducing repair cost and when broken. Typically there is no loss of water from a dry barrel hydrant broken by vehicle.

Disadvantage - Dry Barrel

The major disadvantage to dry barrel hydrants, is the difficulty of connecting a second fire hose to the hydrant once it has been opened. The hydrant must either be shut off to make this connection or a manually installed valve must be placed on the second discharge nozzle during the connection of the first hose.

Common Types of Dry Barrel Hydrants

Three Types

There are three common types of dry barrel hydrants: the **compression hydrant**[13], the **toggle hydrant**[14], and the **slide gate hydrant**[15]. In each case, the main valve, is located in the bottom section of the hydrant close to the inlet from the lateral.

Compression Hydrants

The most common hydrant used in the United States is the compression hydrant. Some of the common brands of this hydrant include (American Darling, Waterous, Clow, Dresser, Kennedy, Mueller, M & H, Terminal City, U. S. Pipe, and Crane of Canada. The compression hydrant is designed with the main valve mounted horizontally on a vertical operating stem. The main valve opens by moving vertically away from the main valve seat (which is commonly made of brass). With the exception of the Eddy hydrant, manufactured by the Clow Valve Co., the main valve opens by being forced down against the pressure. The Eddy opens by moving the main valve upward with the flow.

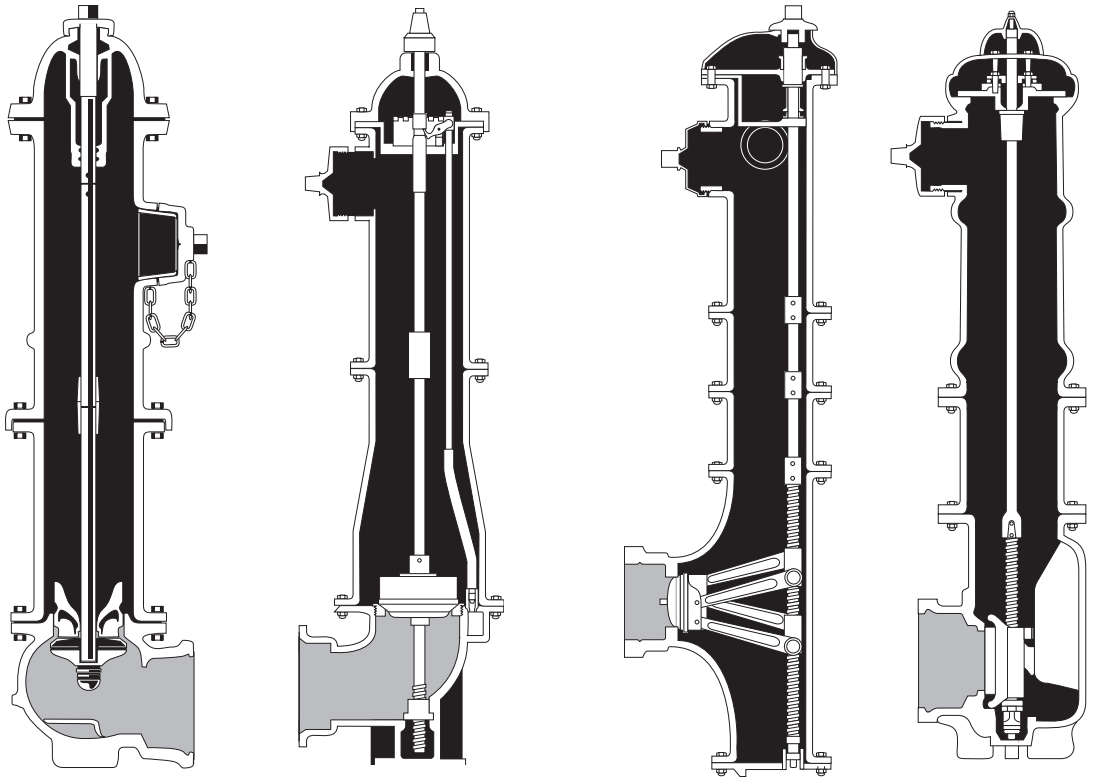
The operating stem on compression hydrants is located in the center of the hydrant and is rotated to open and close the hydrant. With the exception of the Eddy hydrant, the **operating nut**[16] that is rotated does not move up or down during opening and closing of the hydrant.

Toggle Hydrants

The second type of dry barrel hydrant is the toggle hydrant (also referred to as the Corey hydrant). While this type of hydrant is no longer manufactured, some of the brands of this hydrant are Pacific States, Clow, Iowa, Core,y and Rensselaer. With the toggle hydrant, the main valve is mounted vertically and is moved horizontally back and forth against a brass seat to open

[13] **Compression Hydrant** - A dry barrel hydrant with the main valve mounted horizontally on a vertical shaft. The main valve is moved vertically to open and close the hydrant.
[14] **Toggle Hydrant** - A dry barrel hydrant with the main valve mounted vertically on a horizontal toggle device. The device is moved by rotating a vertical shaft. The valve is moved horizontally to open and close the hydrant.
[15] **Slide Gate Hydrant** - A dry barrel hydrant with a vertically mounted valve that is shaped very much like a gate on a gate valve. The valve is moved vertically up and down a threaded shaft to open and close the hydrant.
[16] **Operating Nut** - A part that is internally threaded and engages with threads on the stem so that when it is rotated, the stem is raised, lowered or otherwise moved to open and close the main valve.

and close the hydrant. The main valve is connected to a vertical shaft by two or more arms. When the main shaft is rotated, one set of arms is moved up the shaft while the other is moved down the shaft. This movement causes the main valve to move away from the valve seat. The valve stem is normally offset from the center of the hydrant. The drain valve is placed on the very bottom of the hydrant.



Compression Hydrants

Opens against flow

Opens with flow

Toggle Hydrant

Slide Gate Hydrant

Slide Gate Hydrant

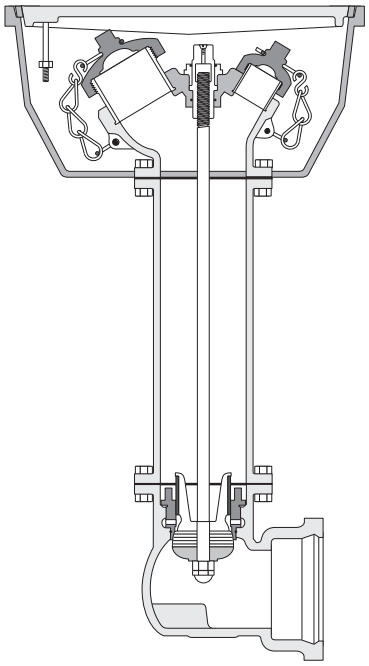
The third style of dry barrel hydrant is the slide gate hydrant. The two existing manufacturers of these hydrants are Ludlow and Terminal City. The slide gate hydrant has a valve very similar to the gate in a single disk gate valve, mounted vertically on a vertical shaft. When the shaft is rotated, the valve makes a slight horizontal movement away from the brass valve seat and is then moved vertically upward. The operating shaft is commonly in the center of the hydrant and the drain valve is placed in the very bottom of the hydrant.

Special Types of Dry Barrel Hydrants

As mentioned previously, dry barrel hydrants are also manufactured as flush hydrants and high pressure hydrants. Besides these two styles, there are also **frost jacket hydrants**[17]**, traffic model hydrants**[18], special Arctic hydrants, and wet and **dry top hydrants**[19]. What follows is a brief description of each of these styles of hydrants.

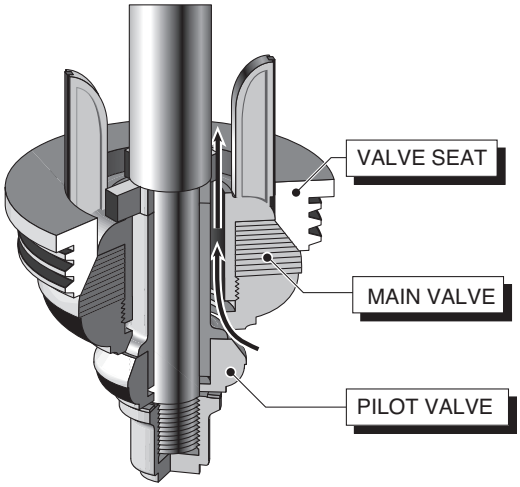
Flush hydrants

Flush hydrants are those hydrants that are designed with the entire operating unit placed underground and covered with a lid at ground level. The flush hydrant is not very common in the United States. It is used on bridges and in airports or other situations were it would be dangerous for the hydrant to extend above the ground. The lower section of a flush hydrant is identical to the lower section of a post hydrant.



High Pressure Hydrants

High pressure hydrants are hydrants manufactured to be operated at pressures above 150 psi. Most dry barrel high pressure hydrants look the same as standard pressure hydrants. The difference is in the strength of the materials



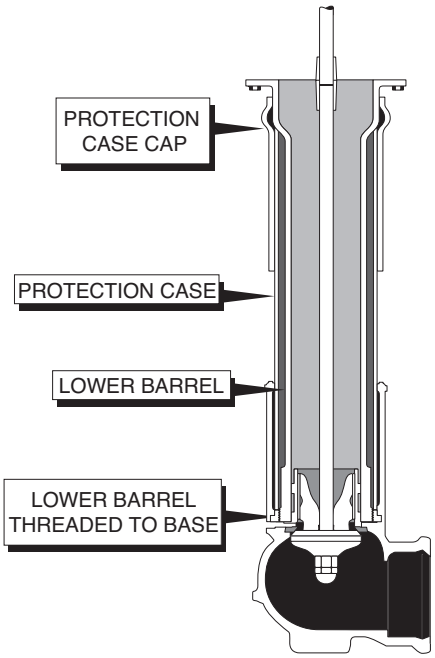
[17] **Frost Jacket Hydrant** - A hydrant designed with a protective sheet extending from the base to the ground line.
[18] **Traffic Model Hydrant** - A hydrant designed and constructed so that if it is struck by a vehicle, certain easily replaceable components will break and allow the upper portion above ground line to become detached from the lower portion below the ground line.
[19] **Dry Top Hydrant** - A compression-type hydrant in which the operating mechanism at the top of the hydrant is sealed from the barrel so that water does not contact the mechanism during hydrant use.

and the operating mechanism which is designed so that the hydrant can be more easily opened under these high pressures. One such design uses a special pilot valve in the center of the main valve. At the present time, only U. S. Pipe manufacturers such a valve. The pilot valve opens first, allowing water into the upper section of the hydrant and equalizing the pressure above and below the main valve. After a few more turns of the operating stem, the main valve begins to open.

Upon closing, the main valve closes first and then the pilot valve. This closing sequence reduces the possibility of water hammer during shutdown.

Frost Jacket Hydrants

The frost jacket hydrant is no longer being manufactured in the U.S. However, there are thousands of them in existence in systems throughout the country. They are a post-type hydrant designed with a metal tube attached to the **base**[20] of the hydrant and extending above the ground line. The barrel of the hydrant, including the main valve, was inserted inside of this tube and threaded into the base. The air space between the tube and the barrel of the hydrant serves to give some protection from freezing. The major disadvantage to this type of hydrant is strictly in the area of maintenance. In order to work on the main valve, the entire assembly from the base up has to be unthreaded and withdrawn from the tube.

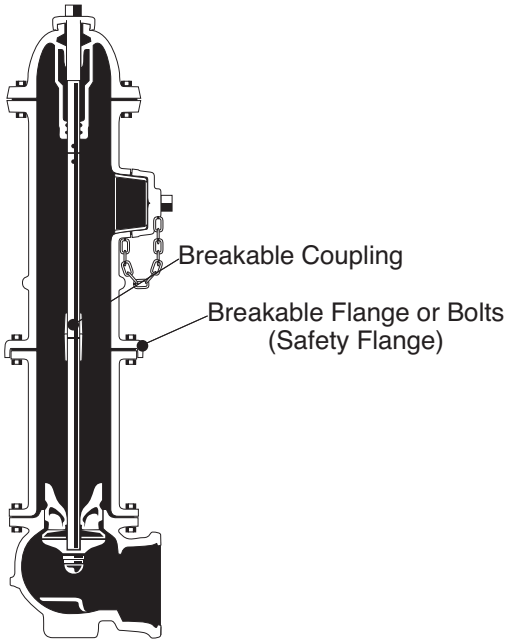


Traffic Model Hydrants

Traffic model hydrants are unique to the dry barrel hydrants. They are designed so that if they are struck by a vehicle they will break at a predesignated point with very little damage to the hydrant. The breaking point of the barrel is normally just above the ground line. The breakable component may be a flange or breakable bolts or some combination. There is also a

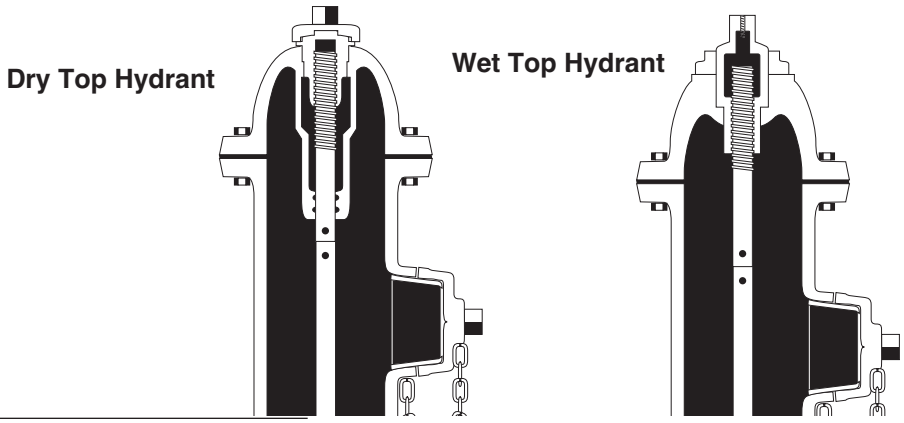
[20] **Base** - A part that provides a lateral connection to the water distribution system and directs the flow vertically upward.

breakable point on the stem coupling. All of the breakable components are easily replaced and typically are low in cost, making it relatively easy to put the hydrant back in service in an hour or less.



Wet Top and Dry Top Hydrants

The operating nut on most dry barrel hydrants is usually hollow and threads over the operating stem. The nut rotates and the stem is moved up and down inside of the nut. When a hydrant is designed so that water within the hydrant, when it is flowing, can reach these threads, the hydrant is referred to as a **wet top hydrant**[21]. When the threads are protected from the flow of water, the hydrant is called a dry top hydrant. The dry top hydrant requires a packing plate and some type of packing or "O" ring around the shaft. While this requires added maintenance, it reduces the maintenance problems associated with the operating stem threads being exposed to water each time the hydrant is used.

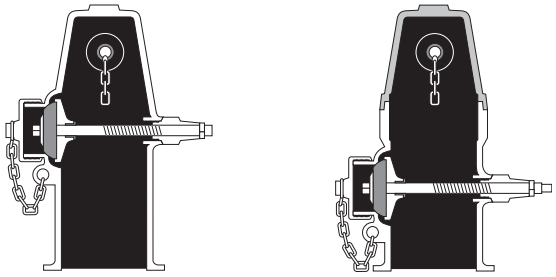


[21] **Wet Top Hydrant** - A compression-type hydrant in which the operating mechanism at the top of the hydrant is not sealed from the hydrant barrel.

Nomenclature for Wet Barrel Hydrants

Two types of Wet Barrel Hydrants

There are two types of wet barrel fire hydrants: one-piece and two-piece. These terms reference the portion of the hydrant that extends above the ground.

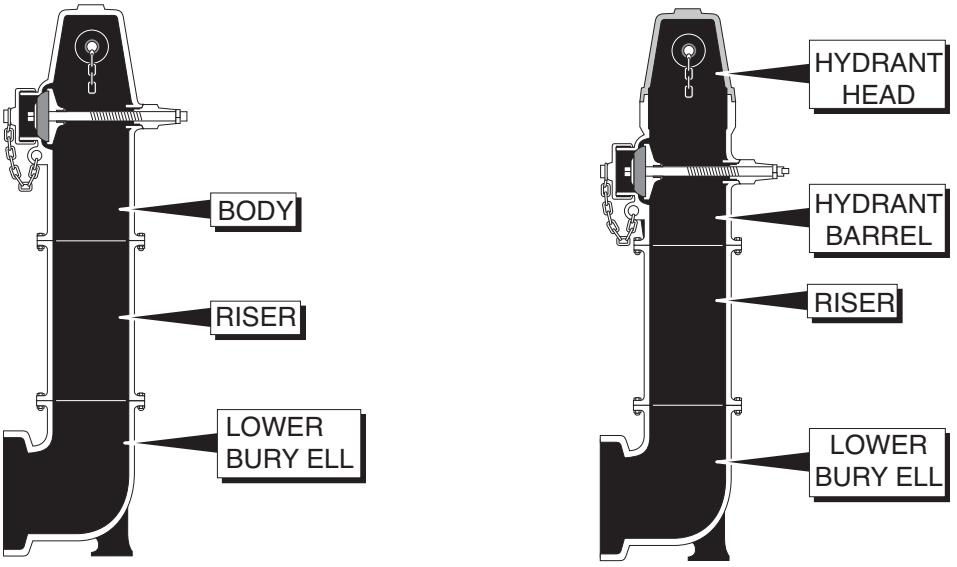


One Piece Two Piece

Wet Barrel Hydrant Components

Examining the hydrant from the top down, the major components of a wet barrel hydrant are identified as follows:

The **top section**[22] of a one-piece hydrant is called the body. The top section of a two-piece hydrant is divided into two components: the **hydrant head**[23], located at the top of the hydrant, and the **hydrant barrel**[24].

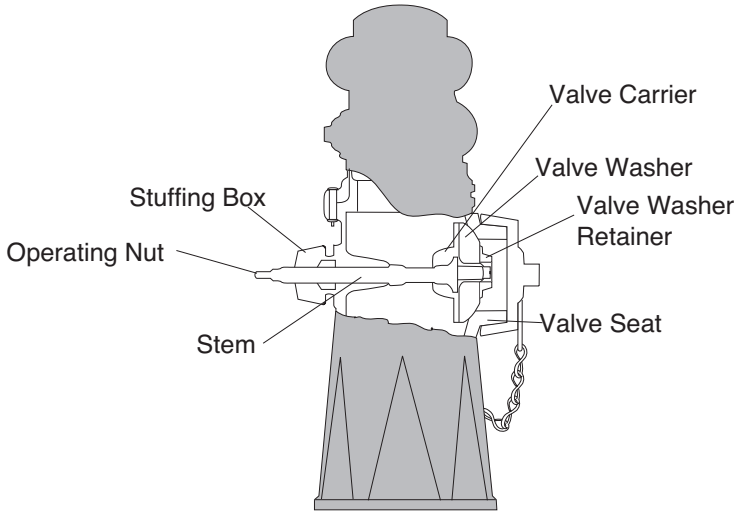


ONE PIECE HYDRANT TWO PIECE HYDRANT

[22] **Top Section** - The above ground portion of the hydrant.
[23] **Hydrant Head** - The upper portion of the top section of a two-piece hydrant. This portion contains outlet valves.
[24] **Hydrant Barrel** - The lower portion of the top section of a two-piece hydrant. This portion may contain outlet valves.

The main valves are located in the top section of the hydrant. With the two-piece hydrants the valves may all be located in the hydrant head or divided between the head and the barrel sections.

The main valves are composed of a stem and the operating nut used to open and close the valve. The valve face, made of a resilient material, is called a **washer**[25]. Support is given to the washer by a metal disk called the valve **carrier**[26]. The valve closes against a brass seat which is a machined face on the back side of the hydrant nozzles.



The lower section of the hydrant is called the **bury section**[27]. The bottom of the bury section is the **lower bury ell**[28]. This is a flange, M.J., or hub fitting used to connect the hydrant to the lateral line.

With some hydrants the bury section is composed of two pieces, the lower bury ell and a **riser**[29]. The riser is typically a flange by flange section used to adjust the height of the hydrant.

Some utilities prefer to purchase only the top section of the hydrant, and use a M.J. x M.J., a flange by flange, or M.J. by flange ductile cast iron ell and a ductile cast iron riser made on-site.

[25] **Washer** - A part made of resilient material that is forced against the valve seat to form a watertight seal when the valve is closed.
[26] **Carrier** - A part mounted onto the stem that supports the valve washer from the pressure side.
[27] **Bury Section** - The below-ground section of the hydrant. May be constructed of one or two pieces.
[28] **Lower Bury Ell** - A part that connects the top section or riser of a wet-barrel hydrant to the hydrant lead.
[29] **Riser** - A section of pipe used to vertically extend the lower bury ell.

Nomenclature for Dry Barrel Hydrants

Reference to AWWA

Each manufacturer of fire hydrants incorporates some unique features not available on other hydrants. These features and related components must be named. It is because of the uniqueness of each brand of hydrant that there are so many names for some of the common components. In order to bring some order to this situation, the AWWA Fire Hydrant Standards Committee, in its 1988 publishing of the M-17 manual, offered a listing of "preferred terms" for the most common hydrant components. The descriptions offered here are consistent with those found in M-17. The descriptions that follow trace the water flow through the hydrant from the main to the top of the hydrant.

Auxiliary Valve

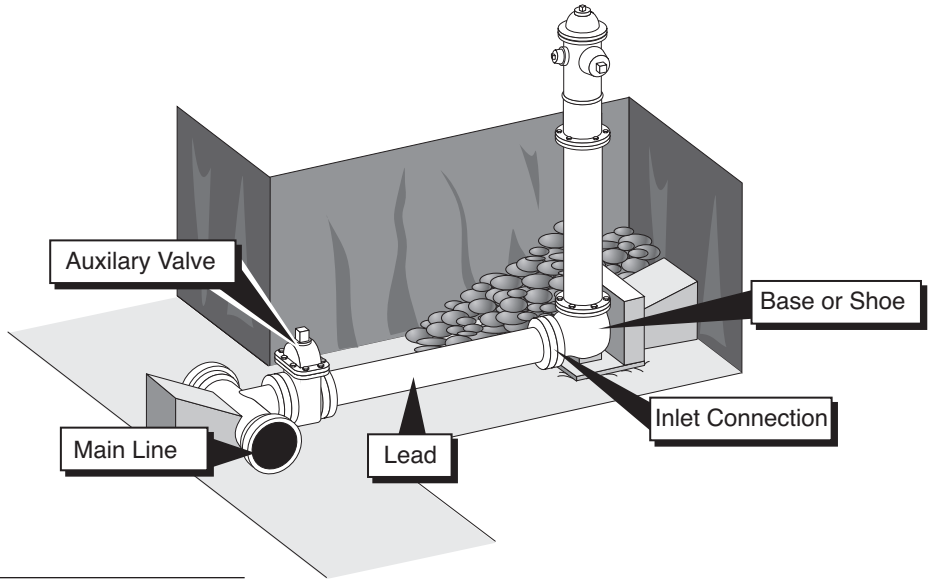
The **auxiliary valve**[30] is the valve placed in the lateral. This valve is normally a non-rising stem gate valve. The valve's primary function is to allow the operator to shutdown the hydrant for repair without any portion of the main being shutdown. It is common practice to place this valve as close to the main line as possible. By doing so, the valve can be used to shutdown the lateral should it be broken or develop a leak.

Lateral Line

The line leading from the main to the hydrant is referred to as the lateral line. It has also been referred to as the hydrant **lead**[31], auxiliary line, and hydrant branch. This line is typically 6 inches and is made of the same material as the main line.

Base

The lateral connects to the hydrant at the hydrant base. The base houses the **inlet connection**[32] and

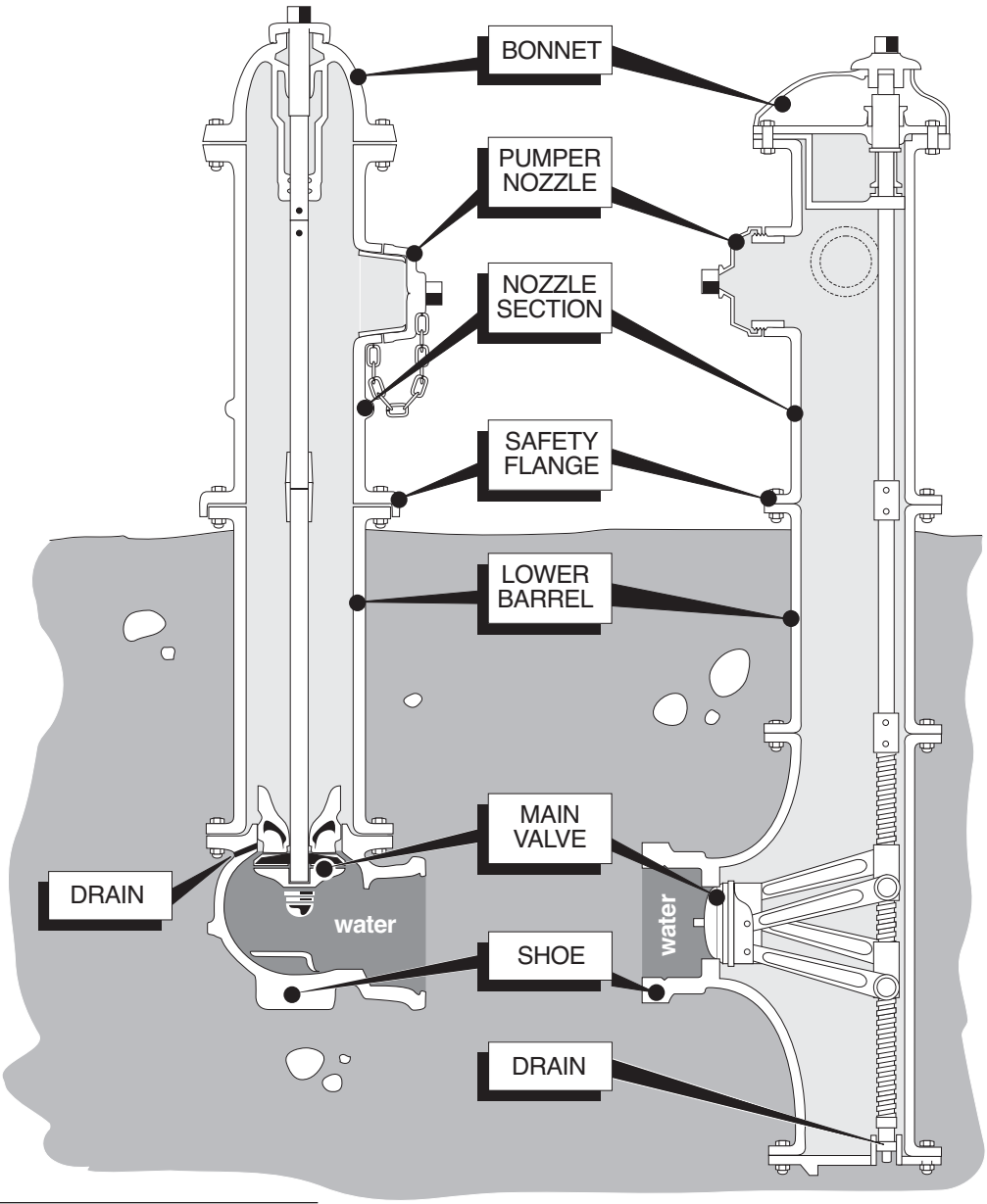


[30] **Auxiliary valve** - The valve placed in the line leading between the hydrant and the main; the lateral line.
[31] **Lead Line** - The line leading between the main and the hydrant. Also called the lateral, branch or auxiliary line.
[32] **Inlet Connection** - The connection to the lateral line; usually a 6-inch MJ, rubber ring push on, or flange connection.

the main valve *seat* which is threaded into or otherwise secured to the base. The inlet connection is commonly 6 inches and may be a Mechanical Joint, rubber ring push on for PVC, cast iron or AC, or it may be a flanged joint.

Main Valve & Seat

The main valve is commonly some resilient material such as neoprene or leather. A common replacement material for main valves is polyurethane. The size of a hydrant is judged by the inside diameter of the main valve seat. This size is referred to as the MVO, **main valve opening**[33], and normally ranges from 4¼ inches to 6 ½ inches. The size of the inlet connection does not dictate the MVO size. For instance a 6-inch



[33] **Main Valve Opening** - The inside diameter of the main valve seat.

inlet connection may be purchased with MVO sizes ranging from 4¼ inches to 6½ inches. The main valve sits against a brass seat called the main valve seat.

Drain Valve

The drain valve is also located in the base. On compression hydrants, it is located just above and along side of the main valve. The drain valve is connected through a channel to one or more holes in the side of the base. The drain valve on most compression hydrants consists of one or more flat pieces of rubber-like material or leather that are slid over an opening to close the drain. With toggle and slide gate hydrants, the drain valve is in the bottom of the hydrant. The valve consists of a leather or rubber-like material that is operated against a brass valve seat. (Drain valves are not allowed on hydrants sold or installed in the state of Maine.)

Lower Barrel

The **lower barrel**[34] is the section of the hydrant that extends from the base to the ground line. This is usually made of cast iron or ductile cast iron.

Safety Flange

Most traffic model hydrants are designed to break on impact at a point between the lower barrel and the nozzle section. This breaking device may be a flange or special bolts. A breakable coupling is placed on the shaft that connects the main valve with the operating nut. This coupling, like the safety flange, is designed to break when the hydrant is struck, without damage to the hydrant.

Nozzle Section

The section that extends above the ground may be one or two components. When it is one component, it is referred to as the **nozzle section**[35] because it houses the outlet nozzles. When this section is a two-piece section, the top section is referred to as the nozzle section and the section between the lower barrel and the nozzle section is called the **upper barrel**[36].

Outlet Nozzles

There are two types of outlet nozzles. The most common outlet nozzles are the hose nozzle outlets. These nozzles are designed to connect fire hoses up to 3 inches in diameter. The most common hose outlet nozzles are 2½ inches with National Standard Threads. However, many specific fire departments have requirements for special threads that are only used in that fire jurisdiction. Most hydrants are manufactured with two 2½-inch hose nozzle outlets. The other common outlet nozzle is the pumper nozzle outlet. The pumper nozzle is 3½ inches or larger. Most hydrants with a pumper nozzle have only one pumper

[34] **Lower Barrel** - A part that extends from the base to the ground line, enclosing the operating mechanism, and conducts water from the base to the upper portion of the hydrant.
[35] **Nozzle Section** - A part that extends upward from the barrel and contains the outlet nozzles. It may be integral with the upper barrel.
[36] **Upper Barrel** - The part that extends from the lower barrel to the nozzle section, enclosing the operating mechanism. It may be integral with the nozzle section.

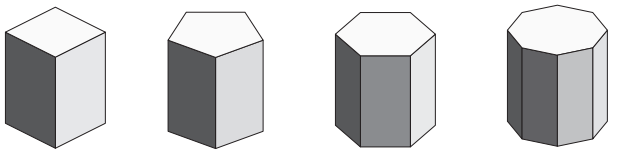
nozzle and two hose nozzles. In summary, then, there are two common hose nozzle combinations: two 2½-inch hose nozzles or two 2½-inch hose nozzles and one pumper nozzle.

Bonnet & Packing Plate

The **bonnet**[37] sits on top of the nozzle section and houses the operating nut and, if present, the packing plate.

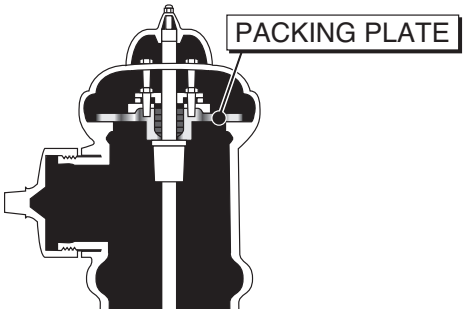
Operating Nut

Operating nuts come in a variety of sizes and shapes. The common shapes are pentagon, square and octagon. The hydrant wrench connection on the outlet nozzle is the same size and shape as the operating nut on the hydrant. From an operations standpoint, it would be desirable to standardize the size and shape of all operating nuts on all the hydrants in the system. These nuts can be changed with relative ease so that if they are not standard they can be changed to a single size and shape with relatively little cost.



Packing and O-rings

The packing plate is only found on dry top hydrants. The packing plate forms a physical barrier between the nozzle section and the bonnet. It protects the threads on the operating stem and operating nut from the water in the nozzle section. The operating stem passes through the packing plate. To prevent water from traveling upward around the operating stem, packing or "O" rings are placed around the stem.



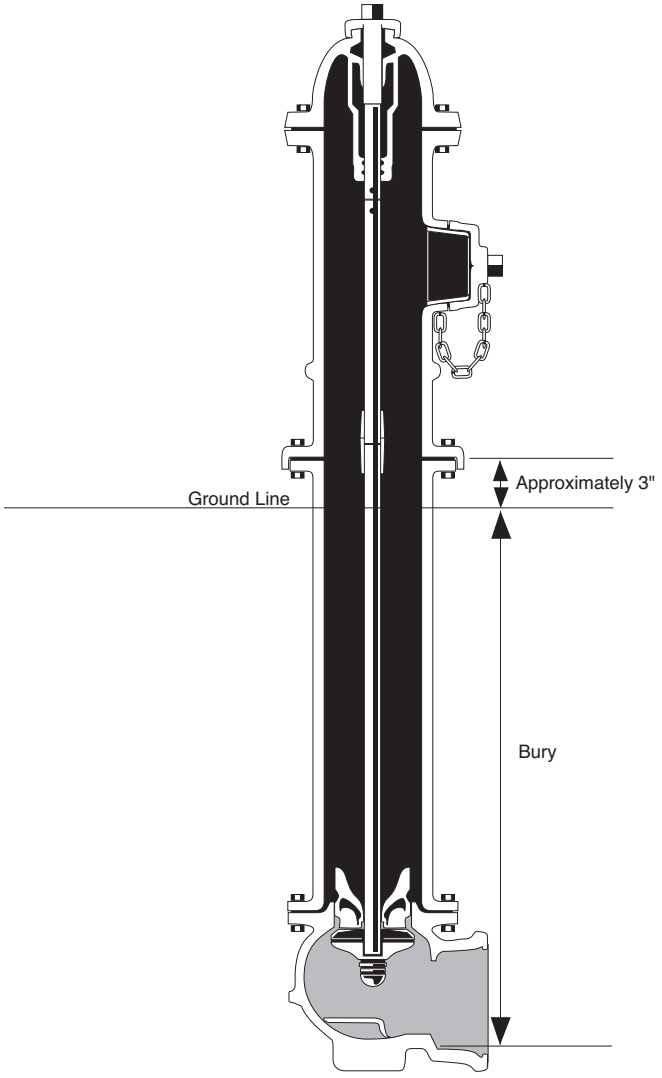
Until very recently, the packing material used in fire hydrants was made from a combination of long fibrous asbestos and graphite. Due to the health hazards in the manufacture of asbestos-based packing, it is no longer available. Fire hydrant manufacturers recommend that existing packing be replaced with

[37] **Bonnet** - A part that attaches to the top of the nozzle section and encloses the support portions of the operating mechanism. It may be integral with the nozzle section.

non-asbestos material. Check with the manufacturer for a recommendation of type of packing material. We recommend Teflon based packing. Jute, flax, and cotton based packing should be replaced every three to five years. Teflon packing should have a life expectancy of 10 years or more. The packing is held in place and the leakage controlled with a packing gland. This gland is drawn down against the packing with two bolts.

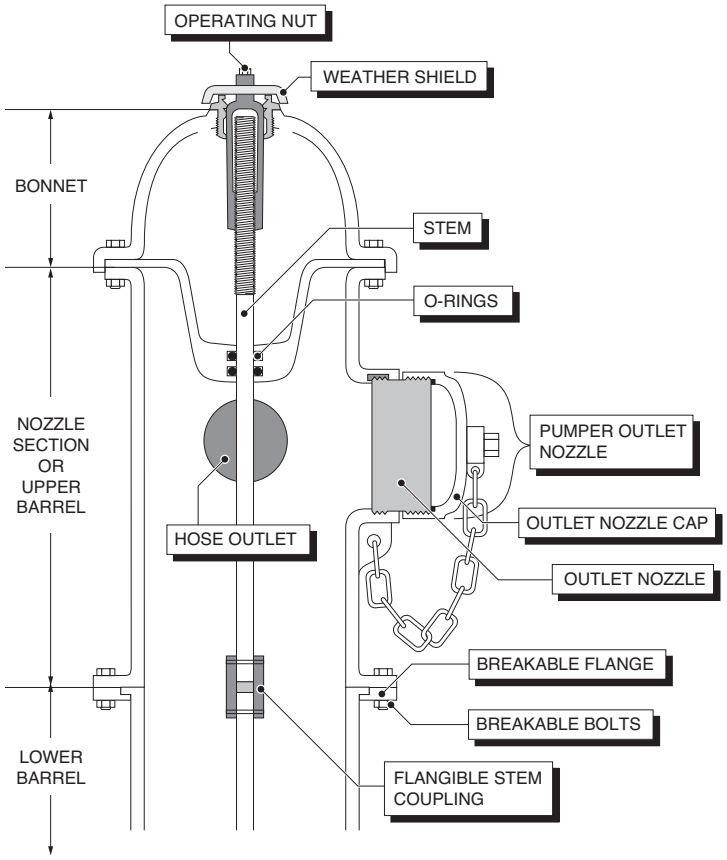
Bury

The **bury**[38] is not a hydrant component, but a description. Bury is the distance from the bottom of the trench to some predetermined point on the lower barrel of the hydrant. The point is usually 2 to 3 inches below the flange that connects the lower barrel to the nozzle section.

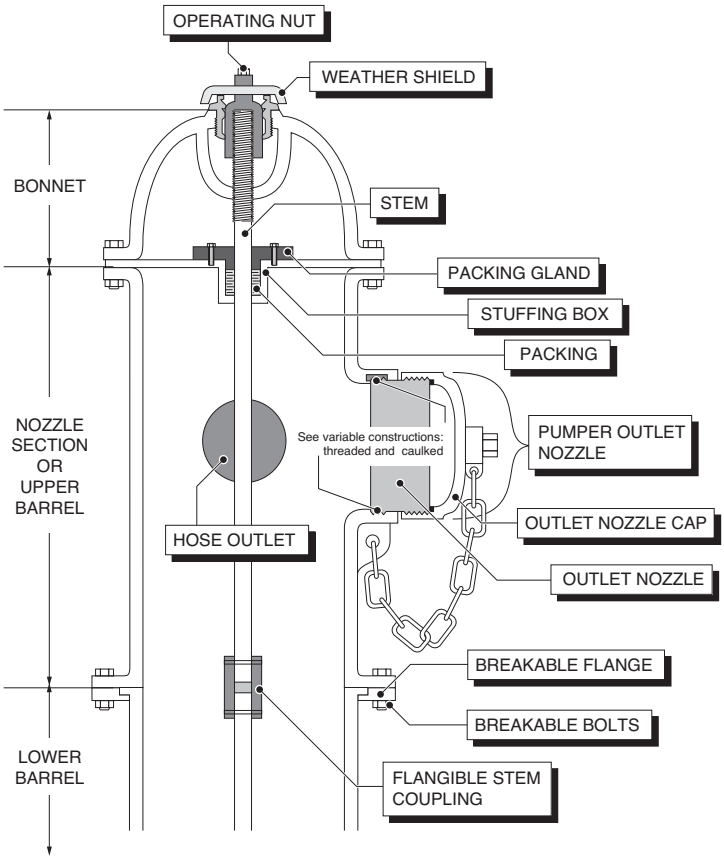


[38] **Bury** - The nominal vertical distance between the ground line and the bottom of the pipe connected to the hydrant inlet, measured to the nearest six-inch increment.

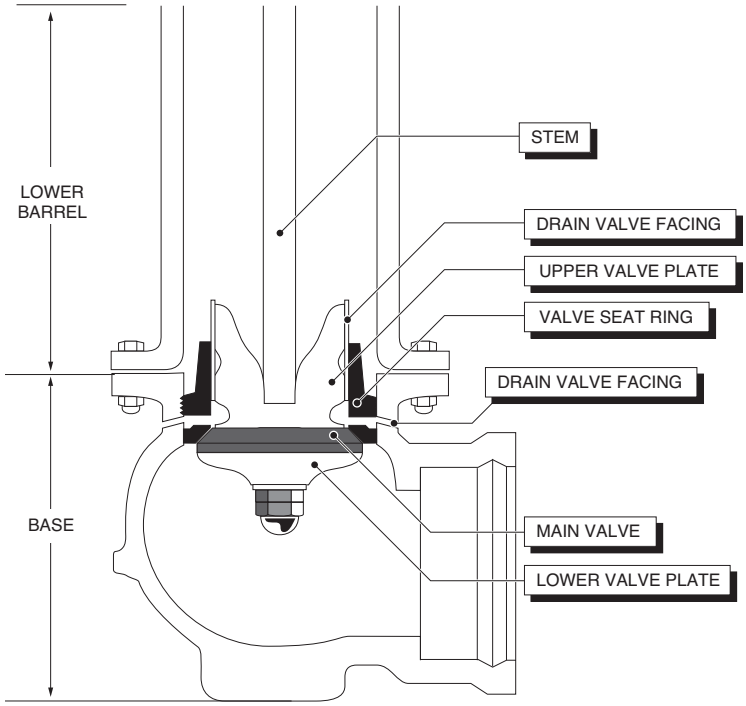
Dry Barrel hydrant with "O"ring stuffing box.



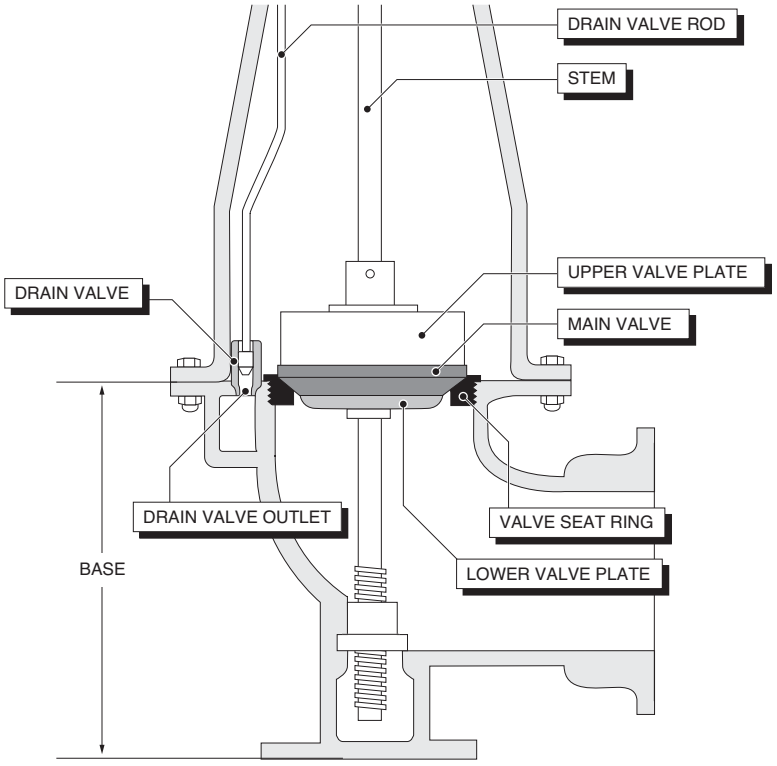
Dry Barrel hydrant with packing stuffing box.



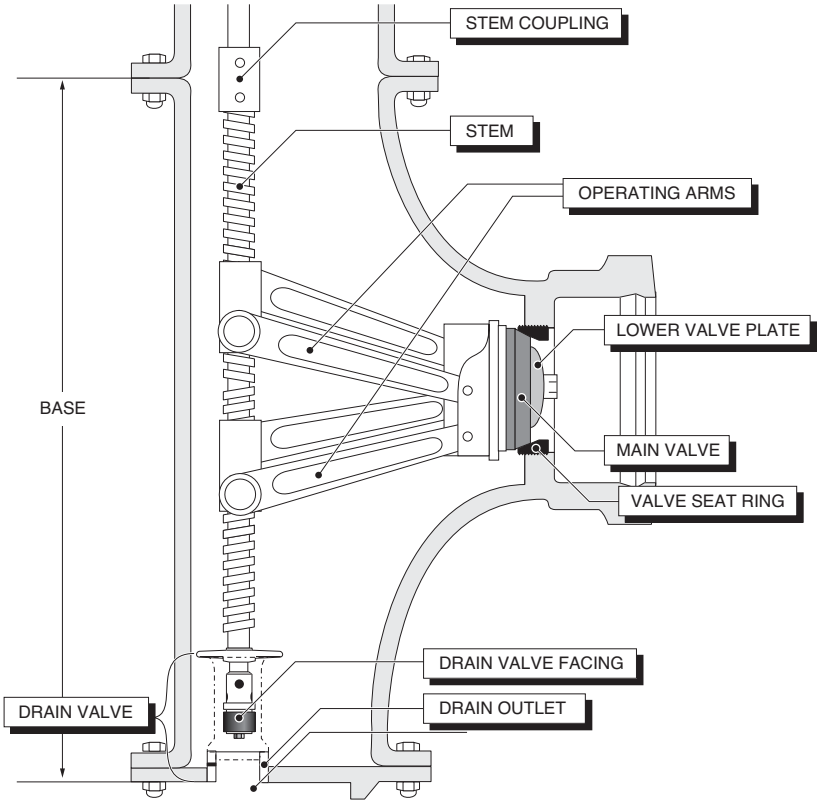
Compression Hydrant Opens against Flow



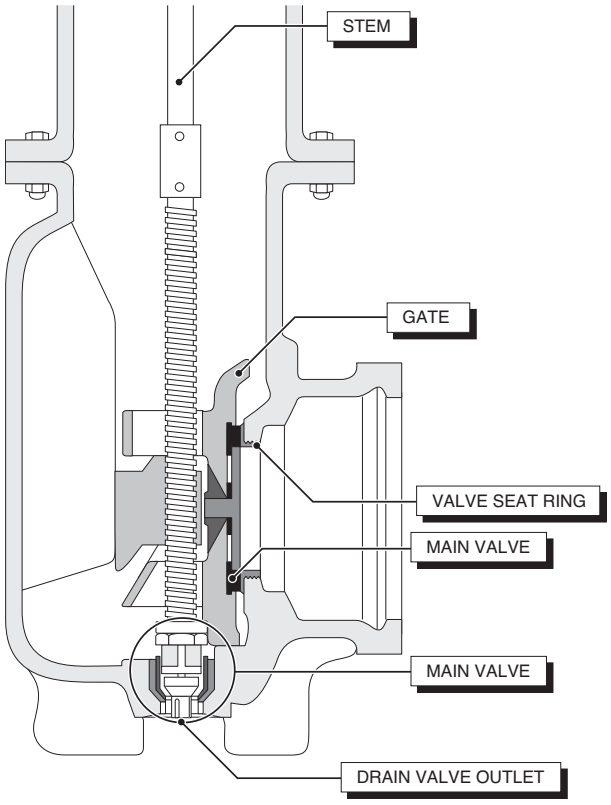
Compression Hydrant Opens with Flow



Toggle Hydrant



Slide Gate Hydrant



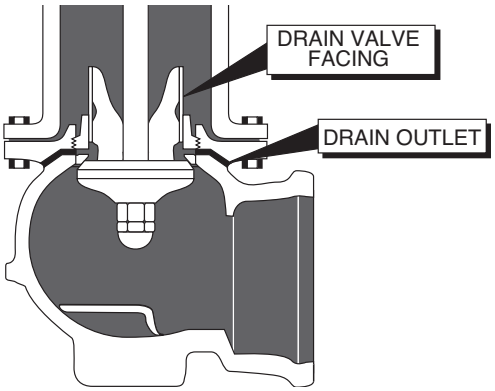
Operation of Dry Barrel Hydrants

Compression & Toggle

The main differences between the operation of the compression and toggle hydrants are the direction that the main valve moves and the design of the drain valve. The operation of the main valve is fairly obvious, what is not so obvious is the operation of the drain valve.

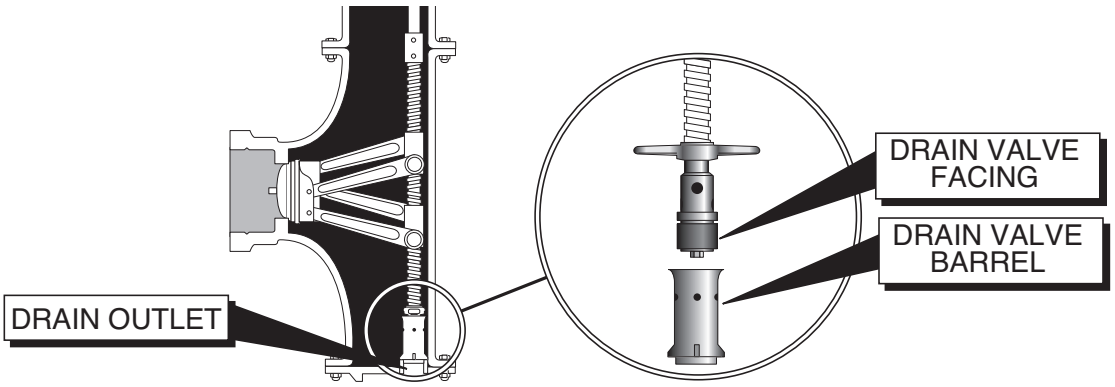
Drain Valve Compression

Most compression hydrants open against the flow. The drain valve on this type of hydrant is composed of one or two leather or neoprene plates. These plates are attached to the upper valve plate. In order to close the drain valve, the plates slide across an opening in the main valve seat when the main valve is opened.



Drain Valve Toggle

The toggle hydrant forces a neoprene-like material against a valve seat in the bottom of the hydrant.

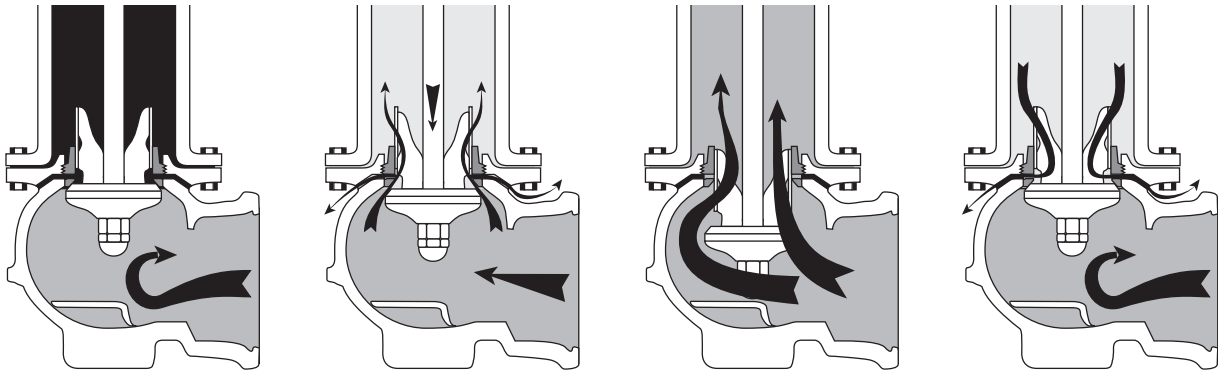


Operation Sequence - Opening

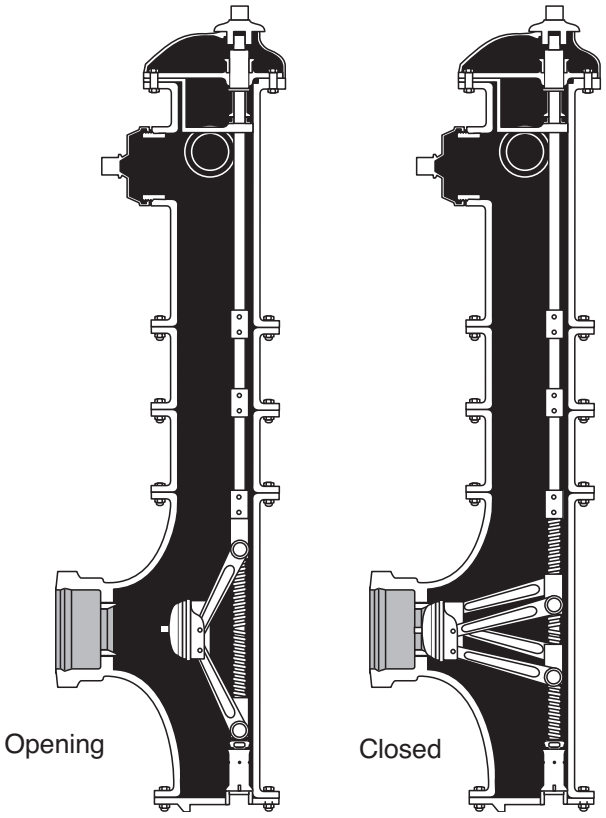
When a dry barrel hydrant is in a closed position, the main valve is closed and the drain valve is completely open. The drain valve will remain open during the first 1 to 5 turns of the stem. As the main valve is opened, the drain valve begins to close. This will allow a positive pressure to develop in the hydrant prior to the closing of the drain valve, thus helping to clear the drain valve opening. After about 1 to 5 turns, the drain valve is completely closed and all flow is directed out through the outlet nozzles.

Operating Sequence - Closing

During closing of the hydrant, the drain valve remains closed until the main valve is within 1 to 5 turns of being closed. At this time the drain valve will begin to open, allowing water under pressure to once again clear the drain holes. As the main valve reaches full closure, the drain valve returns to a full open position. All remaining water in the barrel of the hydrant will drain through the drain valves. This assumes that the drain valve is not below the water table, plugged, or frozen.



Compression Hydrant Operating Sequence



Toggle Hydrant Operating Sequence

Proper Opening and Closing Procedure: Dry Barrel

Do Not Trap Air

With all dry barrel hydrants, it is important that the hydrant be opened slowly. The air that is in the barrel should be allowed to exit the barrel before the hydrant is fully opened. It is a good practice to open the hydrant only enough to start a flow of water but not enough to close the drain valve. This allows the air to exit slowly and the drain valve to be cleared. Should you open the hydrant too quickly, you could produce water hammer.

Do Not Throttle

After all the air has exited, the hydrant should be fully opened. At no time should a hydrant be left in a partially open condition. In this condition, water may exit the drain valve and erode the base under the hydrant causing failure of the hydrant or lateral.

The Last 5 to 8 Turns

Closing is similar to the opening process. The hydrant may be closed rather quickly down to the last 5 to 8 turns. Slowly moving through these last few turns is critical in order to prevent water hammer. Considerable damage to main lines, service connections, and household water heaters can be attributed to water hammer created by closing hydrants too rapidly. *All hydrants can be closed with sufficient speed to cause water hammer. However, the center stem hydrants that close with the pressure can cause considerably more damage.*

Check Drain Valve

After the hydrant is closed, wait until the barrel has drained before replacing the nozzle caps. If the nozzle caps are replaced prematurely, they may prevent the hydrant from draining and allow water to stand in the barrel.

Should be Easy to Operate

It should not take excessive pressure to close the hydrant. If it does, then there is probably some damage to the main valve, stem, or operating nut, and the hydrant should be scheduled for repair.

Back-off 1/4 Turn

After the hydrant is closed, back off on the opening nut about 1/4 turn. This removes the pressure from the operating nut and stem. The main valve will remain closed. This also allows the next person who opens the hydrant to determine quickly if they are turning the operating nut in the wrong direction. If they are, it will move easily for 1/4 turn, then stop.

.

Operation of Wet Barrel Hydrants

Proper Opening and Closing Procedure: Wet Barrel

Do Not Throttle

The valves of wet barrel hydrants should not be used to throttle the flow. Doing so can damage the valve face.

Open Slowly

It is a good practice to open the hydrant only enough to start a flow of water. Once water is flowing from the hydrant it can be opened fully.

Closing

The hydrant can be closed quickly until you reach the last 6 to 8 turns, then slow the rate of closure to prevent water hammer. Considerable damage to main lines, service connections and household water heaters can be attributed to water hammer created by closing hydrants too rapidly.

Check for Leakage

After the hydrant is closed, check the valves for leakage before installing the hydrant nozzle caps.

Should be Easy to Operate

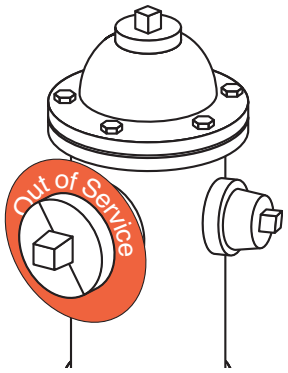
It should not take excessive pressure to close the hydrant. If it does, then there is probably some damage to the main valve, carrier, or valve stem and the hydrant should be scheduled for repair.

Routine Conditions

Inoperable Hydrants

Notify Fire Department

Hydrants that are inoperable should be tagged, the fire department notified, and repairs scheduled ASAP.



Metal Tags

There are two common methods of tagging inoperable fire hydrants. One is the use of a metal tag placed over the outlet nozzle and held in place by the nozzle cap. The tag has “Out of Service” written in bold letters on the front side.

Bags

The second method is the placement of a sack over the hydrant. The sack is tied at the bottom or taped on with duct tape.

Color Coding Fire Hydrants

Purpose

Fire hydrants are color coded to indicate various system conditions including flow, type or size of fire main (for instance wood), type of distribution system (potable, non-potable, or private) and system pressure zone.

Typical Systems

It must be understood that there is no required system or color scheme. However, the NFPA (National Fire Prevention Association) standard number 219 recommends that if hydrants are to be color coded for flow that the following color scheme be used. This color scheme is based on a calculated flow at the hydrant with a calculated system residual of 20 psi and an actual residual adjacent to the hydrant of at least 40 psi. If the actual residual is less than 40 psi, the color code should be based on one-half of the actual observable flow rather than the calculated flow.

The Color Code

Flow	Color
Greater than 1000 gpm	Green
1000 gpm down to 500 gpm	Orange
Less than 500 gpm	Red

Which Portion to Paint

The portion of the hydrant that gets painted varies as much as the color schemes used. Some typical painting patterns include:

1. Painting the entire hydrant to proper color.
2. Paint only the bonnet with the proper color.
3. Paint the nozzle caps.
4. Paint both the nozzle caps and the bonnet.

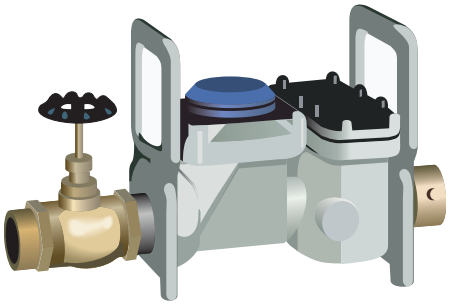
Other Operating Concerns

Control of Use

A great deal of water is lost from a water system through both the misuse of fire hydrants and through the use of hydrants by contractors. To control this loss, utilities have taken at least two positive actions coupled with a good community relations program.

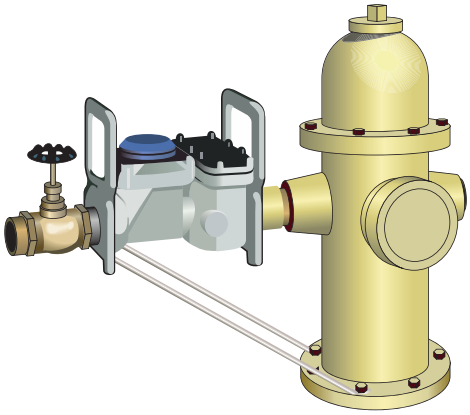
Hydrant Meters & RPZ

When faced with contractors requiring temporary service from fire hydrant, utilities may place a specifically designed hydrant meter on one or more of the hose nozzle outlets. A gate valve is installed on the outlet of the meter and the hydrant turned fully on. Some utilities install a RPZ at the same time. Thus, they reduce the possibility of contamination due to backflow. The



Hydrant Meter - PlantPRO®

contractor is billed on a monthly basis for the actual amount of water used. While this practice does not stop the use of water, it has drastically reduced unaccounted-for water in many areas.



Illegal Use

To retard the illegal use of fire hydrants, several manufacturers have devised unique nozzle caps and operating nut protection devices. The installation of these devices is usually accompanied with a well planned community education program. Some communities have also adopted a program of making available special fine-spray caps that can be installed by specially trained hydrant attendants. These various programs have drastically reduced the loss of water and unauthorized use of fire hydrants.

Lubrication of Fire Hydrants

Lubrication of Nozzle Caps

Gaskets

In order to properly lubricate the nozzle caps, they should be removed and the threads of both the nozzle and the cap cleaned with a wire brush. If the cap gasket is missing, it should be replaced. Some utilities replace the manufacturer's gasket with a polybutylene gasket. This material has an extremely long life. It is not easily damaged and will not rust to the cap or freeze to the cap in cold weather.

Lubrication

The threads should be lubricated with "never sieze" or a light grease. The caps should be placed on hand tight and then taken 1/4 turn with a spanner wrench. In freezing climates, the threads may be coated with propylene glycol to prevent the cap from freezing to the nozzle.

Lubrication of the Operating Nut

Difficulties

Not all hydrants have a means of lubricating the operating nut. *This discussion does not include the stem threads on toggle hydrants or compression hydrants that open with the flow.* (This is not pointed out to indicate a problem with any brand of hydrant but to relieve some anxiety if you should find that

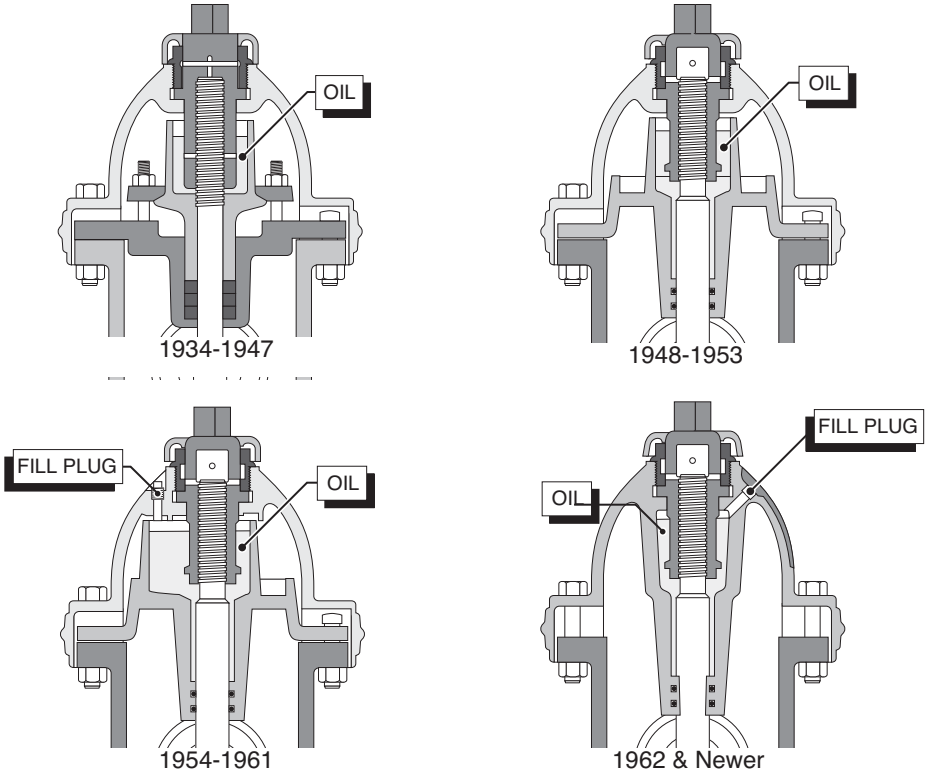
some of the hydrants in your system cannot be lubricated.) The proper lubrication of the operating nut can drastically improve the ease with which hydrants can be operated. The lack of proper lubrication can be the primary cause of hydrants that are difficult to operate.

Oil or Grease

Some hydrants (mainly Mueller) use oil to lubricate the operating nut. However, most brands of hydrants use grease. Before proceeding with the process of lubrication of the operating nuts, check with the manufacturer for proper lubricant and lubrication procedure. The following guidelines are given only as a supplement to the manufacturer's procedures.

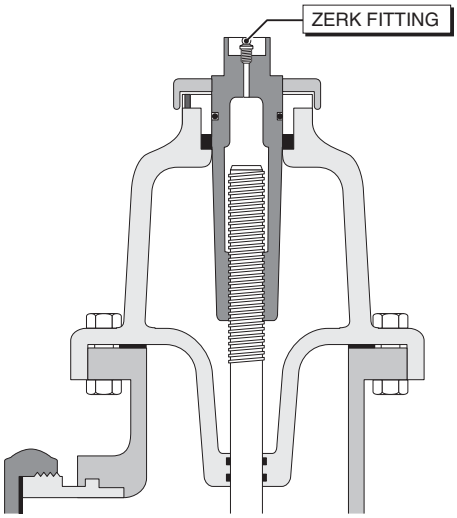
Mueller Hydrants

Mueller hydrants have used oil to lubricate the operating nut since 1934. In order to check the oil level on hydrants manufactured from 1934 until 1953, the bonnet must be removed. The oil level should be within 3/4-inch of the top of the reservoir. The oil reservoir on Mueller hydrants manufactured between 1954 and 1961 can be checked by removal of a plug that is placed in the bonnet. This oil level can be checked with a dip stick provided by the manufacturer. The oil level on hydrants manufactured after 1961 can be checked by simply removing the oil filler plug. The oil level should be at the bottom of the plug when the hydrant is closed. In order to lubricate the "O" rings in the stuffing box, the hydrant must be exercised.



Kennedy & M & H Hydrants

Most other brands of hydrants are lubricated by using grease on the stem operating threads. The process of applying this grease is primarily through a zerk fitting. The zerk fitting may be installed by the factory (Kennedy) or need to be inserted where the manufacturer has placed a screw (M & H). This screw must be replaced after the hydrant has been lubricated. Before proceeding with lubrication, the manufacturer should be consulted as to the type of grease, amount of grease and whether to grease the hydrant in a open or closed position. Most hydrants are greased with the main valve closed. The operating nut is then rotated to completely open and closed to lube the threads and "O" rings.



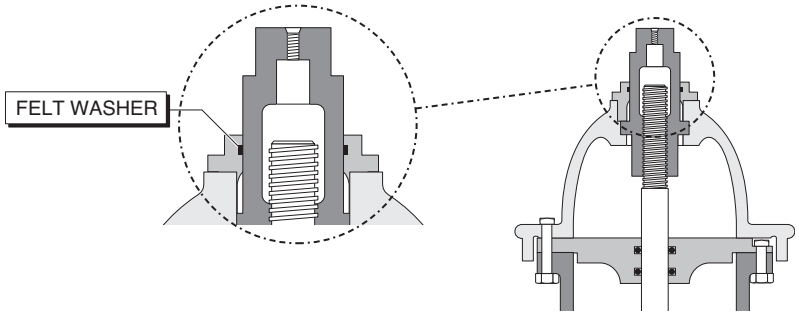
Weather Shields

Some operators prefer to remove the operating nut annually and clean the threads and outside of the nut of rust and corrosion. They then apply grease and reinstall the nut. This process is particularly useful when the hydrant does not have a *weather shield.* This process helps to remove corrosion between the lock nut and the operating nut, making the hydrant easier to operate. The process also allows a positive lubrication of the thrust area between the operating nut and the bonnet.

M & H

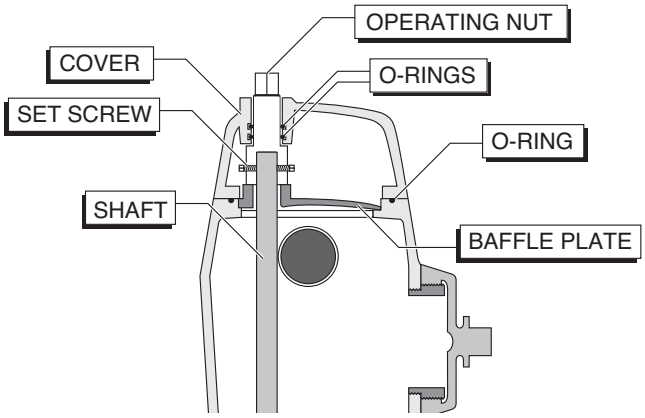
Some hydrants without a weather shield contain a felt washer (M&H) or "O" ring in the hold down nut. It is often difficult to lubricate this washer or "O" ring . The most effective method is to remove the lock nut, clean the *hold down nut* and operating nut, replace the washer with one soaked in oil, lube the operating nut and then replace the lock nut. When the hold down nut contains "O" rings, they should be replaced during this operation.

M & H



Pacific States

Some toggle type hydrants (Pacific States), use a cast iron operating nut that extends through the cast iron bonnet. The nut is prevented from leaking because of "O" rings placed in the bonnet. In wet environments, the area between the bonnet and the operating nut becomes filled with water and the resulting rust makes operating the hydrant very difficult. The operation of this hydrant can be greatly improved by annually removing the bonnet, removing the operating nut, replacing the "O" rings, lubricating the operating nut and reinstalling both the nut and the bonnet.



Routine Inspection

Frequency

AWWA fire hydrant standards committee recommends fire hydrants be inspected at least annually and after each use. In freezing climates, they recommend that in addition to inspection after each use, hydrants be inspected twice each year, once in the fall and again in the spring. Lack of experience with the brands of hydrants being inspected, as well as time between inspections will both contribute to an increase in the length of time necessary to inspect a fire hydrant

Time Consumption - Routine

The **routine inspection**[39] of common fire hydrants by experienced operators should take approximately 20 minutes per hydrant.

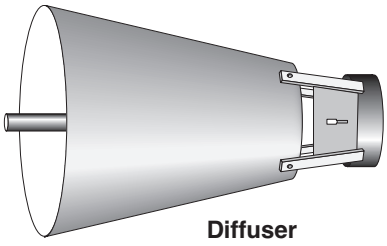
Tools Needed

In order to properly perform hydrant inspections, the following basic tools are recommended:

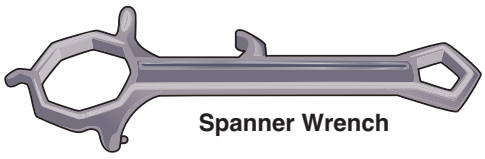
1. A hydrant **spanner wrench**[40]. Several styles are available.
2. Hydrant **deflector**[41] or diffuser
3. Inspection forms
4. Thread lubricant
5. Hand tools including a wire brush
6. Valve wrench
7. Tarp, 12' x 12'

Staff

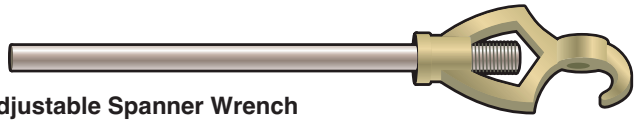
One or two operating personnel.



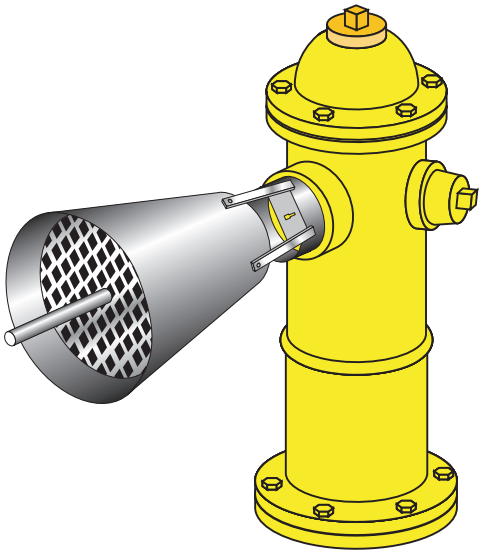
Diffuser



Spanner Wrench



Adjustable Spanner Wrench



Diffuser installed

[39] **Routine Inspection** - An inspection that is done in a prescribed way at specified times.
[40] **Spanner Wrench** - A wrench designed to operate a hydrant. The wrench may be designed for a set size of operating nut with the opposite ends designed to fit the hold down nut. The wrench may be adjustable for various sizes of operating nuts. When the wrench is adjustable, it will not fit the hold down nut.
[41] **Deflector** - A device use to absorb or deflect the velocity head of water exiting a fire hydrant. It is used to protect streets, traffic, and private property from damage resulting from the flow of water from a fire hydrant.

Procedure - Dry Barrel Hydrants

Sequence

1. Check the hydrant appearance. Remove any brush or grass that obstructs the view of the hydrant. If it needs painting, either paint or schedule for painting. Check the hydrant height. If the hydrant needs to be raised due to a change in ground level *(the flange between the lower barrel and nozzle section should be two inches above the ground)* due to construction in the area, then schedule the work.
2. Remove one nozzle outlet cap. Use a listening device to check for leakage of the main valve.
3. Use a plumb bob or a mirror and light to check for the presence of water in the lower barrel. If water is present, determine the cause and correct the problem.
4. Lubricate the operating nut. On some brands of hydrants, lubrication is via grease; on others, an oil reservoir is provided. Follow the manufacturers recommendations for lubrication. Here are some typical lubrication examples: Mueller - check oil level, it should be 1" below the fill plug. American Darling - remove the bonnet, the housing cover, the operating nut, and lubricate the threads with a water resistant grease. Clow remove operating nut and lubricate the threads.
5. Replace the nozzle cap. Leave it loose enough to allow air to vent from the hydrant.

Warning:

If the manufacturer's caps have been replaced with plastic nozzle caps, they will need to be replaced with metal caps prior to proceeding.

If due to the design or age of the hydrant or due to line pressure, the caps may blow off during the test, then this step should be skipped.

6. Open the hydrant two to three turns. Allow air to vent from the hydrant.
7. Tighten the cap.
8. Fully open the hydrant. Check for ease of operation. Some water conditions will cause a buildup on the threads of toggle and compression hydrants that open with the pressure. This can often be removed by a series of opening and closing. Other common problems that lead to difficulty in opening are bad packing, stuck "O" rings, and bent shafts.
9. Check for leakage at flanges, operating nut, packing,"O" rings, nozzles, and nozzle caps. Repair as needed.
10. Close the hydrant enough to cause the drain valve to work. Allow water to flow under pressure through the drain valve for about ten seconds. This will help to

flush the drain valve and keep it in working order.

11. Close the hydrant completely. Back off the operating nut so that pressure is taken off of the thrust bearing or thrust collar.

12. Remove one nozzle cap.

13. Attach a deflector. The recommendation of the hydrant standards committee is to use a deflector that can be set in the gutter and attached to the hydrant with a fire hose. When the style of deflector that attaches directly to the hydrant is used, there is still a potential for damage to property. This can be minimized by placing a tarp under the deflector and using the tarp to direct the flow of water to the gutter or storm drain.

14. Open the hydrant fully to flush the hydrant barrel and lead. Be sure to protect private property, streets and traffic. Storm sewer grates and culverts should be observed and kept clear of debris.

When the hydrant is flowing full, a flow test can be conducted. Some styles of deflectors offer an opening designed specifically to allow a pitot tube measurement to be taken.

15. Close the hydrant completely and remove the deflector. Count the number of turns to close and compare with existing data. If the number of turns is significantly different, then the hydrant should be scheduled for disassembly and internal inspection.

With the hydrant closed, check for proper working of the drain valve by placing your hand over the open nozzle. A slight suction should be felt if the drain valve is working properly.

16. Remove all nozzle caps. Clean the nozzle and cap threads and replace any damaged or missing nozzle cap gaskets. Light grease or a mixture of graphite and various never-seize compounds can used to lubricate the threads.

17. Check for free action of the nozzle cap chains or cables. If they bind, then remove paint or rust and/or open the loop so that they move more freely. If the chains have become damaged or rusted together, they should be replaced. This action will prevent the chains from kinking during emergencies, making removal difficult.

18. Replace the nozzle caps. Tighten and then back off slightly. They should be tight enough to prevent removal by hand but loose enough to be removed with ease using a spanner wrench.

19. Locate and exercise the auxiliary valve. Count the number of turns to close and open. Compare the turns with the data file.

20. Fill out the report form.

Dechlorination Considerations

State environmental regulations may require dechlorination of water flushed from a fire hydrant. Details on dechlorination can be found in the "Construction of Distribution System" manual**.**

Dry Barrel Inspection Checklist

HYDRANT # _____ LOCATION _____

- ❑ 1. Appearance clean and paint as needed
- ❑ 2. Remove outlet-nozzle cap; check main valve leakage
- ❑ 3. Check for water and/or ice in lower barrel
- ❑ 4. Loosely replace nozzle cap
- ❑ 5. Lubricate operating nut; check oil reservoir
- ❑ 6. Open hydrant 2 to 3 turns; allow air to vent through cap
- ❑ 7. Check drain valve
- ❑ 8. Open the hydrant fully
- ❑ 9. Check for ease of operation & Leakage,

  Ease of operation ❑ Yes, ❑ No Leakage ❑ Yes, ❑ No
- ❑ 10. Partially close the hydrant; allow drain valve to work
- ❑ 11. Close the hydrant completely
- ❑ 12. Flush barrel and lead; use deflector
- ❑ 13. Close hydrant; count turns. Number of turns _____
- ❑ 14. Remove all nozzle caps, clean and lube threads; replace damaged or lost gaskets
- ❑ 15. Check nozzle cap chains and/or cable for free action
- ❑ 16. Locate and exercise auxiliary valve

  • Number of turns to close and open _____
- ❑ 17. Problems Identified:

  _____

  _____

  _____

  _____
- ❑ 18. Problems resolved:

  _____

  _____

  _____

Procedure - Wet Barrel Hydrants

Sequence

1. Check the hydrant appearance. Remove any brush or grass that obstructs the view of the hydrant. If it needs painting, either paint or schedule for painting. Check the hydrant height. If the hydrant needs to be raised due to a change in ground level (the flange between the lower barrel and nozzle section should be two inches above the ground) due to construction in the area, then schedule the work.
2. Remove each nozzle cap. Check for leakage from the main valves.

   Clean the nozzle and cap threads and replace any damaged or missing nozzle cap gaskets. A mixture of Graphite and various never-seize compounds can used to lubricate the threads.
3. Open each nozzle two to three turns and close again. Check for leakage from the nozzle main valve and from the packing gland. If there is any leakage, schedule the hydrant for repair.
4. Remove one nozzle cap.

Flow Test

If a flow test is called for, use steps 5 through 7, otherwise go to step 8.

5. Attach a deflector. The recommendation of the hydrant standards committee is to use a deflector that can be set in the gutter and attached to the hydrant by a fire hose. When the style of deflector that attaches directly to the hydrant is used, there is still a potential for damage to property. This can be minimized by placing a tarp under the deflector and using the tarp to direct the flow of water to the gutter or storm drain.
6. Open the hydrant fully to flush the hydrant barrel and lead. Be sure to protect private property, streets, and traffic. Storm sewer grates and culverts should be observed and kept clear of debris.

   When the hydrant is flowing full, a flow test can be conducted.
7. Close the hydrant completely and remove the deflector. Count the number of turns to close and compare with existing data. If the number of turns is significantly different, then the hydrant should be scheduled for repair.
8. Check for free action of the nozzle cap chains or cables. If they bind, then remove paint or rust and/or open the loop so that they move more freely. If the chains have become damaged or rusted together, they should be replaced. This action will prevent the chains from kinking during emergencies, making removal difficult.

9. Replace the nozzle caps. Tighten each nozzle cap and then back off slightly. They should be tight enough to prevent removal by hand but loose enough to be removed with ease using a spanner wrench.

10. Locate and exercise the auxiliary valve. Count the number of turns to close and open. Compare the turns with the data file.

11. Fill out the report form.

Dechlorination Considerations

Environmental regulations may require dechlorination of water flushed from a fire hydrant. Details on dechlorination can be found in the “Construction of Distribution System” manual**.**

Wet Barrel Inspection Checklist

HYDRANT # _____ LOCATION _____

- ❑ 1. Appearance clean and paint as needed
- ❑ 2. Remove outlet-nozzle caps
- ❑ 3. Check outlet nozzles for leaks:

  Hose nozzle ❑ Yes, ❑ No Hose nozzle ❑ Yes, ❑ No

  Pumper nozzle ❑ Yes, ❑ No
- ❑ 4. Clean and lube nozzle caps and outlet nozzle threads
- ❑ 5. Check outlet nozzle cap gasket condition - Replace if necessary
- ❑ 6. Open each hydrant valve fully - One at a time
- ❑ 7. Check for ease of operation:

  Hose nozzle ❑ Yes, ❑ No Hose nozzle ❑ Yes, ❑ No

  Pumper nozzle ❑ Yes, ❑ No
- ❑ 8. Clean each valve carrier and lubricate
- ❑ 9. Close each hydrant valve; count the number of turns:

  Hose nozzle _____

  Hose nozzle _____

  Pumper nozzle _____
- ❑ 10. Replace nozzle caps
- ❑ 11. Check nozzle cap chains and/or cable for free action
- ❑ 12. Locate and exercise auxiliary valve

  • Number of turns to close and open _____
- ❑ 13. Problems Identified:

  _____

  _____

  _____
- ❑ 14. Problems resolved:

  _____

  _____

  _____

Report Example

The following card is an example of a fire hydrant inspection report form.

Fire Hydrant Inspection Report

Location _____ Hydrant No. _____

Type of Hydrant: Wet Barrel ❑ Dry Barrel ❑ Stand pipe ❑

Caps Missing ❑ Replaced ❑ Greased ❑

Chains: Missing ❑ Replaced ❑ Freed ❑

Paint: OK ❑ Repainted ❑

Dry Barrel Operating Nut: OK ❑ Greased ❑ Replaced ❑

Nozzles: OK ❑ Lubricated ❑ Threads cleaned ❑ Replaced ❑

Hose nozzle turns to open _____ Operate OK ❑ Leakage ❑

Hose nozzle turns to open _____ Operate OK ❑ Leakage ❑

Pumper nozzle turns to open _____ Operate OK ❑ Leakage ❑

Flushed ❑ _____ Minutes _____ Nozzles open

Pressures: Static _____ psi Residual _____ psi

Auxiliary valve: Located ❑ Turns to open_____ Condition_____

Other Defects: _____

_____

_____

_____

_____

_____

Inspected by _____ Date_____

Defects Corrected by _____ Date_____

Painting

Public Relations

The appearance of the fire hydrants in a community has a direct impact on the public's perception of the quality of the drinking water and on their perception about the quality of work that is performed by the utility. Therefore, it is necessary to maintain the appearance of the hydrants by painting. There are two methods of painting commonly used: the spray method and the brush method.

Overspary Problems

The spray method requires the least amount of time. However, there is a higher capital cost for the equipment and there is the concern for protection of surrounding property from overspray. The additional cost can be offset by the savings in both time and the amount of paint used. *The spray system will use less paint than the brush system*. Prior to using a spray system, it is important that the operators become familiar with the proper use and care of the system.

Paint Booth

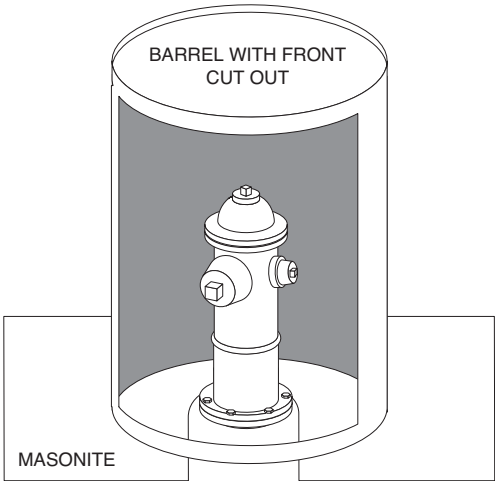
A simple portable paint booth can be made from a plastic 55 gallon drum. Simply cut out the bottom and a portion of one side. The drum can be rotated as the hydrant is painted, allowing easy access to all sides.

Protecting the Sidewalk

When the hydrant is placed in a sidewalk, then the sidewalk must be protected from spray. This device is constructed of 1/4" or 1/8" masonite.

Paint Brush

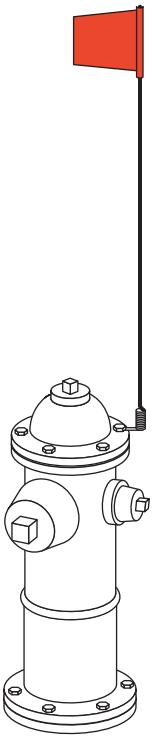
The paint brush method is by far the easiest method of painting fire hydrants. It takes very little training or capital outlay. However, the time consumption can be four to ten times the time required to paint the same number of hydrants with a spray system. When using a brush to paint fire hydrants that are installed in sidewalks, use some type of protection for the sidewalk. The sidewalk could be covered with plastic or use the sidewalk protector described above.



Speciality Items

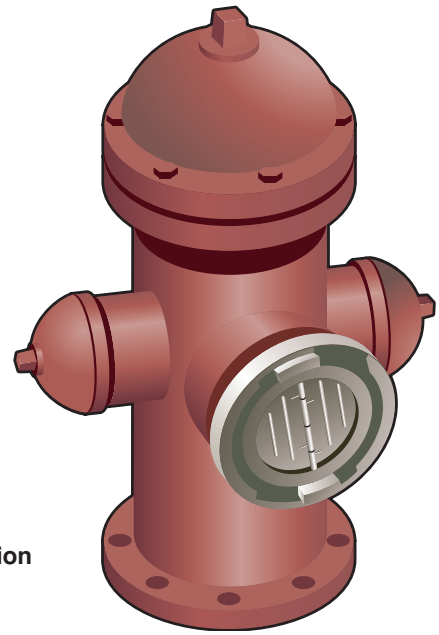
After Market

A number of manufacturers have developed after market components for fire hydrants. These include replacement nozzle caps made from plastic or composite, stainless steel operating nuts, flags to assist in locating hydrants in rural areas and in deep snow, spray nozzles, and quick connections.



Hydra-Storz®

One of the most popular speciality fire hydrant items is the Hydra-Storz® quick connecting system. This system allows connecting to the steamer port without removing the nozzle cap. The connector is made of forged aluminum with stainless steel butterfly vanes. The butterfly vanes are opened by the water flowing from the hydrant. They close with a spring and are thus tamper resistant.

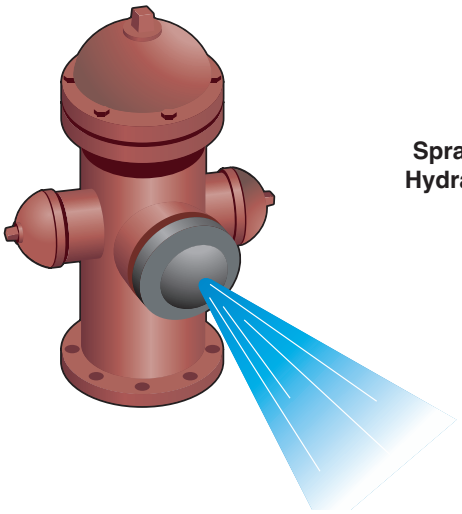


Forged Aluminum Hydra-Storz® quick connection

Spray Nozzles

In many large urban communities fire hydrants are used for summer recreation. To reduce water losses this activity is organized through local police precincts and fire houses. An individual or club may check out a special nozzle and spanner wrench. When obtaining the equipment specific training is provided on the proper use of the hydrant. The spray nozzle is installed and the hydrant turned on. The spray nozzle provides a limited and measured flow. While this

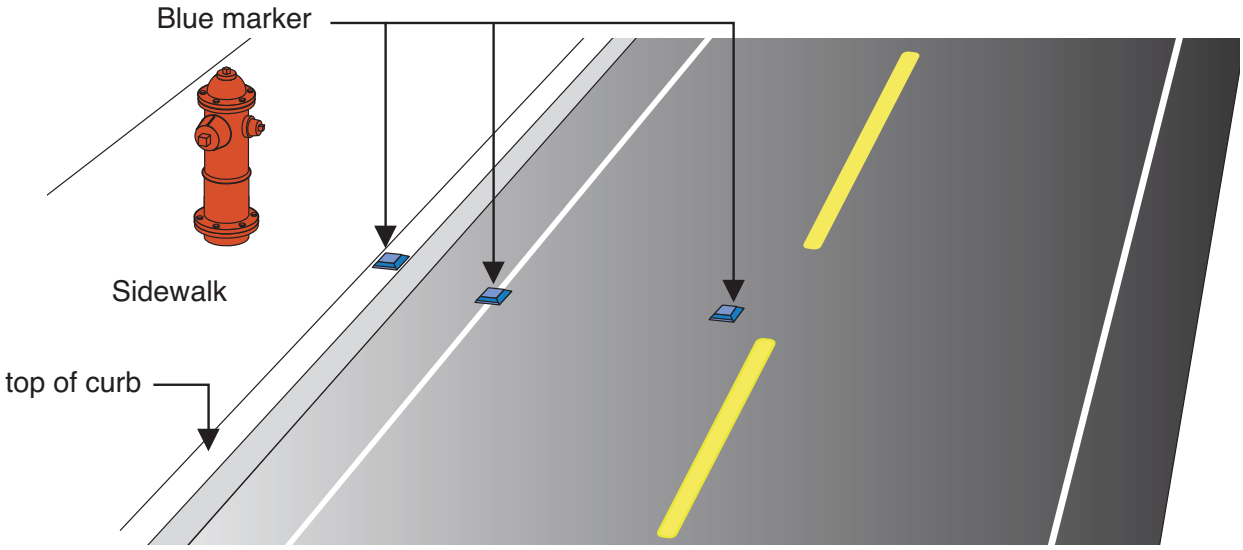
practice is generally discouraged by the water works industry, some large urban utilities find the practice saves water because they are not able to stop the use of hydrants for this purpose. Thus controlling the use is seen as a positive step to controlling water loss. Below is an example of a commercially available hydrant spray nozzle.



Spray Nozzle
Hydra-Shield®

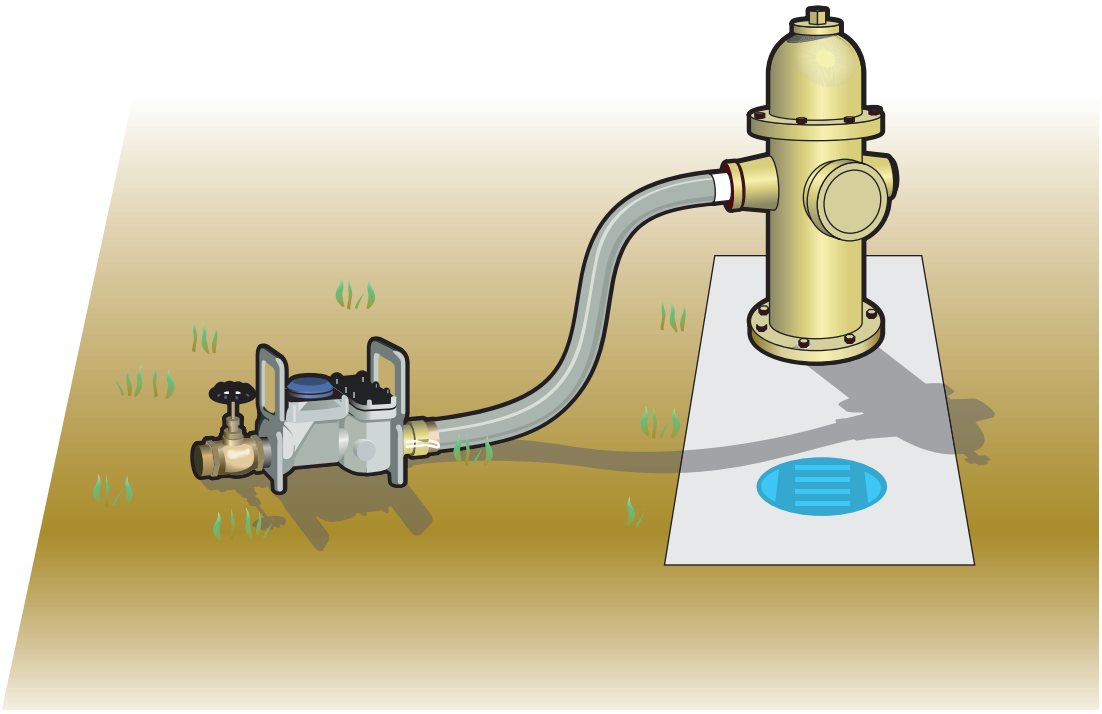
Hydrant Locators

In order to facilitate locating fire hydrants at night blue reflectors are placed on the curb, fog line or offset from the street center line. The offset provides a key to which side of the street the hydrant is located.



Nozzle Saver

Another after market device is the Nozzle Saver by Assured Flow Sales, Inc. While it looks like a short section of hose, it is really a “S” shaped copper or aluminum tube with hose connections on each end. The “S” shape allows easy placement of the hydrant meter or meter and RPZ onto the ground.



Common Hydrant Problems

The following descriptions do not include all of the possible problems associated with fire hydrants. These descriptions do, however, describe six of the most common hydrant problems and methods of resolving each.

Hydrant Won't Open Easily

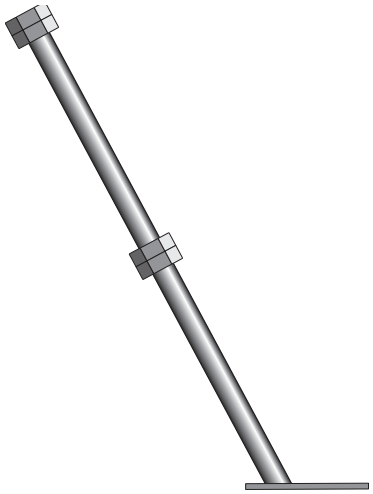
Causes	Cures
1. Lack of lubrication of the operating nut, operating lock nut or stem threads	Lubricate as needed
2. Bent operating stem	Replace stem
3. Corroded threads on toggle hydrants	Remove operating assembly, clean and lubricate the threads
4. The drain valve is stuck or damaged	Remove and replace
5. Too many extensions in operating stem	Disassemble and reduce the number of sections in the stem to 1 on standard hydrants and 2 on traffic models
6. Stuck packing or "O" rings in stuffing box	Remove and replace

Leaking Main Valve

Causes	Cures
1. Damaged by rocks or debris	Remove and replace
2. Toggle hydrant - main valve not centered in valve seat	Adjust position of stem collar

Hydrant Will Not Drain

Causes	Cures
1. High water table	a. Plug drain valve openings and pump barrel after each use
2. Plugged drain valve	a. Pressurize hydrant with main valve only open 1 to 2 turns b. Toggle hydrants— use a rod through the drain hole. Use a 5/8" rod on Rensselaer, Corey and Pacific States and 3/8" rod on Iowa c. Dig down and clear the hole from the outside d. Disassemble and use a tool as shown in the figure below



Hydrant drain hole punch (Gimmicks and Gadgets Opflow Feb. 1977)

Hydrant Will Not Shutdown After Use

Causes	Cures
1. Bent or broken stem	Remove and replace stem
2. Improper adjustment of drain valve on toggle hydrant	Disassemble hydrant and adjust the drain valve
3. Damaged main valve	Remove and replace

Hydrant Vibrates During Shutdown

Causes	Cures
Compression Hydrants	
1. Main valve loose on stem	Disassemble and tighten nuts below lower valve plate
2. Worn threads in operating nut or on stem	Replace either the operating nut or stem, which ever has the worn threads
Toggle Hydrants	
1. Loose pins on the operator arm	Disassemble the hydrant and remove and replace the pins
2. The nature of some toggle hydrants	Do not hesitate at shutdown. (This does not cure the vibration, but it does reduce the amount of time that the hydrant vibrates.) These hydrants should be marked to be used only during an emergency.

No Water Flows From the Hydrant When it is Opened

Causes	Cures
1. Auxiliary valve shut off	Open auxiliary valve
2. Broken stem	Remove and replace
3. Stripped threads on operating nut	Remove and replace
4. Broken arm on toggle type hydrant	May need to use a cutting torch to remove the broken arm Remove and replace broken arm

Hydrant Data

Maintenance Management

One of the basic components of a maintenance management system is the inventory of the systems assets. A detailed discussion of this process is found in the "Operations Management for Small Water Systems." The following is a brief summary of the basic asset data required for system hydrants.

Spare Parts

In order to establish an appropriate spare parts inventory for fire hydrant repair it is critical that specific data be collected and placed into an asset management system. On the next page is an example of a data card used to hold fire hydrant data. In addition, the data may be entered into a computerized asset management database. In addition, all of the fire hydrants should be identified on the distribution map

Fire Hydrant Data Card

Hydrant No. _____

Type of Hydrant: Wet Barrel ❑ Dry Barrel ❑ Stand pipe ❑

Location _____

Street _____ Intersection _____

Brand/Manufacturer _____ Year _____ Model _____

Hydrant Inlet Type: ❑ MJ ❑ Hub ❑ Flange Inlet Size _____

Hose Nozzle size _____ Thread type _____

Pumper Nozzle size _____ hread type _____

Main Line size _____ Material: ❑ Steel ❑ DCIP ❑ PVC

Line Static Pressure _____ psi Bury _____ ft

Auxiliary Valve: Yes ❑ No ❑ Auxiliary Valve - Turns to Open _____ OL OR

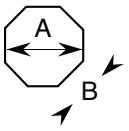
Installed by _____ Date _____ W/O No. _____

Dry Barrel Information

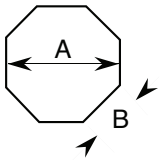
MVO _____ Operating Nut shape & size: _____ Turns to Open _____ OL OR

Wet Barrel Information

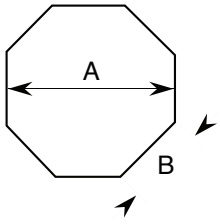
Stuffing box nut size



Hose outlet nut size



Pumper outlet nut size



Stuffing box nut size: **A** _____ **B** _____

Hose nozzleoutlet nut size: **A** _____ **B** _____

Pumper nozzle outlet nut size: **A** _____ **B** _____

Operating nuts shape and size: _____

Stand Pipe Information

Hose nozzle operating nut size: _____ Turns to Open _____ OL OR

Fire Hydrant Operation & Inspection

Worksheet

1. The most common fire hydrants installed in the US are:

   _____ a. Wet Barrel

   _____ b. Dry Barrel

   _____ c. Post type

   _____ d. Flush type

   _____ e. High pressure

2. The major advantage to using a wet barrel hydrant is...

   _____ a. Easier to repair

   _____ b. Protected from freezing

   _____ c. Easier to connect a second fire truck

   _____ d. Easier to install and maintain, reducing maintenance cost

   _____ e. There is no advantage

3. Hydrants classified as high pressure hydrants are designed to operate in conditions where the pressure exceeds _____ psi.

   _____ a. 100

   _____ b. 150

   _____ c. 200

   _____ d. 250

   _____ e. 300

4. Hydrants designed to break at a specific point when hit by a vehicle are classified as _____ model hydrants.

   _____ a. Flush

   _____ b. Breakable

   _____ c. Dry top

   _____ d. Traffic

   _____ e. Two piece

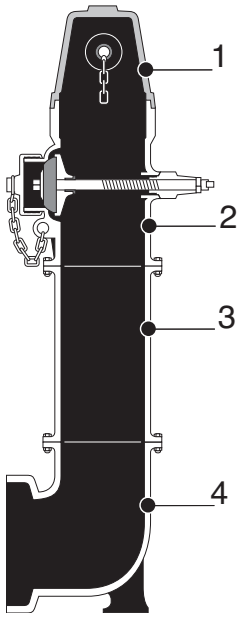
5. In the drawing on the right, identify the hydrant components indicated.

   _____ a. Riser

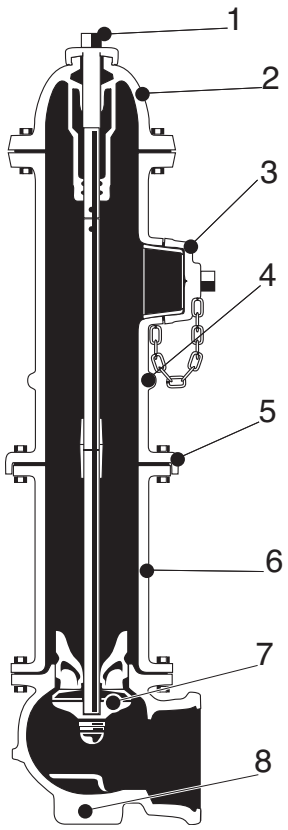
   _____ b. Barrel

   _____ c. Head

   _____ d. Lower Barrel Ell



6. In the drawing on the right, identify the hydrant components indicated.



_____ a. Shoe
_____ b. Safety Flange
_____ c. Upper Barrel
_____ d. Lower Barrel
_____ e. Bonnet
_____ f. Operating nut
_____ g. Pumper Nozzle cap
_____ h. Main valve

7. The most common hydrant inlet connection size is...

_____ a. 4 inch
_____ b. 2 inch
_____ c. 6 inch
_____ d. 3 inch
_____ e. 8 inch

8. On a fire hydrant what does MVO mean?

_____ a. Most Valuable Organization
_____ b. Main Valve Operation
_____ c. Most Variable Operation
_____ d. Main Valve Opening
_____ e. Many Variable Openings

9. The drain valve on a compression hydrant is located in what component?

_____ a. Main valve
_____ b. Lower barrel
_____ c. Nozzle section
_____ d. Base
_____ e. Inlet connection

10. The most common outlet connection for a fire hydrant is the ....

_____ a. 3 inch pumper nozzle
_____ b. 2.5 inch NST
_____ c. 2 inch IPT
_____ d. 3 inch IPT
_____ e. 4 inch NST

11. The component used to separate the bonnet from the nozzle section is called the _____.

_____ a. “O” ring section

_____ b. Nozzle guard

_____ c. Packing plate

_____ d. Packing gland

_____ e. Upper bonnet plate

12. The bury of a hydrant is the distance between _____ and the _____.

_____ a. Bottom of the trench and a point just below the safety flange

_____ b. The invert of the pipe and a point 2 inches above the safety flange

_____ c. The invert of the pipe and a point 2 inches below the safety flange

_____ d. The bottom of the trench and the center of the safety flange

_____ e. The bottom of the trench and the top of the ground

13. A fire hydrant that uses a scissors-type action for its operating mechanism is called a _____ .

_____ a. Compression hydrant

_____ b. Toggle hydrant

_____ c. Slide gate hydrant

_____ d. High pressure hydrant

_____ e. Frost jacket hydrant

14. When the main valve of a compression fire hydrant is closed the drain valve is..

_____ a. Closed

_____ b. Open

15. When opening a compression hydrant the drain valve remains open during the first _____ to ____ turns.

_____ a. 1 - 10

_____ b. 5 -10

_____ c. 3 - 8

_____ d. 2 - 6

_____ e. 1 - 5

16. Identify the hydrants below. If a hydrant is a dry barrel then identify if it is a toggle or compression type.

A. ❑ Wet or ❑ dry barrel, ❑ compression or ❑ Toggle

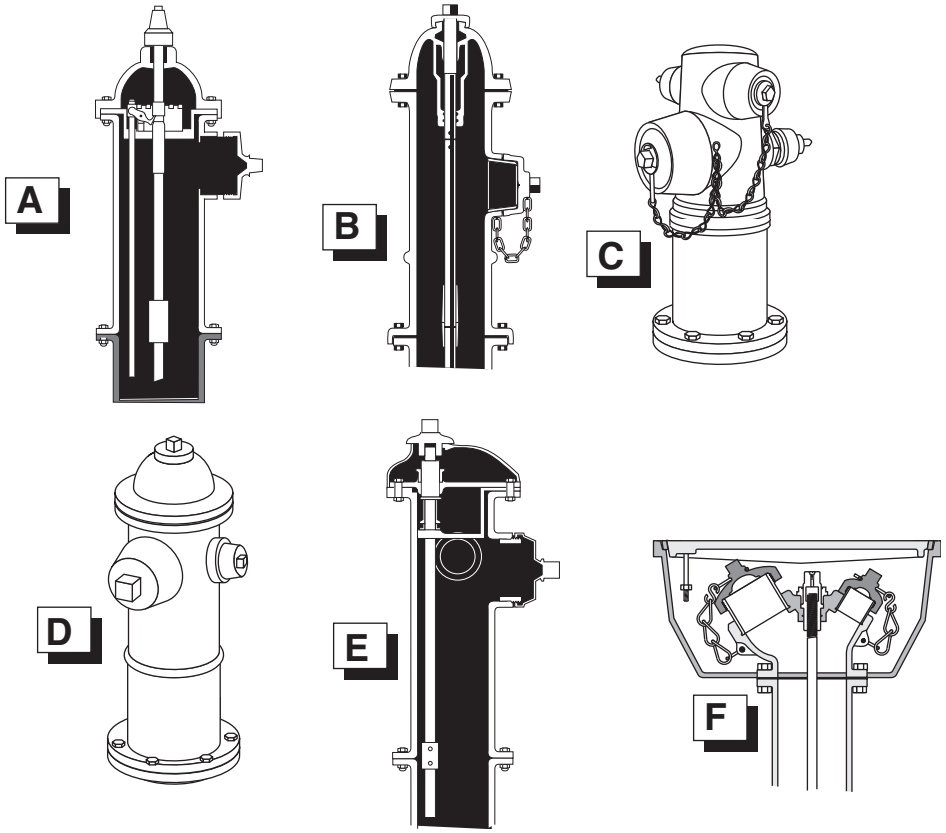
B. ❑ Wet or ❑ dry barrel, ❑ compression or ❑ Toggle

C. ❑ Wet or ❑ dry barrel, ❑ compression or ❑ Toggle

D. ❑ Wet or ❑ dry barrel, ❑ compression or ❑ Toggle

E. ❑ Wet or ❑ dry barrel, ❑ compression or ❑ Toggle

F. ❑ Wet or ❑ dry barrel, ❑ compression or ❑ Toggle



17. As a result of closing a fire hydrant rapidly ...

_____ a. Water hammer can be produced

_____ b. The flow is stopped quickly

_____ c. The operating nut can be damaged

_____ d. The stem may come unthreaded

_____ e. The main valve will be pushed away from the seat causing excessive leakage

18. When opening a compression hydrant that opens against the flow you would expect the stem to turn easiest.

_____ a. When first opening the hydrant

_____ b. After the hydrant is nearly completely open

_____ c. In the middle of the opening cycle

_____ d. There should be no change in the amount of effort to rotate the shaft regardless of the position

_____ e. At the start and at the end of the opening cycle

19. When a fire hydrant is used, with permission, by a contractor it is advisable to install two items on the hydrant. These two items are?

_____ a. Hydra-Storz®

_____ b. RPZ

_____ c. Out of service tag

_____ d. Diffuser

_____ e. Meter

20. How is the operating nut on a Mueller hydrant lubricated?

_____ a. It is not lubricated

_____ b. An oil reservoir in the bonnet

_____ c. Water resistant grease

_____ d. Silicone lubricant

_____ e. By water flowing past the threads

21. What should be used to lubricate fire hydrant nozzle threads?

_____ a. White grease

_____ b. Lock Tight™

_____ c. Molycoat™ 100

_____ d. Light grease

_____ e. The threads of a fire hydrant should never be greased

22. In the list below, the operating nut of which brand of fire hydrant is lubricated with grease applied through a zerk fitting?

_____ a. Clow

_____ b. M & H

_____ c. Long Beach

_____ d. Waterous

_____ e. Mueller

23. What is the minimum frequency for the inspection of hydrants?

_____ a. 3 times each year

_____ b. Only after they are used

_____ c. Twice each year

_____ d. Once each year

_____ e. Only when there is expected problems

24. How tight should the nozzle caps be after a hydrant inspection?

_____ a. Hand tight

_____ b. Hand tight plus 2 turns with a spanner wrench

_____ c. Tighten with a spanner wrench and then back off 1/4 turn

_____ d. Tighten as tight as can be pulled with one hand on a spanner wrench

_____ e. Torque to 75 pounds

25. What is the color of the reflective markers that are commonly installed on a street to indicate the location of a fire hydrant?

_____ a. Blue

_____ b. Yellow

_____ c. Red

_____ d. White

_____ e. Green

26. From the list below, select the most probable cause of a compression hydrant vibrating during shutdown.

_____ a. Broken stem

_____ b. Plugged drain valve

_____ c. Loose drain valve

_____ d. Loose main valve

_____ e. Corroded threads on the stem

27. From the list below, select the most appropriate reason for collecting fire hydrant name plate data.

_____ a. Establish an appropriate spare parts inventory

_____ b. Meet the maintenance management system requirements

_____ c. Development of a fire hydrant inspection program

_____ d. Meet the ISO requirements

_____ e. Meet the regulatory agency requirements