WATTS®

Top 10 Considerations for Specifying Backflow

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Co-author

Frank DiBenedetto is an Engineering Strategist who collaborates with Industry professionals to provide forward-thinking solutions elevating value proposition and mitigating risk. Nearly twenty years experience mapping solutions, ten of those managing backflow product development for the brands of Watts, Frank is passionate about water safety and solving challenges which the Industry holistically faces in today's dynamic landscape. A highly knowledgeable, driven, and charismatic individual with proven ability to lead large scale initiatives, setting tactical direction and focus teams to deliver results.

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Arnold Runnells is the owner of Granite State Irrigation with over 20 years in the business. He has extensive knowledge of Backflow devices, polypropelene/PVC and HDPE piping. Runnells designs and installs complete irrigation systems to improve water efficiency as well as smart integration with real time monitoring and weather alerts. His experience includes golf course, major college, and large business systems. Runnells takes pride in providing solutions and savings using today's technology to meet all customers' needs.

Top 10 Considerations for Specifying Backflow

- Flow Performance
- Calculated Building Flow Demand
- Serviceability
- Application Conditions
- Valve Size/Weight
- Installation Options
- Troubleshooting Ability
- Shutoff Options
- Code Compliance
- Importance of Agency Approvals

Backflow

[bak-floh]

(N.) THE UNWANTED FLOW OF CONTAMINANTS OR POLLUTANTS BECAUSE OF A PRESSURE DIFFERENTIAL.

1 COMMON CAUSES

- water-line flushing
- firefighting events
- water-main breaks
- installation of heating systems

2 BACKSIPHONAGE

Occurs when there is a loss in pressure from the supplying source, creating a vacuum that allows contaminant or pollutants into a potable-water supply.

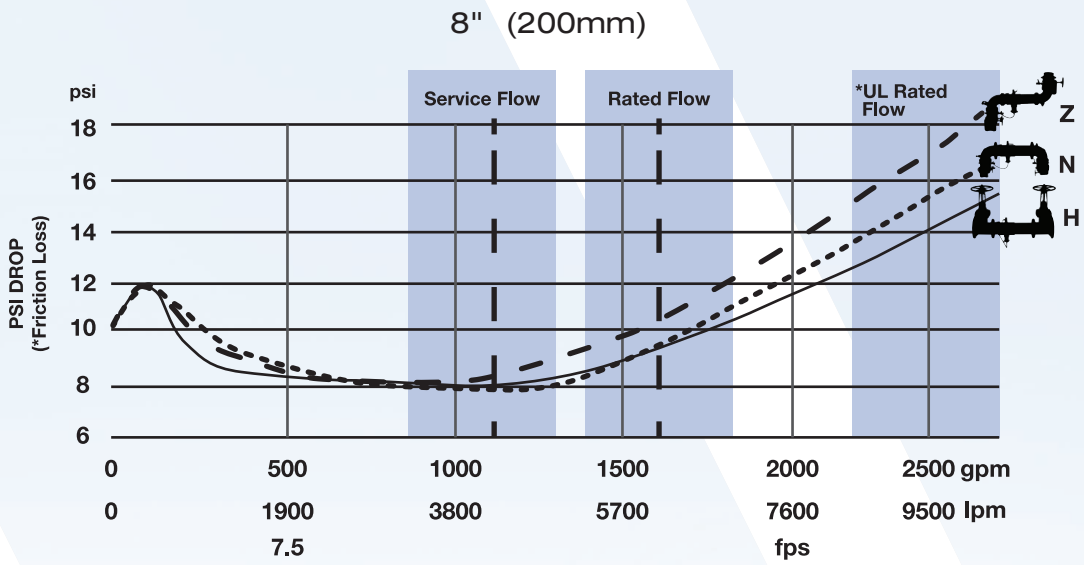
3 BACKPRESSURE

Occurs when the water pressure of the recipient exceeds the source's water pressure, reversing direction of proper water flow.

Backflow continues to represent a significant threat to our fresh water supply. Caused by a cross-connection between a potable water system and a suspected source containing used water, industrial fluid, gas, or any other contaminating material, backflow events are difficult to detect until irregularities are present and potentially serious symptoms arise.

With a backflow preventer that is properly specified, installed, and maintained, the risk of events due to backsiphonage and backpressure can be avoided.

Specifying a correct backflow solution is dependent on the application. Awareness of the potential pitfalls presented by the plumbing system's design is critical. A poor choice of backflow preventer can have disastrous consequences for your community, environment, and potentially, your bottom line.



Flow Performance

Backflow flow performance is important when it comes to minimizing system pressure loss as the available pressure throughout the system needs to be calculated during the design process. If the pressure loss is too high for the system to provide adequate pressure to its components, it could mean having to add a booster pump or use larger diameter piping, both of which could add significant expense.

Though pressure loss is an area of concern in all systems, it is especially critical within a fire prevention system:

- The size of the entire riser system can be based on the performance of the backflow preventer
- Minimizing pressure loss is critical in a fire system, where 20psi at the most remote sprinkler head is required
- If incoming water pressure is low, high pressure loss in the backflow preventer can have a dramatic impact on overall sprinkler system design and cost

All Backflow manufacturers publish pressure/flow curves for their devices. These curves are typically provided by one of two primary certifying bodies:

- the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research [USC]
- Underwriters Laboratories [UL]

When comparing flow curves, make sure they are both indicating the same situation – as increasing flow curves and decreasing flow curves are often very different.

Typically manufacturers will use the increasing flow curves, however some may choose to publish the decreasing flow curve it makes the valve seem as if it performs better. If you aren't sure what curve you are looking at, contact your manufacturer's representative for clarification.

TAKEAWAY: Be sure to take the pressure loss across the backflow device into consideration, especially in critical situations such as fire protection systems or systems with low incoming water pressure.

Calculated Building Flow Demand

The total theoretical demand for a water supply system is calculated by adding the known maximum demand for all fixtures in the system. The flow characteristics of a backflow device can directly impact the overall flow performance of buildings potable water or fire sprinkler system. When specifying, be aware of the building flow demand requirements.

Backflow devices are made to operate at a certain flow rate, the same way a car is made to go a certain speed. Go faster, and you will limit the life of the components. It's desirable to keep the typical flow rate around the service flow, which corresponds to a water velocity of 7.5 ft/s. At the highest rate of typical use, you don't want to exceed the rated flow, the flow rate above which you'll experience greatly increased wear and tear. For fire systems, full fire flow should not exceed the UL rated flow of the valve. It's important to keep this in mind when choosing the correct valve size.

TAKEAWAY: Backflow preventers should be sized to the system flow requirements; both under-sizing and over-sizing the device can cause premature and excessive wear to internal components.

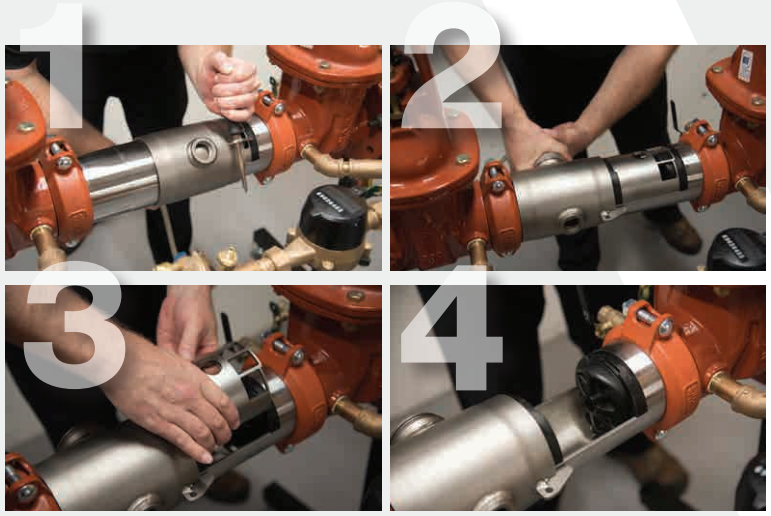
Serviceability

Despite your best efforts, wear and tear to a backflow preventer will occur from normal operation and unavoidable external sources – such as excessive debris in the water. The backflow preventer will inevitably need to be serviced in time, which should be done by a professional plumber.

There are a number of factors to consider when selecting a backflow preventer:

- Types of tools needed, or if any particularly uncommon tools are required
- The ease of servicing and repair: How easy is it to access the internals? Do you have to remove components to access? Can the parts be repaired individually? Are they readily available from local suppliers? Can components like the relief or shutoff valves be removed for service or replacement? This can be understood by reading the repair documentation found on the manufacturer's web site, or watching videos if they are available. The harder to service, the more hours required, the more costly the repair
- Does the device appear to have multiple complex moving parts? The more moving parts, the higher the risk of one malfunctioning, the more complicated the repair, and the higher the cost

Remember: The larger the valve, the more difficult it is to service so time spent understanding serviceability is time well-spent.



TAKEAWAY: The ability to quickly and easily service the valve will greatly impact the total lifetime cost of the valve, and make life easier for the plumbers that have to service it.

Application Conditions

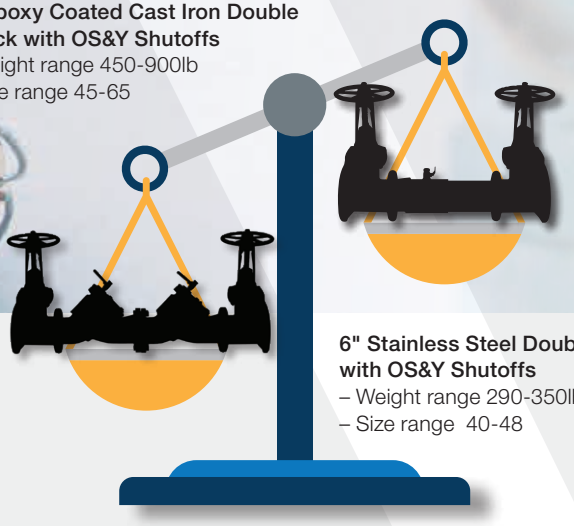
It's important to understand the challenges your project presents when specifying the correct backflow preventer. These application conditions will have a significant impact on the design of your system, the install, as well as your budget. Whether these factors are attributable to logistic, economic, or environmental concerns – they will always have a bearing on your decisions.

Ask yourself:

- **Could this device be a health hazard?** Local authorities have jurisdiction over the type of valves that are used in each of these types of applications. It's imperative you check before buying and installing.
- **What is the overall length of the valve?** This information can typically be found on the technical data sheet provided by the manufacturer and is critical when replacing an existing application. But keep in mind, it can also impact a new installation if space is at a premium, i.e. cramped mechanical rooms.
- **What type of environment will this device be located in?** For instance, a Reduced Pressure Zone Assembly may not be used in a sub-ground level box or pit as they may become flooded. You also want to consider what kind of weather the valve will be exposed to, and how it will affect the exposed components.
- **Is the valve easily accessible?** If not, special equipment may be required. It is also important to ensure a plumber would be able to access the valve without difficulty in the event it needs to be serviced.
- **How does the valve look?** Owners can be conscious about the aesthetics of the valve, and may prefer a certain valve for that reason, or require an enclosure to hide it.

TAKEAWAY: Consider the size, location, and nature of your application when selecting your backflow preventer to make sure it provides the level of safety required, and also fits where you want it to go!

6" Epoxy Coated Cast Iron Double Check with OS&Y Shutoffs
– Weight range 450-900lb
– Size range 45-65



6" Stainless Steel Double Check with OS&Y Shutoffs
– Weight range 290-350lb
– Size range 40-48

Valve Size/Weight

Weight factors into the backflow device selection mostly in regards to the labor costs associated with handling and installing the device. Things to consider:

- Will you require stands and strapping to support the device after installation? This is especially important when considering larger devices.
- Will the backflow preventers have to be hand carried to the installation site? Can you fit a crane truck or lift into the required space?
- Will the valve fit into the required space? This is especially relevant when replacing an existing assembly.
- The larger the valve, the higher the cost of materials, time, and man-power for installation of the valve.
- How much will it cost to ship the valve? Weight will increase shipping costs.
- What material is it made from? Composites and stainless steel are typically lighter than cast or ductile iron

When selecting a larger device, it's important to consider what other needs you may have to make your selection and installation successful; for example, additional people, lifts, stands, or fixtures.

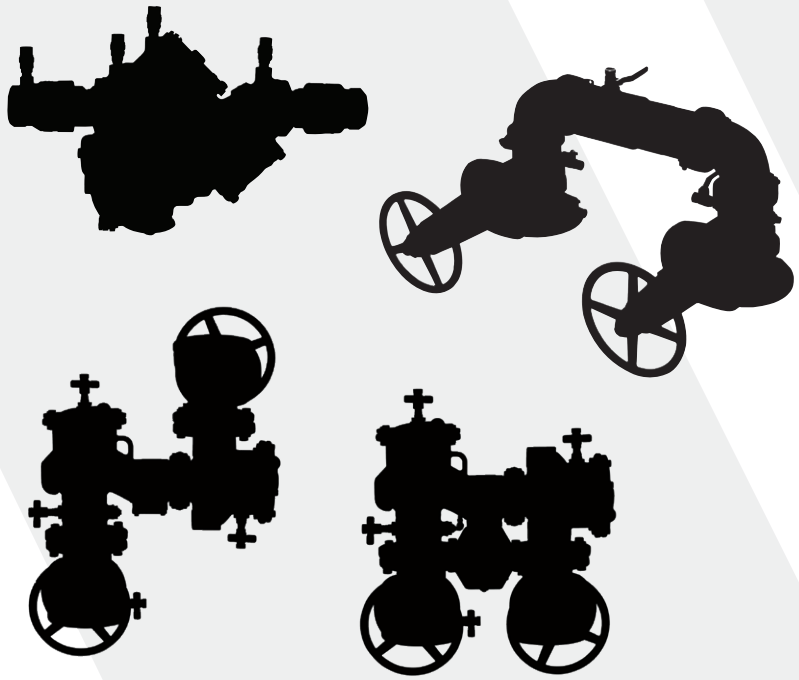
Smaller is better in the sense that it can allow for extra space for other critically needed valves in the system, or allow you to use a smaller footprint for your mechanical room. This could also mean not requiring support stands, and can be small enough for one person to carry and install, further cutting labor costs associated with backflow installation.

TAKEAWAY: When selecting a larger device, it's important to consider the size and weight to ensure the valve will fit in the desired location, and you will have the equipment/manpower to install and support it.

Installation Options

Backflow preventers are installed in a variety of locations, from large open spaces to small cramped mechanical rooms. They are designed to allow for multiple installation configurations to enable the design engineer to fit the device into the space allowed.

Installation options are Horizontal [most common], Vertical, ‘N’ Pattern, and ‘Z’ Pattern. In general there is little to no change in valve performance based on its installation configuration; however you should always read the manufacturer’s technical information and consult with local plumbing code officials before making your buying decision or final installation, especially for vertical installs.



TAKEAWAY: Installing a valve horizontally isn’t your only option, explore your options to make sure you are most effectively utilizing your space.

Troubleshooting Ability

The way you test a valve will depend on your local water authority's requirements, however the valve itself can affect how easy the valve will be to test and troubleshoot.

Test Cock Location: Testers will need access to test cocks in order to effectively test the device's function. If the valve has plenty of clearance around all sides this typically won't be an issue, however when this is not possible (against manufacturer recommendations) or when retrofitting a valve, walls or existing piping may make access to test cocks difficult or impossible—which will lead to re-piping or replacing the valve entirely.

Test Cock Size: One use for test cocks, other than testing the valve, is flushing a valve to try and clear debris that may be fouling the checks. Larger test cocks will allow more flow, increasing the chance that you can clear the debris—potentially allowing the valve to pass the test.

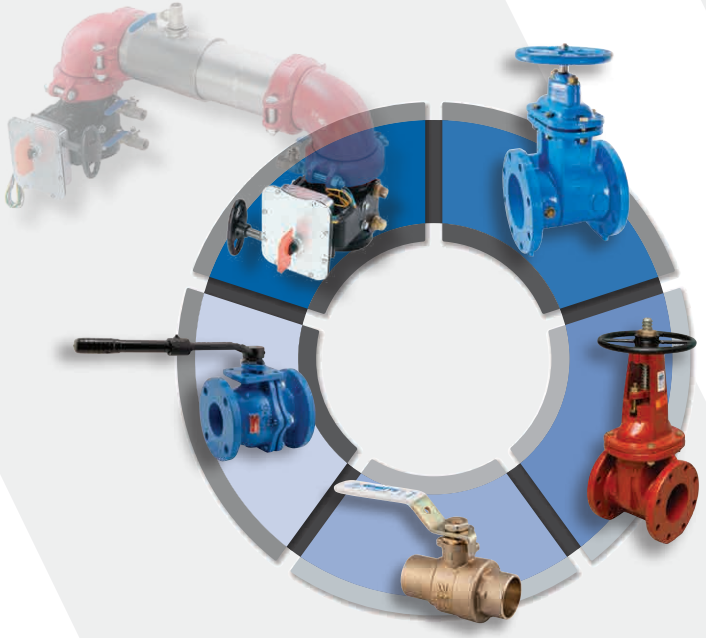
Shutoff Valve Tightness: In order to test and troubleshoot a valve, it's important that at least the downstream shutoff valve shuts tight and leak free. For this reason, high quality shutoffs are an important part of the backflow assembly. Not only will the quality of the shutoff valve be important, but the ability to repair them in order to make the valve testable again is also key. For this reason, you should be careful when selecting a valve with integrated shutoffs, as often this will mean that if the shutoff valve malfunctions, the entire assembly must be replaced instead of just the shutoff valve.

TAKEAWAY: Take into account how the environment the valve is installed in will affect the access to it's test cocks and choose a valve you will be able to easily test. Make sure you are using high quality, repairable shutoffs.

Shutoff Options

There are a variety of shutoff valve options available when specifying your backflow preventer. Including:

- **Ball Valves** – typical for assemblies 2" and allow for easy 1/4-turn on or off operation
- **Butterfly Valves** – when a shorter lay length is desirable, can be gear operated for slow close operation to avoid water hammer (a requirement in fire protection systems), or controlled electronically.
- **NRS [Non-Rising Stem] Gate Valves** – desirable when you don't have clearance above the hand wheel and don't need a visual indication of position (open/closed).
- **OSY [Outside Stem and Yoke] Gate Valves** – standard for large diameter fire valves because the rising stem gives a visual indication of position (open/closed), and can be fitted with a tamper switch.
- **PIV [Post Indicator Valves]** – Typically an option on NRS gate valve, these valves are meant to attach to a post that will visually indicate "OPEN" or "SHUT", and are typically used in fire systems when the valve will be inaccessible, such as underground or behind a wall.



TAKEAWAY: Be sure to choose the right shutoffs for your application ensures compliance with various codes and avoids costly replacements later.

Code Compliance

It is important to understand your local codes and requirements, as a device may be allowed in an application in one county and considered insufficient in the next.

Variations can include:

- Whether an application is considered a health hazard or a non-health hazard
- Whether a testable or non-testable device is required
- Using a pressure vacuum breaker vs. a reduced pressure principle device for irrigation
- Whether or not lead-free is allowed in certain non-potable applications, such as irrigation or hydronics

It is advisable to maintain a relationship with your local plumbing inspectors and water authorities so you can avoid either failing an inspection, or installing a more expensive device when a more economical one would have satisfied the requirements.

TAKEAWAY: Always be aware of local codes, as they can be town-specific, and frequently consult with local plumbing inspectors.

Importance of Agency Approvals

There are resources available providing information, education, product testing and certification, building product evaluations, and code development assistance; to name a few. These organizations can help the plumbing professional with a number of issues that might occur regarding backflow.

- **IAPMO –** The International Association of Plumbing and Mechanical Officials (IAPMO) has been protecting the public's health and safety for ninety years by working in concert with government and industry to implement comprehensive plumbing and mechanical systems around the world. – http://www.iapmo.org for more information.
- **USC –** The University of Southern California [USC] Foundation for Cross Connection Control and Hydraulic Research has developed a set of standards for backflow prevention assemblies and rigorously tests them for certification. Municipalities and water purveyors often require that valves have been certified by them. – http://fccchr.usc.edu/list.html for more information.
- **ASSE –** The American Society of Sanitary Engineers (ASSE) is an international organization that promotes "Prevention Rather Than Cure" through its product performance standards and professional qualification standards to protect public health and safety. Almost every water purveyor will require either ASSE or USC approval. – http://www.asse.org for more information.
- **NSF –** The National Sanitation Foundation (NSF) was created with a mission to protect and improve global health. In the case of backflow devices this includes certifying that they are lead free and safe to use in potable water.

TAKEAWAY: Be sure to know which agency approvals are appropriate for your application, and which are required.

Plumbers, contractors, and engineers have more options to recognize, plan for, and prevent potential backflow threats before they occur, but ever-changing plumbing codes and complex plumbing systems have made it a difficult landscape for plumbing professionals to navigate. Specifying the correct backflow preventer is the first step to a safe and secure water supply.

It's important to remember that the best way to ensure the right solution for the application we must:

- Identify potential cross-connections within the water system
- Identify and diagnose potential backflow situations
- Understand what backflow prevention device is used for specific applications (usually identified in local plumbing codes)
- Stay up-to-date on local plumbing codes and water quality regulations
- Inspect existing preventers and ensure they function and are up to code – using OEM repair parts to remain compliant
- Provide the highest-quality backflow prevention devices
- Contact the device manufacturer directly, if there is any doubt, regarding questions relating to the use, installation, and repair of their backflow preventer

TOGETHER, THREE WATTS BRANDS PROVIDE SOLUTIONS FOR A BROAD ARRAY OF BACKFLOW PREVENTION APPLICATIONS.