



Upcoming Meeting

Date: December 15th, 2021

Time: 6:00pm to 8:00pm

Place: Olive Grove Restaurant

Topic: Control and Pressure Reducing Valves

Speaker: Nick Azmo –Watts

Meeting Format

6-6:30 Social

6:30-6:45 Announcements and Table Tops

6:45 Dinner Served

7:00-8:00 Speaker

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MEETING LOCATION



Olive Grove
Restaurant & Lounge

**705 North Hammonds Ferry Road
Linthicum, Maryland 21090
Phone: 410.636.1385**



*Local Chapters are not authorized to speak for the Society.
Newsletter questions please contact [Jason Eagles](#)*

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Please Contact [Jason Eagles](#) or [Jeff Edwards](#)

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ASPE Design Guide Volume 4 Chapter 4

“The goal of the designer should be for the system to operate with as little energy as possible for a given demand.”

“At no time is a booster at 100 percent flow based on Hunter’s diversity curves”

“When selecting the total flow capacity, one preferred way to evaluate the operational efficiency is to use a method that can be scientifically proven, such as the 70 percent method.”

“Tanks will typically be required when the manufacturer does not utilize low flow testing algorithms to detect low flow”

“New energy standards concede that reducing the speed of a pump during most of its operational time and restarting for makeup loads is more efficient than using tanks as “water storage batteries” during low-flow conditions.”

** The above is taken from American Society of Plumbing Engineers design guide volume 4 chapter 4**

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Chuck Swope, PE, CPD, LEED AP BD+C
Vice President—Technical

Technical Report

♪Oh, the weather outside is♪... mild and kind of nice for December. No snow in our near forecast for Baltimore, but there's always hope for a snowy holiday break. A big thanks goes out to our Desmond Richelsen from AMES for an informative seminar on Submersible Pumps and the pitfalls of designing them (pun somewhat intended). Not to pump on the bandwagon (someone stop me), but it was clear to see why the industry is getting closer to eliminating wet sumps by switching to a Direct Inline Pumping system.

This month is another great conversation topic on Control Valves and Pressure Reducing Valves, presented by Nick Azmo from Watts and The Joyce Agency. Thanks to Matt Morris for bringing it to our attention. This is a seminar that I could have used when I had a problem at one of the projects that I worked on several years ago. It was a large public bathroom with approximately 40 water closets and high incoming water pressure. It turned out to be an issue with the pilot pressure reducing valve, but it was hard to convince the contractor that it was installed incorrectly. Good thing we engineers don't specify faulty PRVs, right? Anyway, we are grateful to bring Nick Azmo to our chapter for another successful and conversation provoking topic!

Nick Azmo is no stranger to the plumbing field. Having spent over 35-years in the Plumbing, Mechanical and Code Enforcement fields, he is currently employed by Watts® Water Technologies and serves as their Eastern Regional ACV Field Applications Engineer for Automatic Control Valves. His duties include support for the agents and distribution channels with pre-sales and post-sales activities and acts as the technical liaison in the East for troubleshooting ACV's. Nick has written numerous articles in various trade journals and magazines regarding his trade. He has presented technical seminars in over 30-States, holds a current Master Plumbers License in the State of NJ, and was past Secretary of the NJ Plumbing Inspectors for over seven-years. He served as past Vice-Chair of the National AWWA Cross-Connection Committee, currently sits on several ASSE Technical Working Group Committees and is involved in his home State of NJ as an ASPE Board Member.

Best Regards,
Charles J. Swope, PE, CPD, LEED AP BD+C
Vice President - Technical



Design Considerations for Pressure Reducing Valve Stations In Domestic Water Systems

August 4, 2004

Providing equipment selection and pipe sizes that deliver adequate water flow to plumbing fixtures and equipment in tall buildings is an important design task of the plumbing design professional.

Providing equipment selection and pipe sizes that deliver adequate domestic water flow within useable pressure ranges to plumbing fixtures and equipment in tall buildings is an important design task of the plumbing design professional.

The necessary design tasks include:

- Determining the "code-allowed maximum" delivery pressure to fixtures and the "minimum useable" delivery pressures of the "exact fixtures" to be included in the project. Using the code minimum delivery pressure for design purposes and installing fixtures with higher than the code minimum requirements will result in poor or unacceptable performance. The most demanding pressure requirements are likely to be shower valves, which vary widely by manufacturer.
- Determining the "maximum probable water flow demand" of fixture groups using the Fixture Unit method and Hunter's Curve, and estimating the "minimum probable water flow demand" using evaluation and experienced judgment of the fixture groups, building type and projected use.
- Determining the system pipe sizes and friction loss of supply piping to fixture groups at "maximum probable flow rate."
- Determining locations of pressure reducing valve (PRV) equipment, considering adequate space for servicing, sounds produced by normal operational noises and safety in the event of valve malfunction.
- Determining the available inlet pressure at PRV equipment and the desired outlet pressure to plumbing fixture groups based on relative locations of stations and fixtures within the building height.

Basic Valves

Smoothly operating PRV stations that instantaneously reduce a higher inlet pressure to a steady lower downstream pressure, regardless of changing flow rate and/or varying inlet pressures, are accomplished using two types of pressure reducing valves.

- Direct-acting, spring-loaded valves are used for low flow rates.
- Pilot-operated, diaphragm-actuated pressure-reducing valves are used for higher flow rates.

The primary differences between these two types of valves are the style of operation, pressure losses through the valves and available sizes.

The direct-acting, spring-loaded valve uses the tension of a spring to close the valve disc against the seat, thus providing a pressure loss or reduction as water flows through the valve. Simple in its operation, the direct-acting valve has a "continuously increasing pressure loss" as water flow increases through the valve, compressing the spring. The pressure difference between the minimum and maximum water flow rates can be as high as 50 psi, making them perform poorly at high flow rates.

The diaphragm-actuated, pilot-operated valve, in contrast, can maintain a steady downstream pressure with a constant, minimal pressure loss through the valve—normally 3-5 psi across the entire flow range of the valve. However, its limitation is that at minimum and intermittent flow rates near the shut-off point of the valve, the pilot system may "hunt" for the correct seat position, producing noise and chatter, and causing "wire drawing" of the seating surfaces.

Wire drawing occurs when the valve disc and seat position operate for extended periods of time close to the shut-off point of the valve, and the water flow erodes or scores a pathway in the seating material that remains when the valve closes tight to the shut-off position. This allows small flows and pressure "creep" from the inlet to the outlet side of the valve at the closed position. Pressure creep into the distribution system is relieved with the operation of plumbing fixtures; however, in systems where fixtures may be lightly used over a weekend, as in a commercial building, the pressure creep may exceed the temperature and pressure relief valve settings on local water heaters throughout the building. The resulting unattended discharge of water from T&P relief valves may cause extensive water damage and bring litigation against the designer's firm.

Wire drawing of valve seat materials can be mitigated by the correct sizing of the valve (smaller is better here, as a smaller valve opens more widely) or the specification of stainless steel seats that resist the scoring action of the water at low flows.

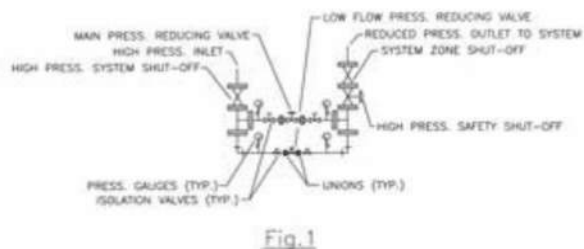


Figure 1

Parallel and Staged Series Arrangements

The limitations of each valve type can be successfully overcome by their use together, in parallel, with each valve overcoming the limitations of the other. The direct-acting valve is operational for low flows, and the diaphragm valve is

operational for high flows above a preset maximum pressure drop of the direct-acting valve. Selecting valve sizes that allow the direct-acting valve to provide for 1/4 to 1/3 of the maximum probable flow demand, and the diaphragm valve to provide for the remaining maximum probable demand, will result in a smoothly operating pressure

reduction across the full range of required flow. Arrangements may have the direct-acting valve included in the pilot piping of the diaphragm valve body to reduce the space required for overall installation, or it may be piped separately from the main valve (Figure 1).

Staged series arrangements of PRVs become necessary when the amount of pressure reduction required exceeds the ability of single valves in parallel to provide smooth pressure reduction without "cavitation." When the required pressure reduction from very high inlet pressures to normal code maximum delivery pressure causes a single valve to operate near its shut-off position to achieve the desired results, cavitation will occur as a result of the high velocity and turbulence created.

Cavitation is a hydraulic dynamic caused by excessive velocity and turbulence that momentarily pulls water apart into its gas constituents of hydrogen and oxygen, then collapsing back into liquid water. The result causes deterioration of internal valve parts and premature failure.

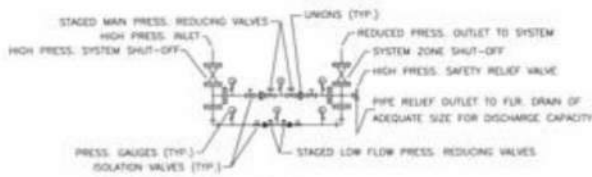


Fig.2

Arranging two PRVs in series to accomplish high pressure reduction allows the valves to reduce pressure in a staged manner, with each valve accomplishing a portion of the required pressure reduction, and it allows each valve to be significantly more into its

full open position, avoiding cavitation and turbulence. The PRV station at the bottom of a very tall building, where flows vary widely and pressure reduction is significant, may need to be arranged in both series and parallel valve arrangements to smoothly accomplish its task (Figure 2).

Valve Size Selection, Typical Station Trim and Safety Components

To summarize, for smooth operation, widely ranging flows need parallel valves for transitions between high and low flows, and high pressure reduction requires multiple valves in series. Now we can begin to utilize the information developed by the previously mentioned "necessary design tasks" to configure and specify equipment. Friction loss of supply piping to fixture groups and pressure drop through the PRV at maximum probable flow must be included in the outlet pressure figure.

Pressure-reducing valve sizes should be selected with minimum-maximum flow data and the required inlet-outlet pressures from the sizing data of a single valve manufacturer, utilizing cavitation charts to determine the need of "valves in series" to avoid cavitation. If the manufacturer's data does not include cavitation charts, consult your local representative or factory directly.

Contacting the specific manufacturer to confirm and advise on your selections prior to bid issue is a wise step. This gives them the opportunity to confirm your intended design and suggest additional options, such as "opening and/or closing speed controls in the piloting piping" to smooth valve operation, or the arrangement of pilot piping to provide a "high-pressure safety shut-down" if valve outlet pressures exceed intended design due to a valve diaphragm failure.

Valve sizes and type selection with detailed piping arrangement of the stations should be shown in the contract documents, and a Pressure Reducing Valve Schedule should be completed to indicate the location, valve sizes, minimum-maximum flow and inlet-outlet pressure requirements at each station.

The information shown will be based on a specific manufacturer and will allow other bidding manufacturers to confirm the arrangement and advise on the selection of their valves that provide for the elimination of cavitation and show a smooth transition between valves and flows, assuring proper operation regardless of which manufacturer supplies the equipment to the project.

A typical high-rise zone of predominately flush valve plumbing fixtures will likely result in a supply pipe size of 4" diameter, a low flow valve size of 3/4" or 1" diameter, and a high flow valve size not greater than 1-1/4" to 1-1/2" in diameter.

Show and specify the following trim components:

- System shut-off valves on the supply inlet and outlet to fixture groups. When maintenance of valves is desired without PRV interruption, additional shut-off valves should be provided on the inlet and outlet of each PRV to isolate them from the system separately.
- Threaded unions between PRVs.
- Pressure gauges on the inlet and outlet of the station, and between staged valves in series.
- A pressure relief valve sized to relieve the maximum inlet supply pressure of the station to an acceptable open site drain, in the event of PRV diaphragm failure and the resulting discharge of water from the safety valve.
- A bypass globe valve around PRVs, sized no larger than the high flow PRV size (optional).
- Supply line and pilot line strainers, based on water quality and suspended particulate.

Thoughts on Maintenance and Safety Trim

Water quality has the most direct effect on the need and frequency of maintenance of PRV stations.

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Planned maintenance at intervals that "prevent the failure in service of PRVs" is the best approach. If the main valve fails in service, the small valve will never cover the load at maximum probable demand.

Normal points of failure are clogging of the pilot trim, resulting in erratic operation or the failure of a diaphragm, in which case the PRV makes no pressure reduction until repaired. If the unreduced inlet pressure to the PRV is greater than the listed normal operation pressure of pipe and fittings supplying fixture groups, specify a pressure relief valve or a safety shut-off valve on the station outlet.

A safety shut-off valve is the basic valve with pilot modifications that will sense a rise in pressure from a failing PRV and close tightly, preventing high pressure from entering a supply zone downstream and causing fitting failures and water damage.

The usefulness of a manual globe bypass valve (intended to be adjusted manually by a technician to keep a system in operation while repairing a PRV) is questionable. Wire drawing is again the concern, and the finished repair may be made worthless. Wire drawing can occur with a large diameter globe valve operating near its seat when it is used during repair. When the service contractor places the PRV back into operation, he or she may fail to notice the small pressure creep that results from the wire-drawn seat on the bypass globe valve. This increased pressure may be slow to build and could possibly be relieved with the normal fixture use until the system is unused at night or over weekends. The excessive pressure builds through the wire-drawn seat of the bypass globe, around the just serviced PRV station, and into the supply system, resulting in T&P relief valves opening and damage to piping, fittings and valves having a lower pressure rating.

An improperly designed PRV station can have very detrimental results, such as excessive noise in the building, premature failure of the valve/pipe/fittings and possible water damage. Be sure to spend the necessary amount of time in the design, specification and detailing of PRV stations.

Self-Contained and Remote Pilot Arrangements

The discussion of pilot trim has so far been of the internal or self-contained type, meaning that the pilot locations are on the inlet and outlet of the specific PRV. The plumbing design professional should understand that many options of hydraulic control are available, utilizing different piloting modifications with the same basic valve. Designers will benefit greatly from a manufacturer's sales presentation, as the number and details of options are best explored in a format where questions can be addressed for greater understanding of the full design potential of their products.

Example

The use of a remote pilot location rather than internal piloting at the basic valve has allowed the design of centralized domestic hot water systems with centralized

recirculating returns from separate supply zones of different pressures to be realized. Hot water generated at the top of a tall building has the design advantages of dramatically less static head pressure on heating equipment, shorter flues with gas- or oil-fired equipment, and less overall equipment space required, versus individual water heaters located within each supply zone. Although hot water pressure reduction to fixture groups can be accomplished in an identical manner to the supply of cold water, combining recirculated returns from supply zones with different pressures into a centralized return system has eluded designers until recent years.

The Problem

Previous unsuccessful attempts utilized simple check valves at the point where recirculating zones of different pressures were combined into a central system. The problem is that the zone of highest pressure held the clappers of other lower pressure zones closed, or partially closed; thus only the zone with the highest pressure received adequate recirculation flow.

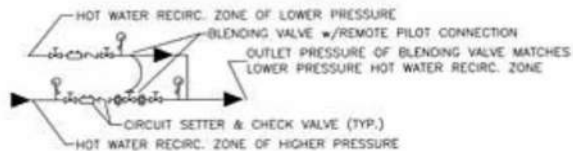


Fig.3

A Solution

Using remote piloting, a basic valve installed in a recirculation line of a higher pressure zone will sense the lower pressure from a separate zone and reduce its higher inlet pressure to match, at its outlet, the

lower pressure of a different supply zone, regardless of changes in flow or pressure of either system. The pressure difference between zones is justified in a dynamic manner, allowing them to combine under all operational circumstances (Figure 3).

After all zones are combined into a single recirculation line and pumped back to the water heating equipment, the same valve/remote pilot arrangement can be used to reduce the recirculation line pressure to that of the lower pressure of the domestic cold supply to the water heaters, completing the centralization of the domestic hot water recirculation system.



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Nikita Patel, EIT, MBA
AYP Liaison



AYP Report

Hello! In January, the Region 1 AYP group will begin holding monthly virtual seminars from 12-1PM on the third Wednesday of each month. **This seminar is open only to those who are 35 and younger.** Although our first virtual seminar will be free for all young professionals, regardless of membership status, all subsequent seminars will require a small fee from non-members.

For those YP's who were able to attend our September meeting, you'll recognize a familiar face for our presentation on Water Heater Technology. If you were unable to attend, I highly recommend joining us for Andrew Macaluso's presentation. We will send out a formal link for registration in the upcoming weeks.

Thanks,

Niki

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What's Old Is New Again: THE ENVIRONMENTAL & OPERATIONAL BENEFITS OF R744 HEAT PUMP WATER HEATERS

Andrew is the Product Manager, Systems Solutions at Watts Water Technologies. He has led the introduction of the newest commercial heat pump water heating technologies. He holds a Bachelor of Science in Mechanical Engineering from Columbia University and is an active ASPE member.

As electrification and decarbonization initiatives continue to grow throughout North America, there is increased scrutiny on the refrigerants being used. Heat pump water heaters powered by R744, better known as CO₂, provide a way to address everevolving energy savings and low-GWP requirements. This session will explore low-GWP CO₂ refrigerants that can provide high performance under a wide range of operating conditions. This rapidly growing product category offers many unique benefits. This session will examine the factors driving the adoption of R744-powered heat pumps, the keys to a transcritical refrigeration cycle, options for maximizing performance, strategies for applying this technology, and opportunities to integrate them with other ecofriendly water heating systems

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Christopher Imhof, PE, CPD
Education Committee Chair

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- 2021 IPC – <https://codes.iccsafe.org/content/IPC2021P1>
- 2018 IPC – <https://codes.iccsafe.org/content/IPC2018>
- 2021 IFGC – <https://codes.iccsafe.org/content/IFGC2018>
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- 2021 UPC & UMC – <https://www.iapmo.org/publications/read-uniform-codes-online/>
- 2021 & 2018 NSPC – <https://www.iapmo.org/ibu/publications/read-national-standard-plumbing-code-online>
- NFPA – <https://www.nfpa.org/Codes-and-Standards/All-Codes-and-Standards/Free-access> (requires free login)

Education

The Chapter is currently working to organize our 2022 Engineers Week Event. This will be the 4th year the Chapter has hosted an event for Engineers Week. This year’s event is planned for Friday, February 18th at the Engineers Club of Baltimore. If you’re interested in volunteering, please email me at christopher.imhof@wsscwater.com

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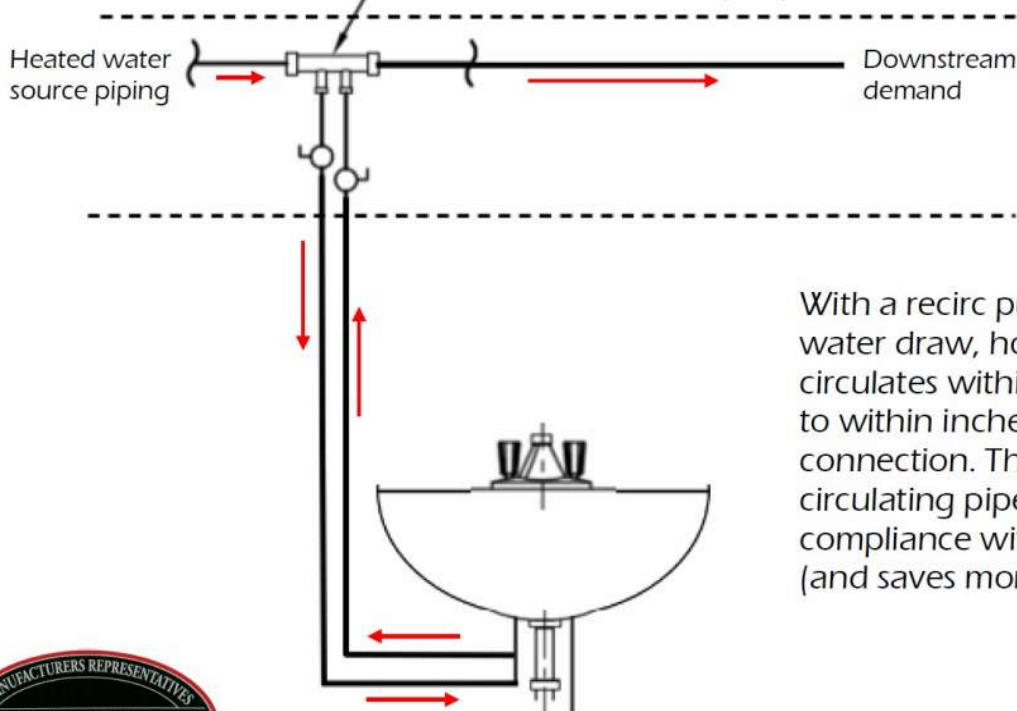
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Kathy Dwyer
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Treasury Report

Merry Christmas to all! I am looking forward to seeing you at Olive Grove on December 15th decked out in your green and red! I know it is a bit of a disappointment not to have our bowling Christmas party but if you are interested in continuing our tradition of a new unwrapped gift, I would be happy to drop them off at Toys for Tots after our meeting. We are in good shape this year due to all our sponsors which we appreciate. God bless you all and your families this Christmas Season.

Thanks,
Kathy

Kathleen Dwyer
kdwyer@ejdwyer.com

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2021-2022 ASPE Baltimore Chapter Meeting Schedule

Date: **September 22nd, 2021**
Speaker: Bay Associates
Topic: Heat Pump Water Heater Technology

Date: **October 27th, 2021**
Speaker: Highland Tank
Topic: Oil/Water Separators

Date: **November 17th, 2021**
Speaker: Ames
Topic: Direct Inline Pumping Systems for Sanitary and Storm

Date: **December 15th, 2021**
Speaker: Joyce Agency
Topic: Pressure Reducing Valves

Date: **January 26th 2022**
Speaker: STH
Topic: Fire Pumps

Date: **February 20-26th, 2022**
Engineer's Week

Date: **February 23rd, 2022**
Speaker: Prof. Ken Isman
Topic: ESFR and Cloud Ceilings

Date: **March 23rd, 2022**
Speaker: Otto Sales
Topic: Wastewater Systems

Date: **April TBD, 2022**
Event: Annual Golf Outing

Date: **April 27th, 2022**
Speaker: Charlotte Pipe
Topic: Hands-on Starter Fittings

Date: **May 25th, 2022**
Speaker: EJ Dwyer
Topic: Emergency Fixtures



Monthly Sponsorship Opportunities

The Baltimore Chapter of ASPE continues to have successful meetings and is looking to continue improving throughout the year.

The Chapter has the following sponsorship opportunities for each month:

Tabletop Presentations: \$100 to provide a tabletop presentation of equipment or material relative to the plumbing profession. The tabletops will be set up from the beginning to the end of the monthly meeting and provides the opportunity to provide a brief (under 5 minutes) presentation.

Please make checks payable to the Baltimore Chapter of ASPE.

Contact Jeff Edwards or Kathy Dwyer if interested

jedwards@muellerassoc.com

kdwyer@ejdwyer.com

NOTE: ONLY APPLICABLE WHEN WE RETURN TO OUR REGULAR IN PERSON MEETING EVENTS