ASSOCIATE MEMBER SPOTLIGHT

DRAIN SIZE - IT MATTERS

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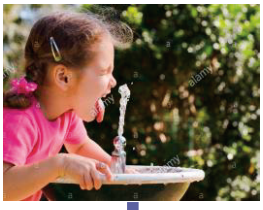


Cross Connection Control

Keeping Potable Water Potable

One of the biggest issues I come across as a backflow tester and repair guy is inadequate drain size. Consider this picture of an actual installation. This is a ¾" Watts 009M3 RPZ Backflow Prevention Device. As required, this unit is installed on a boiler feed line and serves to protect the potable water lines from the chemical additives typically found in boiler systems. As you can see, it is also equipped with a ¾" drain line located at the bottom of the unit.

Without getting into too many details on just how these units operate, suffice it to know that occasionally they do malfunction. Typically, this malfunction is at no fault of its own. It's usually caused by something entering the device through normal water flow. Rather it be mineral deposits or scale build up that has broken loose from the interior wall of water pipes and has lodged itself in the first check valve or lack of preventive maintenance, the results of either could lead to large amounts of water discharging out the relief valve. In any event, that water needs a place to go. This is known as a "Catastrophic Failure".

Should this unit experience a catastrophic failure, at 80 psi of water pressure it would discharge water from the relief valve at a rate of 40 gallons per minute.

Assuming gravity to low pressure, a ¾" drain line is capable of flowing water at a rate of 11 gallons per minute. Do you see the problem? Our relief valve is putting out 40 gallons per minute while our drain line can only handle 11 gallons per minute. What's going to happen to the remaining 29 gallons? You guessed it, it's going on the floor and if there is no floor drain your utility room is going to be converted into an aquarium.

Picture 3 depicts a utility room located at a NYSDOT highway garage. The dimensions of the room are 14' in length x 10' in width x 8' in height. This calculates out to 1120 cubic feet. One cubic foot will hold 7.48 gallons of water. Therefore, this room would hold 8,378 gallons of water. Keep this in mind.

Located on the right wall is a 2" RPZ backflow preventer equipped with a ¾" drain line directed to the floor. The room has no

Picture 3

floor drain and is enclosed with a tightly sealed door. In the event of a catastrophic failure, this unit would produce an average flow rate of 155 gallons a minute at 80 psi of water pressure.

Let's do the math. Our room holds 8,378 gallons of water. With a flow rate of 155 gallons per minute it would take exactly 54 minutes to fill this room with water. So much for the furnace, water heater, air compressor, electrical panel and bolt assortment display located on the left wall. Not to mention the poor guy who opens the door.

Below is a chart showing the average relief valve discharge rates for the Watts 909 series Reduced Pressure Zone Assemble Backflow Preventers, as well as the required drain size for each.

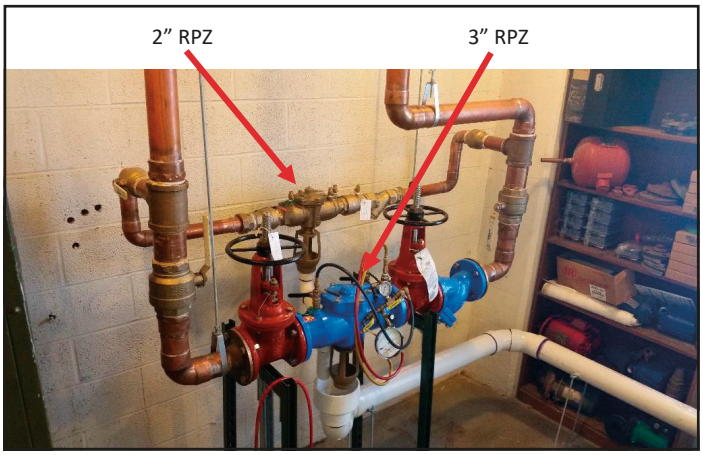
This installation (picture 4) shows a 3" supply line feeding a 3" Watts 009 RPZ (the blue thing on the left) with a 2" bypass line equipped with a 2" Watts 009M2 RPZ. At 80 psi the relief valve on the 3" RPZ is capable of flowing at a rate of 240 gallons per minute while the relief valve on the 2" RPZ will flow at a rate of 150 gallons per minute. This is a total of 390 gallons per minute.

Assuming gravity to low pressure, a 6" drain line is rated to handle a flow of 450 gallons per minute. These units are equipped with an adequate drain line.

Check Valve

Supply Line Size	Relief Valve Discharge Rate @80 psi in gals per minute	Drain Size Required
¾" – 1"	110	3"
1 ¼" – 2"	275	5"
2 ½" – 3"	325	5"
4" – 10"	625	8"

A general rule of thumb is the drain size needs to be 2 1/2 times the size of the supply line. However, discharge rates will differ between various makes and models and drain size considerations will also vary. Be sure to do your homework.



Picture 4

It should also be noted that the drain should be vented through an outside wall and be equipped with a check valve to prevent cold air from getting to the RPZ. Yes, I myself have seen a backflow preventer freeze up in a 70-degree room due to cold air coming through the drain line.

The following was an article taken from:

Safe-t-cover.com/rpz-flooding

Here is an example of a catastrophic flood caused by an RPZ dumping water. Remember, this is exactly what it was designed to do. This flood in the images below occurred in a hospital mechanical room causing over $1M in damage. You are looking at 2 sides of one wall. On the left, we see that the sudden water flow and volume moved the wall into the next room (right photo), which happened to be a telephone and low-voltage wiring room.

The insurer sought recovery from all the risk holders including the engineer, architect, contractor, subcontractor, and even the most recent recorded tester; while the details of who paid what were not made public, we do know that the property insurer >>>

was made whole by one or more of the listed defendants.

This flood risk is still not common knowledge, but it really should be. Backflow preventer manufacturers also make a flood control valve that is designed to be used in conjunction with reduced pressure zone devices. We've looked into what it does and wrote about the Watts version of the flood control valve.

Additionally, backflow manufacturers have made the relief valve discharge rates available to the public for all their RPZ models and sizes. Backflow manufacturers are making an effort to inform and prepare designers and property owners about the amount of water a relief valve can discharge. In turn, water district managers need to develop backflow preventer details with outdoor RPZs. It's then up to engineers to design the backflow prevention solution the best way they can.

As you can see from this article, installing a properly sized

drain in conjunction with a flood control valve is a whole lot cheaper than the $1M worth of damages done at this hospital. The old mentality of hiring your second cousin's boyfriend's best friend, who is out on parole, to slap an RPZ in for you might not pay off in the long run. These units not only should be but are required to be designed by a Professional Engineer (PE). Yes, its going to cost a little but consider the alternative.

Lastly, as a reminder Part 5-1.31 (a)(3) does require that backflow preventers be tested on an annual basis and should be on a 5-year maintenance schedule. This may not prevent a catastrophic failure however it will certainly give some peace of mind.

Please see my ad (Farewell's Backflow Testing and Repair) for contact information to schedule an appointment and remember, "Drain Size Matters".