

HOT OR COLD?

The Basics Of

TEMPERED WATER

For EMERGENCY

SHOWERS and

EYEWASHES





HISTORICALLY, THE BIGGEST CHALLENGE WAS ACCESSIBILITY, the best place for ready access to emergency equipment.

Hot or Cold? The Basics of Tempered Water for Emergency Showers and Eyewashes

The slap of cold water on an unsuspecting victim has been standard comedy fare for years, and it can make for an amusing scenario, assuming you're not the one being doused. In an emergency situation however, cold water is anything but funny. In fact, running non-tempered or cold flushing fluid through industrial emergency equipment can be downright dangerous.

When used properly, emergency showers and eye/face washes minimize the effects of exposure to hazardous materials by drenching the affected areas of the body with significant amounts of water. This serves the dual purpose of removing any remaining hazardous materials and minimizing further injury.

Historically, the biggest challenge faced by designers and specifying engineers was accessibility – determining the best place for ready access to emergency equipment. The basic design objective is to place this equipment as close to potential accident sites as possible. This challenge becomes much more difficult in larger, more complex plants. More recent design configurations usually feature dispersed locations of eye/face washes and showers with centralized activation monitoring.

A more recent design challenge relates to the effect of exposure to the high volumes of water used in both eye/face washes and drench showers. ANSI Z358.1 calls for at least 15 minutes of immediate and constant eye/face wash or shower use in the event of exposure to hazardous materials. But exposure to domestic water temperatures in many parts of the country, combined with the cooling effect of moving water over the body, has its own risk – hypothermia. The possibility has driven many companies to upgrade their emergency equipment to include tempered water. Using tepid water makes the required 15 minutes of eye/face wash or shower exposure possible without exposing the user to the risk of hypothermia.

The International Safety Equipment Association (ISEA) revised the Z358.1 standard to include a water delivery temperature range of 60° to 100°F. On the low end, this range is intended to protect the victim from hypothermia. On the higher end, it's designed to prevent eye tissue damage or increased chemical reaction. At this time, there has been no study to determine the proper delivery temperature for specific hazards. Until such a study can be completed, manufacturers and specifiers use 80° to 85°F as a base point for delivery temperature. As with all installations, a medical advisor should be consulted to determine the optimum delivery temperature.

Tempered water blending systems generally consist of three major components: a hot water storage tank, a heater and a blending system. Additionally, a booster pump is often specified in instances where water pressure might be too low to run multiple pieces of emergency equipment at peak demand. While the foregoing components do define the additional items needed to upgrade an existing emergency equipment system to a tempered water system, opinions differ as to exactly what constitutes a complete system.

Most emergency equipment manufacturers agree that the specific requirements of the showers or eye/face washes that comprise a given system need to be taken into account when sizing the componentry for the tempered water. That means that the definition of the complete system includes both the tempering components and the specific emergency equipment in use or anticipated use. An ANSI-compliant shower may not actually be compliant if the upstream tempering components are sized improperly. ANSI compliance is sought and granted based on specific pressure and flow ranges, which can be affected by tempering components placed in front of the otherwise compliant emergency equipment.

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THE HEART OF THE TEMPERED WATER DELIVERY IS THE MIXING VALVE, which ensures water at the required temperature.



TEMPERING WATER for Emergency Equipment requires more functionality than is built into most mixing valves.

TEPID WATER FOR EMERGENCY EQUIPMENT

The heart of the tempered water delivery system is the mixing valve, which ensures that the safety equipment safely receives water at the required temperature. Safety equipment manufacturers are in the best position to design appropriate mixing valves, since we understand our equipment and our specific flow rate requirements. A clear understanding of both flow and potential peak demand is critical to properly designing a good system. Consider a facility that has several pieces of safety equipment and needs tepid water delivery to all of them.

First, it's necessary to determine how many of those devices may be required to run at once, as the mixing valve must be capable of handling the highest demand of multiple uses at the same time, as well as the lower demand associated with the operation of a single eye/face wash. Determining flow requirements will not only help your safety equipment manufacturer properly size the mixing valve, it will also allow them to determine the appropriate size of the required hot water source.

Once the mixing valve capacity has been established, the associated pressure drop at the highest demand must be determined. The most common oversight is underestimating the pressure required to drive the safety equipment after it has passed through the mixing valve. With a flow requirement of 30 GPM or higher, the mixing valve can have a significant pressure drop. Keep in mind that safety equipment is designed so that it will produce the required flow patterns at a minimum pressure of 30 psi. Adding this minimum pressure requirement to the pressure drop of the valve and the associated piping, you can determine what supply pressure is required. You might find that there is insufficient pressure at the facility to run the system. If this is the case, you will have to either add a booster pump to the supply or limit the number of showers and/or eye/face washes on the system. Another option is to increase the pipe size by one or two sizes to reduce friction losses. Many safety equipment manufacturers also offer components that will reduce the flow at the showerhead without sacrificing required flow patterns.

Once you have the essential data to size the system, ask the safety equipment manufacturer about the safety redundancies of their valve. This is very important to ensure that the mixing valve can offer a full flow bypass of cold water. In the event there is a loss of hot water at the valve, or the cold-water inlet at the valve becomes restricted, it is essential that there is a means to offer a full flow of cold water to the equipment.

If you are considering a mixing valve stated to have an internal cold-water bypass, you will need to ask if this bypass can handle the maximum flow of the system design. If the bypass is less, there is a good possibility that an eye/face wash will not flow water if it is needed concurrently with a shower, as the shower will take as much as it can receive. The offered mixing valve must also have a positive means of hot water shut-off in the event of a cold-water failure. If there is a sudden loss of pressure on the cold side, the mixing valve must shut off completely and not allow any hot water to pass. A valve should not pass only hot water, as there may be enough flow to operate an eye/face wash. Temperatures in excess of 100°F have been determined to be harmful to the eyes. These safety redundancies are essential to the safe operation of the mixing valve, and should be external to the main mixing valve so that their performance is not jeopardized by the overall performance of the mixing valve.

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Tempering water for emergency equipment requires more functionality than is built into most mixing valves. That's because most valves are individual valves – not valve systems – that have been designed by valve manufacturers instead of emergency equipment manufacturers, which have a better understanding of their own equipment requirements. Knowing the emergency equipment's operating requirements from the start allows us to see if the tempered water system under consideration meets all of the necessary requirements. Simply stated, there are two things to look for in a mixing valve system:

one

The mixing valve system must have a full flow by-pass to compensate for hot water loss or thermostat failure

two

The mixing valve system must provide for 100% hot water shut off in the event of cold water supply failure

In designing emergency equipment systems, we sincerely hope they are never used. But in the event that they are needed, we must make certain that the system will deliver the maximum volume needed, safely and adequately. There must also be safeguards and redundancies built into the system to maintain an acceptable minimum operation in case of any possible failure or contingency. The design process should progress from a complete understanding of your shower and eye/face wash requirements to building the upstream tempering elements with those requirements in mind. The goal is to deliver tempered water through your emergency equipment in one integrated, engineered solution, regardless of whether you are specifying a totally new system or adding tempering capabilities to an existing emergency equipment installation.

