TRAPS & TRICKS

SELECTING THE EQUIPMENT: *Stick with simple, well proven fixtures. Stress reliability and ease of maintenance. You may want to gamble on new types of equipment that can substantially reduce water consumption, such as faucets activated by personnel sensors. But don't make a big commitment to unproven equipment. Let others try the equipment first, and ask them about its performance.*

MEASURE 3.1.3 Install efficient shower heads.

RATINGS

New Facilities	Retrofit	O&M
A	B	

SUMMARY

An inexpensive way to save water and water heating energy. Easy to install. Differences in personal preference are a problem.

SELECTION SCORECARD

Savings Potential	$	$	$	
Rate of Return, New Facilities	%	%	%	%
Rate of Return, Retrofit	%	%	%	
Reliability	✓	✓	✓	
Ease of Retrofit	☺	☺	☺	☺

Ordinary shower heads flood the bather with much more water than is needed for efficient bathing. Figure 1 shows an example.

A variety of "high-efficiency" shower heads are available that you can use to limit water flow. These reduce water consumption by three methods: using smaller orifices, narrowing the discharge pattern, and mixing air with the water to increase the sensation of flow.

The sensation provided by the shower head is an important subjective factor for bathers. Experience shows that a particular shower head may be pleasing to one person and annoying to another. A partial solution to this problem is to select shower heads that let the bather change the spray pattern. However, this also forfeits part of the potential saving.

Savings Potential

Present types of high-efficiency shower heads use one to two gallons per minute if the user controls the water pressure to the shower head, and about two to three gallons per minute with full-flow valves. In contrast, common types of shower heads that are not designed for efficiency may pass 4 to 8 gallons per minute. The difference is starting to narrow as manufacturers increasingly design for water conservation. Even today, selecting a shower head for efficiency may reduce water consumption by half or better.

High-efficiency shower heads may cost less than conventional shower heads. This is because they are simpler. In new construction, this makes high-efficiency shower heads pay off immediately. Figure 2 shows a typical inexpensive high-efficiency shower head.

More expensive, "deluxe" shower heads have features that tend to be wasteful. Figure 3 shows an example. Of course, it is always possible for a manufacturer to jazz up an efficient unit and raise the price.

In retrofit, the payback period for replacing shower heads with high-efficiency units varies widely, depending on:

- ***the average number of users per shower head per day.*** High-efficiency units save more energy when installed in a busy gymnasium or in a communal dormitory shower than when installed in a hotel room or in a private residence.
- ***the habits of the bathers.*** The water consumption during each shower depends on the duration of the shower and the setting of the flow rate. This depends largely on whether the shower is used primarily for hygiene or as an esthetic experience. See Measure 3.1.5 about showering behavior.
- ***the type of valve.*** See Measure 3.1.4 about efficient shower valves.
- ***the cost of water and water heating energy***
- ***the characteristics of the shower head,*** discussed next.

Control of Spray Characteristics and Flow Rate

Many high-efficiency shower heads are adjustable to accommodate user preferences. Some people prefer a needle-like spray, while others want a fuller flow at

lower velocity. In order for a shower head to work properly, the full pressure of the water system must be delivered to the orifices to break up the water into droplets.

Most adaptable shower heads adjust the spray pattern by varying the sizes of the orifices. The flow rate varies with the user's setting. With larger orifices, the stream is not broken into droplets. There is no way to avoid the fact that a coarser spray uses more water.

The least expensive models change orifice size by sliding one or more tapered plugs, or plugs with tapered grooves, to various positions in a nozzle plate. More expensive models use several sets of nozzles. Experience teaches that no single type is preferred by a majority of people.

Some models include a pulsing spray as one of the settings, as in Figure 3. This is an esthetic feature, not an energy conserving feature.

Select for Ease of Use

You will save more energy if you make it easy for bathers to use showers efficiently. If you install adjustable shower heads, select a type that is easy to use. The easiest adjustment is a large butterfly knob on the side of the shower head. Some cheap units have a knob in the center of the nozzle plate, forcing the user to reach through the spray to adjust it. This is annoying.

Shower heads that include several spray nozzles commonly require the bather to turn a large ring surrounding the head, as in Figure 3. This can be confusing and awkward for unfamiliar users.

For those of European taste, high-efficiency shower heads are available in "telephone" style, installed on flexible hoses. They are awkward to use. If the shower space is confined, it is more convenient and more efficient to take "Navy" showers using a fixed shower head. See Measure 3.1.5 about this.

Install User-Friendly Shower Valves

If the valve in the shower provides only full flow, the bather must adjust the spray at the shower head to modulate the flow. This is likely to produce a shower that is not as pleasing to the user. Simple shower valves are more efficient and more pleasing. See Measure 3.1.4 about shower valves.

Avoid On-Off Valves on Shower Heads

Some high-efficiency shower heads include an on-off valve. Figure 4 shows an example.

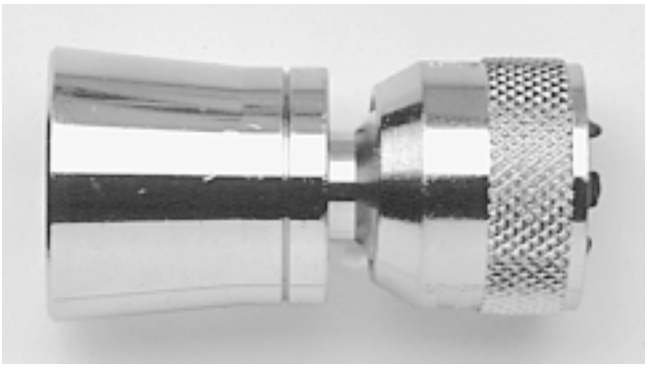
In principle, this valve avoids the need to adjust the main hot and cold water valves. Once the main valves are set properly, the water is simply turned off at the shower head.

Don't use this type of shower head. In reality, it probably does not speed the process of getting the desired water temperature in the shower. The stagnant water must still clear out of the hot water supply line, and this takes longer if the user does not open the hot water valve to clear the line quickly.

Furthermore, this type of shower head may cause a continuous leak. If the main valves are left open with the shower head valve closed, the water line that connects the valves to the shower head is kept under pressure. This causes the valves to leak if they have leaky packings. If the shower is used with a tub, a diverter valve is installed, and this may leak. The valve in the shower head is a crude device that eventually starts leaking itself, so it has to be abandoned anyhow.

WESINC

Fig. 1 Water waster This shower head has large orifices, which require a high flow rate to provide a satisfactory spray.



Resources Conservation Inc.

Fig. 2 Inexpensive water-saving shower head This unit saves water simply by having small orifices and a narrow spray pattern. The unit must be removed occasionally to clean out grit that backs up behind the orifices. For this reason, prefer units that have flats for a wrench instead of a knurled area.

Water Temperature Fluctuations

The bather adjusts the shower water temperature by adjusting the relative flow of hot and cold water. The hot water arrives by a separate pipe all the way from the hot water heater, which maintains the hot water pressure to the shower head. If someone turns on an adjacent cold water fixture, such as a faucet or toilet, the cold water pressure to the shower drops. This causes a sudden increase in the shower water temperature. In extreme cases, this may scald the bather.

High-efficiency shower heads may worsen this problem. If the existing shower heads are sensitive to water pressure, test this possibility before replacing them with high-efficiency units.

This problem occurs only if the cold water piping is too small, so that it cannot maintain water pressure when another fixture draws a large flow. In a well designed service water system, both the cold and hot water piping is of ample diameter to serve all fixtures. Individual fixtures are fed from lines of small diameter, to prevent them from bleeding too much pressure from the main pipe.

WESINC

Fig. 3 Versatile and amusing, but not highly efficient
This shower head provides a variety of spray patterns, including a pulsating spray. Some of the patterns have higher flow rates. The pattern is selected by rotating the large outer ring, which is somewhat awkward.

Testing and Selecting Shower Heads

In the United States, Federal law requires that shower heads made after 1993 must limit water flow to 2.5 gallons per minute with a supply pressure of 80 PSI, but do not assume that this criterion will be met. Reliable data on the water consumption of individual models is usually not available. Consumer publications, such as *Consumer Reports*, occasionally review the efficiency and esthetic factors of currently available shower heads.

If you cannot find reliable information about the performance of different models, you can test samples yourself. Measure the length of time required to fill a bucket through the shower head with the water turned on fully. In retrofit applications, start by testing your existing shower heads.

The nature of the facility environment may be a major factor in your choice. Luxury hotels and private residences typically require greater adaptability than public showers, such as those in gymnasiums and swimming centers. Simple, non-adjustable shower heads may be quite satisfactory for the latter applications, and they are more rugged than the adjustable types.

Maintenance

Non-adjustable high-efficiency shower heads have tiny orifices. These trap particles behind the nozzle plate. The particles typically are too large to clog the orifices themselves, but enough of them may accumulate to choke flow through the entire unit. Correct these problem by unscrewing the unit and dumping out the grit. If the water supply is particularly gritty, you may have to do this often.

Do Not Use Flow Restrictor Inserts

Shower flow restrictors are simple orifices that are intended to reduce shower water consumption. They usually take the form of a plastic insert that is installed inside the shower head connector. These devices have been distributed widely by utility companies, government agencies, and others to promote conservation. Unfortunately, they do not work and they are a nuisance. In order for the flow restrictor to reduce water flow, it must dissipate most of the water pressure ahead of the shower head, so the shower head does not have enough pressure to work properly.

ECONOMICS

SAVINGS POTENTIAL: *40 to 70 percent of the water consumption and water heating energy used in showering.*

Resources Conservation Inc.

Fig. 4 Shower head with integral shutoff valve This may seem like a good idea, but it isn't, for several reasons.

COST: *Low or none, in new facilities. High-efficiency shower heads are typically less expensive than standard units. Typical prices range from $5 to $20 for single-setting shower heads, and up to $50 for units with variable spray patterns.*

PAYBACK PERIOD: *Immediate, in new facilities. One year to several years, in retrofit.*

TRAPS & TRICKS

SELECTING THE EQUIPMENT: *Be aware that people differ in their preferences for shower heads. Try to find a type that most bathers like. In residential facilities, keep a few good types in stock so that you can respond to complaints by installing a different type. Install a few samples on a trial basis before buying in quantity. Test their water consumption.*

MEASURE 3.1.4 Install shower valves that allow easy control of temperature and flow rate.

RATINGS

New Facilities	Retrofit	O&M
A	C	

SUMMARY

Conventional double faucets are the most efficient, the easiest to use, the least expensive, and the easiest to maintain.

SELECTION SCORECARD

Savings Potential	$	$	$	
Rate of Return, New Facilities	%	%	%	%
Rate of Return, Retrofit	%	%		
Reliability	✓	✓	✓	✓
Ease of Retrofit	☺	☺	☺	

The old original style of shower valves, with separate valves for cold and hot water, is the most efficient for general use. Figure 1 shows a typical installation.

Separate valves allow the bather to quickly set the desired flow rate and temperature. They are simplest and easiest to maintain. Everyone knows how to use them. In new installations, they are usually the least expensive type.

Newer types of shower valves waste energy in several ways. The worst energy waste occurs with shower valves that operate only at full flow. High-efficiency shower heads (see Measure 3.1.3) typically use about 50% more water when operating at full pressure than when the bather is able to set the flow rate. Less efficient shower heads may double their water consumption with full-flow valves.

All non-standard types of valves waste water by forcing the bather to fiddle with the valve while attempting to figure out how it works. As the bather fiddles, water is being wasted. Also, a bather who is unfamiliar with a shower valve tends to set it to a higher flow rate than he would use with a familiar valve.

Again, the worst case is full-flow shower valves, which require the water to go to full flow before they control temperature. They also annoy users because they operate in a manner that is contrary to common sense. They probably increase the risk of scalding. This type of valve is the stupidest development in the history of plumbing, an egregious case of spending extra money to irritate the user.

In facilities where inefficient shower valves are installed, try to replace them with conventional separate valves for hot and cold water.

It may not be economical to install double valves in showers where a full-flow valve is presently installed. In such cases, the best replacement is a combination valve in which total flow is controlled by moving the