



# WaterSense at Work

Sanitary Fixtures and Equipment

## 3.2 Urinals



Best Management Practices for  
Commercial and Institutional Facilities



May 2023

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WaterSense® is a voluntary partnership program sponsored by the U.S. Environmental Protection Agency (EPA) that seeks to protect the nation’s water supply by transforming the market for water-efficient products, services, and practices.

*WaterSense at Work* is a compilation of water efficiency best management practices intended to help commercial and institutional facility owners and managers from multiple sectors understand and better manage their water use. It provides guidance to help establish an effective facility water management program and identify projects and practices that can reduce facility water use.

An overview of the sections in *WaterSense at Work* is below. This document, covering water efficiency for urinals, is part of **Section 3: Sanitary Fixtures and Equipment**. The complete list of best management practices is available at [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices). WaterSense has also developed worksheets to assist with water management planning and case studies that highlight successful water efficiency efforts of building owners and facility managers throughout the country, available at [www.epa.gov/watersense/commercial-buildings](http://www.epa.gov/watersense/commercial-buildings).

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This document is one section from *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities* (EPA-832-F-23-003). Other sections can be downloaded from [www.epa.gov/watersense/best-management-practices](http://www.epa.gov/watersense/best-management-practices). Sections will be reviewed and periodically updated to reflect new information. The work was supported under contract 68HERC20D0026 with Eastern Research Group, Inc. (ERG).

## Overview

Urinals can be found in most commercial and institutional facilities. Several different types of urinals exist, including flushing urinals that use water and non-water-consuming urinals. Urinals currently on the market can perform well while using much less water than older models installed before the Energy Policy Act (EPAct) of 1992 maximum flush volume requirements were established.

Flushing urinals flush water to remove liquid waste from the fixture. Flushing urinals use a variety of different technologies. Washdown or washout urinals require the activation of a flushometer valve. Gravity tank-type urinals, which are less common in North America, rely on the release of water stored in an in-wall cistern to provide the necessary water head pressure and flow to remove waste from the urinal, similar to the operation of a gravity tank-type toilet. Siphonic jet urinals have an elevated flush tank and operate by using a siphon device to automatically discharge the tank's contents when the water level in the tank reaches a certain height. This type of urinal requires no user activation.



*Flushing urinal*

Flushing urinals can be equipped with electronic sensors that activate the flushing mechanism when a user has finished using the fixture. Automatic flush sensors provide no additional water-efficiency benefits; however, they provide health and sanitation benefits in public-use facilities because they offer a hands-free option. If not properly maintained, sensors may actually increase water used by urinals through double or “phantom” flushing.

Flushing urinals come in two basic types: standard, single-user fixtures and trough-type, multi-user fixtures. Trough-type urinals are large fixtures designed for multiple users in high-traffic places, such as stadiums, sports arenas, and concert venues. Trough urinals are sold in 36-, 48-, 60-, and 72-inch (91-, 122-, 152- and 183-centimeter) lengths. Some older models were designed to run continuously and, consequently, consume large amounts of water. New trough urinals either use flushometer valves on preset timers (e.g., hourly, for halftime at a football game) or are equipped with electronic sensors that detect a user at the trough.

Some urinals do not use water to flush the liquid waste from the fixture. A non-water-consuming urinal is “a plumbing fixture that is designed to receive and convey only liquid

waste through a trap seal into the gravity drainage system without the use of water for such function.”<sup>1</sup>

Non-water-consuming urinals use a specially designed trap that allows liquid waste to drain out of the fixture, through a trap seal, and into the drainage system. Many non-water-consuming urinals on the market today use a cartridge that contains a liquid barrier seal to prevent the escape of odors and sewer gases. Other models feature cartridge-less designs that use a liquid barrier seal in the urinal’s trap. A third type uses a self-sealing mechanical waste valve trap that does not require a liquid barrier seal; however, U.S. plumbing codes currently prohibit these self-sealing mechanical trap designs.

Because non-water-consuming urinals do not use water to flush the fixture, some sediment can build up in the drainlines if not properly maintained. There are some hybrid urinals that utilize a small amount of water in a drain-cleansing action in conjunction with the liquid barrier seal. These urinals periodically release of a volume of water (not to exceed 1.6 gallons (6.1 liters) per day) to clean the drainline and prevent buildup of sediment.

EPA’s 1992 established the maximum allowable flush volume for all urinals sold in the United States starting in 1994 as 1.0 gallons per flush (gpf) (3.8 liters per flush [lpf]). However, due to their long useful life, many urinals in existing facilities were installed prior to 1994 and flush higher than the 1.0 gpf (3.8 lpf) standard, often between 1.5 and 3.5 gpf (5.7 lpf and 13.2 lpf).

To address efficiency and advances in flushing urinal technology, the U.S. Environmental Protection Agency’s (EPA’s) WaterSense® program published the *WaterSense Specification for Flushing Urinals*.<sup>2</sup>

WaterSense labeled flushing urinals are independently certified to use 0.5 gpf (1.9 lpf) or less, while still achieving equal or superior performance in removing liquid waste.

The specification is applicable to the following devices:

- Urinal fixtures that receive liquid waste and use water to convey the waste through a trap seal into a gravity drainage system.

#### Look for WaterSense Labeled Flushing Urinals

When replacing old, inefficient urinals or purchasing new urinals look for the WaterSense label. A product with the label uses at least 20 percent less water than standard models and is independently certified for performance. Looking for the label is a simple way to quickly identify urinals that save water and perform well. Facilities can also use WaterSense’s Product Search Tool to find labeled urinals. Go to [www.epa.gov/watersense/product\\_search](http://www.epa.gov/watersense/product_search) to get started.



<sup>1</sup> American Society of Mechanical Engineers (ASME) A112.19.19-2016. *Vitreous China Nonwater Urinals*.

<sup>2</sup> U.S. Environmental Protection Agency’s (EPA’s) WaterSense program. Urinals. [www.epa.gov/watersense/urinals](http://www.epa.gov/watersense/urinals).

- Pressurized flushing devices that deliver water to urinal fixtures.
- Flush tank (gravity type) flushing devices that deliver water to urinal fixtures.

While EPA 1992 established the maximum allowable flush volume for urinals at the national level, some states and municipalities have adopted regulations mandating that urinals have a flush volume of 0.5 gpf (1.9 lpf) or less, consistent with the WaterSense specification. A few states, including California and Washington, require wall-mounted urinals to have a flush volume of 0.125 gpf (0.47 lpf) or less, although non-wall-mounted urinals can have a flush volume up to 0.5 gpf (1.9 lpf).<sup>3</sup> It is important to note that, while some of these regulations establish flush volume criteria consistent with or more stringent than the WaterSense specification, they may not require products to be WaterSense labeled or to meet WaterSense's performance criteria. Looking for the WaterSense label when purchasing urinals will ensure that the product meets both efficiency and performance criteria.

## Operation, Maintenance, and User Education

For optimum urinal efficiency, consider the following tips specific to flushing urinals and non-water urinals:

### Flushing Urinals

- At least annually, inspect diaphragm or piston valves, and replace any worn parts. To determine if the valve insert is in need of replacement, determine the time it takes to complete a flush cycle. The flush volume of a urinal valve can be estimated by counting the number of seconds it takes from activation until the valve closes.<sup>4</sup> Use Equation 1 below. For example, a properly functioning 1.0 gpf (3.8 lpf) flush valve should not have a flush cycle longer than four seconds. If the calculated flush volume greatly exceeds the rated flush volume of the urinal, replace the diaphragm or piston valve insert.

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#### Equation 1. Flush Volume of Flushing Urinal (gallons or liters per flush)

$$= \text{Time to Flush} \times 0.25$$

Where:

- Urinal Flush Volume: Gallons or liters per flush
  - Time to Flush: Seconds per flush
- 

<sup>3</sup> Appliance Standards Awareness Project. State Standards. <https://appliance-standards.org/states>.

<sup>4</sup> South Florida Water Management District. 2013. *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities: A Guide for Facility Managers*. [www.sfwmd.gov/document/water-efficiency-and-self-conducted-water-audits-commercial-and-institutional-facilities](http://www.sfwmd.gov/document/water-efficiency-and-self-conducted-water-audits-commercial-and-institutional-facilities).



- If replacing valve inserts, make sure the replacements are consistent with the valve manufacturer's specifications, including the rated flush volume. If replacing the entire valve, make sure it has a rated flush volume consistent with manufacturer specifications for the existing urinal fixture.
- Annually check and adjust automatic sensors, if installed, to ensure they are operating properly and avoid double or "phantom" flushing.
- Flushing urinals equipped with automatic flush sensors often will have an override switch, allowing maintenance personnel to manually activate the flush. Activating the override switch may release a larger volume of water than is typical for the standard flush. Train cleaning and maintenance personnel on how to effectively clean and maintain urinals with automatic flush sensors to ensure that the urinal is returned to its intended flush volume after maintenance operations are completed.
- Post signage and train users to report continuously flushing, leaking, or otherwise improperly operating urinals to the appropriate personnel.



*Urinals with automatic sensors*

### Non-Water-Consuming Urinals

If non-water-consuming urinals are selected for the facility, regularly clean and replace the seal cartridges or other materials as specified by the manufacturer and follow all other manufacturer-provided guidance. Proper maintenance is especially vital to the long-term performance of non-water-consuming urinals.

### Retrofit Options

In general, avoid retrofit options to reduce the flush volume of valves, including valve inserts that have a lower flush volume, unless those inserts are rated to provide a flush volume that is compatible with the existing urinal fixture. Confirm compatibility with the urinal fixture manufacturer, as many new urinal fixture models are designed to function across a range of flush volumes (e.g., 0.125 gpf to 1.0 gpf or 0.47 lpf to 3.8 lpf). Consider piloting the retrofit in a limited number of urinals to ensure performance is maintained before expanding to the whole facility. If the flush volume of the valve insert is not

compatible with the urinal fixture, it may not provide the expected performance, especially if the original equipment is not designed to handle a reduced flush volume.

## Replacement Options

When installing new flushing urinals or replacing older, inefficient flushing urinals, choose WaterSense labeled models.<sup>5</sup> WaterSense labeled flushing urinals have been independently certified to use no more than 0.5 gpf (1.9 lpf), which is at least 50 percent more water-efficient than standard flushing urinals on the market. Some WaterSense labeled models have flush volumes as little as 0.125 gpf (0.47 lpf). In addition, WaterSense labeled flushing urinals must meet specific criteria for flush performance and drain trap functionality and are designed to be non-adjustable above their rated flush volume, which helps ensure long-term water savings. To ensure high performance and water savings, choose a valve and fixture combination with matching rated flush volumes.

### Considerations for Urinal Replacements

When installing new flushing urinals or replacing old flushing urinals, choose WaterSense labeled models. If considering non-water-consuming urinals, adhere to the requirements of plumbing codes and green building standards, which require at least one water supply fixture unit (e.g., a faucet) to be installed on the drainline upstream of the non-water-consuming urinal(s) to facilitate drainline rinsing. Follow manufacturer recommendations for cleaning and maintenance, and when necessary, periodically use a bucket of water to manually flush non-water-consuming urinal drainlines to ensure there is no buildup of solids over time.

Non-water-consuming urinals certified to ASME A112.19.19 can also be considered during urinal installation or replacement to save water. When looking to install non-water-consuming urinals and very low volume flushing urinals (e.g., 0.125 gpf or 0.47 lpf urinals), consider the condition and design of the existing plumbing system and the expected usage patterns to ensure that these products will provide the anticipated performance. As a good rule of practice, adhere to the requirements outlined in both the Uniform Plumbing Code (UPC)<sup>6</sup> and the International Association of Plumbing and Mechanical Officials (IAPMO) *Water Efficiency and Sanitation Standard for the Built Environment (WE•Stand)*<sup>7</sup> which require at least one water supply fixture unit (e.g., a faucet) to be installed on the drainline upstream of the non-water-consuming urinal(s) to facilitate drainline flow and rinsing. Supplemental water or even periodic manual flushing of the drainlines using a bucket is important, because these products have little to no water going through the drain to flush out any solids that may build up over time. It is also important to carefully adhere to manufacturer-recommended cleaning and maintenance requirements to

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<sup>5</sup> Use WaterSense's product search tool at [www.epa.gov/watersense/product-search](http://www.epa.gov/watersense/product-search) to help identify WaterSense labeled models.

<sup>6</sup> IAPMO. 2021. *2021 Uniform Plumbing Code*.

<sup>7</sup> IAPMO. 2020. *WE•Stand Water Efficiency and Sanitation Standard for the Built Environment*. Chapter 4.

ensure products continue to perform as expected. Some hybrid urinals integrate a water-using, drain-cleansing action, which can help automate this periodic flushing.

## Savings Potential

Water savings can be achieved by replacing existing flushing urinals with WaterSense labeled flushing urinals, which use no more than 0.5 gpf (1.9 lpf). To estimate facility-specific water savings and payback, use the following information:

### *Current Water Use*

To estimate the current water use of an existing flushing urinal, identify the following information and use Equation 2 below:

- Flush volume of the existing urinal: Urinals installed prior to 1994 have flush volumes that typically range between 1.5 and 3.5 gpf (5.7 and 13.2 lpf). Urinals installed in 1994 or later have flush volumes of 1.0 gpf (3.8 lpf) or less.
- Average number of times the urinal is flushed per day, which will be dependent on the number of male building occupants: Male building occupants use the urinal two times per day on average.<sup>8</sup>
- Days of facility operation per year.

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### Equation 2. Water Use of Urinal (gallons or liters per year)

**= Urinal Flush Volume x Number of Flushes x Days of Facility Operation**

Where:

- Urinal Flush Volume: Gallons or liters per flush
  - Number of Flushes: Flushes per day
  - Days of Facility Operation: Days per year
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### *Water Use After Replacement*

To estimate the water use of a replacement WaterSense labeled flushing urinal, use Equation 2, substituting the flow rate of the replacement WaterSense labeled flushing urinal. WaterSense labeled flushing urinals use between 0.125 gpf and 0.5 gpf (0.47 lpf and 1.9 lpf).

For non-water-consuming urinals, while no water is used for urinal flushing, take into consideration any water that will be used for maintenance or for a periodic drain cleansing action.

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<sup>8</sup> Vickers, Amy. 2001. *Handbook of Water Use and Conservation*. WaterPlow Press.



### Water Savings

To calculate water savings that can be achieved from replacing an existing flushing urinal, identify the following information and use Equation 3 below:

- Current water use as calculated using Equation 2.
- Water use after replacement as calculated using Equation 2.

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#### Equation 3. Water Savings From Urinal Replacement (gallons or liters per year)

$$= \text{Current Water Use of Urinal} - \text{Water Use of Urinal After Replacement}$$

Where:

- Current Water Use of Urinal: Gallons or liters per year
  - Water Use of Urinal After Replacement: Gallons or liters per year
- 

### Payback

To calculate the simple payback from the water savings associated with replacing an existing flushing urinal, consider the equipment and installation cost of the replacement urinal (including any rebates or incentives obtained from a utility that may reduce the incurred cost), the water savings as calculated in Equation 3, and the facility-specific cost of water and wastewater. For non-water-consuming urinals, also take into consideration the cost of any periodic cartridge replacement and special maintenance requirements.

## Additional Resources

EPA's WaterSense program. Urinals. [www.epa.gov/watersense/urinals](http://www.epa.gov/watersense/urinals).

North Carolina Department of Environment and Natural Resources, et al. May 2009. *Water Efficiency Manual for Commercial, Industrial and Institutional Facilities*. [www.deq.nc.gov/watereducation/water-efficiency-business-2/download](http://www.deq.nc.gov/watereducation/water-efficiency-business-2/download).

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Texas Water Development Board. May 2018. *Best Management Practices for Commercial and Institutional Water Users*. [www.twdb.texas.gov/conservation/BMPs/CI/index.asp](http://www.twdb.texas.gov/conservation/BMPs/CI/index.asp).

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Federal Energy Management Program. Best Management Practice #6: Toilets and Urinals. [www.energy.gov/eere/femp/best-management-practice-6-toilets-and-urinals](http://www.energy.gov/eere/femp/best-management-practice-6-toilets-and-urinals).

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