

Pre-Rinse Spray Valves Program Guide



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August, 2021

Revisions

January 2006	<i>CEESM Commercial Kitchens Initiative</i> instituted including CEE Commercial Kitchens Initiative Program Guidance on Pre-Rinse Spray Valves
June 2014	CEE Commercial Kitchens Initiative Program Guidance on Pre-Rinse Spray Valves revised and renamed as Pre-Rinse Spray Valves Program Guide with the adoption of CEE High Efficiency Specifications for Commercial Pre-Rinse Spray Valves
August 2021	Revised with the retirement of the CEE High Efficiency Specifications for Pre-Rinse Spray Valves

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1 Background

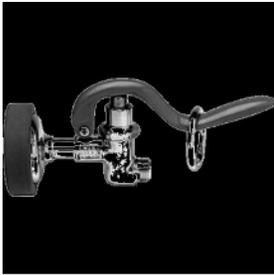
This document is part of the [CEESM Commercial Kitchens Initiative](#) (Initiative), which was adopted in 2005 to provide clear and credible definitions in the marketplace as to what constitutes highly efficient energy and water performance in commercial cooking, refrigeration, and sanitation equipment and to help streamline the selection of products through a targeted market strategy. Since 2005, CEE has developed a suite of specifications to identify energy and water efficient commercial kitchen equipment, tracked availability of commercial kitchen efficiency programs, and documented the approaches and impacts of existing programs. CEE members can find more information on the current Initiative direction and activities on the [CEE Forum](#). Additional resources and specifications have been developed by the [ENERGY STAR[®]](#) program, including specifications and guidance for operators and efficiency program administrators.

CEE has worked to transform the market for commercial pre-rinse spray valves (PRSV) since 2005 when it developed a program template to support member understanding of water and energy savings associated with the 2006 United States federal minimum standard. CEE participated in the development of the US Environmental Protection Agency (EPA) WaterSense[®] PRSV specification from 2010 to 2013 including informing the development of relevant test metrics and methods and communicating program needs to EPA. In 2014, CEE launched the two-tiered *CEESM High Efficiency Specifications for Commercial Pre-Rinse Spray Valves* (CEE PRSV specification) integrating the WaterSense level as Tier 1. Following implementation of the 2019 US federal minimum standard, CEE determined that the PRSV market has reached maximum technological potential and no longer presents an opportunity for a voluntary CEE performance specification to differentiate product energy and water performance that would provide meaningful, cost-effective energy savings beyond the new federal minimum standard. The CEE PRSV specification was retired on January 15, 2021, thereby discontinuing maintenance of the specification and qualified products list, and shifting the focus of this program guide to a strategy based on PRSV as a customer engagement, direct installation opportunity.

2 Purpose

Given the success of market transformation—the wide availability of highly efficient products that meet or exceed the CEE specification tiers, achieved through years-long collaboration between CEE member program administrators, water utilities, federal partners, and other experts—there is an opportunity to use PRSV in program designs aimed at building a relationship with the customer, with CEE members reporting success with using PRSV in direct install. There may also be an early retirement opportunity given the installed base of 1.5 million PRSV and average product life of five years.

This document provides guidance to CEE member energy efficiency program administrators to streamline the development of such voluntary energy efficiency programs for pre-rinse spray valves. This document is part of the CEE Commercial Kitchens Initiative. It includes consensus-based guidance to CEE member energy efficiency program administrators on topics relevant to program design and development including the following: equipment description, product use and lifetimes, specifications and test methods, product availability, price differential, energy savings, program design tips, and references to additional resources. This document was created



by CEE staff based on research and analysis conducted by the CEE Commercial Kitchens Committee during the life of the CEE Pre-Rinse Spray Valves specification. It does not provide program design recommendations or CEE policy positions.

3 Equipment Description

Pre-rinse spray valves are handheld devices designed and marketed for use with commercial dishwashing and ware washing equipment and applications that spray water on dishes, flatware, and other food service items for the purpose of removing food residue before cleaning the items.¹ Products that are used for pot and kettle filling, pet grooming, grocery produce and meat cleaning, residential dish rinsing, and other purposes beyond that described above are outside the scope of this guide. Efficiency is not a driving factor in most customer PRSV purchasing decisions; most customers will simply purchase whatever unit their local supplier recommends and has in stock.

¹ EPA WaterSense™ Pre-Rinse Spray Valve specification (<https://www.epa.gov/watersense/pre-rinse-spray-valves>).

4 Product Use and Lifetimes

According to the California Energy Wise Pre-Rinse Spray Valve Energy Savings Calculator² and the research EPA conducted as part of the WaterSense[®] specification development process³, customers use PRSV between 1 and 3 hours per day, 344 to 365 days per year. PRSV have an average useful life of five years. These assumptions are summarized in Table 1.

Table 1. Comparisons between California Energy Wise Pre-Rinse Spray Valves Energy Calculator and WaterSense Assumptions

	California Energy Wise	WaterSense
Daily Use Time	3 hours	3 hours
Days Used per Year	365 days	344 days
Lifetime	5 years	5 years

The United States Department of Energy (DOE) technical support document for the 2019 federal energy conservation standard provides a detailed analysis of annual PRSV operating hours across building types as shown in Table 2.⁴

Table 2. Average Annual CPSV Operating Time

Building Type	Schedule	Meals per Day	Average Annual CPSV Operating Time (hours)
Education			
K-12	Weekday Only	2	135
K-12	7 days per week	2	188
College/University	7 days per week	3	282
Food Retail			
All groups	7 days per week	NA	39
Healthcare			
Outpatient	7 days per week	3	587
Inpatient	7 days per week	5	978
Lodging			
Dormitory	7 days per week	3	463
Hotel/Motel	7 days per week	3.5	540
Restaurant			
All Groups	Weekday Only	2-3	259
All Groups	7 days per week	2-3	544

² <https://caenergywise.com/calculators/pre-rinse-spray-valve/>

³ <https://www.epa.gov/watersense/product-background-materials> - See Supporting Statement.

⁴ Chapter 7: *Energy and Water Use Analysis* in the U.S. Department of Energy's Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Commercial Prerinse Spray Valves, December 2015. Table 7.2.2 "CPSV Annual Operating Time" and Table 7.2.3 "Weighted Average Annual CPSV Operating Time" Available here: <https://www.regulations.gov/document/EERE-2014-BT-STD-0027-0046>

5 Specifications and Test Methods

The CEE PRSV specification was retired on January 15, 2021, thereby discontinuing maintenance of the specification and qualified products list. However, the performance metrics included in the CEE PRSV Specification that was in effect from 2014-2021 remain relevant to energy efficiency program considerations. These are:

1. Flow rate, tested in accordance with ASTM F2324, *Standard Test Method for Pre-Rinse Spray Valves*
2. Spray force, tested in accordance with ASTM F2324, *Standard Test Method for Pre-Rinse Spray Valves*
3. Life cycles, tested in accordance with ASME A112.18.1/CSA B125.1 Plumbing Supply Fittings

Each metric is described in detail below. Cleanability criteria, measured in accordance with ASTM F2324, *Standard Test Method for Pre-Rinse Spray Valves*, were not included in the CEE specification for reasons described below. Included in the discussion below are insights from a PRSV field study the US Environmental Protection Agency (EPA) conducted from January to June 2010. In this field study, EPA monitored PRSV use at 10 commercial and institutional kitchens for three weeks. The PRSV models used in the study had flow rates from 0.5 to 1.6 gallons per minute and cleanability times from 17 to 26 seconds per plate. EPA surveyed users about their satisfaction with the PRSV models at the end of the study.

5.1 Flow Rate

Flow rate, tested in accordance with ASTM F2324, is measured in gallons per minute (gpm). To measure flow rate, testers aim the PRSV at a receptacle and then measure the amount of water that flowed through the PRSV into the receptacle in a defined amount of time. In the field study described above, EPA confirmed that flow rate is a good indicator of energy and water savings. In the study, users did not operate lower flow PRSV models significantly longer than higher flow models. Higher flow rates did correlate somewhat to higher user satisfaction. However, the CEE specification did not require a minimum flow rate to ensure user satisfaction because a minimum flow rate might limit innovation to create effective lower flow designs. To address user satisfaction concerns, the CEE specification required a minimum spray force.

5.2 Spray Force

Spray force, tested in accordance with ASTM F2324, is a measure of the impact from a PRSV on the target surface. Testers measure spray force by aiming the PRSV directly at a force gauge and recording the force measurement in ounces-force (ozf). This metric was developed in response to

concerns that lower flow valves may result in lower user satisfaction. The CEE Specification required a minimum of 4 ounces-force at both the Tier 1 and Tier 2 levels. This represented a minimum baseline of performance to mitigate potential negative user experiences. For information about how this metric was developed, please see EPA's *WaterSense Specification for Commercial Pre-Rinse Spray Valves Supporting Statement*.⁵ To determine spray force's efficacy as a performance metric, EPA mapped laboratory spray force test data to user satisfaction data for the 14 PRSV models monitored in the field study described above. While the correlation between spray force and user satisfaction was not excellent, spray force does correlate better to user satisfaction than cleanability.

5.3 Life Cycles

Manufacturers' life cycle test PRSV to ASME A112.18.1/CSA B125.1 *Plumbing Supply Fittings*. Units that are certified to meet the ASME standard must perform a minimum of 150,000 cycles. During the field study described above, about half of certified and half of uncertified models leaked or otherwise malfunctioned during the three-week testing period. For this reason, the CEE Specification required a more rigorous life of 250,000 cycles, which is the same number of cycles required in the WaterSense PRSV specification and more strongly correlates to the expected life of PRSV.

5.4 Cleanability

Cleanability was originally intended as a metric to provide a performance floor, but early program experience indicated that a PRSV scoring well on cleanability would not necessarily live up to customer expectations. In the field study described above, EPA confirmed the poor relationship between cleanability and user performance satisfaction. EPA also found that ASTM F2324-03 cleanability test results did not correlate with actual use time in the field. Given the field test results, the CEE Specification did not include cleanability requirements.

5.5 Federal Standard

On January 28, 2019, the revised US DOE federal minimum standard went into effect. The new standard made significant changes, including decreasing the maximum allowable flow rate criteria to levels aligned with or below WaterSense/CEE Tier 1 performance criteria, an improvement of 20 percent to 40 percent compared to the previous standard established in 2006.

⁵ <https://www.epa.gov/sites/production/files/2017-01/documents/ws-products-support-statement-prsv.pdf>

Additionally, DOE added the spray force metric, using it to define three classes of end-user applications:⁶

- Class 1: Cleaning delicate glassware and removing loose food particles from dishware (≤5.0 ounces-force (ozf))
- Class 2: Cleaning wet foods (>5.0 to ≤8.0 ozf)
- Class 3: Cleaning baked-on foods (>8.0 ozf)

Table 3 compares the 2006 and 2019 federal minimum standards to the retired CEE and EPA WaterSense specifications. While the 2019 federal standard provides a strong basis for PRSV efficiency, program administrators may wish to include the life cycle criterion of ≥250,000 cycles that was previously specified by CEE and WaterSense to ensure adequate product durability.

Table 3. Comparison of 2006 and 2019 DOE Federal Minimum Standard with EPA WaterSense and CEE Specification Performance Criteria

Performance Metrics	2006 DOE Federal Minimum Standard	EPA WaterSense Specification (Sunset)	CEE Specification (Retired)		2019 DOE Federal Minimum Standard		
			Tier 1	Tier 2			
Flow Rate (gallons per minute, gpm)	≤1.6	≤1.28	≤1.28	≤0.75	≤1.00	≤1.20	≤1.28
Spray Force (ounces-forces, ozf)	Not Specified	≥4.0	≥4.0	≥4.0	≤5.0	>5.0 to ≤8.0	>8.0
Life Cycle (# of cycles)	Not Specified	≥250,000	≥250,000	≥250,000	Not Specified		

6 Product Availability and Market Penetration

It is estimated that 306,000 PRSV are sold in the US each year.⁷ As of the writing of this document, nine PRSV manufacturers or entities that brand these products were listed in the US DOE Compliance Certification Database:

⁶ U.S Department of Energy, 2016-01-27 *Energy Conservation Program: Energy Conservation Standards for Commercial Prerinse Spray Valves; Final Rule*, January 2016, accessed November 15, 2019: <https://www.regulations.gov/document?D=EERE-2014-BT-STD-0027-0050>

⁷ The National Restaurant Association (NRA) estimates that there are approximately one million commercial foodservice establishments in the US (<http://www.restaurant.org/News-Research/Research/Facts-at-a-Glance>). EPA, based on observations during its field study and input from stakeholders, assumes that there are 1.5 PRSVs per foodservice establishment on average, resulting in approximately 1.5 million PRSVs in use in the US (<https://www.epa.gov/sites/production/files/2017-01/documents/ws-products-support-statement-prsv.pdf>). California Energy Wise estimates a 5 year useful life for PRSVs (based on the [Pre-Rinse Spray Valve Energy Savings Calculator](#)) and EPA, in the report cited above, estimates a 5 year useful life. So, 20% of an estimated 1.5 million units are replaced per

- BKResource
- Bricor
- Chicago Faucet
- Component Hardware
- Fisher
- Krowne
- Strahman
- T&S Brass
- Zurn

Each manufacturer may make a small number of models that vary by quality of construction, flow rate, and spray pattern. Manufacturers also package PRSV in multiple ways: as stand-alone products, as parts of plumbing assemblies that may include faucets, hoses, or other plumbing components, or broken down into PRSV components (for example, just the head, without the valve).

There were 283 products listed in the DOE Compliance Certification Database on November 2, 2020 (up from 229 in November 2019). This included 53 models in the $\geq 5\text{oz}$ and $\leq 8\text{oz}$ Spray Force Category with product flow rates ranging from 1.07 to 1.15 gallons per minute, although 49 of those models were from one manufacturer and had a spray force of 5.4 ounces-force (ozf). There were 230 models in the $< 5\text{ozf}$ category with the products having a flow rate of either 0.65 or 0.7 gallons per minute.

7 Incremental Retail Price

Based on the prices of popular PRSVs available via online dealers, there is not a price differential between standard and high efficiency pre-rinse spray valves. Some manufacturers offer what is essentially the same valve in both standard and high efficiency versions. The primary difference between standard and high efficiency versions is the spray nozzle—the rest of the plumbing components in these cases are the same in both the standard and high efficiency versions.

The table below shows the online prices for base⁸ and high efficiency PRSV models made by T&S Brass.⁹ The unit construction, except for the nozzle, is essentially the same, as are the prices.

year—approximately 300,000 existing PSRVs are replaced per year, assuming no growth in the number of foodservice facilities.

⁸ As these models fall in the ≤ 5.0 ozf product class, the base models do not meet the current federal minimum standard, which requires a flow rate of ≤ 1 gpm.

⁹ Prices are from <https://www.webstaurantstore.com/14999/pre-rinse-spray-valves.html?vendor=T-S-Brass-and-Bronze-Works> as of November 25th, 2020.

Table 4. **Online Prices for Example Standard and High Efficiency PSRVs by T&S Brass**

Brand Name	Model Number	Spray Force (ozf)	Flow Rate (gpm)	CEE Tier 1/ WaterSense Qualifying?*(Retired)	CEE Tier 2 (Retired) Qualifying?*	Online Price
T&S	B-0107-C	4.4	0.65	Yes	Yes	\$61.82
T&S	B-0107	Not listed	1.15	No	No	\$61.82
T&S	B-0108-C	4.6	0.65	Yes	Yes	\$91.58
T&S	B-0108	Not listed	1.07	No	No	\$91.58

*Based on flow rate only.

8 Energy and Water Savings

Because efficient PRSV models reduce consumption of heated water, PRSV have been a relevant opportunity for all CEE members and water efficiency organizations, making the measure an attractive partnership opportunity. The following energy and water savings estimates were derived by using equations from the U.S. Department of Energy Technical Supporting Document.¹⁰

Table 5. Energy and Water Savings Estimates for Class 2: ≤5.0 ounces-force (ozf) PRSV

Criteria	Previous US Federal Minimum Standard	2019 US Federal Minimum Standard	Example of High Efficiency Model
Device flow rate (gallons per minute, gpm)	1.60	1.00	0.65
Operating hours per day	3	3	3
Operating days per year	365	365	365
Annual water consumption (gallons)	105,120	65,700	42,705
Annual water savings (gallons)	N/A	39,420	22,995
Annual water savings (%)	N/A	37.5	35
Annual water heating energy with electric water (95% efficient, 70-degree rise) (kWh)	18,901	11,813	7,678
Annual water heating energy savings with electric water heater (kWh)	N/A	7,088	4,135
Annual water heating energy savings with electric water heater (%)		38%	35%
Annual water heating energy with gas water heater (60% efficiency, 70-degree rise) (therms)	876	547	356
Annual water heating energy savings with gas water heater (therms)	N/A	328	192
Annual water heating energy savings with gas water heater (%)	N/A	38%	35%

¹⁰ Equations can be found in “Chapter 7: *Energy and Water Use Analysis*” in the U.S. Department of Energy’s Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Commercial Prerinse Spray Valves, published in December 2015. Available here: <https://www.regulations.gov/document/EERE-2014-BT-STD-0027-0046>

Table 6. Energy and Water Savings Estimates for Class 2: >5.0 to ≤8.0 ounces-force (ozf)

Criteria	Previous US Federal Minimum Standard	2019 US Federal Minimum Standard	Example of High Efficiency Model
Device flow rate (gallons per minute, gpm)	1.60	1.20	1.07
Operating hours per day	3	3	3
Operating days per year	365	365	365
Annual water consumption (gallons)	105,120	78,840	70,299
Annual water savings (gallons)	N/A		8,541
Annual water savings (%)	N/A		
Annual water heating energy with electric water (95% efficient, 70-degree rise) (kWh)	18,901	14,175	12,640
Annual water heating energy savings with electric water heater (kWh)	N/A	4,725	1,536
Annual water heating energy savings with electric water heater (%)		25%	11%
Annual water heating energy with gas water heater (60% efficiency, 70-degree rise) (therms)	876	657	586
Annual water heating energy savings with gas water heater (therms)	N/A	219	71
Annual water heating energy savings with gas water heater (%)	N/A	25%	11%

9 Program Design Tips

CEE members promoting high efficiency PRSV have primarily taken either or both of the following approaches to date:

- Prescriptive incentives
- Direct installation

Program administrator experience has shown that there are continued barriers to customer participation in commercial foodservice programs, especially for equipment categories where the cost of the equipment is low, such as PRSVs. Many CEE members have leveraged PRSV direct installation programs to get a foot in the door with customers and build a relationship that eventually leads to additional high efficiency equipment purchases. In addition to building trust with the customer and providing an entry point for further program participation, a direct install approach can also allow the program administrator to document the relevant building conditions, such as water pressure, to determine the right product to use based on the customer's facility and needs. Some programs may consider offering two products to the customer based on the water flow conditions in the building. Direct install programs also create an opportunity to provide the customer with on-the-spot education to overcome misconceptions about low flow products. To ensure that customers continue to use the new product, the old unit should be removed by the program and not left with the customer, as this will better ensure that the customer does not return to the old unit. Alternatively, program administrators may giveaway PRSVs at in person educational events. For example, Southern California Edison has given them out during educational seminars at its Food Service Technology Center for customers to install themselves. Like direct install, this approach helps to build a positive relationship with the customer but does not offer the opportunity to document relevant building conditions or collect the old PRSV.

Direct install eliminates the need for the customer to spend valuable time completing a program incentive application form on a low-cost item, encourages early upgrading, has the potential to increase customer satisfaction with the program, and can be an entry point into other commercial foodservice equipment offerings. CEE member program administrators have seen success using a direct install approach, even more so when it is bundled with other direct install measures such as lighting. Once this relationship of trust is built, program administrators should continue to reach out and encourage customers to participate in other program offerings.

Programs may also, with permission, leave magnets or stickers on other equipment intended to remind customers to seek out high efficiency equipment and program incentives upon failure and replacement of that equipment.

10 Additional Resources

Additional resources that may be useful are:

- WaterSense Pre-Rinse Spray Valves page: <http://www.epa.gov/watersense/pre-rinse-spray-valves>. Includes a specification and general information about pre-rinse spray valves.
- California Energy Wise Pre-Rinse Spray Valve Energy Savings Calculator: <https://caenergywise.com/calculators/pre-rinse-spray-valve/>. On this web page, California Energy Wise provides an energy savings calculator for pre-rinse spray valves. Calculators for other commercial kitchen equipment categories are also provided.
- U.S. Department of Energy Appliance and Equipment Standards Rulemakings and Notices – Commercial Prerinse Spray Valves: https://www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=69&action=viewcurrent. This webpage consists of information regarding energy conservation standards for commercial pre-rinse spray valves.