Point-of-Use (POU) and Point-of-Entry (POE) Water Treatment Devices: Ensuring Fit-for-Purpose

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ADEQ
Arizona Department
of Environmental Quality

Clean Air, Safe Water,
Healthy Land for Everyone

Point-of-Use (POU) and Point-of-Entry (POE) Water Treatment Devices: Ensuring Fit-for-Purpose

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Purpose and Audience

Point-of-Use (POU) and Point-of-Entry (POE) water treatment devices are increasingly seen as convenient and cost-effective solutions for addressing drinking water contaminants in small utilities and private homes. These devices offer decentralized treatment tailored to smaller-scale demands, such as single-family residences or businesses with low potable water needs. However, the improper application of POU and POE devices can pose significant risks. Achieving reliable water quality and treatment performance requires a systematic design approach, strict adherence to certifications, and consistent maintenance. Without these measures, the devices may fail to effectively remove contaminants, potentially leading to unsafe drinking water and false confidence in their effectiveness.

The specifics of POU/POE certifications are complex and often not well understood. Their suitability for compliance with new or updated rules such as those for per- and polyfluoroalkyl substances (PFAS) and lead (Pb) is complicated. This is due to: (1) the fact that the POU/POE industry has not yet developed certification claims corresponding to the recently finalized maximum contaminant levels (MCLs) for PFAS by the U.S. Environmental Protection Agency (EPA), and (2) multiple and frequent updates to the Lead and Copper Rule and an already complicated compliance approach which is based on action levels and treatment techniques rather than MCLs (however, to date this hasn't affected the eligibility of existing lead certified POU/POE devices to address current requirements).

The ongoing maintenance requirements of POU/POE devices are demanding and often are a deciding factor in determining what treatment approach (centralized or decentralized) is selected. Maintaining a "fleet" of POU/POE devices for long-term compliance involves accessing private homes and can quickly become cost-prohibitive.

To navigate these challenges and ensure appropriate application of these devices, the Arizona Department of Environmental Quality (ADEQ) has developed this technical guidance document to:

- Assist in device selection
- Outline design considerations
- Detail certification standards and associated benefits
- Provide estimated costs and maintenance requirements
- Elaborate on the efficacy of POU and POE devices for PFAS and lead
- Specify permitting requirements and expectations

The primary audience for this guidance is public water systems (PWSs) and their engineers considering POU/POE devices as a means of meeting public health standards mandated by the Safe Drinking Water Act (SDWA). Although written to address questions about compliance and requirements for minimum design criteria applicable to regulated PWSs, this document also provides general information on these devices and serves as a resource for those looking to better understand and assess the suitability of POU and POE devices, and therefore, it may also be useful for homeowners seeking to protect themselves and their families.

Organization

To facilitate use of this document, it is structured in a Frequently Asked Questions format, allowing readers to either review the document in its entirety or navigate directly to specific topics and questions of interest. Major topics include:

Section 1 Basics of Decentralized Treatment

What are POU and POE Devices?

POU and POE devices are solutions for decentralized water treatment. Understanding their intended use is essential to determine the most suitable application of POU and POE devices.

- POU devices: These are installed at specific locations within a building, such as a kitchen sink, to treat water at the point of use.
- POE devices: These are installed after the water meter and treat all water entering the building, providing treatment for the entire building(s) behind the water meter.

What are the Key Benefits and Challenges of POU/POE Devices?

Both POU and POE devices offer distinct benefits and challenges compared to centralized treatment systems.

Benefits:

- Lower capital costs for small systems or single contaminant settings: POU/POE devices generally require less initial investment compared to large-scale, whole-of-system treatment facilities.
- Less engineering/knowledge requirements for implementation: POU/POE devices are typically purchased ready for installation and require comparatively less engineering design.
- Simple retrofitting of existing infrastructure: POU/POE devices leverage minor plumbing modifications and avoid the need for extensive infrastructure upgrades.
- Rapid deployment in emergency situations: POU/POE devices can be quickly implemented, much more rapidly than building a centralized system.
- Interim solution: POU/POE devices can be leased in order to temporarily serve in an emergency or stopgap situation.

Challenges:

- Higher capital cost for larger systems or multiple contaminant settings: Purchasing and monitoring numerous individual POU/POE devices and contaminants often leads to a higher total capital cost due to significant economies of scale for centralized treatment.
- Limitations in flow and water quality: POU/POE devices may have restrictions on the volume of water they can treat and the range of contaminants they can effectively remove. Therefore, larger demands and/or higher concentrations of contaminants can become limiting factors.
- Dispersed maintenance: Maintenance responsibilities for POU/POE devices are spread across multiple locations, which can complicate oversight.
- Access constraints: Gaining access to monitor and maintain POU/POE devices in private buildings or residences can be challenging.
- Higher monitoring costs: POU/POE monitoring costs rise in proportion to the number of installed devices, as each device must be monitored individually.
- Multiple O&M costs: O&M costs for POU/POE devices may be higher than costs of O&M for a centralized treatment system, for example including costs not commonly associated with centralized treatment, such as legal assistance to develop access agreements, increased public education costs, insurance costs for employees accessing private residences or in the event that personal property is damaged from device leaks and flooding.

- Sourcing NSF-certified devices and parts: Potential challenges may exist in procuring compatible and certified replacement parts for POU/POE devices if smaller manufacturers discontinue operations. This could affect the long-term reliability of these devices.
- Corrosivity impact: POE devices, especially membranes and softeners, can affect the corrosivity of the water, resulting in increased leaching of metals such as lead or copper from premise plumbing materials. POU systems generally don't have this issue due to the limited post-treatment plumbing, which is often plastic tubing that comes with the device.
- Localized treatment: Since POU devices only treat water at a single tap, they may not be appropriate for treating contaminants that may affect public health through inhalation or dermal contact, for example volatile organic compounds (VOCs).

What Treatment Technologies Do POU/POE Devices Employ?

Many of the same technologies used for centralized treatment are used for POU/POE treatment. The most common technologies utilized in POU and POE devices that are certified for regulated contaminants include adsorption (AD), ion exchange (IX), and reverse osmosis (RO).

- Adsorption Beds (usually carbon block): This process involves the transfer of contaminants from water to a solid medium known as an adsorbent. The most prevalent adsorbent is activated carbon, which is produced from carbon-rich materials such as coal, coconut shells, peat, or wood. Activated carbon is effective due to its large surface area, which allows organic contaminants to adhere to its surface.
- Ion Exchange Packed Beds: Ion exchange resins act like a magnet, attracting and retaining oppositely charged contaminants from water. Unlike natural carbon adsorption media, ion exchange resins are synthetic polymers specifically designed to target particular contaminants, making them more selective for the removal of inorganic substances from the water. Cation exchange resins are most often used to remove hardness (specifically calcium and magnesium) from water by releasing sodium ions as hardness is removed. Anion exchange resins are most often used to remove arsenic or nitrate, releasing chloride ions into water.
- Reverse Osmosis Membranes: This technology differs significantly from adsorption and ion exchange and employs pressure to force water molecules through a semipermeable membrane, separating larger contaminants from water. Reverse osmosis is suitable for simultaneous removal of multiple and diverse (organics and inorganics) contaminants. Its efficiency strongly depends on the available pressure, affecting both contaminant rejection and wastewater production.

Multi-stage POU/POE devices are comprised of additional cartridges/elements which provide pre-treatment. Sedimentation filters, typically the first cartridge placed before adsorption beds or reverse osmosis membranes, protect them from fouling by removing larger particles with paper or ceramic materials. Common sizes are 5 to 20 µm, which can remove corrosion products, sediment, and some pathogens like cryptosporidium. Multiple technologies can also be combined to achieve better performance. For example, many POU adsorption cartridges combine activated carbon with anion exchange resin to improve treatment performance.

For Which Contaminants Can POU/POE Devices Be Used?

POU/POE devices can address a wide range of contaminants. A comprehensive list of these contaminants is available in Appendix A. In general, POU/POE devices can help mitigate contaminants that pose health risks, as well as those that affect aesthetic qualities. Detailed guidance on this topic is available in EPA's

Point-of-Use or Point-of Entry Treatment Options for Small Drinking Water Systems (EPA 815-R-06-010) (Exhibits 3.1 and 3.2).

Note that although a POU/POE device may be able to reduce the level of a certain contaminant, it may not reduce it sufficiently to meet an MCL for compliance purposes. Regulated PWSs must comply with MCLs applicable for their classification, and have all water elements permitted. For more information, refer to "Is Permitting from ADEQ Required for Installation of POU/POE Devices?".

How Do I Decide Between POU and POE Treatment?

The choice between POU and POE treatment depends on water purpose, demand and availability, the number of locations requiring treatment, and waste management. The decision-making should focus on minimizing the number of devices required to effectively meet the water demand and produce the lowest amount of wastewater. It is recommended to first consider typical production rates for POU and POE devices as detailed in Table 1, followed by the specific needs.

POU treatment is usually preferred for residential applications, while POE treatment may be more appropriate for businesses or institutions with numerous drinking water taps that require treatment. Public water systems which serve homes must ensure treated water is available at least at one location (typically the kitchen sink) within every residence. Conversely, for establishments like restaurants, a POE device may be more cost-effective as this approach can reduce costs related to purchasing, maintenance, and compliance sampling. By treating all water entering the building, a single POE system eliminates the need to install and maintain individual POU devices at multiple taps (e.g., ice machines, soda fountains, and food preparation areas). It's also important to consider that, generally speaking, certified POE devices are less available than certified POU devices.

In situations where water availability and wastewater management options are limited, the preferred technologies are usually AD and IX because they treat 100% of the water entering them, while RO treats a fraction of the water flow (typically 20-30%), and wastes untreated water to the sewer/septic system. There may also be cases when the source water is not up to drinking standards but is safe for all non-consumptive uses. In these cases, POE RO treatment would be very wasteful, and POU would likely make more sense. In other cases where the source water has contaminants that may negatively impact health through inhalation or dermal contact, e.g. VOCs, users might be worried about aerosols when showering. Therefore, POE devices could be a sensible choice for treating these contaminants.

Table 1: Typical production rates of POU and POE devices in regards to treatment technology

	POU	POE
AD/IX	0.5 - 1 GPM*	Greater than 4 GPM
RO	10 - 100 GPD*	Greater than 300 GPD
* GPM is gallons per minute, and GPD is gallons per day. Both units are used to show the difference in instantaneous capacity between technologies. Gallons per minute is used for AD/IX because they treat the instantaneous flow, whereas gallons per day is used for RO because of its reliance on a storage reservoir. (To convert GPM into GPD, multiply by 1,440 minutes per day.)		

Is Permitting from ADEQ Required for Installation of POU/POE Devices?

Permitting requirements for installing POU and POE devices vary based on the type of user. All regulated PWSs must obtain permits, while individual homeowners or business do not require permits. **Because the**

most common reason for the denial of POU/POE applications is the absence of appropriate certifications, PWSs are strongly encouraged to coordinate with ADEQ prior to submitting an application or implementing this solution.

ADEQ recommends that the use of POU/POE devices be limited to very small PWSs with no more than 25 service connections due to the higher O&M costs associated with decentralized systems, and the regulatory compliance challenges of maintaining a large number of devices.

For PWSs, the permitting process is similar to any other treatment project and involves two key steps:

1. Approval to Construct (ATC)
2. Approval of Construction (AOC)

Due to the lower complexity of POU/POE devices compared to centralized treatment, ADEQ has created a consolidated ADEQ POU/POE Treatment Templates and Forms document. An ATC application must be submitted along with information about the certification. The legal basis for POU/POE permitting is outlined in the Arizona Administrative Code (AAC) R18-4-218, as well as in 40 Code of Federal Regulations (CFR) 142.62(h). Additional information can be found in ADEQ's Point-of-Entry and Point-of-Use Treatment Devices Policy.

Depending upon the contaminant, POU/POE devices may or may not be appropriate compliance options:

- PWSs may not use a POE or POU treatment device to achieve compliance with an MCL or treatment technique for a microbial contaminant per 42 U.S.C. 300g-1(b)(4)(E)(ii).
- **Because POU/POE devices are not currently recognized as a compliance option for PFAS, ATC/AOC permits cannot currently be obtained for this purpose** (find more details under "What NSF/ANSI Standards Apply to Specific Contaminants?" and "What Water Quality Improvements Can I Expect from Certified POU/POE Devices?").
- The certification for POU/POE devices does comply with the Lead and Copper Rule Improvements (LCRI), and PWSs can apply for ATC/AOC permits for lead compliance using POU/POE devices.

Private homeowners and businesses may install POU/POE devices without ADEQ approval, provided that the installation is separate from the public water system (i.e., after the service meter and the tested backflow preventer). Homeowners and businesses are also not required to conduct regular water quality sampling after installation, refer to "What Monitoring Requirements Apply to POU/POE Devices?" for more details.

Section 2 Certified Devices

Why is It Important to Select a Certified POU/POE Device?

When purchasing a POU or POE device, it is essential to select one that is independently certified to reduce the specific contaminant(s) of concern. Certification standards are developed by NSF International (NSF) and accredited by the American National Standards Institute (ANSI), together commonly referred to as NSF/ANSI standards. Certification is critical, not only for meeting regulatory permitting requirements but also for ensuring product reliability. Certification serves as a third-party verification that the device performs as advertised by the manufacturer and allows for direct, standardized comparison with other certified devices. Certification is required by law (AAC R18-4-218(B)(3)) for POU/POE devices installed by regulated PWSs.

The certification documentation provides essential details to guide selection, including:

- Flow Rate: Ensures the device can deliver water at the volume needed for the application.
- Pressure Requirements and Impacts: Quantifies the pressure needs and losses defined by the POU or POE manufacturer at the time of selection. POU and POE devices may require certain ranges of pressure conditions for optimal operations, and other water demands behind the water meter or in buildings may have minimum pressure requirements.
- Service Cycle: Indicates the duration or capacity of effective operation before maintenance or replacement is needed.
- Replacement Elements (e.g., Cartridges): Provides insight into the frequency and cost of replacements, useful to assess the long-term feasibility of maintaining the devices. Evaluating these factors ensures that the selected devices meet the operational needs and align with the maintenance capacities.

How Can I Identify Certified POU/POE Devices?

In the United States, there are five independent third-party testing agencies that currently test and certify products against NSF/ANSI standards. Databases that list certified devices (including PFAS and lead reduction) include:

- NSF
- Water Quality Association
- IAPMO R&T
- UL Solutions
- CSA Group

In these databases, a user can search by a contaminant, an NSF/ANSI standard or a combination of both. Refer to Example 1 and Example 2 to see how to search by contaminants of interest and standards. A search by standard or combination will require the user to understand the differences between standards; refer to the question "What NSF/ANSI Standards Apply to Specific Contaminants?" and see Table 2 O&M comparison between NSF/ANSI 53 and NSF/ANSI 58 certified devices.

Note: Certification bodies exist outside the United States. Their claims may be of use to homeowners but might face limited acceptance by US regulatory agencies, complicating POU/POE permitting for PWSs.

How Can I Interpret Certification Claims and Avoid Certification Pitfalls?

Reading certification claims starts with accessing the certification databases. Locating a device in one of the online databases listed under "How Can I Identify Certified POU/POE Devices?" allows a user to ensure that a certification claim exists and is not expired. Database listings are focused on a few major criteria, and reviewing the Performance Data Sheet is necessary for details about testing conditions and performance. Note that Performance Data Sheets are not found in the databases but are provided by the manufacturers.

In order to rely on the claimed performance of POU/POE devices, the user's raw water quality must be better than or equal to the certification testing conditions ("challenge") (refer to Appendix B: Raw water tests needed for comparison with the challenge test conditions and the devices' performance limits). For compliance purposes, performance should at least meet the MCL(s). Example 3 and Example 4 demonstrate the differences in claim information available on the database websites and on the Performance Data Sheets.

A common mistake occurs when the certification stamp on the device box is interpreted as proof that the device meets all regulatory requirements and the user's needs. There are many types of NSF/ANSI certification, and a certification may not be the one that is required. For example, many POE devices have received an NSF/ANSI 61 certification (which allows them to post the NSF stamp on the box), but this certification only means that the products are safe for contact with drinking water in the United States and does not certify that they are effective for a particular contaminant.

Standards are also updated occasionally, so it is important to know which standard a device is certified to (particularly in regard to PFAS). Users must be cautious because unsold devices which were certified for previous versions could be available on the market at the same time as those certified for newer versions. Confusion may result because the device's label may not identify the applicable version until the box is opened. Some standards also have a phase-in period during which manufacturers are allowed to stamp when a new standard is available but before it has taken effect.

Another common mistake is referring only to supplemental statements on certification stamps as an indication that specific contaminant testing is done. These statements may not have enough information to determine if the device is appropriate. For instance, the statement may not provide information on whether the device was tested for 70 parts per trillion (ppt) or 20 ppt of PFAS in treated water. The statement may also not provide information about the flow rate or service cycle. To confirm a device's effectiveness for specific needs, users should check the certification details and the Performance Data Sheet.

Users should check the database and find the claim specification in the detailed information about a specific device model. Example 4 and Example 5 demonstrate the relationship of multiple certification stamps and devices' performance as specified on the claim and the Performance Data Sheet.

What NSF/ANSI Standards Apply to Specific Contaminants?

The following NSF/ANSI standards are commonly used for compliance purposes (i.e., treatment of regulated contaminants):

- NSF/ANSI Standard 53: Drinking Water Treatment Units – Health Effects (These products are based on AD, IX or a combination of these two technologies.)
- NSF/ANSI Standard 58: Reverse Osmosis Drinking Water Treatment Systems

Multiple standards may apply to a single contaminant depending on the technology used. This is because some standards apply to contaminants while others are based on technology types. For example, arsenic can be found under NSF/ANSI 53 which address contaminants with health effects but also under NSF/ANSI 58 which is for membrane technologies (reverse osmosis).

The same situation exists with PFAS and lead: devices that claim to reduce PFAS and/or lead can be certified under both NSF/ANSI 53 and NSF/ANSI 58 standards. The claim is listed as "Lead Reduction", and in the case of PFAS, as "Total PFAS Reduction" or as reduction of one of the following PFAS compounds: PFOA, PFOS, PFHxS, PFNA, PFHpA (labeled as "PFOA/PFOS/PFHxS/PFNA/PFHpA Reduction").

Additional background information on the certification for PFAS and lead which may be useful include:

- The testing conditions for PFAS are the same for NSF/ANSI 53 and NSF/ANSI 58, but it is important to note that there are currently two versions (2021 and 2022/2023) of NSF/ANSI 53 and NSF/ANSI 58 standards. The versions differ in testing conditions and targeted reduction concentrations as a result of past health advisories.
    - The older version (2021) has claims for PFOA/PFOS reduction to 70 ppt when tested against the challenge water matrix that contains a total of 1500 ppt of PFOS/PFOA (1000 ppt PFOS and 500 ppt PFOA).
    - The latest version (2022/2023) has claims for a total PFAS reduction (7 compounds) or/and individual PFAS reduction (5 compounds) and lower reduction targets. Specifically, this means that POU/POE devices with a total PFAS reduction claim under the 2022/2023 version reduce the 2160 ppt PFAS combination (PFOA/PFOS/PFHxS/PFNA/PFHpA/PFBS/PFDA as 500/1,000/300/50/40/260/10 ppt) down to 20 ppt (total PFAS). In addition, individual PFAS reduction claims (20 ppt of PFOA, PFOS, PFHxS, PFHpA, or 6 ppt of PFNA) can be made for all listed compounds, except for PFBS and PFDA.
- For lead certification, a common confusion often arises due to regulation through an action level, instead of the usual numeric MCL, as well as the distinction between dissolved and particulate lead as two potential forms of contamination. Regarding the regulations, the lead concentration limit is based on a treatment technique that requires systems to control the corrosiveness of their water in case of an action level exceedance (ALE). An action level exceedance is determined by a calculation, and if more than 10% of the tap water samples exceed the action level of 10 parts per billion (ppb), a PWS must take additional steps. NSF/ANSI certified products with a lead claim have demonstrated the ability to reduce lead concentrations to a level at or below 5 ppb when exposed to 150 ppb of total lead (15 times the action level). For NSF/ANSI 53 devices, the lead reduction certification requires passing two lead reduction tests: (1) the pH 6.5 test which addresses dissolved lead; (2) the pH 8.5 test which requires particulate lead be present in the test water to address the removal of particulate lead. Passing both tests is required for the lead reduction certification. For NSF/ANSI 58 devices, the test water pH is 7.5, and there are no requirements for particulate lead in the test water.

Beyond NSF/ANSI 53 and NSF/ANSI 58, there are other standards that may be of interest for non-regulated contaminants:

- NSF/ANSI Standard 42: Drinking Water Treatment Units – Aesthetic Effects (Note: the Class I Particulate Reduction claim under NSF/ANSI 42 does not reduce particulate lead)
- NSF/ANSI Standard 44: Cation Exchange Water Softeners
- NSF/ANSI Standard 55: Ultraviolet Microbiological Water Treatment Systems (Per AAC R18-4-218(B)(1), microbial compliance cannot be achieved with POU/POE devices)

What Water Quality Improvements Can I Expect from Certified POU/POE Devices?

For most regulated contaminants, a device's claim is based on the MCLs. In other words, as long as the quality of raw water is better or equal to the standard tested water ("influent challenge concentration"), a device is certified to reduce a contaminant to a concentration below the MCL, assuming it is operated in line with manufacturer specifications and maintenance requirements.

The situation is more complicated with PFAS because a device's claim depends on the NSF/ANSI standard version used for certification. There are two standard versions valid at the time of writing, NSF/ANSI 2021 and NSF/ANSI 2022/2023. If the device is certified against the NSF/ANSI 2021 version, its performance is rated to 70 ppt of PFOA/PFOS in treated water; while in the 2022/2023 version, performance is rated to 20 ppt of total PFAS in treated water, or 20 ppt of PFOA, PFOS, PFHxS, PFHpA, or 6 ppt of PFNA individually. It is necessary to read the claim to find such information. As of January 2025:

- Most commercially available certified devices have been validated against the 2021 version of NSF/ANSI (reduction to 70 ppt of PFOA/PFOS – note that this is many times higher than the new MCLs for individual PFAS compounds and the Hazard Index). Each certifying body can determine their own timeline for products to meet new requirements. For PFAS, all certified products will comply with the 2022 edition by the end of 2025;
- The NSF/ANSI Standards 53 and 58 are expected to be updated to address the new PFAS MCLs by adding HFPO-DA (GenX) to the testing list and decreasing the targeted effluent concentrations of PFOA and PFOS to 4.0 ppt and PFNA and PFHxS to 10 ppt (i.e. the MCLs). It's uncertain at this time how the individual and total claims will be established, considering the complexity of the individual MCLs and Hazard Index definitions.
- Brita and PUR pitcher or faucet style filters do not claim to remove PFAS. Although these filters may be able to reduce PFAS because the filter media combines activated carbon and an ion exchange resin, both of which are designated as best available technologies (BATs) for PFAS reduction, their effectiveness has not been tested against NSF/ANSI Standard 53 for PFAS reduction claims.

Products certified for lead have demonstrated the ability to reduce lead concentrations to a level at or below 5 ppb which meets the lead compliance requirements. Due to complexity of lead action levels and forms of detected lead (dissolved and/or particulates), it is recommended that PWSs contact ADEQ before proceeding with this compliance option. Homeowners are advised to check the EPA brochure Consumer Tool for Identifying Point-of-Use and Pitcher Filters Certified to Reduce Lead in Drinking Water.

Section 3 Operation & Maintenance

Are Operation and Maintenance of POU/POE Devices Challenging?

Proper adherence to operation limits and maintenance schedules is essential to ensure the continued effectiveness and safety of the treatment devices (See Table 2). Manufacturers provide specific O&M instructions, and device certifications outline replacement intervals for individual components such as filters or cartridges. A device can only meet its certified performance claims within these specified intervals.

Example 6 demonstrates how a variety of replacement intervals can apply to a single POU device. Failure to properly operate and/or maintain water treatment devices can lead to degraded water quality. **In some instances, contaminants accumulated in the POU/POE device may leach back into the treated water, potentially resulting in concentrations several times higher than those in the untreated source water. This can be the result of failing to replace exhausted filters or cartridges, or running hot water through them (see Example 6b). This issue is particularly critical for homeowners, as they are not required to conduct regular water quality sampling.**

Table 2: O&M comparison between NSF/ANSI 53 and NSF/ANSI 58 certified devices

	NSF/ANSI 53 (AD/IX)	NSF/ANSI 58 (RO)
Production rate (flow)	Higher (see Table 1)	Lower (see Table 1)
Pre-treatment	Usually none, as specified by manufacturer.	Minimum 1 unit, as specified by manufacturer.
Post-treatment	Usually none, as specified by manufacturer.	Minimum 1 unit, as specified by manufacturer.
Reservoir	Usually none, as specified by manufacturer.	Usually included, as specified by manufacturer due to flow limitations.
Liquid waste streams	Ideally zero liquid discharge. Initial backwashing (after installation) is needed for POE. Although possible, further operational backwashing should be avoided.	Typically, for every 10 gallons sent into the POU treatment device, 7-8 gallons are sent down the drain as waste, and 2-3 gallons of treated water are produced. Total water usage will therefore increase with installation of this type of treatment.
Operation	Flow rate is limited by device type (check instantaneous production rate). Use only with cold water (see Example 6b).	Limited by device type (check instantaneous production rate or daily production rate if reservoir is included). Use only with cold water (see Example 6b). There is potential for corrosion of faucet fixtures.
Maintenance	POU: Replacement of cartridge(s). POE: Replacement of media.	Replacement of membrane, multiple pre- and post-membrane cartridges, reservoir cleaning, maintenance of pressurization pump. Usually more complex than AD/IX due to multiple cartridges (see Example 6a).
Solid Disposal	POU: Cartridges can be disposed of in trash. POE: Depending on the contaminant removed, media disposal may have specific requirements and as such may not be accepted by all landfills.	Cartridges can be disposed of in trash.

How Much Does It Cost to Install and Maintain POU/POE Devices?

For detailed cost estimates, visit the EPA's POU/POE Cost Estimating Tool and Guidance. Table 3 provides rough estimates.

Table 3: Approximate cost estimates of commercially available PFAS-reducing POU/POE devices (in 2024 dollars)

	POU		POE	
	AD/IX (NSF/ANSI 53)	RO (NSF/ANSI 58)	AD/IX (NSF/ANSI 53)	RO (NSF/ANSI 58)
Initial equipment purchase cost	$400 - $1,200	$300 - $1,500	$2,000 -$3,000	From $2,000
Annual cost for cartridges/media replacement*	$200 - $400	$200	$100 (media) $500 (cartridge)	From $900
Cost of treated water**	$0.1 - $0.2/gallon	$0.1/ gallon	$0.0005/gallon (media) $0.004/ gallon (cartridge)	$0.008/ gallon
PFAS analysis	$400/sample/device (note: if PFAS is detected, the field blank is run which will double the analysis cost)			
Lead analysis	$15/sample/device			
* Media/cartridge cost is based on currently available information that targets 70 ppt of PFAS in treated water. ** Cost of treated water assumes water usage of 5 GPD for POU and 300 GPD for POE and 1-year membrane lifetime. Cost calculation excludes initial equipment cost and water losses with RO. These costs are expected to increase as the PFAS targets are revised to 4.0 and 10 ppt and more frequent replacement is needed.				

What Monitoring Requirements Apply to POU/POE Devices?

Monitoring requirements are different than AOC permitting requirements. In order to receive an AOC, water samples from all installed units must be tested by a laboratory certified by the Arizona Department of Health Services for contaminant reduction performance and bacteriological validity. Compliance monitoring, on the other hand, varies depending on the type of contaminants being treated. Monitoring of POU/POE devices is recommended but not required for private homeowners.

PWSs must follow specific monitoring schedules and protocols as specified in ADEQ's Point-of-Entry and Point-of-Use Treatment Devices Policy and as approved by ATC/AOC permits.

- POU/POE devices approved for acute contaminants such as nitrate are required to be sampled on an annual basis.
- POE/POU devices approved for non-acute (chronic) contaminants are required to be sampled every year with samples from 1/3 of the devices sent to a certified lab and the remaining 2/3 sampled with test strips. For contaminants that do not have an available field test indicator, a surrogate may be acceptable – check with ADEQ.

As required for PWS compliance, the allowance for reduced laboratory monitoring for chronic contaminants (a third of installed devices shall be sampled every year) is applicable only if appropriate field test or surrogate method for that contaminant is available and approved by ADEQ.

- Current PFAS field tests (including surrogates) are not suitable for compliance purposes due to detection limits that exceed MCLs, which means that each device is required to be sampled and analyzed annually by a certified laboratory. As an example, in a PFAS treatment scenario of 25 installed devices, with a cost of approximately $400 for sample analysis, per device, the annual monitoring cost estimate could total $10,000 and likely exceed O&M centralized treatment cost.
- When it comes to dissolved lead, field tests with detection limit below the ALE are available, but their suitability must be checked with ADEQ. For particulate lead fraction, field tests are not suitable because with insufficient acidification (i.e. pretreatment) of a water sample, the particulate lead fraction can be under-quantified. For more information, refer to Field Analyzers for Lead Quantification in Drinking Water Samples.

Section 4 Design Considerations

What Does the Start-To-Finish Process Entail?

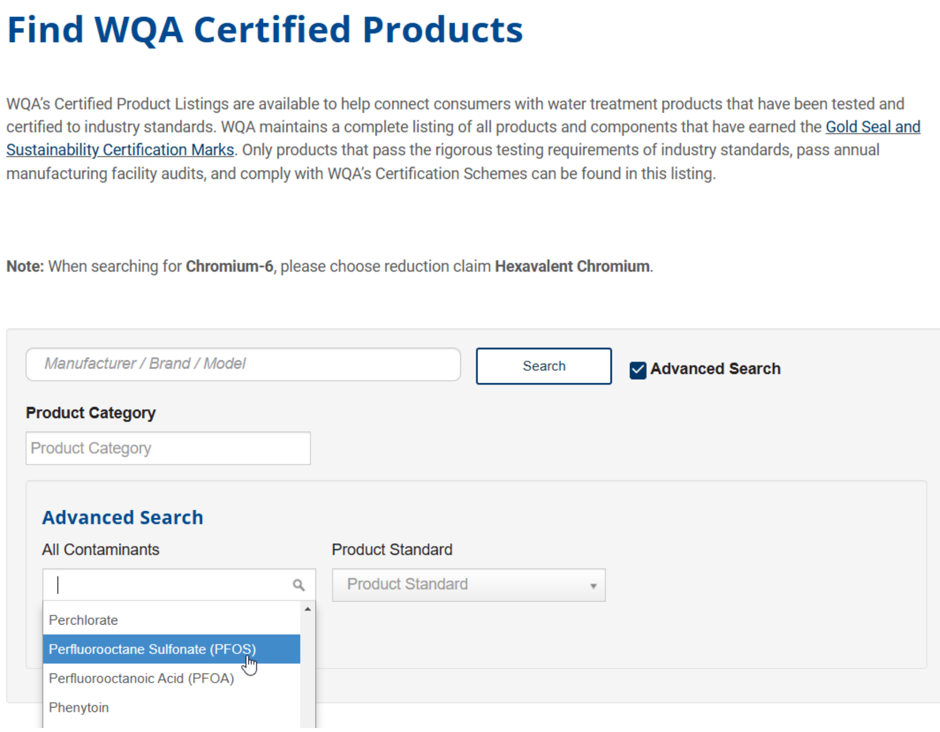
To ensure fit-for-purpose application, meet minimum permitting requirements, and ensure long term compliance through optimal O&M, it is recommended to base POU/POE design decisions on the following nine sequential steps. These steps pertain to PWSs. Homeowners are recommended to follow the same process, except for the permitting described in steps 6 and 8.

1. **Characterize Water Quality:** Perform water quality screening to identify and quantify contaminants of concern as well as background water quality (interferences). Background water quality will affect (i.e., interfere with) the performance of the device. Appendix B provides a list of suggested water tests.
2. **Determine Quantity of Treated Water Needed (Water Usage)**: Consider the number of treatment locations within the building and how much water will need to be treated for usage. Utilize POU devices for individual taps (e.g., kitchen sink), or POE devices for entire households or businesses. Refer to "How Do I Decide Between POU and POE Treatment?"
3. **Measure pressure at potential installation locations**: POU/POE devices are not suitable for low pressure locations. To achieve claimed performance, it is important to have a minimum of 50 psi or 60 psi for NSF/ANSI 58 and NSF/ANSI 53 certified devices, respectively. This is especially important for applications in buildings two stories and taller.
4. **Select Certified Devices**: Utilize NSF/ANSI databases to find certified units. Compare results from Step 1 (Characterize Water Quality) and Step 2 (Water Usage) with a device's certification claim. Choose devices that are certified for the usage/demand needs and specific contaminants of concern in conditions that are not less challenging than the target water quality. For more details, refer to questions "How Can I Identify Certified POU/POE Devices?", "What Water Quality Improvements Can I Expect from Certified POU/POE Devices?", and "How Can I Interpret Certification Claims and Avoid Certification Pitfalls?"
5. **Consider Costs**: Calculate upfront and lifetime replacement/maintenance costs. Refer to "How Much Does It Cost to Install and Maintain POU/POE Devices?" for details.
6. **Obtain ATC Permit**: Permitting is required for PWSs. For more details, refer to "Is Permitting from ADEQ Required for Installation of POU/POE Devices?". One hundred percent of users (i.e., all service connections) must participate. Do not purchase devices before receiving an ATC permit. At the time of writing, an ATC permit cannot be obtained for microbial and PFAS contaminants.
7. **Install and Test**: Devices must be installed per manufacturer specifications, with proper start-up testing. A certified operator must install the devices for a PWS. See Table 2 for details.
8. **Obtain AOC Permit:** This permit is required to start utilization by users. One hundred percent installation is mandatory – all users must receive treated water and the number of installed devices cannot be less than what was specified on the ATC permit, unless justification is provided and approved by ADEQ. Performance of all devices must be confirmed by a certified laboratory for contaminant reduction performance and bacteriological validity.
9. **Operate, Maintain and Monitor**: Follow certified maintenance intervals, and ensure monitoring is performed as required by ADEQ's Point-of-Entry and Point-of-Use Treatment Devices Policy. For PWSs, the certified operator is responsible for maintenance within homes. Maintenance generally consists of cartridge replacement and is model specific. Neglecting maintenance can magnify issues. Refer to questions "Are Operation and Maintenance of POU/POE Devices Challenging?" and "What Monitoring Requirements Apply to POU/POE Devices?". Spent POU devices can be disposed of in waste.

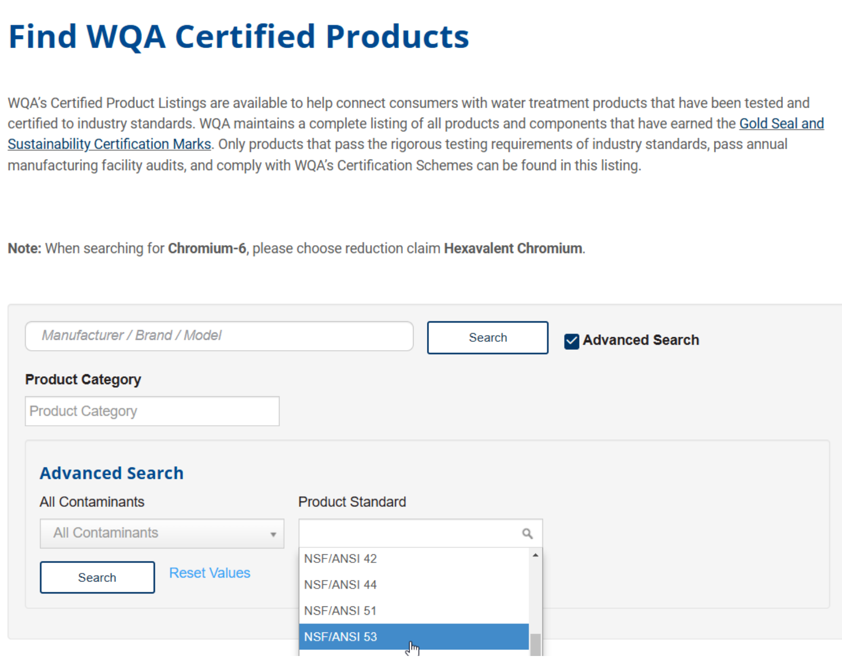
Example 1 – WQA Database Search

Users can search by contaminants of interest (Example 1a) or NSF/ANSI standard (Example 1b). The database allows for single (contaminant or standard) or combined (contaminant + standard) searches. Multiple selections are possible. Note that some regulated PFAS are not listed at this time.

Example 1a: WQA Database Search by Contaminant



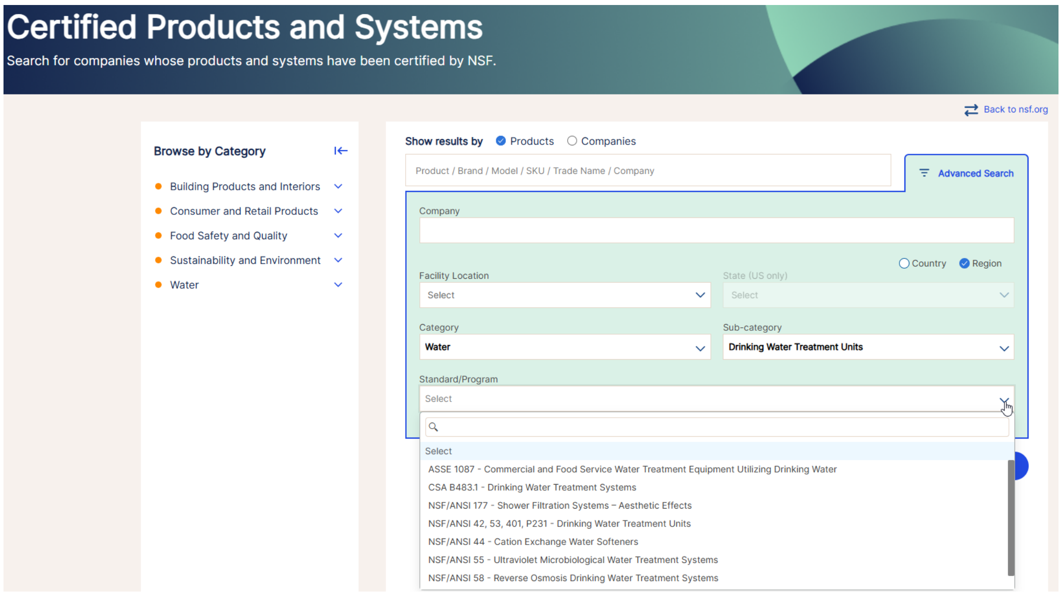
Example 1b: WQA Database Search by Product Standard



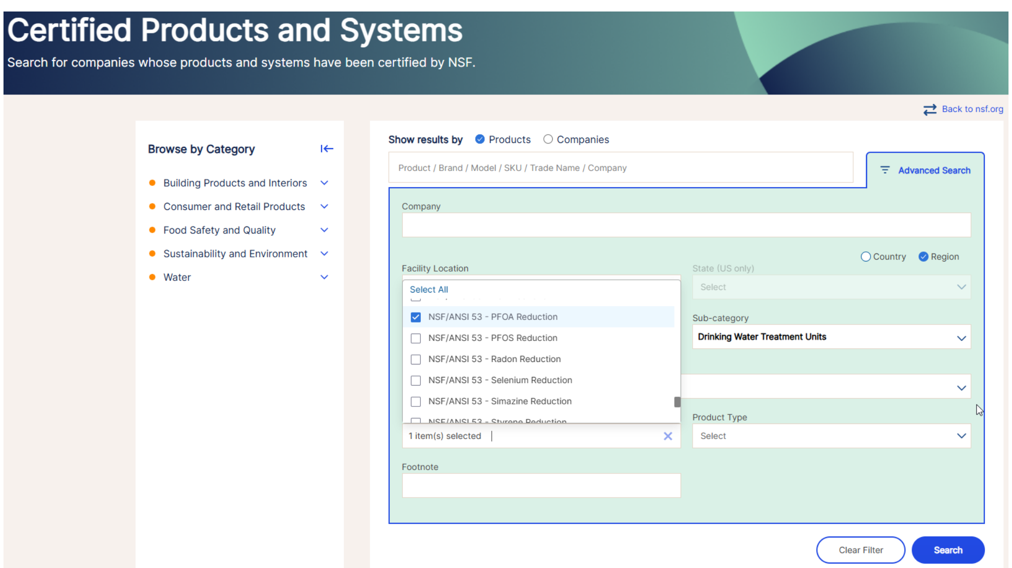
Example 2 – NSF Database Search

The NSF database allows standard or combined (standard + contaminant) selection, but not contaminant-only searches. Example 2a demonstrates the need to first select the appropriate standard in order to reach the contaminants claim, as shown in Example 2b. Refer to the question "[What NSF/ANSI Standards Apply to Specific Contaminants?]"

Example 2a: Step 1 in NSF Database Search by Standard



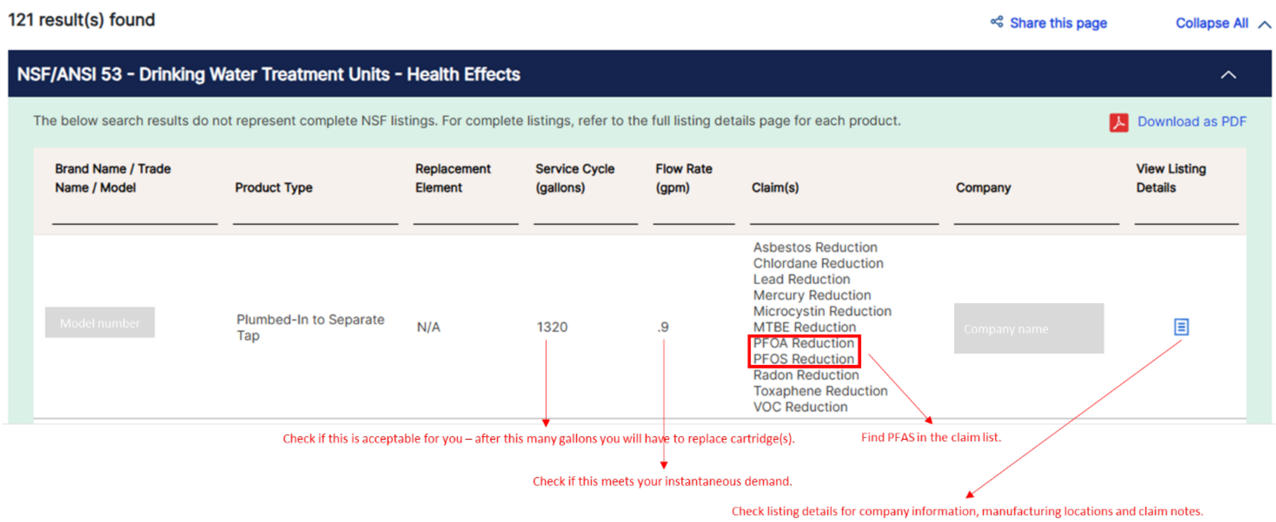
Example 2b: Step 2 in NSF Database Search by Standard and Claim



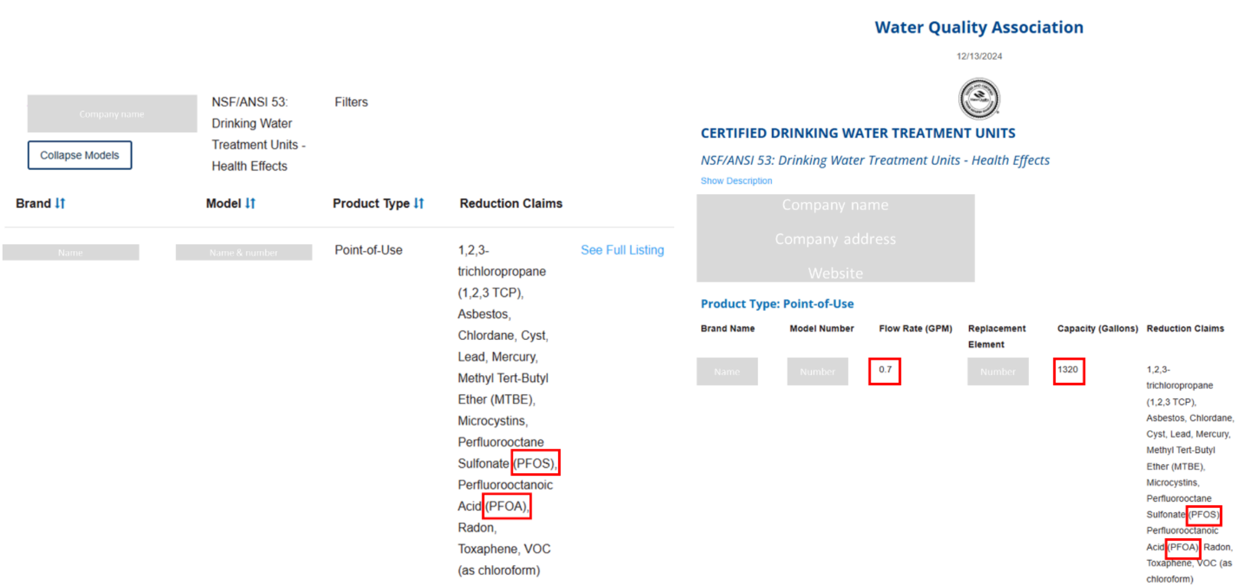
Example 3 – Accessing Basic Certification Information on Database Websites

Example 3a illustrates the NSF database, while Example 3b demonstrates the WQA database. Both databases include links for obtaining additional information. Notably, the NSF database provides service cycle and flow rate information in the initial step, whereas this information is available under "See Full Listing" in the WQA database. In Example 3b, the left side presents the initial information, and the right side displays the additional information accessible after clicking on "See Full Listing". When reviewing the performance data sheets, please check for the following details: contaminants listed under the certification claim, flow rate, service cycle, replacement elements, model name/number, and company information.

Example 3a: NSF Database



Example 3b: WQA Database



Example 4 – Finding Detailed Claim (Performance) Data

If unavailable online, contact the seller. Performance Data Sheets for two POU devices are shown below. Example 4a's sheet shows certification for reducing PFOA/PFOS, dissolved and particulate lead, with a basis of 20 ppt PFOA/PFOS. Example 4b's sheet shows certification only for reducing PFOA/PFOS, with a basis of 70 ppt PFAS.

Example 4a

ENG Performance Data Sheet

The Water Purifier is listed with NSF International and the WQA.

The following product information is presented in compliance with NSF International and WQA disclosure requirements.

Replaceable Cartridge No.:

The Water Purifier is comprised of a compressed activated carbon block filter and UV-C LEDs. The filter is composed of two outer non-woven pre-filters, and a layer of immobilized activated carbon.

This Water Purifier is certified as a Class B system in compliance with NSF/ANSI Standard 55 and is equipped with UV-C LEDs that require replacement at intervals in accordance with the manufacturer's instructions. This Class B system conforms to NSF/ANSI 55 for the supplemental bactericidal treatment of disinfected public drinking water or other drinking water that has been tested and deemed acceptable for human consumption by the state or local health agency having jurisdiction. The system is only designed to reduce normally occurring non-pathogenic, nuisance microorganisms. Class B systems are not intended for the treatment of contaminated water. WQA certifies the system when completed as 122940 and 122941.

This Water Purifier has been tested according to NSF/ANSI 42, 53 and 401 for reduction of the substances listed below. The concentration of the indicated substances in water entering the system was reduced to a concentration less than or equal to the permissible limit for water leaving the system as specified in NSF/ANSI 42, 53 and 401.

Substance	Influent Challenge Concentration	Reduction Requirements/ Max. Permissible Product Water Concentration	% Reduction
NSF/ANSI Standard 42 Aesthetic Effects			
Particulates-Class I (#/mL at 0.5 to <1 micron)	>10,000	>85%	>95
Chlorine Taste and Odor (mg/L as chlorine)	2 ± 10%	≥50%	>95
Chloramine (mg/L)	3 ± 10%	0.5	>95
NSF/ANSI Standard 53 Health Effects			
Asbestos (fibers/L >10 um)	10^7 - 10^8	>99%	>99
Lead at pH 6.5 (μg/L)	150 ± 10%	5	>95
Lead at pH 8.5 (μg/L)	150 ± 10%	5	>95
Mercury at pH 6.5 (μg/L)	6.0 ± 10%	2.0	>90
Mercury at pH 8.5 (μg/L)	6.0 ± 10%	2.0	>90
Chlordane (μg/L)	40 ± 10%	2.0	>95
Methyl tert-butyl ether (MTBE) (μg/L)	15 ± 10%	5.0	>95
Radon (pCi/L)	4000 ± 25%	300	>94
Toxaphene (μg/L)	15 ± 10%	3.0	>90
Microcystin (mg/L)	0.004 ± 10%	0.0003	>95
Cyst (#/L)	>50,000	>99.95%	>99.95
PFOA/PFOS (ug/L)	1.5 +/- 10%	0.02	>98
1,2,3-Trichloropropane (ug/L)	0.3 +/- 10%	0.005	>98
†VOC's (μg/L as chloroform)	300 ± 10%	95%	>95

Tested in water with 150 ppb of dissolved lead at different pH until it reached concentration of 5 ppb in treated water

Tested in water with 1500 ppt of PFAS until it reached concentration of 20 ppt in treated water

Example 4b

PERFORMANCE DATA SHEET

IMPORTANT NOTICE: Read this Performance Data Sheet and compare the capabilities of this unit with your actual water treatment needs. It is recommended that before purchasing a water treatment unit you have your water supply tested to determine your actual water treatment needs. All contaminants reduced by this water treatment device are not necessarily in your water supply. While testing was performed under standard laboratory conditions, actual performance may vary.

This system has been tested according to NSF/ANSI 42 and NSF/ANSI 53 for reduction of the substances listed below. The concentration of the indicated substances in water entering the system was reduced to a concentration less than or equal to the permissible limit for water leaving the system, as specified in the relevant standard.

System Certified by IAPMO R&T against NSF/ANSI Standard 53 or 42 for the reduction of substances in the table to the right.

SUBSTANCE	Overall Percent Reduction	Influent Challenge Concentration (mg/L)	Maximum Effluent Concentration (mg/L)	Maximum Permissible Effluent Concentration (mg/L)
NSF/ANSI Standard 53 - Health Effects				
Chromium Hexavalent, pH 6.5	99.6	0.3 ± 10%	0.003	0.050
Chromium Hexavalent, pH 8.5	99.6	0.3 ± 10%	0.002	0.050
Lead, pH 6.5	99.7	0.15 ± 10%	0.0005	0.010
Lead, pH 8.5	95.9	0.15 ± 10%	0.0075	0.010
Mercury, pH 6.5	96.7	0.006 ± 10%	0.0002	0.002
Mercury, pH 8.5	96.0	0.006 ± 10%	0.0004	0.002
PFOA / PFOS	94.9	0.0015 mg/L ± 10%	0.00007	0.00007
NSF/ANSI Standard 42 - Aesthetic Effects				
Chlorine	97.5	2.0 ± 10%	0.05	50% of influent

O&M

Tested in water with 1500 ppt of PFAS until it reached concentration of 70 ppt in treated water.

Rated service life is 15 gallons (56.78 Liters). It is recommended to change the filter with replacement element at this point.

Service flow rate is 4.0 gallons (15.14 Liters) per day. Operating temperature is 40-90F (4.44-32.22C). → Can produce 4 GPD

This water treatment device is intended only for use with potable water. Do not use water that is microbiologically unsafe or of unknown quality without proper disinfection before or after the system.

Example 5 – Certification Stamps

Certification stamps do not necessarily mean that device is tested for a particular contaminant of interest. For example, the statement next to the stamp is a good indication what contaminant testing has been done, but it does not provide information on if the device has been tested for 70 ppt or 20 ppt of PFAS, or what the flow rate and service cycle are. Look for details on the claim and Performance Data Sheet.

Examples of certification stamps

System Tested and Certified by NSF International against NSF/ANSI 42, 53, 55, 401, and CSA B483.1 for the reduction of the claims specified on the Performance Data Sheet.

System Certified by IAPMO R&T against NSF/ANSI Standard 53 or 42 for the reduction of substances in the table to the right.

System tested and certified by NSF International against NSF/ANSI Standard 42 and CSA B483.1 for the reduction of Chlorine, Chloramine, Taste & Odor, Particulate Class I and NSF/ANSI Standard 53 for PFOS/PFOA.

Example 6 – Operation and Maintenance

POU/POEs have strict model-specific requirements for O&M. As shown in Example 6a, a multistage POU (RO) device is comprised of elements/cartridges which serve different purposes in the overall treatment process and, as such, may have different life cycles. Users must follow specific replacement schedules for each individual element/cartridge to achieve performance as specified in the certification claim. Users should be aware of this additional complexity for O&M for POU RO units. As shown in Example 6b, common to the operation of all POU/POE devices is that they should only be used with the cold water.

Example 6a

FILTER Specification

Life cycles of cartridges which are part of single POU device can be different; O&M must follow the specified replacement schedule.

Model	Element Type	Capacity / Life Cycle	Micron rating	Flow rate	Benefit
SD	Sediment	- gal / 6 months	3 / 5 / 10 / 25 ㎛	0.5 GPM	Particulate / Dirt & Sand
CB	Carbon Block	1,500 ~ 2,500 gal / 6 months	1 / 5 ㎛	0.5 GPM	Particulate / Dirt & Sand / Chlorine / Taste & Odor
MC	Melt-blown Carbon	1,000 ~ 2,000 gal / 6 months	5 / 10 ㎛	0.5 GPM	Particulate / Dirt & Sand / Chlorine / Taste & Odor
UF	Ultra Filtration membrane	- gal / 12 months	0.1 ㎛	0.5 GPM	Particulate / Dirt & Sand / Cyst / Bacteria / E-coli
VF	Virus Ultra Filtration membrane	- gal / 18 months	0.01um	0.5 GPM	Particulate / Dirt&Sand / Cyst / Bacteria / E-coli / Virus
GAC	Granular Activated Carbon	1,000 ~ 2,000 gal / 6 months	- ㎛	0.5 GPM	Chlorine / Taste & Odor
GP	GAC + Polyphosphate	1,000 ~ 2,000 gal / 6 months	- ㎛	0.5 GPM	Chlorine / Taste & Odor / Scale inhibitor
CP	Carbon Block + Polyphosphate	1,500 ~ 2,500 gal / 6 months	1 / 5 ㎛	0.5 GPM	Particulate / Dirt & Sand / Chlorine / Taste & Odor / Scale inhibitor
Mineral	GAC + Mineral	2,000 gal / 6 months	- ㎛	0.5 GPM	Chlorine / Taste & Odor / pH booster
RO	Reverse Osmosis membrane	- gal / 24 months	0.0001 ㎛	50 / 75 / 100 / 150 GPD	Turbidity / TDS / IONIC Substance / Arsenic / Barium / Cadmium / Chromium (Trivalent, Hexavalent) / Copper / Fluoride / Lead / Radium 226/228 / Selenium

Example 6b

SPECIFICATIONS

Model:
Replacement Filter:
Filter Capacity: 600 Gallons
Flow Rate: 1.0 gpm
Housing: Stainless Steel
Rubber Items: Silicone
Inlet: 1/8" NPT
Outlet: 1/8" NPT
System Size: 11" H x 5.75" D
Weight: 6.6 lbs (With Filter)
Working Pressure Range: 30 psi (2.1 kg/cm2) to 100 psi (7.0 kg/cm2)
Operating Pressure Range: 30° F (0°C) to 100° F (38° C) cold water use only
Particulate Retention Size: Sub-Micron
Housing Warranty: Lifetime

Requirement for all POU/POE devices

Appendix A: List of Contaminants for Which POU/POE Devices Can Be Used (available NSF/ANSI claims at the time of writing)

Reduction Claims for Drinking Water Treatment Units - Health Effects		
1,1,1-Trichloroethane Reduction	Chromium (Trivalent) Reduction	Monochlorobenzene Reduction
1,1,2,2-Tetrachloroethane Reduction	Chromium Reduction	Nominal Particulate Reduction
1,1,2-Trichloroethane Reduction	Copper Reduction	O-Dichlorobenzene Reduction
1,1-Dichloroethylene Reduction	Cyst Reduction	P-Dichlorobenzene Reduction
1,2,3-Trichloropropane	Dibromochloropropane Reduction	PCB Reduction
1,2,4-Trichlorobenzene Reduction	Dinoseb Reduction	PFOA Reduction
1,2-Dichloroethane Reduction	Endrin Reduction	PFOS Reduction
1,2-Dichloropropane Reduction	Ethylbenzene Reduction	Pentachlorophenol Reduction
2,4,5-TP (Silvex) Reduction	Ethylene Dibromide Reduction	Selenium Reduction
2,4-D Reduction	Filter First	Simazine Reduction
Alachlor Reduction	Haloacetonitriles Reduction	Styrene Reduction
Arsenic (Pentavalent)<=50 ppb Reduction	Haloketones Reduction	Taste and Odor Reduction
Asbestos Reduction	Heptachlor Epoxide Reduction	Tetrachloroethylene Reduction
Atrazine Reduction	Heptachlor Reduction	Toluene Reduction
Benzene Reduction	Hexachlorobutadiene Reduction	Total PFAS Reduction
Cadmium Reduction	Hexachlorocyclopentadiene Reduction	Toxaphene Reduction
Carbofuran Reduction	Lead Reduction	Tribromoacetic Acid Reduction
Chlordane Reduction	Lindane Reduction	Trichloroethylene Reduction
Chlorine Reduction	MTBE Reduction	Trihalomethanes (TTHM) Reduction
Chlorobenzene Reduction	Mercury Reduction	VOC Reduction
Chloropicrin Reduction	Methoxychlor Reduction	Xylenes Reduction
Chromium (Hexavalent) Reduction	Microcystin Reduction	
Reduction Claims for Reverse Osmosis Drinking Water Treatment Systems		
1,1,1-Trichloroethane Reduction	Chloropicrin Reduction	Lead Reduction
1,1,2,2-Tetrachloroethane Reduction	Chromium (Hexavalent) Reduction	Lindane Reduction
1,1,2-Trichloroethane Reduction	Chromium (Trivalent) Reduction	Methoxychlor Reduction
1,1-Dichloroethylene Reduction	Cis-1,2-Dichloroethylene Reduction	Nitrate/Nitrite Reduction
1,2,4-Trichlorobenzene Reduction	Cis-1,3-Dichloropropylene Reduction	O-Dichlorobenzene Reduction
1,2-Dichloroethane Reduction	Copper Reduction	P-Dichlorobenzene Reduction
1,2-Dichloropropane Reduction	Cyst Reduction	Pentachlorophenol Reduction
2,4,5-TP (Silvex) Reduction	Dibromochloropropane Reduction	Selenium Reduction
2,4-D Reduction	Dinoseb Reduction	TDS Reduction
Alachlor Reduction	Ethylene Dibromide Reduction	Trans-1,2-Dichloroethylene Reduction
Arsenic (Pentavalent)<=300 ppb Reduction	Fluoride Reduction	Tribromoacetic Acid Reduction
Arsenic (Pentavalent)<=50 ppb Reduction	Haloacetonitriles Reduction	Trichloroethylene Reduction
Asbestos Reduction	Haloketones Reduction	Trihalomethanes (TTHM) Reduction
Atrazine Reduction	Heptachlor Epoxide Reduction	VOC Reduction
Barium Reduction	Heptachlor Reduction	Xylenes Reduction
Cadmium Reduction	Hexachlorobutadiene Reduction	
Carbofuran Reduction	Hexachlorocyclopentadiene Reduction	
Reduction Claims for Drinking Water Treatment Units - Aesthetic Effects		
Bacteriostatic Effects	Filter First	Zinc Reduction
Chloramine Reduction	Nominal Particulate Reduction	
Chlorine Reduction	Taste and Odor Reduction	
Reduction Claims for Cation Exchange Water Softeners		
Barium Reduction	Hardness Reduction	
Efficiency Rated	Radium 226/228 Reduction	
Reduction Claims for Ultraviolet Microbiological Water Treatment Systems		
Disinfection Performance, Class A	Disinfection Performance, Class B	
Reduction Claims for Shower Filtration Systems - Aesthetic Effects		
Free Available Chlorine Reduction		
Reduction Claims for Drinking Water Treatment Units - Emerging Compounds/Incidental Contaminants		
Atenolol Reduction	Linuron Reduction	Phenytoin Reduction
Bisphenol A Reduction	Meprobamate Reduction	TCEP Reduction
Carbamazepine Reduction	Metolachlor Reduction	TCPP Reduction
DEET Reduction	Microplastics Reduction	Trimethoprim Reduction
Estrone Reduction	Naproxen Reduction	
Ibuprofen Reduction	Nonylphenol Reduction	

Appendix B: Raw Water Tests vs Challenge Test Conditions

Raw water tests needed for comparison with POU/POE challenge test conditions and corresponding devices' performance limits. Water quality samples should be taken at the entry point to the distribution system (EPDS) and be representative of all service locations unless the system's layout and contamination specifics require user tap sampling to be included.

Parameters	Notes
Contaminant of interest	More than one sample is recommended
pH	Regardless of contaminant; Field measurement
Temperature	
TDS	Regardless of contaminant; Important for fouling impact assessment
Turbidity	
Hardness	
Alkalinity	
TOC	
Iron	
Manganese	
Silica	
Pressure	At the installation point; NSF/ANSI 58 devices tested at 50 ±3 psig or the manufacturer's minimum recommended inlet pressure, whichever is lower; NSF/ANSI 53 devices are tested at 60 ± 3 psig inlet pressure
Arsenic speciation and concentration	Arsenic reduction by is species dependent; NSF/ANSI 58 devices can remove only As(V). To remove As(III) by a NSF/ANSI 58 device, a residual free chlorine concentration must be detectable at the RO system inlet; or the water at the RO system inlet must have been demonstrated to contain only As(V); NSF/ANSI 53 devices claims may be made for As(V) only and for arsenic reduction (III and V)
Sulfate	Important for reduction of nitrate, perchlorate, PFAS
Nitrate	Important for reduction of arsenic, perchlorate
Chloride	Important for reduction of nitrate, perchlorate, PFAS
Orthophosphate	Important for reduction of arsenic
Polyphosphate	Important for reduction of metals, can be omitted if it's known that polyphosphate is not added as corrosion control sequestering substance

Acronyms and Abbreviations

AAC	Arizona Administrative Code
AD	adsorption
ADEQ	Arizona Department of Environmental Quality
ALE	Action Level Exceedance
ANSI	American National Standards Institute
AOC	Approval of Construction
ATC	Approval to Construct
BAT	best available technology
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
EPDS	entry point to the distribution system
GPD	gallons per day
GPM	gallons per minute
HFPO-DA	hexafluoropropylene oxide dimer acid (GenX)
IX	ion exchange
LCRI	Lead and Copper Rule Improvements
MCL	maximum contaminant level
O&M	operations and maintenance
Pb	lead
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonate
PFDA	perfluorodecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxS	perfluorohexane sulfonate
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonic acid
POE	Point-of-Entry
POU	Point-of-Use
ppb	parts per billion
ppt	parts per trillion
psi	pounds per square inch
PWS	public water system
RO	reverse osmosis
SDWA	Safe Drinking Water Act
VOC	volatile organic compound

References and Resources

1. 40 Code of Federal Regulations (CFR) 142.62(h), available at https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-142/subpart-G/section-142.62
2. ADEQ, Point-of-Entry and Point-of-Use Treatment Devices Policy, available at static.azdeq.gov/legal/3001.2021.pdf
3. ADEQ, POU/POE Treatment Templates and Forms, available at static.azdeq.gov/forms/pou_poe_templates.pdf
4. Arizona Administrative Code (AAC) R18-4-218, available at apps.azsos.gov/public_services/Title_18/18-04.pdf
5. CSA Group database, available at www.csagroup.org/testing-certification/product-listing/
6. Doré at al., Field analyzers for lead quantification in drinking water samples, Crit Rev Environ Sci Technol. 2020, available at pmc.ncbi.nlm.nih.gov/articles/PMC7592708/
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8. EPA Office of Water, Point-of-Use/Point-of-Entry Cost Estimating Tool, available at www.epa.gov/sdwa/point-usepoint-entry-cost-estimating-tool
9. EPA Office of Water, Consumer Tool for Identifying Point-of-Use and Pitcher Filters Certified to Reduce Lead in Drinking Water, available at www.epa.gov/system/files/documents/2024-06/how-to-id-filters-certified-to-reduce-lead-in-drinking-water-epa_june-2024.pdf
10. IAPMO R&T database, available at pld.iapmo.org/
11. NSF database, available at listings.nsf.org/#/certified-products-systems?category=Water&subCategory=Drinking%20Water%20Treatment%20Units
12. UL Solutions database, available at productiq.ulprospector.com/en
13. USC Title 42, 300g-1, available at www.govinfo.gov/content/pkg/USCODE-2023-title42/pdf/USCODE-2023-title42-chap6A-subchapXII-partB-sec300g-1.pdf
14. Water Quality Association database, available at wqa.org/find-products/#/