TECHNICAL MEMO

To	From
Cindy Paton, Community Services Leader Regional District of Fraser-Fort George	Christina Saxvik, P.Eng Project Engineer, McElhanney
Re	**Date**
Nukko Lake Community Hall - Water Treatment System Design Brief - **Rev C**	April 28, 2025

McElhanney Ltd. (McElhanney) was retained by the Regional District of Fraser-Fort George (the District) for detailed design of the water treatment upgrades at the Nukko Lake Community Hall. This memo is intended as a design brief to support the Northern Health water construction permit application.

1. Background

The existing water system draws water from Nukko Lake into the Hall with a pump and pressure tank. The original treatment consisted of roughing sediment filters, carbon filter, fine sediment filter, and ultra-violet (UV) light disinfection (Figure 1). There is an onsite septic disposal system consisting of a septic tank and dispersal field (Figure 2).

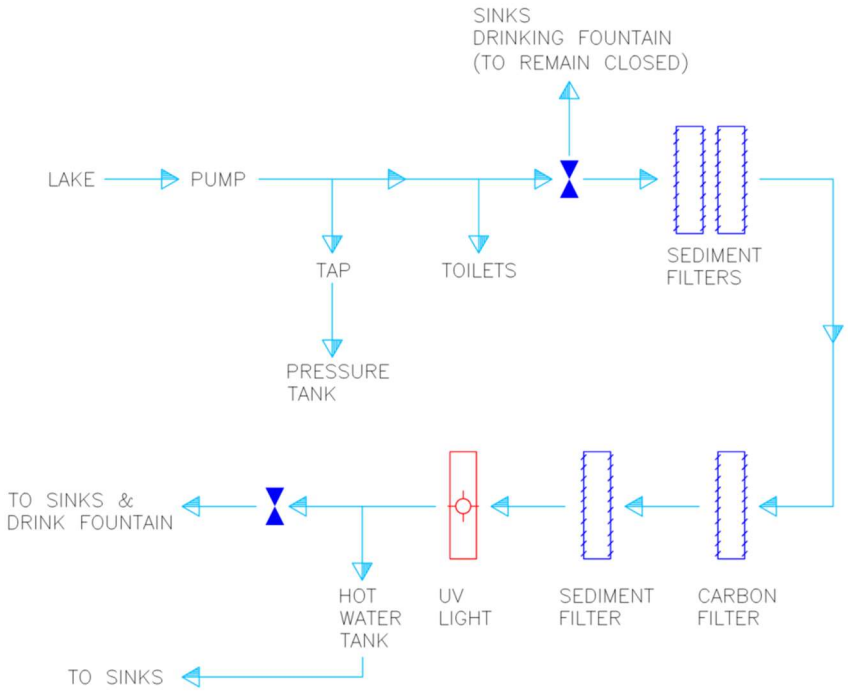


Figure 1: Schematic of Original Treatment at Nukko Hall, Regional District of Fraser-Fort George, 2004

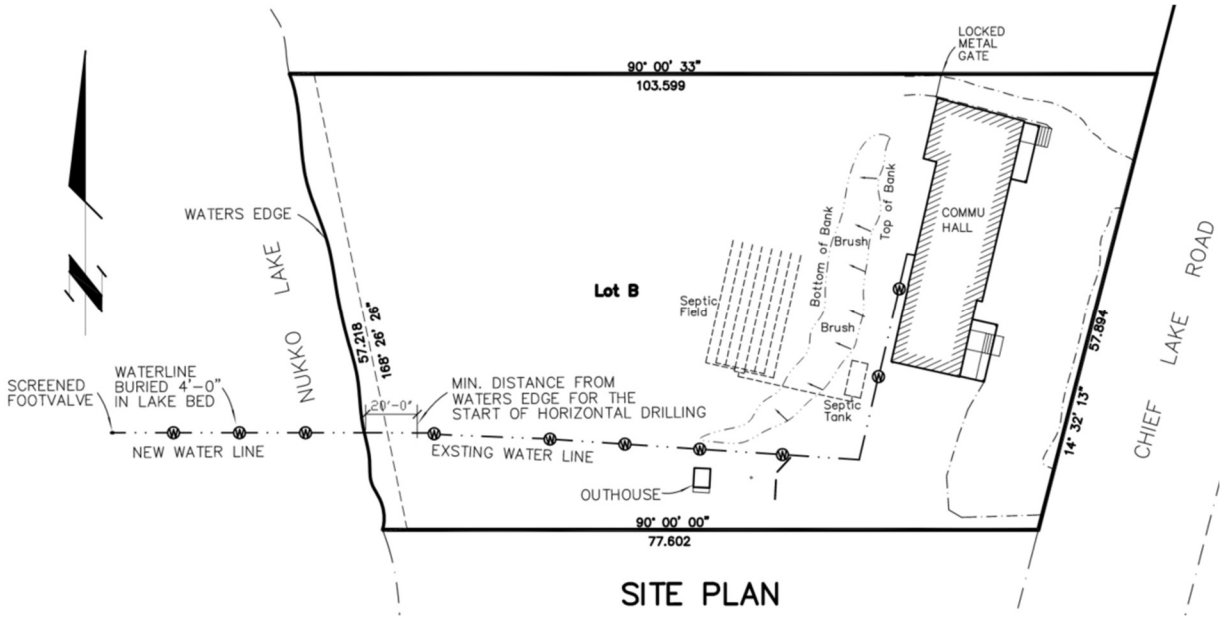


Figure 2: Site Plan with Septic System, Regional District of Fraser-Fort George, 2003

The existing water system has not been maintained and has fallen into disrepair. It was originally installed approximately 20 years ago and replacement parts for some of the treatment elements are no longer available. In August 2023, microbial testing was performed on water from the kitchen sink and there was a non-conformance for total coliforms. In October 2023, Northern Health (NH) performed a routine inspection and found that the only active treatment is a 30-micron filter. The system is currently on a boil water advisory. McElhanney performed a site visit in April 2024 and collected a raw water sample from a tap immediately downstream of the pump. The test results of this sample along with available historical water quality data are included in Appendix B.

In May 2024, McElhanney hosted a virtual meeting between McElhanney, the District, and NH to discuss possible options for addressing the boil water advisory. NH confirmed that a non-potable permit would not be issued for this site based on the usage.

The design brief builds on the findings of the Nukko Lake Water Treatment System Comparison Memo (McElhanney, 2024) and focusses on treatment of the surface water source as the preferred option by the District.

NH requires a construction permit application for any substantial changes to the water system including raw water chemistry sample results and an Emergency Response and Contingency Plan. A designated operator with an Environmental Operators Certification Program (EOCP) Small Waters System (SWS) certification is required. During the meeting, the District noted that the District's environmental staff will be taking over the operation of the system.

2. Design Criteria

2.1. TREATMENT TARGETS

During the meeting with NH and follow-up discussions, the following points related to updating the existing water treatment system were noted by the health authority:

- Water from a surface water source will be required to meet Northern Health's drinking water treatment objectives (4-3-2-1-0)
- Low duration of contaminant exposure risk given that individuals use the water sporadically.
- If some parameters such as manganese are only periodically above the Canadian Drinking Water Guideline values, these are not required specific treatment given the small exposure risk.
- The treatment system is in the same building as the point of use so residual disinfection (typically achieved by dosing the water with sodium hypochlorite) is not strictly required for this site.
- For this intermittent use water system, NH can provide some leniency with respect to requiring chlorine.

2.2. DESIGN FLOW

The existing raw water pump has a maximum flow rate of 1.42L/s (22.5 USGPM) which is the maximum possible flow through the system.

Appendix B indicates a raw water ultraviolet light transmittance (UVT) of 72% from Nukko Lake and it is anticipated that UVT will improve through the treatment process, particularly as there is a process for organics removal. UVT is used to measure the efficacy of a UV light to reliably remove bacteria in the water. Until the upgraded treatment system is in place, it will be difficult to predict the filtered water UVT. To ensure that the UV system remains validated for the design flow, it is recommended that the facility flow is reduced below 22.5 USGPM. Thus, a conservative estimate of 85% UVT would allow a design flow rate of 18 USGPM through the treatment system. See Section 3.4 for more details.

It is anticipated that 22.5 USGPM is high for the fixture count present at the community hall. On March 3, 2025, the District indicated no concerns on reducing the system flow to 18 USGPM. Note that flow records are not available, however a preliminary calculation based on two different calculation methods (maximum building occupancy vs. fixture flow rates) to check that 18 USGPM would be enough water at peak hourly demand, has been provided in Appendix D.

2.3. WATER QUALITY DATA

Available water quality data is available in Appendix B. Water quality parameters of concern for this site are the following:

- Turbidity (improved with 5- and 1-micron cartridges)
- Total coliforms (addressed by UV)
- Manganese (refer to note in Section 2.1)
- TOC, true colour, and THM formation (improved with GAC cartridges)
- Lead & copper (plumbing fixture issues, piping replaced with PVC, CPVC (for hot water) and stainless steel (for UV piping spools))

3. Treatment Design

3.1. INTRODUCTION

McElhanney proposes meeting the drinking water treatment objectives with the following system elements:

Table 1: Option 1 Treatment Approach

Treatment Objective	Requirements	Applicable Treatment Element
4 log (99.99%) reduction or inactivation of enteric viruses (using adenovirus as target – as confirmed with Northern Health)	Under the UVDGM, validated dose ≥ required dose for target pathogen log inactivation. Maximum pathogen log reduction credits assigned determined on a case-by-case basis.	Achieved by UV disinfection. UV system to be validated to 4-log reduction of adenovirus. Proposed UV system dose: 186mJ/cm^2 at **18 USGPM 85% UVT.**
3 log (99.9%) reduction or inactivation of protozoan cysts (including *Giardia* and *Cryptosporidium*)	Minimum UV dose for 3 log inactivation: Cryptosporidium 12mJ/cm^2 Giardia 11mJ/cm^2	Achieved with both 1-micron absolute filtration and UV disinfection in series.
2 treatment processes (multi-barrier approach)	-	Achieved by 1-micron absolute filtration + UV disinfection. Spare parts for UV unit to be procured.
1 NTU turbidity maximum	-	Achieved by multiple stages of filtration including cartridge filters and granular activated carbon (GAC). This should improve both turbidity and UVT.
0 E. coli and Total Coliforms	Minimum UV dose for 4 log inactivation: 5-18mJ/cm^2	Achieved by UV disinfection.

[A] Drinking Water Officers' Guide 2022 – Part B: Section 16 Guidelines for Ultraviolet Disinfection of Drinking Water, BC Ministry of Health, 2022

[B] Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Enteric Viruses, Health Canada, 2019

[C] Guidelines for Ultraviolet Disinfection of Drinking Water - Ministry of Health, 2022. Depending upon the results of a source water assessment from the water supplier or other studies conducted by the water supplier, a Drinking Water Officer has the discretion to base virus log inactivation requirements on either adenovirus or rotavirus. The target species impacts the UV system design, for example adenovirus requires a higher UV dose. Per preliminary discussions with NH, adenovirus was recommended as the target species based on limited information regarding risk of faecal contamination at Nukko Lake.

[D] Early discussions with NH indicated leniency towards requiring a chlorination system for this site.

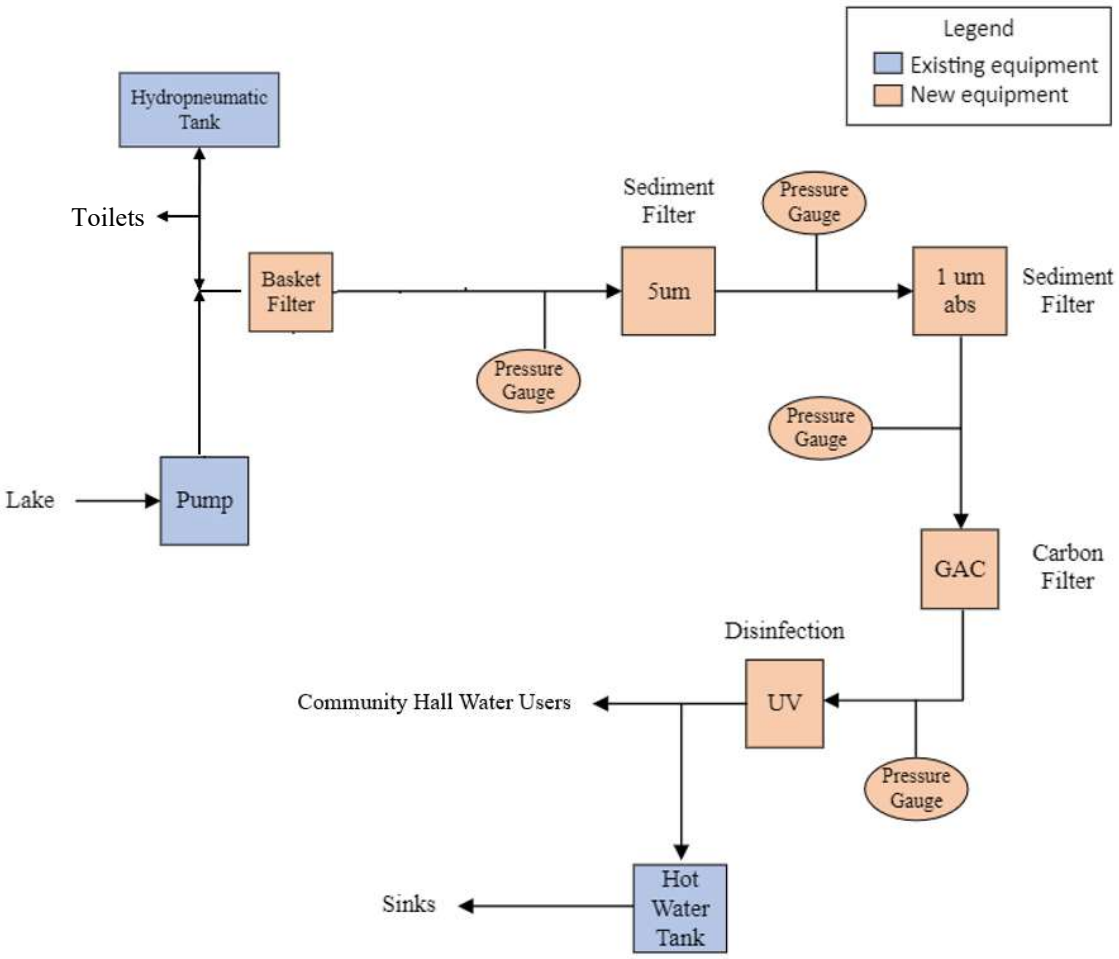


Figure 3: Proposed Treatment Configuration

This upgrade would be like the system currently in place, with an added basket strainer, new filters/filter housings (5- and 1-micron cartridges and GAC), and an upgraded UV system with additional features.

Regular operation requirements will likely include the below.

Table 2: Maintenance Requirements

Frequency	Maintenance Requirement
Monthly (Approximately)	Emptying anything caught in the basket filter
	Checking the pressure gauges to determine when the cartridge filters require replacement. The recommended pressure drop for changing out each cartridge filter shall be defined during commissioning.
	Ensure a sufficient quantity of spare cartridges (5-micron, 1-micron and GAC) are available on site for change outs
Annually	Cleaning the lamp sleeve/s and replacing the UV lamp/s
	Responding to UV system alarms
Water Quality Testing	Must align with the issued operating permit by NH, which shall outline the minimum frequency of bacteriological and chemical sampling. Typically for small water systems, 4 samples per month are required for bacteriological sampling unless a different frequency is specified by the local Drinking Water Officer. Chemical parameters should be tested roughly annually.

3.2. RAW WATER PUMPING

No concerns from the District have been noted to date with the existing raw water pump (Pentair Myers HCM Series Convertible Deep Well Jet Pumps Model HCM150-K, with a 1.5 HP GE Motor and pressure switch & gauge). Therefore, this pump will be retained. Raw water pump details are available in the figure below. Two suction pipes are noted for this model. The discharge piping connection is estimated at 1” based on the online supplier data sheet.

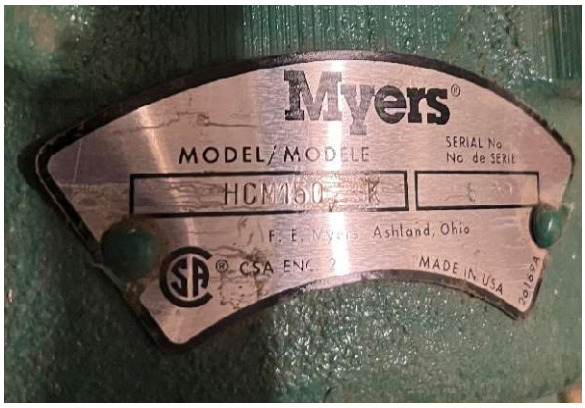


Figure 4: Existing Raw Water Pump and Motor Details

No concerns from the District have been noted to date with the existing pressure tank (Flexicon Wellrite WR360R). Therefore, the pressure tank will be retained. The connection between the raw water pump and pressure tank will need to be replaced as the pressure tank is proposed to be relocated slightly to improve the room layout.

Figure 5: Existing Pressure Tank

3.3. FILTRATION

Piping modifications are recommended to accommodate the new treatment system. All new piping will be 1” SCH 80 PVC. Transition couplings will be required to transition between any existing copper piping and new PVC piping. In accordance with Northern Health’s Small Water Systems Design Guidelines – Surface Water Source guidance document, bypass of the treatment system is not permitted and therefore the treatment bypass line feeding raw water to the community hall will be isolated and removed. The District notes that the building toilets have dedicated raw water piping connections with no risk of cross connections with potable water supply. This connection is retained in the proposed design.

Raw water shall be filtered through a basket strainer, a 5-micron filter, and then a 1-micron absolute filter. The recommended equipment specifications are noted below. These have been captured in the design drawings.

- Basket Strainer: 1" SB Simplex Basket Strainer in PVC with EPDM seals, socket/threaded ends, and PVC 1/16" perforation basket, or approved equal. NSF 61 certified.
- Filter cartridge housing: Install four (4) Big Blue 20" Water Filter Housing by Pentek Part #150233, or approved equal. Must fit 4-1/2” OD cartridges.
- 5 micron filter cartridge: Install one (1) HB-20-5W 5-micron 20" cartridge 4-1/2” OD suitable for a 20” big blue filter housing up to 26 USGPM; or approved equal. Contractor to provide two (2) additional filter cartridges as spares.
- 1 micron absolute cartridge: Install one (1) Waterite's Excelplus+ Pleated Polypropylene Sediment Filter, 1 Micron Poly Pleated Absolute Filter, part #PLA20B01 for Big Blue 20" up to 25 USGPM; or approved equal. Contractor to provide two (2) additional filter cartridges as spares.
- GAC cartridge: Install two (2) GAC filter cartridges (VIQUA C2-02GAC) in parallel suitable for a 4-1/2” OD 20” big blue filter housing, with operation up to 9 USGPM each. Contractor to provide four (4) additional filter cartridges as spares.

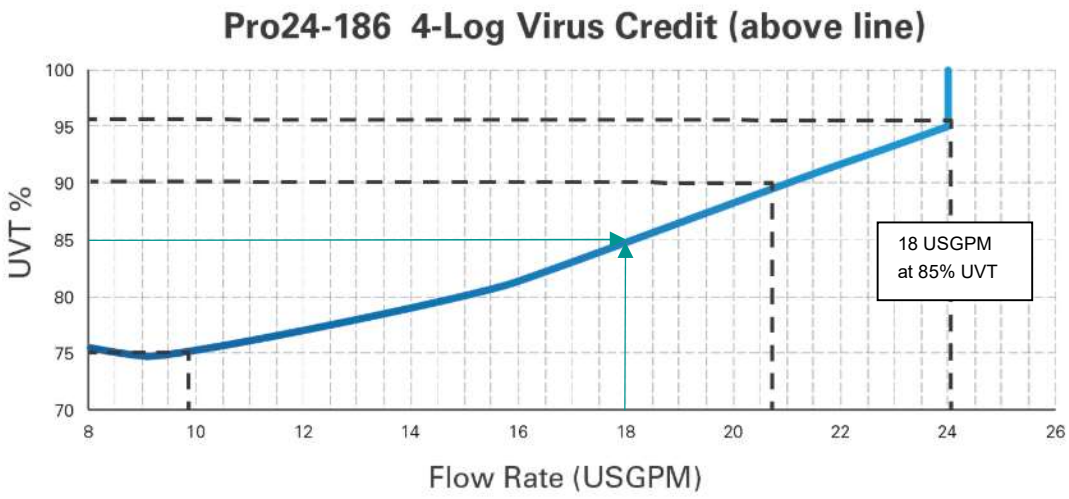
3.4. UV DISINFECTION

A new UV disinfection unit will be installed, with piping modifications required to accommodate the new reactor. The recommended equipment specifications are the following:

- Install one (1) new PRO24-186 4-Log Adenovirus UV Filtration System; Part Number: 660086-R, 660087-R; or approved equal. Connection size 1 1/4″ MNPT x 1″ FNPT combo. Note that the PRO24-186 UV System includes two (2) chambers in the single package.

Note that this UV unit is validated to the USEPA UVDGM standard, with a minimum UV dose of 186 mJ/cm^2 to target 4 log removal of virus, in addition to achieving 3 log removal of protozoa (*Cryptosporidium* and *Giardia*). Specific UV spare parts are requested from the Contractor in the tender package to support operations.

The system will include a flow restriction device to ensure flow does not exceed 18 USGPM (to ensure adequate disinfection for the design UVT%), a built-in UV lamp intensity sensor, automatic shut off when the dose rate is not met or when the unit is unplugged and system failure alarms. The UV system shall be installed after the pressure tank, and installed such that the raw water supply pump will be shut off when the flow to the UV unit is shut off.



A sample will be taken during commissioning to verify system performance and UV validation. Should the treated water UVT be less than 85% and further flow reduction is required, an alternate flow restricting valve can be sourced to further reduce the flow as required, noting the likely oversizing of the existing water system. This is noted in the tender package as a requirement of the Contractor.

4. Closing

We trust that this information will help support the Northern Health permit application. If the District has any questions, please do not hesitate to contact the undersigned.

Sincerely,
McElhanney Ltd.

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2025-04-25

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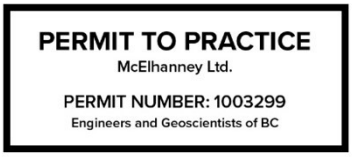

APPENDIX A

Statement of Limitations

Statement of Limitations

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APPENDIX B

Historical Water Quality

Parameter	Units	Treatment Options		Aesthetic		Health	Date Sampled	2003-10-16	2004-02-03	2004-05-27	2004-05-27	2004-11-24	2005-01-12	2007-05-16	2007-11-20	2008-01-31	2008-09-24	2008-10-23	2008-10-23	2008-12-11	2009-01-12
							Sample Location/Name	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Community Hall Kitchen		Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink
		LL	UL	LL	UL	UL	Notes	Before Filter	Before Filter	Before Filter	After Filter	After Filter	Before Filter	Audit	Kitchen Tap / Lake/ Reservoir	After Filter	After Filter	Before Filter	After Filter	After Filter	After Filter
General Parameters and Nutrients																					
pH	pH units		-	6.5	8.5	-															
Langelier Saturation Index	-	-2	2	-100	-	-															
Conductivity	us/cm		-		800	-															
Turbidity	NTU		-		-	1									0.6						
Bicarbonate	mg/L		-		-	-															
Carbonate	mg/L		-		-	-															
Hydroxide	mg/L		-		-	-															
P-Alkalinity, (as CaCO3)	mg/L		-		-	-															
T-Alkalinity, (as CaCO3)	mg/L		-		-	-															
Alkalinity (total)	mg/L	30	500		-	-															
Total Dissolved Solids	mg/L		-		500	-															
Total Suspended Solids	mg/L		-		-	-															
Total Hardness (as CaCO3)	mg/L		-		250	-															
Total Organic Carbon	mg/L		2.5		-	-															
Ammonia, Total (as N)	mg/L		1.5		-	-															
Kjeldahl Nitrogen	mg/L		-		-	-															
Organic N	mg/L		0.15		-	-															
Nitrate and Nitrite, N	mg/L		-		-	-															
Nitrate - N, (dissolved)	mg/L		-		-	10															
Nitrite - N, (dissolved)	mg/L		-		-	1															
Chloride, (dissolved)	mg/L		-		250	-															
Fluoride, (dissolved)	mg/L		-		-	1.5															
Sulphate	mg/L		-		500	-															
Sulphide	mg/L		-		0.05	-															
Phosphorus (total)	mg/L		-		0.1	-															
Cyanide	mg/L		-		-	-															
UV Transmittance	%	80	-		-	-															
Tannins & Lignins	mg/L		0.4		-	-															
Colour, True	CU		-		15	-															
Bacteriological																					
Total Coliforms	MPN/100mL		-		-	0		<1	2	2	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1
Fecal Coliforms	MPN/100mL		-		-	-		<1	<1	<1	<1	<1	<1								
E. Coli	MPN/100mL		-		-	0								<1		<1	<1	<1	<1	<1	<1
Background Count	CFU/100mL		-		-	-															
Heterotrophic Plate Count	MPN/mL	100	500		-	-															
Total Metals																					
Aluminum (total)	mg/L		-		-	-									0.0025						
Antimony (total)	mg/L		-		-	0.006									0.00007						
Arsenic (total), ALARA	mg/L		-		-	0.01									0.00064						
Barium (total)	mg/L		-		-	1									0.0632						
Beryllium (total)	mg/L		-		-	-									<0.00001						
Bismuth (total)	mg/L		-		-	-									0.000023						
Boron (total)	mg/L		-		-	5									<0.005						
Cadmium (total)	mg/L		-		-	0.005									0.000058						
Calcium (total)	mg/L		-		100	-															
Calcium (dissolved)	mg/L		-		-	-															
Chromium (total)	mg/L		-		-	0.05									<0.0001						
Cobalt (total)	mg/L		-		-	-									0.000496						
Copper (total)	mg/L		-		1	2									0.402						
Iron (total)	mg/L		-		0.3	-															
Iron (total)	mg/L		-		-	-															
Lead (total), ALARA	mg/L		-		-	0.005									0.00215						
Lithium (total)	mg/L		-		-	-									<0.0005						
Magnesium (total)	mg/L		-		30	-									3.6						
Magnesium (dissolved)	mg/L		-		-	-															
Manganese (total)	mg/L		-		0.02	0.12									1.55						
Manganese (dissolved)	mg/L		-		-	-															
Mercury (total)	mg/L		-		-	0.001															
Molybdenum (total)	mg/L		-		-	-									0.00056						
Nickel (total)	mg/L		-		-	-									0.00483						
Potassium (total)	mg/L		-		400	-															
Potassium (dissolved)	mg/L		-		-	-															
Selenium (total)	mg/L		-		-	0.01									<0.00004						
Silicon (total, as Si)	mg/L		-		-	-															
Silicon (dissolved)	mg/L		-		-	-															
Silver (total)	mg/L		-		-	-									0.000005						
Sodium (total)	mg/L		-	20	200	1000															
Sodium (dissolved)	mg/L		-		-	-															
Strontium (total)	mg/L		-		-	-									0.0602						
Sulphur (total)	mg/L		-		-	-															
Thallium (total)	mg/L		-		-	-									0.000002						
Tin (total)	mg/L		-		-	-									0.00006						
Titanium (total)	mg/L		-		-	-															
Uranium (total)	mg/L		-		-	0.02									0.000004						
Vanadium (total)	mg/L		-		-	-									<0.0002						
Zinc (total)	mg/L		-		5	-									0.302						
Zirconium (total)	mg/L		-		-	-															
Disinfectant By-Product																					
Total Trihalomethanes	mg/L		-		-	0.1															
Bromodichloromethane	mg/L		-		-	-															
Bromoform	mg/L		-		-	-															
Chloroform	mg/L		-		-	-															
Dibromochloromethane	mg/L		-		-	-															
Hydrocarbons																					
Benzene	µg/L		-		-	5															
Toulene	µg/L		-		24	-															
Ethylbenzene	µg/L		-		2	-															
Xylenes	µg/L		-		300	-															
Organic Compounds																					
Total Phenolics	mg/L		-		-	-															

Parameter	Units	2009-03-17	2009-06-17	2009-09-23	2010-02-11	2010-04-28	2010-09-21	2010-10-26	2010-11-04	2010-12-07	2011-02-03	2011-07-06	2012-10-25	2012-12-06	2013-01-22	2013-03-05	2013-04-15	2013-05-23
		Nukko Lake Hall	Community Hall Kitchen	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Community Hall Kitchen	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink
			Audit	After Filter	After Filter	After Filter	After Filter	After Filter	After Filter	After Filter	After Filter	Audit	After Filter	After Filter	After Filter	After Filter	After Filter	After Filter
General Parameters and Nutrients																		
pH	pH units	7.13																
Langelier Saturation Index	-	-2																
Conductivity	us/cm	106																
Turbidity	NTU	0.52																
Bicarbonate	mg/L	66.2																
Carbonate	mg/L	<0.5																
Hydroxide	mg/L	<0.5																
P-Alkalinity, (as CaCO3)	mg/L																	
T-Alkalinity, (as CaCO3)	mg/L																	
Alkalinity (total)	mg/L	54.3																
Total Dissolved Solids	mg/L	58																
Total Suspended Solids	mg/L																	
Total Hardness (as CaCO3)	mg/L	37.5																
Total Organic Carbon	mg/L	6.2																
Ammonia, Total (as N)	mg/L	0.05																
Kjeldahl Nitrogen	mg/L	0.7																
Organic N	mg/L																	
Nitrate and Nitrite, N	mg/L	<0.05																
Nitrate - N, (dissolved)	mg/L	<0.05																
Nitrite - N, (dissolved)	mg/L	<0.002																
Chloride, (dissolved)	mg/L	3.57																
Fluoride, (dissolved)	mg/L	<0.05																
Sulphate	mg/L	<0.5																
Sulphide	mg/L	<0.05																
Phosphorus (total)	mg/L	<0.02																
Cyanide	mg/L	<0.01																
UV Transmittance	%																	
Tannins & Lignins	mg/L																	
Colour, True	CU	25																
Bacteriological																		
Total Coliforms	MPN/100mL	<1	<1	<1	<1	<1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fecal Coliforms	MPN/100mL	<1																
E. Coli	MPN/100mL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Background Count	CFU/100mL																	
Heterotrophic Plate Count	MPN/mL																	
Total Metals																		
Aluminum (total)	mg/L	0.002																
Antimony (total)	mg/L	<0.0002																
Arsenic (total), ALARA	mg/L	0.0004																
Barium (total)	mg/L	0.038																
Beryllium (total)	mg/L																	
Bismuth (total)	mg/L																	
Boron (total)	mg/L	<0.01																
Cadmium (total)	mg/L	<0.00004																
Calcium (total)	mg/L																	
Calcium (dissolved)	mg/L	10.2																
Chromium (total)	mg/L	<0.0002																
Cobalt (total)	mg/L																	
Copper (total)	mg/L	0.162																
Iron (total)	mg/L	0.16																
Iron (total)	mg/L	0.12																
Lead (total), ALARA	mg/L	0.0006																
Lithium (total)	mg/L																	
Magnesium (total)	mg/L	2.9																
Magnesium (dissolved)	mg/L	2.91																
Manganese (total)	mg/L	0.127																
Manganese (dissolved)	mg/L	0.129																
Mercury (total)	mg/L	<0.00002																
Molybdenum (total)	mg/L																	
Nickel (total)	mg/L																	
Potassium (total)	mg/L																	
Potassium (dissolved)	mg/L	2.31																
Selenium (total)	mg/L	<0.0002																
Silicon (total, as Si)	mg/L																	
Silicon (dissolved)	mg/L	0.8																
Silver (total)	mg/L																	
Sodium (total)	mg/L	2.04																
Sodium (dissolved)	mg/L	2.1																
Strontium (total)	mg/L																	
Sulphur (total)	mg/L																	
Thallium (total)	mg/L																	
Tin (total)	mg/L																	
Titanium (total)	mg/L																	
Uranium (total)	mg/L	<0.0001																
Vanadium (total)	mg/L																	
Zinc (total)	mg/L	0.099																
Zirconium (total)	mg/L																	
Disinfectant By-Product																		
Total Trihalomethanes	mg/L																	
Bromodichloromethane	mg/L																	
Bromoform	mg/L																	
Chloroform	mg/L																	
Dibromochloromethane	mg/L																	
Hydrocarbons																		
Benzene	µg/L	<0.1																
Toulene	µg/L	<0.1																
Ethylbenzene	µg/L	<0.1																
Xylenes	µg/L	<0.1																
Organic Compounds																		
Total Phenolics	mg/L																	

Parameter	Units	2013-07-03	2013-08-27	2013-09-26	2013-10-03	2013-10-30	2013-12-17	2016-07-11	2016-07-13	2016-07-19	2016-08-09	2016-09-15	2016-11-03	2017-05-10	2017-12-11	2018-05-14	2019-07-23	2019-11-05
		Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Community Hall Kitchen		Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink	Kitchen Sink
		After Filter	After Filter	After Filter	After Filter	After Filter	After Filter	After Filter	Audit		After Filter	After Filter	After Filter	After Filter	After Filter	After Filter	After Filter	After Filter
General Parameters and Nutrients																		
pH	pH units																	
Langelier Saturation Index	-																	
Conductivity	us/cm																	
Turbidity	NTU																	
Bicarbonate	mg/L																	
Carbonate	mg/L																	
Hydroxide	mg/L																	
P-Alkalinity, (as CaCO3)	mg/L																	
T-Alkalinity, (as CaCO3)	mg/L																	
Alkalinity (total)	mg/L																	
Total Dissolved Solids	mg/L																	
Total Suspended Solids	mg/L																	
Total Hardness (as CaCO3)	mg/L																	
Total Organic Carbon	mg/L																	
Ammonia, Total (as N)	mg/L																	
Kjeldahl Nitrogen	mg/L																	
Organic N	mg/L																	
Nitrate and Nitrite, N	mg/L																	
Nitrate - N, (dissolved)	mg/L																	
Nitrite - N, (dissolved)	mg/L																	
Chloride, (dissolved)	mg/L																	
Fluoride, (dissolved)	mg/L																	
Sulphate	mg/L																	
Sulphide	mg/L																	
Phosphorus (total)	mg/L									<.02								
Cyanide	mg/L																	
UV Transmittance	%																	
Tannins & Lignins	mg/L																	
Colour, True	CU																	
Bacteriological																		
Total Coliforms	MPN/100mL	<1	<1	20	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Fecal Coliforms	MPN/100mL																	
E. Coli	MPN/100mL	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Background Count	CFU/100mL																	
Heterotrophic Plate Count	MPN/mL																	
Total Metals																		
Aluminum (total)	mg/L																	
Antimony (total)	mg/L									0.0002								
Arsenic (total), ALARA	mg/L									<0.0005								
Barium (total)	mg/L									0.042								
Beryllium (total)	mg/L																	
Bismuth (total)	mg/L																	
Boron (total)	mg/L									0.006								
Cadmium (total)	mg/L									0.00003								
Calcium (total)	mg/L									11.3								
Calcium (dissolved)	mg/L																	
Chromium (total)	mg/L									<0.0005								
Cobalt (total)	mg/L																	
Copper (total)	mg/L									3.12								
Iron (total)	mg/L									0.03								
Iron (total)	mg/L																	
Lead (total), ALARA	mg/L									0.0022								
Lithium (total)	mg/L																	
Magnesium (total)	mg/L									3.01								
Magnesium (dissolved)	mg/L																	
Manganese (total)	mg/L									0.248								
Manganese (dissolved)	mg/L																	
Mercury (total)	mg/L																	
Molybdenum (total)	mg/L																	
Nickel (total)	mg/L																	
Potassium (total)	mg/L									2.04								
Potassium (dissolved)	mg/L																	
Selenium (total)	mg/L									<0.0005								
Silicon (total, as Si)	mg/L																	
Silicon (dissolved)	mg/L																	
Silver (total)	mg/L																	
Sodium (total)	mg/L									2								
Sodium (dissolved)	mg/L																	
Strontium (total)	mg/L																	
Sulphur (total)	mg/L																	
Thallium (total)	mg/L																	
Tin (total)	mg/L																	
Titanium (total)	mg/L																	
Uranium (total)	mg/L									<0.00002								
Vanadium (total)	mg/L																	
Zinc (total)	mg/L									0.077								
Zirconium (total)	mg/L																	
Disinfectant By-Product																		
Total Trihalomethanes	mg/L																	
Bromodichloromethane	mg/L																	
Bromoform	mg/L																	
Chloroform	mg/L																	
Dibromochloromethane	mg/L																	
Hydrocarbons																		
Benzene	µg/L																	
Toulene	µg/L																	
Ethylbenzene	µg/L																	
Xylenes	µg/L																	
Organic Compounds																		
Total Phenolics	mg/L																	

Parameter	Units	2021-11-04	2023-08-15	2024-04-03	2024-04-03	Exceedances			
		Kitchen Sink	Kitchen Sink	Nukko Raw	Nukko Raw	Treatment Options	Aesthetic	Health	No. Samples
		After Filter	After Filter	Pumphouse Tap	DBP Formation Potential				
General Parameters and Nutrients									
pH	pH units			7.05		0	0	0	2
Langelier Saturation Index	-			-1.6		1	0	0	2
Conductivity	us/cm			103		0	0	0	2
Turbidity	NTU			1.05		0	0	1	3
Bicarbonate	mg/L			50		0	0	0	2
Carbonate	mg/L			<6		0	0	0	2
Hydroxide	mg/L			<5		0	0	0	2
P-Alkalinity, (as CaCO3)	mg/L			<5		0	0	0	1
T-Alkalinity, (as CaCO3)	mg/L			41		0	0	0	1
Alkalinity (total)	mg/L					0	0	0	1
Total Dissolved Solids	mg/L			49		0	0	0	2
Total Suspended Solids	mg/L			<2		0	0	0	1
Total Hardness (as CaCO3)	mg/L			42		0	0	0	2
Total Organic Carbon	mg/L			7.7		2	0	0	2
Ammonia, Total (as N)	mg/L			<0.025		0	0	0	2
Kjeldahl Nitrogen	mg/L			0.46		0	0	0	2
Organic N	mg/L			0.46		1	0	0	1
Nitrate and Nitrite, N	mg/L			0.14		0	0	0	2
Nitrate - N, (dissolved)	mg/L			0.15		0	0	0	2
Nitrite - N, (dissolved)	mg/L			<0.01		0	0	0	2
Chloride, (dissolved)	mg/L			3.48		0	0	0	2
Fluoride, (dissolved)	mg/L			<0.01		0	0	0	2
Sulphate	mg/L			0.5		0	0	0	2
Sulphide	mg/L					0	0	0	1
Phosphorus (total)	mg/L			<0.05		0	0	0	3
Cyanide	mg/L					0	0	0	1
UV Transmittance	%			72		1	0	0	1
Tannins & Lignins	mg/L			0.2		0	0	0	1
Colour, True	CU			6		0	1	0	2
Bacteriological									
Total Coliforms	MPN/100mL	<1	200.5	1		0	0	6	49
Fecal Coliforms	MPN/100mL			<1.0		0	0	0	8
E. Coli	MPN/100mL	<1	<1	<1.0		0	0	0	43
Background Count	CFU/100mL			15800		0	0	0	1
Heterotrophic Plate Count	MPN/mL			33		1	0	0	1
Total Metals									
Aluminum (total)	mg/L			0.006		0	0	0	3
Antimony (total)	mg/L			0.00007		0	0	0	4
Arsenic (total), ALARA	mg/L			0.0004		0	0	0	4
Barium (total)	mg/L			0.051		0	0	0	4
Beryllium (total)	mg/L			<0.00005		0	0	0	2
Bismuth (total)	mg/L			<0.0001		0	0	0	2
Boron (total)	mg/L			0.003		0	0	0	4
Cadmium (total)	mg/L			<0.00001		0	0	0	4
Calcium (total)	mg/L			12		0	0	0	2
Calcium (dissolved)	mg/L			12		0	0	0	2
Chromium (total)	mg/L			0.00014		0	0	0	4
Cobalt (total)	mg/L			0.00003		0	0	0	2
Copper (total)	mg/L			0.0099		0	0	1	4
Iron (total)	mg/L			0.21		0	0	0	3
Iron (total)	mg/L					0	0	0	1
Lead (total), ALARA	mg/L			0.0058		0	0	1	4
Lithium (total)	mg/L			<0.0005		0	0	0	2
Magnesium (total)	mg/L			3.3		0	0	0	4
Magnesium (dissolved)	mg/L			3.1		0	0	0	2
Manganese (total)	mg/L			0.046		0	1	3	4
Manganese (dissolved)	mg/L			0.002		0	0	0	2
Mercury (total)	mg/L			<0.00001		0	0	0	2
Molybdenum (total)	mg/L			0.00019		0	0	0	2
Nickel (total)	mg/L			0.0004		0	0	0	2
Potassium (total)	mg/L			2.5		0	0	0	2
Potassium (dissolved)	mg/L			2.4		0	0	0	2
Selenium (total)	mg/L			<0.0002		0	0	0	4
Silicon (total, as Si)	mg/L			1.2		0	0	0	1
Silicon (dissolved)	mg/L					0	0	0	1
Silver (total)	mg/L			<0.00001		0	0	0	2
Sodium (total)	mg/L			2.1		0	3	0	3
Sodium (dissolved)	mg/L			2.1		0	0	0	2
Strontium (total)	mg/L			0.053		0	0	0	2
Sulphur (total)	mg/L			0.36		0	0	0	1
Thallium (total)	mg/L			<0.00001		0	0	0	2
Tin (total)	mg/L			0.0001		0	0	0	2
Titanium (total)	mg/L			0.0002		0	0	0	1
Uranium (total)	mg/L			<0.00001		0	0	0	4
Vanadium (total)	mg/L			0.00026		0	0	0	2
Zinc (total)	mg/L			0.32		0	0	0	4
Zirconium (total)	mg/L			<0.0001		0	0	0	1
Disinfectant By-Product									
Total Trihalomethanes	mg/L				0.298	0	0	1	1
Bromodichloromethane	mg/L				<0.0050	0	0	0	1
Bromoform	mg/L				<0.0050	0	0	0	1
Chloroform	mg/L				0.298	0	0	0	1
Dibromochloromethane	mg/L				<0.0050	0	0	0	1
Hydrocarbons									
Benzene	µg/L			<0.5		0	0	0	2
Toulene	µg/L			<0.5		0	0	0	2
Ethylbenzene	µg/L			<0.5		0	0	0	2
Xylenes	µg/L			<0.5		0	0	0	2
Organic Compounds									
Total Phenolics	mg/L					0	0	0	1

APPENDIX C

Manufacturer Specifications

VIQUA | **PRO24-186**

Ultraviolet Water Systems from VIQUA

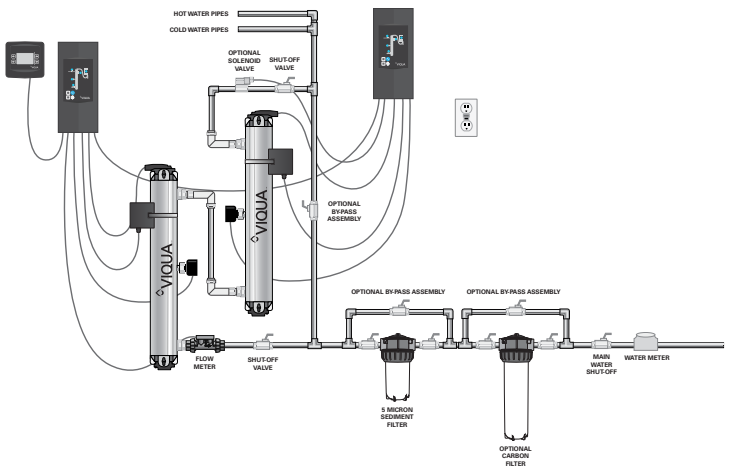
VIQUA's 4-Log Adenovirus UV water system makes complying with the Ground Water Rule and LT2 regulations a lot easier. These systems provide a 186 mJ/cm^2 UV dose for 4-log reduction of viruses, including Adenovirus.

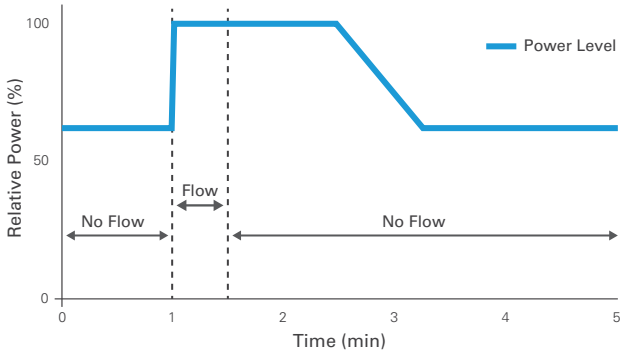
The PRO24-186 systems are fully validated to UVDGM protocol for 4-log Adenovirus reduction. 4-log virus validated UV water treatment equipment provides significantly greater peace of mind for small public water systems.

The VIQUA PRO24-186 system provides treated drinking water for small public water systems (PWS), in accordance with state, provincial, and federal regulations. As PWS get smaller, the available capacity for testing, metering, and monitoring becomes a challenge. The PRO24-186 is designed to measure and log UV dose and flow, and with a four-point stepped validation, ensures compliance at all times.

Public Water Applications

- Churches
- Schools
- Rest Areas
- Bed & Breakfasts
- Community Centers
- Restaurants
- Camps
- Dairy Farms
- Swine Farms
- Poultry Farms



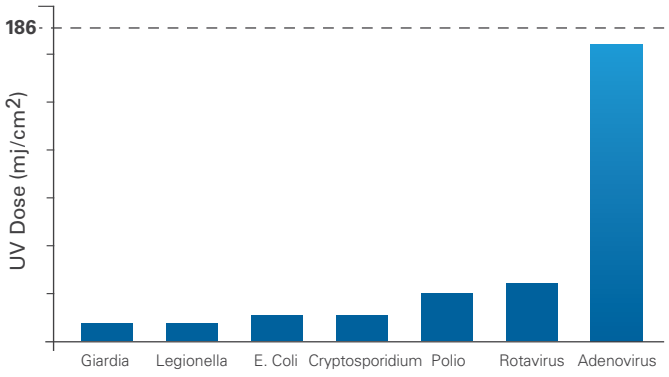


VIQUA's LightWise technology allows the system to reduce lamp power during periods of no flow.

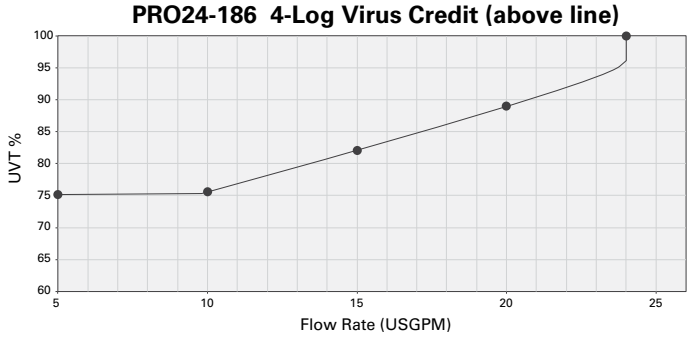
Features of VIQUA UV water systems

- Third party validated for Adenovirus (4-log virus) for 24 gpm (45 lpm) flow at an applied UV dose of 186 mJ/cm^2.
- Two-chamber, ultra-high output VIQUA amalgam UV lamps with Cool-Touch fan technology.
- The CoolTouch Fan significantly reduces water temperature and does not waste any water.
- For the sleeve bolts, a quarter-twist to the positive stop and you're done. No tools, no risk of over-tightening.
- Like a standard plug - no more grounding wires!
- The optional plug-and-play solenoid valve stops water flow in the event that water treatment is compromised.
- Flexibility to connect to either 1¼" MNPT or 1" FNPT
- Our revolutionary amalgam lamps reduce maintenance requirements by lasting up to 2 years.
- Intuitive Interface - a picture is worth a thousand words.
- With plug-and-play colour coded connections, it's as easy as "connect the dots."
- The COMMcenter displays UV dose!
- Flow sensor monitors flow to provide real time UV dose.
- The UVMAX systems use a revolutionary lamp with twice the output of current high-output lamps, giving you compact single-lamp systems that are half the size of their predecessors.
- LightWise Technology allows the controller to reduce lamp power during periods of no water flow. By adjusting the lamp power, water temperature is maintained below 40˚C (104˚F), the rate of sleeve fouling is consequently reduced by as much as 60%, resulting in estimated energy savings of 30%.

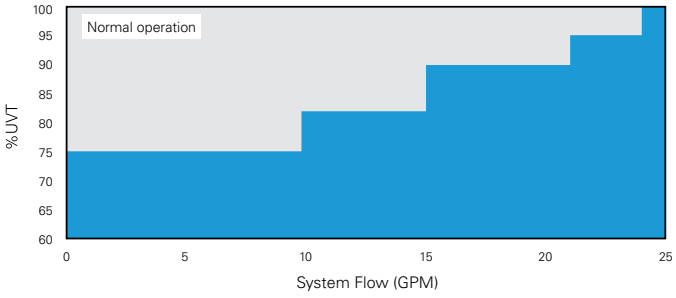
USEPA requirement for 4-log inactivation of viruses

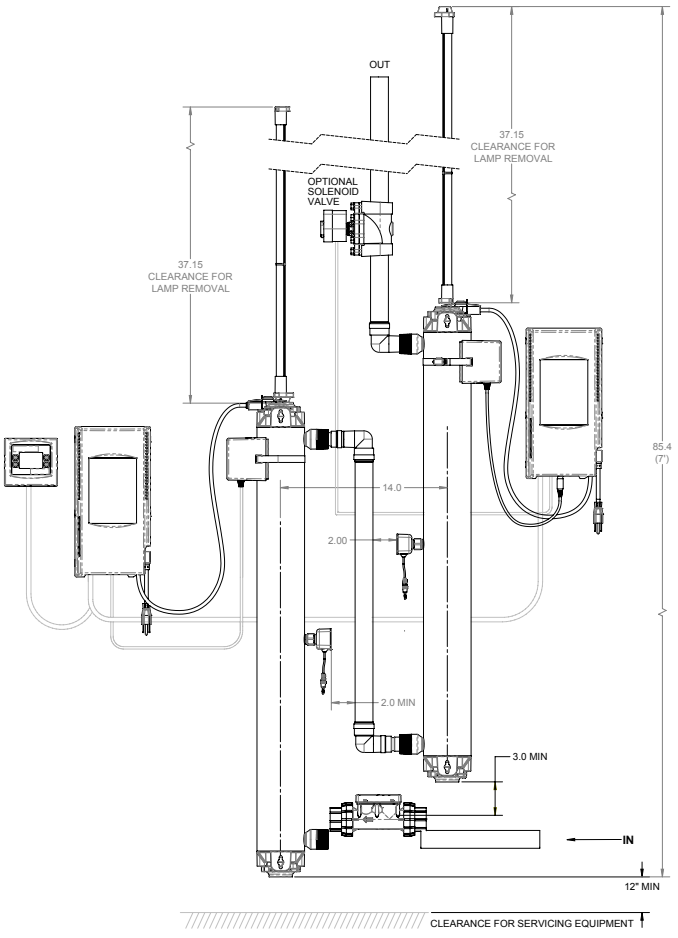


PRO24-186 4-Log Virus Credit (above line)



Stepped Dose Alarm





Specifications

MODEL	PRO24-186
FLOW RATES	
UV Dose	186 mJ/cm^2
Validated Flow	10/15/20/24 GPM (38/57/75/90 lpm) *UVT Dependant** (2.3/3.4/4.5/5.4 m^3/hr)
Validated UVT	75%/85%/90%/95%
DIMENSIONS	
Chamber	41" x 18" (103 cm x 45 cm)
Controller	13" X 6 1/2" x 4 1/2" (33 cm x 16.5 cm x 11.5 cm)
Inlet/Outlet Port Size	1 1/4" MNPT / 1" FNPT COMBO
Shipping Weight	63 lbs (29 kg)
ELECTRICAL	
Voltage	100-240V / 50/60 Hz
Power Consumption	460 W
Maximum Operating Pressure	125 psi (8.62 bar)
Influent Water Temperature	2-40°C (36-104°F)
FEATURES	
Visual "Power On"	YES
Chamber Material	316 SS
Visual Lamp Life Remaining	YES
Audible Lamp Failure	YES
Audible Lamp Replacement Reminder	YES
UV Sensor	YES
Sensor Reading Output (4-20mA)	Optional
Flow Meter	YES
Cool Touch Fan	YES

* Please refer to the Validation Charts for alternate UVT validated flow rates

Replacement Parts

602850-103 (QUANTITY 2) – lamp & quartz sleeve kit	
602856 (QUANTITY 2) – lamp	**650709-013** – controller
602976 (QUANTITY 2) – quartz sleeve	**410982R-30** – flow meter
650580 (QUANTITY 2) – UV sensor	**270288-R** – COMMcenter

Water Quality Parameters

Hardness	Iron	Tannins
< 7 grains (120 mg/L)	< 0.3 mg/L	< 0.1 mg/L

425 Clair Rd. W, Guelph, Ontario, Canada N1L 1R1
t. 1.519.763.1032 • **f.** 1.519.763.5069 • **tf.** 1.800.265.7246 (US/CAN) • **t.** +31.73.747.0144 (EUR) • info@viqua.com • **www.viqua.com**

HARMSCO®

CBC

Calypso Blue™ Cartridges

Industrial and Residential

Premium and WaterBetter® Series

Designed for 4-1/2” diameter filter housings.

Certified to NSF/ANSI Standard 61

- **Lower overall operating cost**
- **Longer filter runs for fewer change outs**
- **Lower initial pressure drops**
- **Reduced maintenance down time and cost**
- **Increased contaminant removal**
- **High flow capability**

Features

- Pleated design for more surface area
- FDA approved materials - NSF 61 certified
- Engineered media for superior performance
- Cleanable and reusable in most applications and micron sizes
- Thermally bonded end caps to ensure better sealing
- Full product line - largest selection of micron ratings

Applications

- Reverse Osmosis Pre-filtration
- Municipal Drinking Water Filtration
- Commercial/Residential Drinking Water Filtration
- Desalination Pre-filtration
- Industrial Water Filtration
- Cooling Tower Filtration
- Chill Water Loop Filtration
- Food & Beverage Filtration
- Marine/Aquatic Filtration

Calypso Blue™ Cartridges

Specifications

- **Nominal Micron Ratings:** 0.35, 1, 5, 10, 20, 50 microns; **Absolute Micron Rating:** 1 micron
- **Filter Media:** Polyester-Plus™, Synthetic Fiber
- **End Caps:** Urethane
- **Shrink Wrap:** Standard on all Premium and WaterBetter® Calypso Blue cartridges
- **Temperature:** up to 140°F (60°C)
- **Center Tubes:** ABS or PVC

NSF

Certified to NSF/ANSI Standard 61

Cartridge Selection/Sizing Guide

9-3/4" 20"

4-1/2" O.D. 9-3/4" and 20" Calypso Blue™ Cartridges - Premium and WaterBetter®

Product Code	Nominal Micron Rating	Media (sq ft)	Maximum Flow Rate* (GPM)	Length (in)	O.D. (in)	No./Case
Polyester-Plus™ - engineered for high efficiency, low pressure drops						
HB-10-0.35W	0.35	12	12	9-3/4	4-1/2	8
HB-10-1W	1	12	12	9-3/4	4-1/2	8
HB-10-5W	5	12	12	9-3/4	4-1/2	8
HB-10-10W	10	12	12	9-3/4	4-1/2	8
HB-10-20W	20	12	12	9-3/4	4-1/2	8
HB-10-50W	50	12	12	9-3/4	4-1/2	8
HB-20-0.35W	0.35	26	26	20	4-1/2	4
HB-20-1W	1	26	26	20	4-1/2	4
HB-20-5W	5	26	26	20	4-1/2	4
HB-20-10W	10	26	26	20	4-1/2	4
HB-20-20W	20	26	26	20	4-1/2	4
HB-20-50W	50	26	26	20	4-1/2	4
Harmsco-Free - 100% synthetic composite media						
HB-10-1W-HF	1	8	8	9-3/4	4-1/2	8
HB-10-5W-HF	5	8	8	9-3/4	4-1/2	8
HB-10-20W-HF	20	8	8	9-3/4	4-1/2	8
HB-20-1W-HF	1	20	20	20	4-1/2	4
HB-20-5W-HF	5	20	20	20	4-1/2	4
HB-20-20W-HF	20	20	20	20	4-1/2	4
Poly-Pleat™ - absolute, multi-layed media						
PP-BB-10-1	1	8	4	9-3/4	4-1/2	8
PPFS-BB-10-1	1	8	4	9-3/4	4-1/2	8
PP-BB-20-1	1	20	10	20	4-1/2	4
PPFS-BB-20-1	1	20	10	20	4-1/2	4
SureSafe™ Antimicrobial - reduces growth of bacteria and mold on media						
HB-10-20W-AM	20	12	12	9-3/4	4-1/2	8
HB-10-50W-AM	50	12	12	9-3/4	4-1/2	8
HB-20-20W-AM	20	26	26	20	4-1/2	4
HB-20-50W-AM	50	26	26	20	4-1/2	4
EZ-Clean - 100% synthetic composite 50 micron media						
HB-10-EZ-CLEAN	50	12	12	9-3/4	4-1/2	8
HB-20-EZ-CLEAN	50	26	26	20	4-1/2	4
WaterBetter® Polyester - economy grade						
WB-HB-10-0.35W	0.35	9.5	10	9-3/4	4-1/2	8
WB-HB-10-1W	1	9.5	10	9-3/4	4-1/2	8
WB-HB-10-5W	5	9.5	10	9-3/4	4-1/2	8
WB-HB-10-10W	10	9.5	10	9-3/4	4-1/2	8
WB-HB-10-20W	20	9.5	10	9-3/4	4-1/2	8
WB-HB-10-50W	50	9.5	10	9-3/4	4-1/2	8
WB-HB-20-0.35W	0.35	21	20	20	4-1/2	4
WB-HB-20-1W	1	21	20	20	4-1/2	4
WB-HB-20-5W	5	21	20	20	4-1/2	4
WB-HB-20-10W	10	21	20	20	4-1/2	4
WB-HB-20-20W	20	21	20	20	4-1/2	4
WB-HB-20-50W	50	21	20	20	4-1/2	4

** Harmsco recommends operation at 50-70% of maximum flow rate for optimum performance.*

HARMSCO® Filtration Products
7169 49th Terrace North, Riviera Beach, FL 33407
(561) 848-9628 • Toll-free: (800) 327-3248 • Fax: (561) 845-2474 • E-mail: sales@harmsco.com
www.harmsco.com

Made in USA

12/18

CALEFACTIO

FLOW REGULATORS

APPLICATIONS

- → GEOTHERMAL EQUIPMENT
- → ELECTRONIC FAUCET
- → WATER PURIFICATOR
- → IRRIGATION
- → TANKLESS WATER HEATER
- → GENERAL OR INDUSTRIAL USE

WATER MANAGEMENT AND ENERGY SAVING

ONLY AVAILABLE AT CALEFACTIO
UNION TYPE REGULATORS

Water is becoming more precious than ever. It's an essential resource for all types of living form on earth. In order to help homeowners and industries to save this valuable resource, Calefactio presents its flow regulators. Not only it can help you save water, but also energy and money, as many areas and industries must comply with taxes on water. Calefactio's Flow regulators will keep a constant water flow rate (within variations of 15%), up to pressure drops of 125 PSI. Calefactio's Flow regulators have applications in a lot of domains, such as general household use (electronic faucet, tankless water heater, water softener, etc.), industrial use (distributing machine, geothermal system, etc.) and even irrigation.

CUSTOM REQUESTS ARE WELCOME (OEM)

Drinking water
NSF/ANSI 61
NSF/ANSI 372 LLC

ALSO AVAILABLE IN 316SS

calefactio.com

WORKING PRINCIPLE

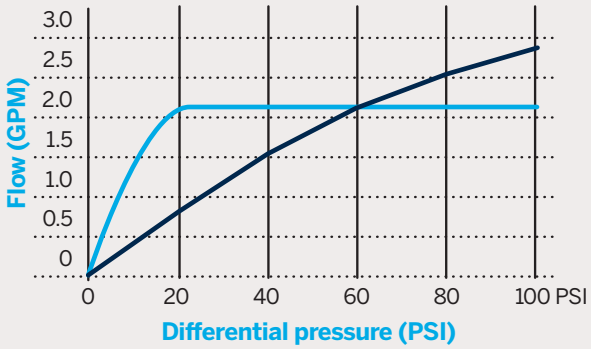
Flow regulators are used to maintan a defined flow rate regardless of pressure variations of the supply line. Precise flow control improves system performance and in the case of plumbing systems, it provides comfort of use at low pressure as well as water and energy saving at high pressure. When there is no flow or pressure, the o-ring is relaxed. When there is normal pressure, the o-ring subjected to the line pressure is compressed into the seating area. As the pressure increases, the o-ring is compressed further into the seating area. As the pressure decreases, the o-ring relaxes. Since the flow rate for a given orifice changes to the square root of delta P, the o-ring deformation is equal to this thus giving a constant flow over a wide range of pressure variations.

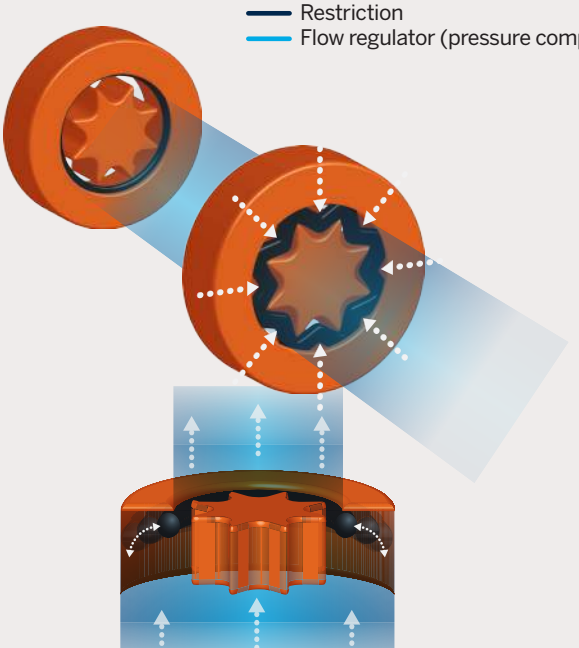
FLOW TOLERANCE refers to the deviation from Nominal Flow tolerated across the pressure range once the threshold pressure is reached. In general the flow tolerance is +/- 15%.

WORKING CONDITIONS refers to the usual parameters of the application such as medium (usually drinking water), pressure range (usually 0 to 150 PSI) and temperature range (usually 40 to 150°F).

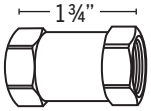
THRESHOLD PRESSURE refers to the pressure at which the flow regulator effectively begins controlling the flow. Standard regulators begin controlling at 15 PSI.

FLOW CHARACTERISTICS

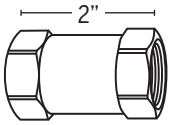




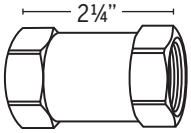
FIXED TYPE REGULATORS



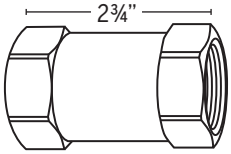
A and SSA
⅜" FNPT
0.13 to 4.00 GPM
3 oz (A), 2.9 oz (SSA)



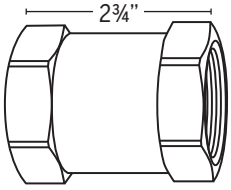
B and SSB
½" FNPT
0.25 to 9.00 GPM
3.6 oz (B), 3.3 oz (SSB)



C and SSC
¾" FNPT
0.25 to 30.00 GPM
6 oz (C), 5.5 oz (SSC)



X and SSX
1" FNPT
2.50 to 30.00 GPM
10.8 oz (X), 9 oz (SSX)

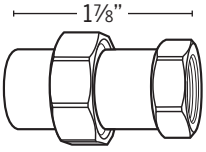


Z and SSZ
1½" FNPT
5.00 to 30.00 GPM
22.6 oz (Z), 21 oz (SSZ)

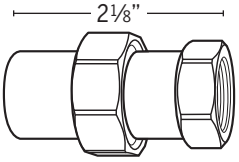
Drinking water
NSF/ANSI 61
NSF/ANSI 372 LLC

ALSO AVAILABLE IN 316SS

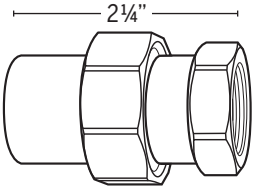
UNION TYPE REGULATORS



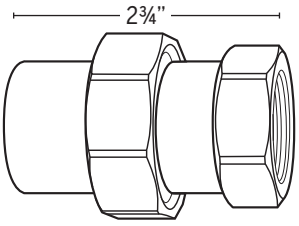
AU and SSAU
⅜'' FNPT
0.13 to 4.00 GPM
0.02 oz



BU and SSBU
½'' FNPT
0.25 to 9.00 GPM
4 oz



CU and SSCU
¾ FNPT
0.25 to 30.00 GPM
6.4 oz



XU and SSXU
1'' FNPT
2.50 to 30.00 GPM
12.8 oz

Drinking water
NSF/ANSI 61
NSF/ANSI 372 LLC

ALSO AVAILABLE IN 316SS

FLOW RATE

Gallon per minute

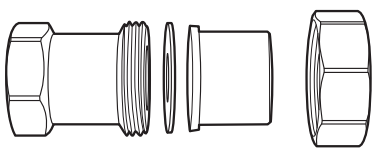
	0.13	0.19	0.25	0.35	0.50	0.75	1.00	1.30	1.50	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	6.50	7.00	8.00	9.00	10.0	12.0	13.0	13.5	15.0	18.0	20.0	24.0	25.0	26.0	30.0
A	•	•	•	•	•	•	•	•	•	•	•	•	•		•																		
B			•		•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•											
C			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
X												•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Z																	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

	0.13	0.19	0.25	0.35	0.50	0.75	1.00	1.30	1.50	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	6.50	7.00	8.00	9.00	10.0	12.0	13.0	13.5	15.0	18.0	20.0	24.0	25.0	26.0	30.0
SSA	•	•	•	•	•	•	•	•	•	•	•	•	•		•																		
SSB			•		•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•											
SSC			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
SSX												•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
SSZ																	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

	0.13	0.19	0.25	0.35	0.50	0.75	1.00	1.30	1.50	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	6.50	7.00	8.00	9.00	10.0	12.0	13.0	13.5	15.0	18.0	20.0	24.0	25.0	26.0	30.0
AU	•	•	•	•	•	•	•	•	•	•	•	•	•		•																		
BU			•		•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•											
CU			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
XU												•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

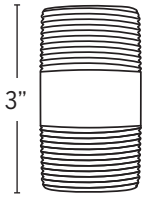
	0.13	0.19	0.25	0.35	0.50	0.75	1.00	1.30	1.50	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	6.50	7.00	8.00	9.00	10.0	12.0	13.0	13.5	15.0	18.0	20.0	24.0	25.0	26.0	30.0
SSAU	•	•	•	•	•	•	•	•	•	•	•	•	•		•																		
SSBU			•		•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•											
SSCU			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
SSXU												•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

CUSTOM REQUESTS ARE WELCOME (OEM)

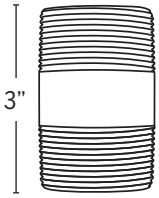


ONLY AVAILABLE AT CALEFACTIO
UNION TYPE REGULATORS

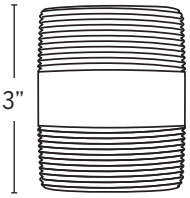
INDUSTRIAL



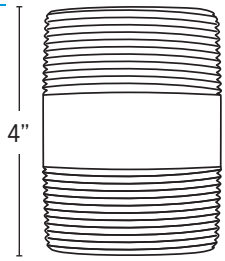
P Series
1¼”x1¼” MNPT
5.00 to 30.00 GPM
10 oz



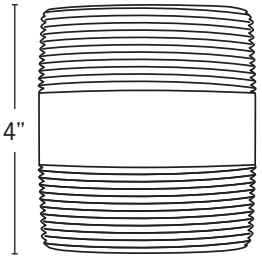
T Series
1½”x1½” MNPT
5.00 to 30.00 GPM
13 oz



F Series
2”x2” MNPT
10.00 to 30.00 GPM
19 oz



H Series
2½”x2½” MNPT
30.00 to 90.00 GPM
32 oz

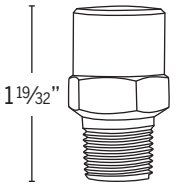


K Series
3”x3” MNPT
30.00 to 120.00 GPM
51 oz

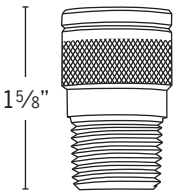
Gallon per minute

	5.00	6.00	6.50	7.00	8.00	9.00	10.0	12.0	13.0	13.5	15.0	18.0	20.0	24.0	25.0	26.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0	100	105	110	115	120
P Series	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•																		
T Series	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•																		
F Series							•	•	•	•	•	•	•	•	•	•	•																		
H Series																	•	•	•	•	•	•	•	•	•	•	•	•	•						
K Series																	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

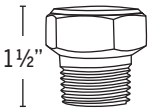
FAUCET SHOWER IRRIGATION



FMA Series
⅜” MNPT x ⅜” FNPT
0.50 to 1.50 GPM
1.6 oz



SR Series
½ MNPT x ½ FNPT
2.00 to 3.00 GPM
3.3 oz



Y Series*
¾” MNPT x ¾” FNPT
1.00 to 10.00 GPM
4.5 oz

Gallon per minute

	0.50	0.75	1.00	1.30	1.50	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	6.50	7.00	8.00	9.00	10.0
FMA	•	•	•		•														
SR							•	•	•										
Y			•		•		•	•	•	•	•		•	•		•	•	•	•

*This model is not CSA accreditated.

Information in this document is founded on the most recent data available at the moment of its publication and is meant for a general presentation of our products. The accuracy of this information cannot be guaranteed. Our products are steadily enhanced and their technical specifications can be modified without prior notice.

Drinking water
NSF/ANSI 61
NSF/ANSI 372 LLC

ALSO AVAILABLE IN 316SS

Calefactio Solutions Inc.
Quebec (Canada)

T 450 951.0818
F 450 951.2165

calefactio.com
info@calefactio.com

CALEFACTIO

PL-REG-BR-E-2017-01-E

MARCH SALE !

Big Blue 20" - 1 Micron Poly Pleated Absolute Filter part # PLA20B01

LIST PRICE: $150.00

$119.50
~~$125.00~~

Waterite

SKU	PLA20B01	Brand	Waterite
Get Rewards	1138.10 Points !		

1 ADD TO CART

On Sale Savings !
$30.50

Delivery Info

In Stock: Ships in 1 - 3 days

Shipping: Calculated at checkout

Overview | Brand Info

1 Micron Absolute Rated Pleated Polypropylene Sediment Filter in 20" Big Blue

Waterite's Excelplus+ Pleated Polypropylene Sediment Filter cartridges provide increased surface area and longer life.

Features:

- Meets or Exceeds NSF Standard 53 for cyst removal
- Made from #1 FDA Grade Virgin Polypropylene
- Synthetic filter media (cellulose free) is bacteria resistant and free of binders or additives which may cause foaming
- Washable & reusable
- Pleated for greater surface area, low pressure drop, and extended life
- Guaranteed 100% removal to 1 Micron Absolute

Specifications

- Filter Media: 100% chemical resistant Polypropylene, Polyester and PET, with no binders or additives
- Dimensions: 19 ¾" (L) × 4½" (D)
- Performance: 0.3 psi pressure drop @ 20gpm
- Flow Rates (max): 25 GPM per 20" BB, flow rates vary with micron rating
- Micron Rating: 1 Micron Absolute
- Operational Tempature Ratings: 5° C to 60° C
- Part Number: PLA20B-01 or PLA20B01

Water Filter Cartridge also fits Cuno, AquaPure, Omni, Sears, Fulflo, Teledyne Water Pik, Ace, Master Plumber, Flotec, Honeywell, General Electric, American Plumber, and all true 20" Big Blue water filter housings for 19 3/4" x 4.5" filters.

CATEGORIES

Certified to NSF/ANSI 61 & 372 PVC and CPVC

SB Series Simplex Basket Strainers

1/2" TO 4" PVC, CPVC, GFPP BLACK, GFPP PLATINUM AND EASTAR®

KEY FEATURES

- Available in PVC, CPVC, GFPP and Eastar®
- True Union Design
- Ergonomic Hand-Removable Cover
- In-Line or Loop Connections
- External Cover Threads
- Integral Flat Mounting Bases
- PVC or CPVC Baskets Standard
- NSF / ANSI 61 and NSF / ANSI 372 Listed

OPTIONS

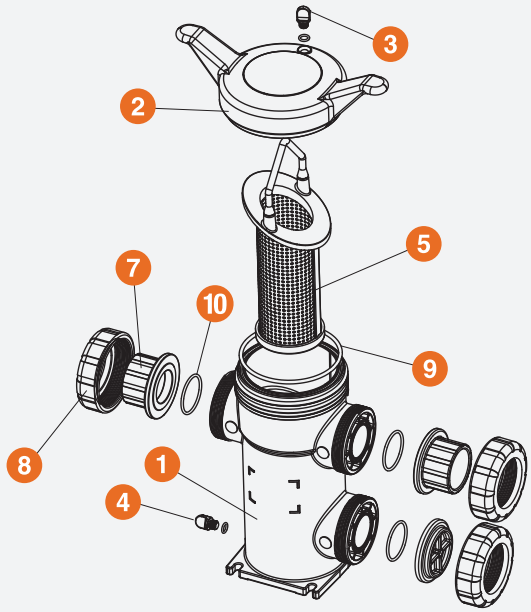
- Stainless Steel, Monel®, Hastelloy® and Titanium Strainer Baskets
- Pressure Differential Gauge and Switch
- Baskets Available with Perforated or Mesh Liners

MATERIALS

- PVC Cell Class 12454 per ASTM D1784
- CPVC Cell Class 23447 per ASTM D1784
- GFPP Cell Class 85580 per ASTM D4101
- Eastar®
- FPM and EPDM O-Ring Seals

TECHNICAL INFORMATION

EXPLODED VIEW



SELECTION CHART

SIZE*	MATERIAL	END CONNECTION	SEALS	PRESSURE RATING
1/2" – 4" (DN15 – DN100)	PVC or CPVC	Socket, Threaded or Flanged	FPM or EPDM	150 PSI @ 70°F 10 Bar @ 21°C Non-Shock
	Eastar®*			100 PSI @ 70°F 7 Bar @ 21°C Non-Shock
	GFPP	Socket Fusion, Threaded or Flanged		150 PSI @ 70°F 10 Bar @ 21°C Non-Shock

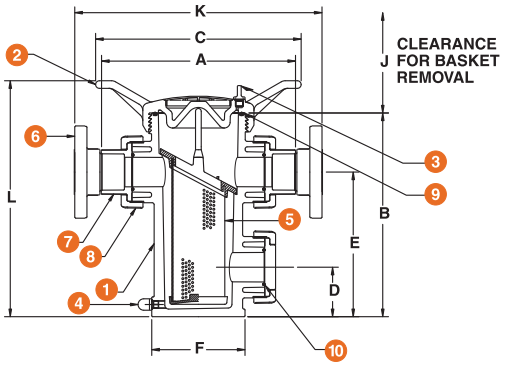
* End connections and assembly nuts are PVC.
** PVC and CPVC socket ends available to ISO 727-1 and threaded ends to BS21.
*** PP socket fusion ends per ASTM F2389 and threaded ends per BS21.
Flanged ends available in DIN / EN PN10.

SB Series
Simplex Basket Strainers
1/2" TO 4" PVC, CPVC, GFPP AND EASTAR®

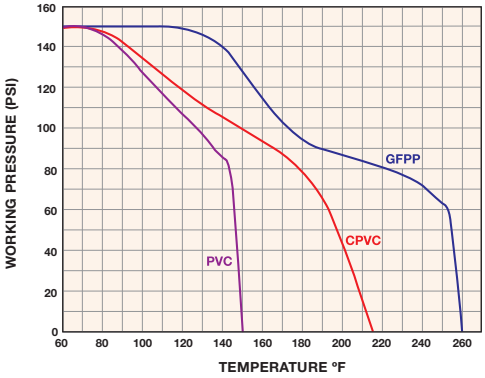
TECHNICAL INFORMATION, *CONTINUED*

PARTS LIST

1. Body
2. Cover
3. Vent Plug and O-Ring
4. Drain Plug and O-Ring
5. Basket
6. Flange (Optional)
7. End Connector
8. Nut
9. Cover O-Ring
10. End Connector O-Ring



OPERATING TEMPERATURE/PRESSURE



Consult factory for Eastar Temperature & Pressure ratings

DIMENSIONS

SIZE in / DN	A in / mm	B in / mm	C in / mm	D in / mm	E in / mm	F in / mm	J in / mm	K in / mm	L in / mm	WEIGHT lbs / kg SOC / THD	WEIGHT lbs / kg FLANGED	VOLUME gal / LT
1/2 / 15	8.64 / 219	9.63 / 245	11.00 / 279	2.25 / 57	6.75 / 171	4.31 / 109	8.00 / 203	10.77 / 274	11.70 / 297	8.00 / 3.63	9.00 / 4.08	.20 / .76
3/4 / 20	8.64 / 219	9.63 / 245	11.00 / 279	2.25 / 57	6.75 / 171	4.31 / 109	8.00 / 203	11.02 / 280	11.70 / 297	8.00 / 3.63	9.00 / 4.08	.20 / .76
1 / 25	8.64 / 219	9.63 / 245	11.00 / 279	2.25 / 57	6.75 / 171	4.31 / 109	8.00 / 203	11.36 / 289	11.70 / 297	8.00 / 3.63	9.00 / 4.08	.20 / .76
1-1/4 / 32	12.75 / 324	13.38 / 340	13.50 / 343	3.25 / 83	9.50 / 241	6.13 / 156	12.86 / 327	15.63 / 397	15.50 / 394	14.00 / 6.35	16.50 / 7.48	.70 / 2.65
1-1/2 / 40	12.69 / 322	13.38 / 340	13.50 / 343	3.25 / 83	9.50 / 241	6.13 / 156	12.86 / 327	15.89 / 403	15.50 / 394	14.00 / 6.35	16.50 / 7.48	.70 / 2.65
2 / 50	12.75 / 324	13.38 / 340	13.50 / 343	3.25 / 83	9.50 / 241	6.13 / 156	12.86 / 327	16.29 / 413	15.50 / 394	14.00 / 6.35	16.50 / 7.48	.70 / 2.65
2-1/2 / 65	16.52 / 420	19.83 / 504	16.00 / 406	4.83 / 123	14.83 / 377	7.25 / 184	17.25 / 438	21.02 / 534	22.30 / 566	28.00 / 12.70	33.00 / 14.97	2.80 / 10.60
3 / 80	16.40 / 417	19.83 / 504	16.00 / 406	4.83 / 123	14.83 / 377	7.25 / 184	17.25 / 438	20.36 / 517	22.30 / 566	28.00 / 12.70	33.50 / 15.20	2.80 / 10.60
4 / 100	17.27 / 439	19.83 / 504	16.00 / 406	4.83 / 123	14.83 / 377	7.25 / 184	17.25 / 438	22.13 / 562	22.30 / 566	28.00 / 12.70	37.00 / 16.78	2.80 / 10.60

Dimensions are subject to change without notice – consult factory for installation information

PRESSURE DROP CALCULATIONS

BASKET PERFORATION CORRECTION FACTORS

For 1/2" to 4" Strainers

Plastic		Stainless Steel			
1/32"	1.05	1/32"	.82	20 Mesh	.79
1/16"	1.00	1/16"	.74	40 Mesh	1.01
1/8"	.58	1/8"	.58	60 Mesh	1.20
3/16"	.46	5/32"	.37	80 Mesh	1.16
		3/16"	.46	100 Mesh	1.20
		1/4"	.58	200 Mesh	1.09
		3/8"	.45	325 Mesh	1.22

PRESSURE LOSS CALCULATION FORMULA

The pressure drop across the strainer, for water or fluids with a similar viscosity, can be calculated using the formula at the right:

$$\Delta P = \left[\frac{Q}{Cv}\right]^2$$

ΔP = Pressure Drop

Q = Flow in GPM

Cv = Flow Coefficient

Cv VALUES

SIZE in / DN	Cv VALUES	SIZE in / DN	Cv VALUES
1/2 / 15	15	2 / 50	60
3/4 / 20	18	2-1/2 / 65	290
1 / 25	20	3 / 80	300
1-1/4 / 32	55	4 / 100	350
1-1/2 / 40	58		

The above Cv Values were determined using a 1 / 16" perforated plastic basket in 1/2" through 4" strainers.

To calculate pressure drop through vessels using other than 1 / 16" perforated baskets, first calculate the pressure drop using the listed Cv, and then multiply the result by the correction factor in the Correction Factors chart to the left.

USA: 1.888.429.4635 • Fax: 1.888.778.8410 • One Hayward Industrial Drive • Clemmons, NC 27012 • Email: hfcsales@hayward.com
Canada: 1.888.238.7665 • Fax: 1.905.829.3636 • 2880 Plymouth Drive • Oakville, ON L6H 5R4 • Email: hflowcanada@hayward.com
Visit us at: haywardflowcontrol.com

BIG BLUE HEAVY DUTY SERIES

FILTER HOUSINGS

Big Black not shown

Pentair Big Blue§ and Big Black Heavy Duty Filter Housings offer the versatility to meet all of your large-capacity filtration needs, including high-flow and heavy-sediment applications. The extra large housing allows for greater cartridge capacity, reducing the number of vessels required for high flow-rate applications. Sumps are available in both 10" and 20" lengths.

The High-Flow Polypropylene (HFPP) cap is available with 3/4", 1" or 1-1/2" NPT inlet and outlet ports. The 1-1/2" internal port allows a greater volume of liquid to pass through the HFPP cap more rapidly.

Big Blue and Big Black Housings are compatible with a broad range of chemicals and are available with or without a pressure relief button. They accept a wide variety of 4-1/2" diameter cartridges.

FEATURES • BENEFITS

- Large capacity housing suitable for high flow applications
- Pressure relief/bleed on inlet side of cap
- Accepts up to 4-1/2" diameter cartridges
- Available in 10" and 20" lengths

SPECIFICATIONS

- **Housing**
  Polypropylene
- **Cap**
  Polypropylene (HFPP)
- **Button Assembly**
  300-Series stainless steel, EPDM, and polypropylene
- **O-Ring**
  EPDM
- **Temperature Rating**
  40-100°F (4.4-37.8°C)
- **Maximum Pressure**
  10": 100 psi (6.9 bar)
  20" : 90 psi (6.2 bar)

The 150233, 150234, 150235, 150236, 150237, 150238, 150239, 150240, 150467, 150468, 150469, and 150470 are Tested and Certified by NSF International to NSF/ANSI Standard 42 for material and structural integrity requirements.

SPECIFICATIONS AND PERFORMANCE

PART #	DESCRIPTION	MAXIMUM DIMENSIONS	INITIAL ΔP (PSI) @ FLOW RATE (GPM)
150469*	3/4" #10 Big Blue Black/Blue HFPP w/PR	12.75" x 7.38" (324 x 187 mm)	2 psi @ 15 gpm (0.14 bar @ 57 Lpm)
150470*	3/4" #10 Big Blue Black/Blue HFPP w/o PR	12.75" x 7.38" (324 x 187 mm)	2 psi @ 15 gpm (0.14 bar @ 57 Lpm)
150467*+	3/4" #20 Big Blue Black/Blue HFPP w/PR	23.04" x 7.38" (585 x 187 mm)	2 psi @ 15 gpm (0.14 bar @ 57 Lpm)
150468*	3/4" #20 Big Blue Black/Blue HFPP w/o PR	23.04" x 7.38" (585 x 187 mm)	2 psi @ 15 gpm (0.14 bar @ 57 Lpm)
158799*	3/4" #20 Big Blue Black/White HFPP w/PR	23.04" x 7.38" (585 x 187 mm)	2 psi @ 15 gpm (0.14 bar @ 57 Lpm)
150237*	1" #10 Big Blue Black/Blue HFPP w/PR	13.30" x 7.45" (338 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)
150238*	1" #10 Big Blue Black/Blue HFPP w/o PR	13.30" x 7.45" (338 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)
150233*	1" #20 Big Blue Black/Blue HFPP w/PR	23.22" x 7.45" (590 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)
150234*	1" #20 Big Blue Black/Blue HFPP w/o PR	23.22" x 7.45" (590 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)
150239*	1-1/2" #10 Big Blue Black/Blue HFPP w/PR	13.45" x 7.45" (342 x 189 mm)	1 psi @ 20 gpm (0.07 bar @ 76 Lpm)
150240*	1-1/2" #10 Big Blue Black/Blue HFPP w/o PR	13.45" x 7.45" (342 x 189 mm)	1 psi @ 20 gpm (0.07 bar @ 76 Lpm)
150235*	1-1/2" #20 Big Blue Black/Blue HFPP w/PR	23.74" x 7.45" (603 x 189 mm)	1 psi @ 20 gpm (0.07 bar @ 76 Lpm)
150236*	1-1/2" #20 Big Blue Black/Blue HFPP w/o PR	23.74" x 7.45" (603 x 189 mm)	1 psi @ 20 gpm (0.07 bar @ 76 Lpm)
150671	1" #10 Big Blue Black/Black HFPP w/o PR	13.30" x 7.45" (338 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)
150426	1" #10 Big Blue Black/Black HFPP w/PR	13.30" x 7.45" (338 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)
150383	1" #20 Big Blue Black/Black HFPP w/PR	23.22" x 7.45" (590 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)
150672	1" #20 Big Blue Black/Black HFPP w/o PR	23.22" x 7.45" (590 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)
150639	1-1/2" #20 Big Blue Black/Black HFPP w/o PR	23.74" x 7.45" (603 x 189 mm)	1 psi @ 15 gpm (0.07 bar @ 57 Lpm)

*NSF component listed

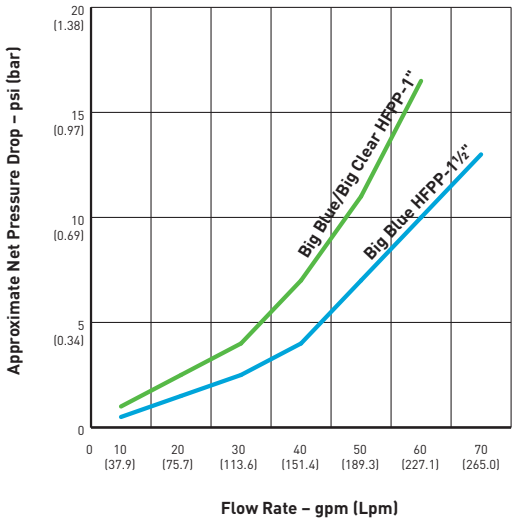
CAUTION: Protect against freezing to prevent cracking of the filter and water leakage.

+ ISLAMIC SERVICES OF AMERICA حلال HALAL SINCE 1975 U.S.A.

ACCESSORIES

PART #	DESCRIPTION
150296	SW-3 Wrench for 10" Big Blue
144368	SW-4 Wrench for 20" Big Blue
SH144229	Cartridge Coupler for 4-1/2" Cartridges
151122	EPDM O-ring for Big Blue
244718	WB-ZP - Zinc Plated Bracket ONLY
150061	WB-ZP Kit - Zinc Plated Bracket
357639	WB-SS - Stainless Steel Bracket ONLY
357640	WB-SS Kit - Stainless Steel Bracket
144928	WB-PC Kit - Powder Coated White Bracket
144258	Two-Housing Bracket
144259	Three-Housing Bracket
160210	Big Blue /Big White/Big Clear Skid, Fiberglass Hardware Kit (Assembly Required)

PRESSURE DROP VS FLOW RATE



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310053 Rev F JA23

C2-02

Carbon Block Cartridge

Part Number: C2-02

Ideal For: Chlorine, Smell

Tested and Certified by NSF International against NSF/ANSI Standard 42 for material safety and structural integrity.

COMPONENT

Product Details

- Modified carbon block cartridge for taste and odor
- Available in regular and high-flow configurations
- Chlorine capacity: 40,000 gal @ 4 gpm (150,000 L @ 15 lpm)

Features & Specs

Specifications

Maximum Flow Rate	10 GPM (38 lpm) (2.3 m^3/hr)

Dimensions	4 1/2″ x 20″ (10.8 cm x 50.8 cm)
Micron Rating	10 micron
Shipping Weight/Case Lot	13 lbs (5.9 kg)/6

*Efficacy of VIQUA UV systems has been demonstrated in internal testing using surrogate organisms, specifically MS2 Phage. MS2 is a well-documented surrogate organism that is accepted in the water treatment industry in the design and testing of UV systems being used to treat *cryptosporidium* and *giardia*. Contact VIQUA for the details on internal testing performed.

† Versus identical incoming water that is not treated with a UV system. Based on internal efficacy testing, VIQUA UV treatment systems, when installed in accordance with the manufacturer's recommendations and with use of a VIQUA UV lamp that is within its expected life, and subject to mechanical and water quality variables, can inactivate common waterborne pathogens. Actual efficacy of any particular VIQUA UV system will be dependent upon mechanical and water quality variables, including incoming water quality, the specific pathogen(s) present, age of UV light bulb, etc. Accordingly, no guarantee can be provided of actual percentage of common waterborne pathogens inactivated in an application.

APPENDIX D

Preliminary Flow Calculations

Calculation Method 1: Maximum Occupancy

Description	Value	Unit	Comments
Occupancy	210	people	Based on standing occupancy.
Demand Value	15	L/ day/ person	Average demand for an assembly hall, according to the Sewerage System Standard Practice Manual Version 3, Table III- 11. Non-residential Average Daily Flow Rate guide.
Demand (ADD)	3150	L/day	Calculated
Estimated Operational Hours Per Day	8	hrs/day	Estimated based on a typical working day, community center opening hours may vary.
Estimated Average Day Demand (ADD)	0.11	L/s	
Estimated Average Day Demand (ADD)	1.73	usgpm	
Maximum Day Demand (MDD) Peaking Factor	3.6	-	Based on a population < 300; Table 21-1 Design Guidelines for Drinking Water Systems in British Columbia, 2024
Peak Hourly Demand (PHD) Peaking Factor	5.4	-	Based on a population < 300; Table 21-1 Design Guidelines for Drinking Water Systems in British Columbia, 2024
Estimated Maximum Day Demand (MDD)	6.2	usgpm	
Estimated Peak Hourly Demand (PHD)	9.4	usgpm	< 18 usgpm

Calculation Method 2: Fixture Count

Description	Value	Unit	Comments
Fixture Count			
Kitchen Faucets	3	#	
Bathroom Faucets	6	#	
Toilet (WC)	7	#	
Toilet Urinal	2	#	
Dishwasher	1	#	
Design Flows			
Kitchen Supply Fittings	8.3	L/min	National Plumbing Code of Canada 2020.
Lavatory Faucet	1.9	L/min	National Plumbing Code of Canada 2020. Public-use lavatory faucet.
Dishwasher	37.9	L/cycle	Assuming 10 gallon low efficiency cycle; 1 cycle per day; cycle operating for 1 hr
Toilet (WC)	10	L/ day/ use	Assuming one use every hour. Sewerage System Standard Practice Manual Version 3, Table III- 11. Non-residential Average Daily Flow Rate guide
Toilet Urinal	5	L/day/ use	Assuming one use every hour. Sewerage System Standard Practice Manual Version 3, Table III- 11. Non-residential Average Daily Flow Rate guide
Estimated Operational Hours Per Day	8	hrs/day	Estimated based on a typical working day, community center opening hours may vary.
Results			
Combined Estimated Maximum Day Demand (MDD)	37.1	L/min	Assuming all fixtures are operating all at the same time.
	0.618	L/s	
	9.8	usgpm	
MDD Peaking Factor	3.6	-	Based on a population < 300; Table 21-1 Design Guidelines for Drinking Water Systems in British Columbia, 2024
PHD Peaking Factor	5.4	-	Based on a population < 300; Table 21-1 Design Guidelines for Drinking Water Systems in British Columbia, 2024
Estimated Peak Hourly Demand (PHD)	15.2	usgpm	= MDD x PHD_PF / MDD_MF; < 18 usgpm

Note 1: If toilets and urinals are excluded from the flow calculation, such that raw water is sourced for the toilets as per current operation, the estimated peak hourly demand is reduced to 14.6 usgpm.