



STATE OF WASHINGTON
 DEPARTMENT OF HEALTH
 NORTHWEST DRINKING WATER REGIONAL OPERATIONS
 20425 72nd Avenue South, Suite 310, Kent, Washington 98032

March 8, 2013

TO: WSDOH Engineers, Interested Parties

FROM: Samuel A. L. Perry, WSDOH Water Treatment Engineer

SUBJECT: Harmsco® HC/170-LT2 Cartridge Filter with MUNI-1-2FL-304 Housing – Alternative Technology Approval

This memorandum provides background information and operating parameters for the Harmsco® HC/170-LT2 cartridge filter contained within a HUR 1X170FL/MUNI-1-2FL-304 housing. This technology meets the filtration requirements of an Alternative Filtration Technology under WAC 246-290-676 (2)(b) with removal credit shown in Table 1, and subject to the operating parameters identified in Table 2.

Table 1 - Filter Removal Credit

Target Organism	Removal Credit (log ₁₀)
<i>Giardia lamblia</i>	2.0
<i>Cryptosporidium</i>	2.0
Viruses	0

Table 2 – System Operating Parameters

Parameter	Value
Maximum Flowrate	100 gpm ¹
Maximum Differential Pressure	30 psid ²
Maximum Raw Water Turbidity	1.0 NTU ³
Turbidity performance requirement WAC 246-290-660 (1)(a)(i)	≤ 1.0 NTU 95 % of the time Never Exceed 5.0 NTU

- Notes:*
1. Although this is allowed maximum filter flow rate, it may result in excessive headloss accumulation and render the system economically non-viable. Pilot-testing must verify the appropriate design rate.
 2. The differential pressure is that measured across the Harmsco HC/170-LT2 cartridge filter and associated housing.
 3. Maximum influent turbidity according to the manufacturer. Pre-filtration is required if the raw water turbidity exceeds this value.

This approval does not constitute construction approval for installation in a public water system. Purveyors must submit site specific project reports and construction documents under Chapter 246-290 WAC for any proposed installation of this treatment equipment.

Background

Harmsco® Filtration Products manufacture the subject filter and housing in West Palm Beach, Florida. These cartridge filters are rigid, disposable filters contained within Harmsco® MUNI-1-2FL-304 pressure



vessels. The original challenge testing in 2011 was conducted using a Harsco® HUR 1X170FL housing. Since that time, Harsco® developed a separate municipal products division to better serve the municipal market place. The Harsco® Swingbolt line of housings has been modified with the addition of ANSI/NSF Standard 61 listed pressure gauges and ball valves. No internal wetted components were altered, so it is appropriate that this approval apply to the Harsco® MUNI-1-2FL-304 housings which are functionally equivalent to the Harsco® HUR 1X170FL housings.

For this treatment equipment, flow is from the outside of the cartridge to the inside. Filtration effectiveness relies primarily on physical straining of the water to remove target pathogens. The filter cartridge pore size(s) determine what size of organism can be removed from the water stream. This cartridge filter is designed to remove protozoan cysts and oocysts. Bacteria and virus-sized particles are expected to pass through the filter bag. Coagulation chemicals are typically not used with this type of filtration system.

At the time of this approval, the Harsco® HC/170-LT2 cartridge filters and MUNI-1-2FL-304 housings produced in the West Palm Beach, Florida facilities are ANSI/NSF Standard 61 certified. If the ANSI/NSF Standard 61 certification is revoked or discontinued, this approval will end.

Field Installation Issues

The laboratory challenge testing consisted of two challenge runs with differential pressures ranging from 6.0 to 32.0 psi. The differential pressure was increased by adding fine test dust (ISO 12103-1 A2 fine). **The duration of the filter run was less than one day. It is uncertain how long filter runs will last under field conditions.** Therefore, it is **very strongly recommended that pilot testing be conducted** to determine the useful life of cartridges and the benefits of pretreatment. Once the differential pressure across both the filter and housing reaches 30 psi, the filter must be replaced. Additional prefiltration should be considered to extend the useful life of the cartridge filter.

The filters must be changed at least annually to minimize the risk of physical, chemical, or biological degradation of the bags sufficient to compromise public health protection. More frequent changing will likely be required. **Filters must be disposed of following use. No bypass around a filter will be allowed.**

Testing Results

Pace Analytical Services/IBR Laboratories (March 2011)

The challenge testing was conducted with a goal of meeting the bag and cartridge filter testing requirements of the Long Term 2 Enhanced Surface Water Treatment Rule. The challenge testing reportedly followed the protocol in ANSI/NSF Standard 53. In this case, 2 um polystyrene microspheres were used as the challenge particulate (Thermo Fisher Scientific Inc. – Model G0200; Mean size 1.9 um, uniformity ±5%). They were fed at a rate of 6,050 to 9,300 microspheres/L. Assuming a filtrate detection limit of 1/L, this feed concentration is within the 1×10^4 limit in LT2ESWTR. Challenges were conducted at:

1. Startup.
2. 50 percent of the maximum differential pressure.
3. 100 percent of the maximum differential pressure.

The treatment system that was challenged consisted of a HC/170-LT2 cartridge filter contained within a HUR 1X170FL housing. Three filters were tested from an initial pressure differential of 6.0 psi up to a maximum pressure differential of 30 and 32 psi. Each test was conducted at a flow rate of 100 gpm.

The particle removal data for these six runs are summarized in Table 3. Between challenge testing points, fine test dust was added at a target rate of 40 mg/L to increase the differential pressure across the filters.

Filter Run	Diff. Pressure (psi)	Influent Microspheres (#/L)	Effluent Microspheres (#/L)	Log Removal
1	8.0	7100	1.9	3.6
	15.0	6600	1.0	3.8
	30.0	7550	1.1	3.9
2	7.0	7850	1.1	3.9
	15.0	6050	1.3	3.8
	32.0	9300	2.0	3.7

Comparison to Membrane Filtration

Membranes are in some ways similar to bag filters in that protozoan log removal credit was not established in the Surface Water Treatment Rule the way it was for conventional, direct, slow sand, and diatomaceous earth filtration. Without a framework, States developed different regulatory approaches to membrane filtration with most granting 2.5 to 3.0 log removal credit (EPA, 2000). These log removal credits can be considered conservative since membranes, when intact, present a complete barrier to protozoa.

The Long Term 2 Enhanced Surface Water Treatment Rule and associated guidance offer a better defined framework for the regulation of membrane filtration. In addition to continuous indirect monitoring of membrane effluent, periodic direct integrity testing must be performed on a daily basis, with sufficient resolution to detect a 3 μ m defect and with enough sensitivity to merit the protozoan log removal credit awarded.

There are no similar means of directly measuring the integrity of the cartridge filters reviewed herein. It is only through turbidity measurements and pressure differential that the integrity of the bags can be assessed. Given the inability of the bags to undergo direct integrity monitoring, it would not make sense to award a bag filtration system a higher log removal value than any membrane filtration system. Without these means of on-going measurement of filtration efficacy, use of bag or cartridge filters as the sole protozoan barrier on raw waters with high microbial risk is inappropriate. These factors were considered as part of determining the appropriate log removal credit for the cartridge filtration system.

References

- Pace Analytical Services, Inc. (2011) Laboratory Analysis of the Harmsco Hurricane HUR 1X170FL Housing with HC/170-LT2 Filter. Minneapolis, MN.
- USEPA (2001) Low-Pressure Membrane Filtration For Pathogen Removal: Application, Implementation, and Regulatory Issues. EPA 815-C-01-001.
- USEPA (2003) Long Term 2 Enhanced Surface Water Treatment Rule: Tool Box Guidance Manual. "Chapter 8.0 – Bag and Cartridge Filters". June 2003 Draft. EPA 815-D-03-009.



STATE OF WASHINGTON
DEPARTMENT OF HEALTH

NORTHWEST DRINKING WATER REGIONAL OPERATIONS
20425 72nd Avenue South, Suite 310, Kent, Washington 98032

March 7, 2013

HARMSCO FILTRATION PRODUCTS
ATTN: JAMES KASPRICK
P.O. BOX 14066
NORTH PALM BEACH, FL 33408

Subject: Harmsco® Model HC/170-LT2 Cartridge Filter – Alternative Filtration Technology Approval

Dear Mr. Kasprick:

Enclosed please find a memorandum for the approval of the HC/170-LT2 cartridge filter housed in a MUNI-1-2FL-304 housing for use in Washington State. The subject technology is an approved Alternative Filtration Technology, as allowed under WAC 246-290-676 (2)(b), with removal credit identified in the following table.

Filter Removal Credit	
Target Organism	Removal Credit (log ₁₀)
<i>Giardia lamblia</i>	2.0
<i>Cryptosporidium</i>	2.0
<i>Viruses</i>	0.0

The acceptance of your technology is specific to the subject system described in the attached memorandum with the limitations listed therein. You must notify the department of any changes in the physical attributes, characteristics, or other attributes of the filter and housing so that modifications can be made to the approval as appropriate. Future regulatory revisions may be more stringent and require modifications to this approval.

Regulations establishing fees for review of alternative filtration technologies have been adopted (WAC 246-290-990). An invoice for \$1,785 is enclosed based upon a total of 17.5 hours spent on the review of the subject product. Please remit your complete payment in the form of a check or money order within thirty days of the date of this letter to: **WSDOH, Revenue Section, P.O. Box 1099, Olympia, WA 98507-1099.**

If you have any questions or concerns regarding the enclosed approval, please contact me at (253) 395-6755 or at sam.perry@doh.wa.gov.

Sincerely,

Samuel A. L. Perry, PE
Water Treatment Engineer
WSDOH Office of Drinking Water

encl: - Alternative Filtration Technology Approval

cc: Hank Harms – Harmsco Filtration Products
Mike Means- WSDOH
Ethan Moseng - WSDOH

