



State of New Mexico
ENVIRONMENT DEPARTMENT

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Governor

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NOTE TO PROGRAM FILE

BUTCH TONGATE
Deputy Secretary

TOM BLAINE, P.E.
Director

Date: February 26, 2014
RE: Long Term Enhanced Surface Water Treatment Rule
Action: Re-Evaluation of the challenge testing of a Harmsco HC/170-LT2 cartridge filter in the MUNI-1-2FL-304 housing for conformance with the requirements of 40CFR§141.719(a).

The challenge testing of Harmsco HC/170-LT2 cartridge filter in the MUNI-1-2FL-304 housing was evaluated for conformance with the requirements of 40CFR§141.719(a). The test report used to evaluate the testing was submitted by Steve Omer, E.I., of Brilliam Engineering on February 26, 2014. IBR Laboratories conducted the testing.

Verify Field Testing Organization (FTO) Credentials – IBR Laboratories is accredited by the American Association for Laboratory Accreditation (A2LA), Certificate Number: 1362-01. Their accreditation includes testing particle filtration under ANSI/NSF Test Methods 42, 50 and 53. The accreditation allows for testing water under the following operating conditions: flow to 100 gpm, temperatures between (10 and 90) °C, pressure to 100 psig and particle size ranging between (0.1 and 1000) microns. Neither the test protocol nor the test report stated the temperature. The challenge testing was conducted within all other operating conditions specified in the accreditation.

Evaluation of Challenge Test

40CFR§141.719(a) Systems receive Cryptosporidium treatment credit of up to 2.0-log for individual ...cartridge filters and up to 2.5-log for ...cartridge filters operated in series by meeting ...criteria.... To be eligible for this credit, systems must report the results of challenge testing that meets... requirements... to the State. The filters must treat the entire plant flow....

Sheet P3 of Appendix A in the PER shows that three filters are arranged in parallel (i.e., individual cartridge filters) to treat the entire plant flow.

The requirement to treat the entire plant flow is satisfied in the configuration shown in Sheet P3 of Appendix A of the PER.

40CFR§141.719(a)(1) Systems may use results prior to January 5, 2006 if the prior testing was consistent with the criteria specified....

The test was conducted on August 28, 2011.

40CFR§141.719(a)(2) Challenge testing must be performed on full-scale ... cartridge filters, and the associated filter housing or pressure vessel, that are identical in material and construction to the filters and housings the system will use for removal of Cryptosporidium. ...cartridge filters must be challenge tested in the same configuration that the system will use, either as individual filters or as a series configuration of filters.

- Full-Scale Cartridge Filter of Identical Material and Construction – The challenge testing was performed on a full-scale cartridge filter. The designation is HC/170_LT2.
- New Mexico Environment Department (NMED) Drinking Water Bureau (DWB) will accept plans and specifications that specify the Harmsco HC/170_LT2 cartridge filter.
- Full-Scale Housing of Identical Material and Construction – The filter housing used during the challenge test was MUNI-1_2FL-304. The previous designation was HUR 1x170Fl.
- NMED DWB will accept plans and specifications that specify the Harmsco MUNI-1-2FL-304 housing. The previous designation was HUR 1x170Fl.
- Same Configuration, Individual Filters or Series Configuration of Filters – The protocol that IBR Laboratories uses for the challenge test shows that the filters are tested as individual filters.
- Figure P3 of Appendix A shows that the filters will installed as individual filters (parallel) configuration. The test results support the maximum log removal value for an individual filter, 2.0-log.

40CFR§141.719(a)(3) Challenge testing must be conducted using Cryptosporidium or a surrogate that is removed no more efficiently than Cryptosporidium. The microorganism or surrogate used during the challenge testing is referred to as the challenge particulate. The concentration of the challenge particulate must be determined using a method capable of discreetly quantifying the specific microorganism or surrogate used in the test: gross measurements such as turbidity may not be used.

- Conservative or Ideal Challenge Particulate - Particles, 2 µm in size, were used as the challenge particulate in the test. The particles were spherical.
- The particle size and shape are conservative because the size is in the lower size range for Cryptosporidium, (3 µm to 7 µm¹) and because the shape is spherical the size is uniform in every direction.
- Enumeration of the Challenge Particulate - The rule requires enumeration using a method capable of discreetly quantifying the surrogate used in the test. Gross measurements such as turbidity may not be used. Particle counting may also be a gross measurement depending on other factors². The test protocol that IBR Laboratories used was included in the submittal. The test protocol references EPA particle counting by microscopy and requires an episcopic microscope with automatic particle counter, calibrated in size range.
- The method for enumerating particles in the challenge water and in the filtrate is acceptable.

¹ Membrane Guidance Manual EPA 815-R-06-009 Table 3.1

² Membrane Guidance Manual EPA 815-R-06-009 Paragraph 3.9.3.2

40CFR§141.719(a)(4) *The maximum feed water concentration that can be used during a challenge test must be based on the detection limit of the challenge particulate in the filtrate (i.e., filtrate detection limit) and must be calculated using the following equation:*

Maximum Feed Concentration = $1 \times 10^4 \times$ (Filtrate Detection Limit).

- The feed water concentration was reported as 7,100 particles/L in the initial test; 6,600 particles/L in the 50% terminal psid test and 7,550/L in the 100% terminal psid test.
- Each of these feed concentrations is within the allowable limit of 10,000 particles/L based on a detection limit of 1 particle/L.

40CFR§141.719(a)(5) *Challenge testing must be conducted at the maximum design flow rate for the filter as specified by the manufacturer.*

- The manufacturer's specification shows a maximum flow rate of 100 gpm.
- The test was conducted at 100 gpm.

40CFR§141.719(a)(6) *Each filter evaluated must be tested for a duration sufficient to reach 100 percent of the terminal pressure drop, which establishes the maximum pressure drop under which the filter may be used to comply....*

- The terminal pressure drop specified by the manufacturer is 30 psi.
- The test was conducted at 100% of the terminal pressure, 30 psi. New Mexico Environment Department Drinking Water Bureau accepts the pressure drop specified by the manufacturer.

40CFR§141.719(a)(7) *Removal efficiency of a filter must be determined from the results of the challenge test and expressed in terms of log removal values using the following equation: $LRV = LOG_{10}(C_f) - LOG_{10}(C_p)$, Where LRV = log removal value demonstrated during challenge testing; C_f = the feed concentration measured during the challenge test; and C_p = the filtrate concentration measured during the challenge test. In applying this equation, the same units must be used for the feed and filtrate concentrations. If the challenge particulate is not detected in the filtrate, then the term C_p must be set equal to the detection limit.*

- The feed and filtrate concentrations were reported in particles/L.
- The feed and filtrate concentrations were reported in the same units (particles/L).

40CFR§141.719(a)(8) *Each filter tested must be challenged with the challenge particulate during three periods over the filtration cycle: within two hours of start-up of a new filter; when the pressure drop is between 45 and 55 percent of the terminal pressure drop; and at the end of the cycle after the pressure drop has reached 100 percent of the terminal pressure drop. A LRV must be calculated for each of these challenge periods for each filter tested. The LRV for the filter (LRV_{filter}) must be assigned the value of the minimum LRV observed during the three challenge periods for that filter.*

- The test was conducted at the start-up of the filter, at 50 percent of the terminal pressure drop (15 psi) and at the terminal pressure drop (30 psi).
- The lowest log removal value (LRV) demonstrated during the test was 3.6. A factor of safety equal to 1-log for an individual filter will be applied based on

40CFR§141.719(a)(1). The filter is therefore eligible for the maximum treatment credit for an individual cartridge filter, 2.0-log removal.

40CFR§141.719(a)(9) If fewer than 20 filters are tested, the overall removal efficiency for the filter product line must be set equal to the lowest LRV_{filter} among the filters tested. If 20 or more filters are tested, the overall efficiency for the filter product line must be set equal to the 10th percentile of the set of LRV_{filter} values for the various filters tested. The percentile is defined by $(i/(n+1))$ where I is the rank of n individual data points ordered lowest to highest. If necessary, the 10th percentile may be calculated using linear interpolation.

- The overall removal efficiency for the filter product line will be set to the LRV_{filter} for the only filter tested, the Harmsco HC/170-LT2 in the MUNI-1-2FL-304 housing.
- Based on the test data, NMED DWB determined that the log removal value demonstrated during the test for the Harmsco HC/170-LT2 in the MUNI-1-2FL-304 housing was 3.6. When the factor of safety for an individual filter, 1.0-log, is applied the LRV_{filter} is 2.6. Therefore the filter is eligible for the maximum treatment credit for an individual cartridge filter, 2.0-log removal.

40CFR§141.719(a)(10) If a previously tested filter is modified in a manner that could change the removal efficiency of the filter product line, challenge testing to demonstrate the removal efficiency of the modified filter must be conducted and submitted to the State.

- A single filter unit is comprised of the filter media, housing, and associated piping and valves³. The HC/170-LT2 filter was tested in the MUNI-1-2FL-304 housing.
- NMED DWB will accept plans and specifications that specify the HC/170-LT2 filter installed in the MUNI-1-2FL-304 housing.

Operating Parameters for Treatment Credit

- Flow rate, ≤100 gpm
- Pressure, ≤ 30 psi

Maximum Eligible Treatment Credit

The log removal value demonstrated during the challenge test was 3.6. When the factor of safety for an individual filter, 1.0-log, is applied the LRV_{filter} is 2.6. Therefore the filter is eligible for the maximum treatment credit for an individual cartridge filter, 2.0-log removal.

Incorporation into Accepted Alternative Technologies List

Challenge testing of the Harmsco HC/170-LT2 cartridge filter in the MUNI-1-2FL-304 housing conformed to the requirements of 40CFR§141.719(a). The equipment will be added to the New Mexico Drinking Water Alternative Technologies List. The equipment is to be operated at a flow rate ≤ 100 gpm and at a pressure differential ≤ 30 psi.

³ LT2ESWTR Toolbox Guidance Manual Paragraph 8.5