NSF International

MEMORANDUM

TO: Joint Committee on Public Drinking Water Equipment Performance

FROM: Bob Powitz, Chairperson

DATE: August 30, 2018

SUBJECT: Proposed draft standard NSF 419 – *Public Drinking Water Equipment Performance – Filtration* (419i6r2).

Draft 2 of NSF 419 issue 6, is being forwarded to the Joint Committee for balloting. Please review the proposed standard and **submit your ballot by September 13, 2018** via the NSF Online Workspace.

Please note that if you do not return a vote for this revised ballot, your last recorded vote from the previous draft revision will remain in effect.

Purpose

The enclosed ballot contains multiple revisions to section 5 of NSF/ANSI 419 including:

- addition of an example test apparatus for challenge testing bags and cartridge filters; and
- language to clarify the test method.

Revision 2 incorporates a comment received during the revision 1 ballot to change several recommendations to requirements (i.e., replacing the word "should" with "shall"). The revised draft also includes few additional clarifications suggested by the original issue proponent. Revision 2 changes are highlighted in yellow.

Background

In early 2017, a straw ballot was submitted to the Joint Committee that included multiple revisions to NSF/ANSI 419. Upon discussion at the subsequent JC meeting, the committee unanimously voted to proceed with separate ballots for each of the major revisions being proposed. This ballot includes the proposed revisions for Section 5. Separate ballots will be sent out over the next few weeks for proposed revisions to Annex C, Annex F, and the incorporation of the new informational Annex G on the design and installation of membranes.

Please refer to the 2017 PDWEP JC meeting summary excerpt under the referenced items for additional information.

If you have any questions about the technical content of the ballot, you may contact me in care of:

Dr. Robert Powitz
Chairperson, Joint Committee
c/o Monica Leslie
Joint Committee Secretariat
NSF International
Tel: (734) 827-5643
E-mail mleslie@nsf.org

[Note – the changes are seen below using strikeout for removal of old text and gray highlights to show the suggested text. ONLY the highlighted text is within the scope of this ballot. Text highlighted in yellow has changed between revision 1 and revision 2, per comments received on the revision 1 ballot.]

NSF International Standard / American National Standard –

Public Drinking Water Equipment Performance – Filtration

5 Bag and cartridge filter systems

5.1 General requirements

5.1.1 A complete description of the bag or cartridge system to be tested shall be provided. The description shall include the following information for both filter and pre-filter (if applicable):

- model name/number of cartridge/bag and filter vessel;
- maximum design flow rate;
- maximum inlet pressure;
- terminal pressure drop requiring filter changeout;
- exploded schematic diagram of the filter element and housing; ~~and~~
- status of ~~module~~ filter certification to NSF/ANSI 61~~.~~; and
- and any additional product specifications requested in Annex C.

Reason: Revised per E. Hofeld's comment and JC meeting discussion on 10/27/16. Revisions in yellow added per comment by J. Mendez on the 419i6r1 ballot.

5.1.2 A minimum of two filter units shall be tested. A filter unit is defined in the EPA LT2ESWTR Toolbox Guidance Manual (TGM) as the filter media (bag or cartridge), housing, and associated piping and valves. More than two units are permitted to be tested if required by a regulatory agency. The bags or cartridges to be tested ~~should~~ shall be selected from different production runs~~, if possible~~.

5.2 Experimental design

5.2.1 The two units shall be configured in parallel for testing or multiple vessel units ~~should~~ shall be configured for testing in series.

5.2.2 Filters shall be tested at the maximum design flow rate for a duration sufficient to reach 100% of the terminal pressure drop. Each filter tested shall be challenged with the challenge particulate within two hours of start-up of a new filter, when the pressure drop is between 45% and 55% of the terminal pressure drop, and after the terminal pressure drop has been reached.

5.3 Challenge particulate

5.3.1 The system shall be tested using polystyrene latex microspheres. The polystyrene microspheres shall have 95% of particles in the range of 3.00 ± 0.15 µm. See Annex E for additional information on challenge particulate selection. The size variation of the polystyrene microspheres shall be confirmed by electron microscopy. The spheres shall have a surface charge content of less than 2 uEq/g. The microspheres shall contain a fluorescein isothiocyanate (FITC) dye or equivalent.

Reason: Added reference to Annex E per comment submitted by J. Mendez (10/21/17). Replaced the word "should" with "shall" per comment submitted by B. Bartley on 419i6r1.

5.3.2 The maximum feed concentration shall be $1.0x10^4$ times the filtrate detection limit, to prevent overseeding leading to artificially high log removals.

5.4 Apparatus

The filters shall be tested in a test apparatus that meets the requirements of LT2ESWTR and the objectives of this standard and its scope. At a minimum, a test apparatus suitable for conducting challenge testing ~~should~~ shall include equipment such as pumps, valves, instrumentation, and controls necessary to evaluate full-scale modules. See Figure 1 for example test apparatus. The test apparatus ~~should~~ shall also be designed to mimic the hydraulic configuration of the full-scale system as much as practical. The test equipment ~~should~~ shall be capable of providing the precision and accuracy necessary to generate data within the requirements of this Standard.

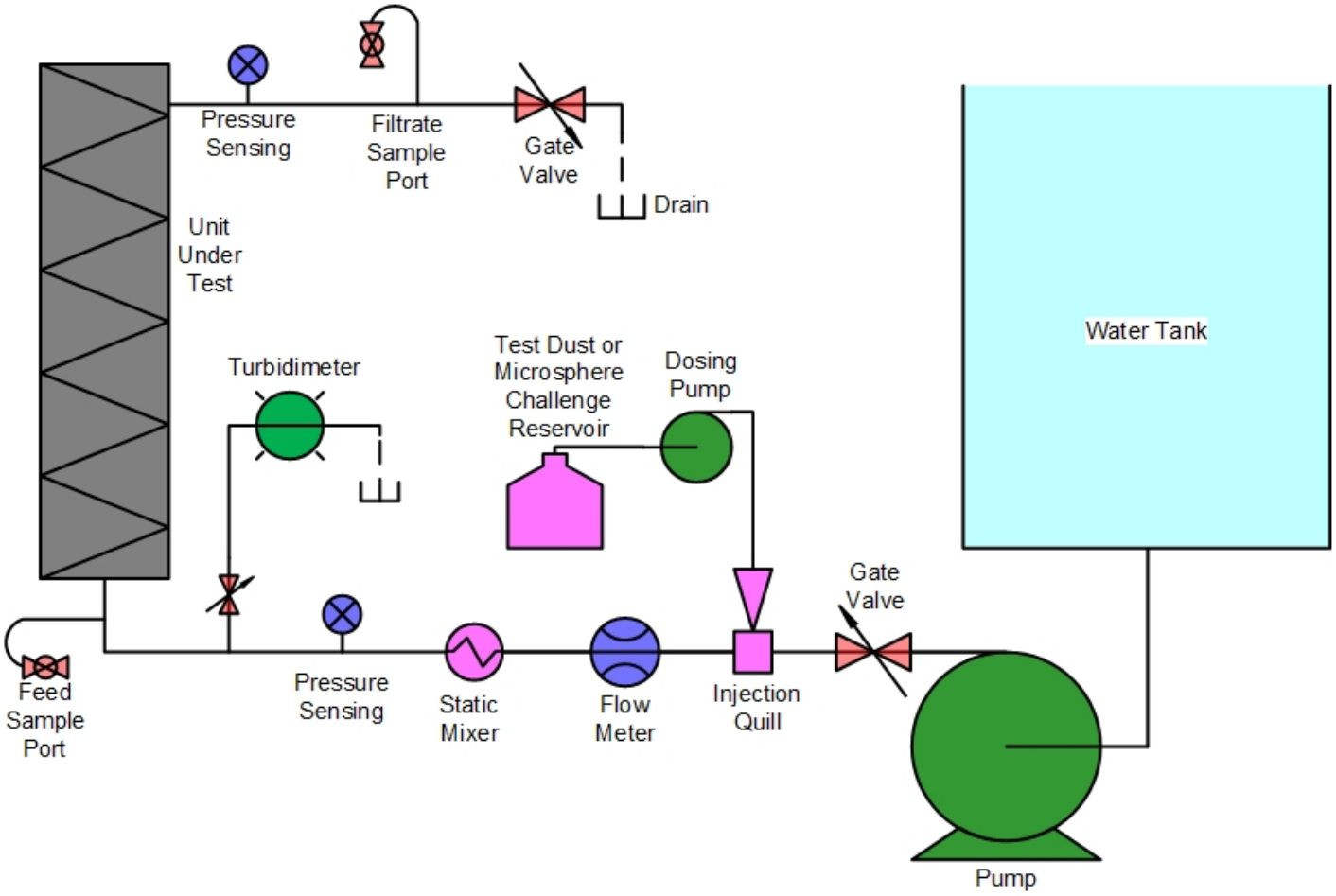

Figure 1 – Example test apparatus for challenge testing bags and cartridge filters

Reason: Added reference to test apparatus figure per comment submitted by J. Mendez (10/21/17).

5.5 Flow rate

The filtration systems shall be operated at the manufacturer's specified maximum design flow. There is no requirement for inlet pressure; it shall be set as necessary to achieve the required flow. Each filter shall be tested for a duration sufficient to reach terminal pressure drop.

5.6 General test water

A dechlorinated, potable water supply shall be used with the following characteristics:

alkalinity	≥ 20 mg/L
HPC	< 500 bacterial colonies/mL
iron[1]	< 0.3; recommend non-detectable levels
manganese[1]	< 0.3; recommend non-detectable levels
pH	6.5 to 8.5
residual disinfection or oxidants in tap water (e.g., free chlorine, total chlorine, potassium permanganate, and chloramines)	None detected
temperature	10 to 27 °C (50 to 81 °F)
total organic carbon (TOC)[1]	measure and report values in test report
turbidity	< 0.3 NTU
[1] The levels of these parameters and any others present in the test water shall not be of a type and quantity to form a cake on the filtration media that could bias the observed reduction of challenge microspheres over the performance of the test.	

5.6.1 Test dust loading water

The test dust is used to load the filter to create a pressure drop across the filter. Test dust shall be added to the general test water specified in 5.6 to achieve a maximum of 10 NTU. The test dust shall have a nominal 0 to 5 µm size classification and shall have 96% (by volume percent) of its particles within this range and 20 to 40% (by volume percent) of its particles greater than 2.5 µm (see Annex E for more information on test dust selection).

Reason: Added reference to Annex E per comment submitted by J. Mendez (10/21/17).

5.7 Set-up

5.7.1 Sanitization

Prior to initiation of testing, and during each module change out, the test rig shall be sanitized using a bleach solution at an appropriate concentration and exposure time. A sample shall be collected to confirm that there is no microbiological contamination as defined in Annex B.

NOTE – Sanitization should be done in accordance with the manufacturer's recommended procedures or a commonly accepted practice such as AWWA C653 - *Disinfection of Water Treatment Plants*.

5.7.2 Conditioning

The filter units shall be conditioned in accordance with the manufacturer's instructions using the general test water specified in 5.6. If no conditioning instructions are provided, the units shall be flushed with a

minimum of 3 hold-up volumes using the general test water specified in 5.6.

5.8 Method

There shall be no conditioning period, other than that specified by the manufacturer to prepare the filters for service.

a) Each test unit shall be individually plumbed to the test rig after the rig has been sanitized and rinsed.

b) The filters shall be conditioned per section 5.7.2. During this period the feed flow and inlet pressure shall be adjusted as necessary to obtain the proper flow for the challenge test per section 5.5 of this Standard.

c) At the end of the conditioning period, negative control filtrate samples shall be collected for challenge microsphere enumeration. At least one negative control sample shall contain the test dust at the concentration to be used during the challenge test. This shall aid in assessing potential interferences with the microsphere enumeration analytical procedures.

d) Filter operation shall begin at the proper flow. Injection of the challenge microsphere suspension shall be started. Feed and filtrate samples shall be collected after at least three void volumes of water containing the challenge microspheres have passed through the test unit, to allow for establishment of equilibrium. The vendor shall provide the unit void volume, or alternatively, the calculated approximate volume of the housing and associated piping ~~should~~ shall be used ~~to provide an additional safety factor~~ as a conservative estimate of unit void volume. For instance, if the housing is a typical cylinder design, the calculated volume of a cylinder of the height and diameter of the housing, plus the volume of any piping ~~should~~ shall be used. After the appropriate injection time, grab samples shall be collected from the feed and filtrate sample taps. The sample taps shall be fully flushed prior to sample collection. After sample collection is complete, challenge suspension injection shall be stopped and filter operation shall continue.

e) The filter shall be operated until the pressure drop across the filter is 50% ± 5% of the terminal pressure drop value. At this point, the second microsphere challenge shall be conducted following the procedure in step d).

f) Immediately following the second microsphere challenge, resume filter operation until the terminal pressure drop is reached. Repeat step d) to conduct the terminal pressure drop microsphere challenge.

g) Immediately after the terminal pressure drop microsphere challenge is complete, filter operation shall be stopped for a five minute rest period, Operation shall then be restarted and injection of microspheres resumed. Samples for polystyrene microsphere analysis shall be collected from the first filtrate water out of the system upon restart, then again after five minutes of operation and ten minutes of operation.

h) LRV values shall be calculated according to the guidelines established in Annex C.

Reason: Revised per comments submitted by J. Mendez (10/21/17). Replaced the word "should" with "shall" per comment submitted by B. Bartley on 419i6r1.

5.9 Analytical methods

This Standard specifies procedures that shall be used to ensure accurate documentation of bag and cartridge filters. Careful adherence to these procedures and to the analytical procedures shall result in verifiable performance data.

5.9.1 Detection and enumeration of polystyrene microspheres shall be done in accordance with Annex A.

5.9.2 A list of analytical methods is provided in Table 5.1.

Table 5.1 – Analytical methods for laboratory analyses

Parameter	Method[1]
alkalinity (total)	SM 2320B
HPC	SM 9125
iron	SM 200.7
manganese	SM 200.7
pH	SM 4500-H^+ B
TDS	SM 2540 C
TOC	SM 5310B
total chlorine	SM 4500-Cl G
turbidity	SM 2130 B

[1] *Standard Methods for the Examination of Water and Wastewater*

5.9.3 Flow rate

During validation testing, the ~~variability or precision~~ accuracy of flow rate measurements ~~should~~ shall be less than or equal to five percent.

5.9.4. Pressure measurements

During validation testing, the accuracy of pressure sensor measurements shall be less than or equal to one percent of the full scale of the sensor.

5.10 A final report shall be completed per guidelines established in Annex C.

Reason: Revised per comments submitted by J. Mendez and B. Bartley on 419i6r1.