Canadian Environmental Technology Verification (ETV) Program Information Bulletin

Bulletin Number: CETV 2014-05-0001

Subject: Revisions to the Canadian ETV Program Procedure for Laboratory Testing of Oil-Grit Separators

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1. Background

The "*Procedure for Laboratory Testing of Oil-Grit Separators*", prepared by Toronto and Region Conservation Authority for the Canadian Environmental Technology Verification Program, provides a common procedure for independent testing and verification of the actual performance of treatment devices under controlled conditions. It is anticipated that independent

verification of performance data will assist regulatory agencies, permitting authorities and other affected stakeholders in evaluating treatment technology options.

Although the performance testing procedure is not intended to be a compulsory standard, it does represent an effective approach for conducting testing in order to produce verifiable performance data on specific technologies under defined operating conditions. Environment Canada's *Canadian ETV Program* supports the use of this protocol to reduce uncertainty and improve acceptance of independently generated performance data.

It is understood that the ultimate decision to approve, select and implement a particular technology rests with the technology buyer, guided by the requirements of the respective permitting authorities within affected jurisdictions.

Version 1.0 of the Canadian ETV Program Procedure for Laboratory Testing of Oil-Grit Separators was released in September 2013. After further review and consideration of comments received since that time, revisions to the procedure have been made to strengthen the procedure and address practical challenges associated with meeting the specified particle size distribution (PSD).

These changes are outlined below under *#2 Modifications to the Procedure for Laboratory Testing of Oil-Grit Separators and Supporting Rationale.*

This Bulletin also includes additional information about possible scour test flow rates that may be required by some jurisdictions in Canada.

Any comments or questions regarding this Bulletin or Version 2.0 of the "*Procedure for Laboratory Testing of Oil-Grit Separators*", should be directed to the Canadian ETV Program Delivery Agent (GLOBE Performance Solutions).

2. Modifications to the Procedure for Laboratory Testing of Oil-Grit Separators and Supporting Rationale

	Original wording	Modified wording	Rationale for Change
3.1 Test Sediment	The well mixed test sediment shall be placed in separate containers in the quantities required for each of the individual test runs. Samples of the dry sediment test mix shall be taken from each container for PSD analysis prior to running the tests to verify that the gradation is uniformly distributed and meets the specified PSD. To verify that the particles are uniformly distributed, each of the individual samples shall have a measured percent less than value within three percentage points of the sample average percent less than value. Further mixing and re-testing will be required if the PSD does not meet this requirement. Once the test sediment PSD is confirmed to be uniformly distributed, the PSD of the average measured value of all samples shall be allowed to vary from the specified percent less than value in Table 1 by three percentage points as long as the median particle size (d_{50}) does not exceed 75 µm. Test sediment PSD analysis shall be conducted in accordance with ASTM D422 – 63.	Three samples of the well mixed test sediment shall be collected and analyzed for PSD in accordance with *Standard Test Method for the Particle Size Analysis of Soils* ASTM D422 – 63 (2007)e1. The PSD of the three sample average of the test sediment shall be allowed to vary from the specified percent less than value in Table 1 by six percentage points as long as the median particle size (d_{50}) does not exceed 75 µm. In addition to the three samples of the test sediment batch, one sample of the test sediment used for each flow rate test shall be collected and analyzed for PSD in accordance with ASTM D422 – 63 (2007)e1. Although not a requirement of the Procedure, the PSD of each of these individual test run samples would be expected to meet the six percent allowance threshold. The individual test run PSD samples will be used to calculate removal efficiencies by particle size fraction, in conjunction with a single PSD sample from the retained sediment mass (see section 3.4). If the particle size percent less than values of an individual test run sample varies by more than six percentage points from the particle size	Sediment mixing companies have had difficulties in achieving the test sediment PSD specification within the three percentage point margin of error, particularly in the size ranges below 75 µm. This has, and was expected to continue to result in significant delays. The modification to the error ranges and the number of PSD samples collected and analyzed against the specification makes testing to the Procedure more achievable from a practical standpoint, while maintaining the scientific rigor of the testing.

		percent less than values of the three sample average of the batch, the test lab shall report removal efficiencies by particle size fraction both for the individual flow test PSD sample and the three sample average PSD of the batch.	
3.2 Test Conditions (last sentence)	Temperature of the water used in the test shall be maintained between 12 and 25°C.	Temperature of the water used in the test shall be maintained between 6 and 19°C.	The test temperatures were lowered to better reflect the average temperature of urban runoff in Canadian cities. The 13°C range between the lowest and highest allowable temperature remains unchanged
3.3.1 Flow Rates (addition)		Modified subheading to Flow Rates and Hydraulic Characteristics Head loss across the device shall be measured on a clean unit without sediment over the full range of operational flow rates using calibrated instruments installed at appropriate locations. The specific methodology for measuring head losses shall be determined by the independent test laboratory, and described clearly in the technical evaluation report. Loss coefficients shall be reported over the full range of test flow rates.	Head loss is a key parameter required by municipalities and road authorities as part of the approval process and provides a context for interpretation of performance results. Approval agencies have asked that this test be added to the Procedure. Independent hydraulic laboratories are in the best position to select the specific methodology for head loss testing based on the specifics of their laboratory set-up.
3.3.2 Test Duration (2nd sentence)	The test must also ensure that a minimum of 12 kg of sediment is fed into the MTD during the test, even if the duration and volume exchange criteria have been satisfied.	The test must also ensure that a minimum of 11.3 kg of sediment is fed into the MTD during the test, even if the duration and volume exchange criteria have been satisfied.	Some sediment mixing companies supply the test sediment in 25 lb (11.3 kg) bags. The small reduction in the minimum amount for each test will not affect the overall results, but will help to ensure that the hydraulic lab does not modify the

			original PSD by mixing partial bags of sediment.
3.3.3 Influent Sediment Concentration (last paragraph)	The average influent concentration during the test shall be determined based on the mass injected divided by the volume of water flowing through the unit during the period of sediment injection. The test sediment used in each test shall be sampled and analyzed for PSD prior to each test to ensure the sediment particles are uniformly distributed and match the specified PSD, as described in section 3.1.	The average influent concentration during the test shall be determined based on the mass injected divided by the volume of water flowing through the unit during the period of sediment injection. The moisture content of the test sediment used for each flow rate test should be measured in accordance with ASTM Method D 4959- 07, *Standard Test Method for Determination of Water (Moisture) Content of Soil By Direct Heating*. The test sediment used in each test shall be sampled and analyzed for PSD in accordance with ASTM D422 – 63 (2007)e1, as described in section 3.1.	Moisture content of the test sediment is required to calculate the mass injected, which is required to determine the influent concentration. The change in section 3.1 necessitated further wording changes in this section.
3.3.4 Modified Mass Balance (last paragraph)	After drying and weighing following ASTM D 4959- 07, the sediment is to be evenly mixed and a minimum of three samples of the sediment are to be collected and analyzed for PSD in accordance with ASTM D422 – 63. Each of the individual samples shall have a measured percent less than value for each size fraction within three percentage points of the three sample average percent less than value to verify that particles in the collected sediment are uniformly distributed. If they do not meet this condition, further mixing will be required and new samples shall be retested.	After drying and weighing following ASTM D 4959- 07, the sediment is to be evenly mixed and a sample of the well-mixed sediment shall be collected and analyzed for PSD in accordance with ASTM D422 – 63 (2007)e1.	The change in section 3.1 necessitated further wording changes in this section.

3.3.5 Background Samples	A minimum of 5 aqueous background samples of the source water shall be taken over the testing period at regular increments. These samples are to be analyzed by the SSC method (ASTM D3977-97 (2013)). Suspended Solids concentrations of background samples shall not exceed 20 mg/L.	A minimum of 5 aqueous background samples of the source water shall be taken over the testing period at regular increments. Background samples should be collected on an hourly basis for all sediment removal tests greater than 5 hours. These samples are to be analyzed by the SSC method (ASTM D3977-97 (2013)). Suspended Solids concentrations of background samples shall be less than 20 mg/L.	The low flow tests can have a duration of over 20 hours. Five background samples would not be sufficient to characterize background sediment concentrations during these longer tests. Hence the number of samples required for tests with a duration longer than 5 hours has been increased to one per hour. For consistency, the background concentration requirement has been modified to read 'less than 20 mg/L' rather than 'shall not exceed 20 mg/L'.
3.4 Sediment Removal Calculation (last two paragraphs)	Sediment removal results shall be reported as a percentage of influent mass retained, both for the total mass and by individual particle size fractions. The average particle size distribution of the three samples taken from each of the influent and retained mass, as described earlier, shall be used as the basis for reporting removal efficiencies by particle size fraction. The size fractions used for reporting of removal efficiencies shall include, at a minimum, the following: < 4 µm 4 µm - 21 µm 21 µm - 42 µm 42 µm - 63 µm 63 µm - 88 µm 88 µm - 125 µm 125 µm - 250 µm 250 µm - 500 µm > 500 µm	Sediment removal results shall be reported as a percentage of influent mass retained, both for the total mass and by individual particle size fractions. The particle size distribution of the samples taken from each of the influent and retained mass, as described previously, shall be used as the basis for reporting removal efficiencies by particle size fraction. The size fractions used for reporting of removal efficiencies shall include, at a minimum, the following: < 5 µm 5 µm - 8 µm 8 µm - 20 µm 20 µm - 50 µm 50 µm - 75 µm 75 µm - 100 µm 100 µm - 150 µm 150 µm - 250 µm 250 µm - 500 µm > 500 µm	The change in section 3.1 necessitated further wording changes in this section. The particle size ranges were modified to correspond with the ranges provided in Table 1 in order to minimize the need for interpolating PSD data.

	Lab results may be graphically or statistically interpolated for the purposes of reporting sediment removal results in the size fractions shown above. However, to minimize errors, interpolations of analytical laboratory data must be based on measurements of no fewer than 22 discrete size fractions.	Lab results may be graphically or statistically interpolated for the purposes of reporting sediment removal results in the size fractions shown above. However, to minimize errors, interpolations of analytical laboratory data should be based on as many discrete size fractions as is practically feasible.	
4.1 Test Sediment	The test sediment preloaded in the sedimentation chamber shall be the same test sediment used in the sediment removal test (see Table 1, Section 3.1). Three samples of the dry sediment test mix shall be collected for PSD analysis from the preloaded material in the sedimentation chamber prior to running the test to verify that the gradation meets the specified PSD and is uniformly distributed. To verify that the particles are uniformly distributed, each of the three individual samples shall have a measured percent less than value within three percentage points of the three sample average percent less than value. Further mixing and re-testing will be required if the PSD does not meet this requirement. Once the test sediment PSD is confirmed to be uniformly distributed, the PSD of the three sample average measured value shall be allowed to vary from the specified percent less than value in Table 1 by three percentage points as long as the median particle size (d_{50}) does not exceed 75 μm.	The test sediment preloaded in the sedimentation chamber shall be the same test sediment used in the sediment removal test (see Table 1, Section 3.1). The three sample average of the batch shall be considered to be representative of the PSD of the preloaded test sediment.	The change in section 3.1 necessitated further wording changes in this section. Since the quantity of pre-loaded material is large, the batch sample for PSD is considered to be sufficiently representative, eliminating the need for unnecessary PSD testing.

4.3.2 Sampling and Analysis (last sentence)	Concentrations of background samples shall not exceed 20 mg/L.	Concentrations of background samples shall be less than 20 mg/L, and effluent sample concentrations shall be adjusted accordingly.	The change in wording improves consistency throughout the document. Previously it was assumed that effluent sample concentrations would be adjusted for background concentrations. In this version it is made into a requirement.
7.1 Suspended Solids	The SSC test method shall be used on aqueous samples: *Standard Test Methods for Determining Sediment Concentration in Water Samples* ASTM D3977-97 (2013).	The SSC test method shall be used on aqueous samples: *Standard Test Methods for Determining Sediment Concentration in Water Samples* ASTM D3977-97 (2013)e1	The ASTM procedure was updated.
7.2 Particle Size Distribution	Test Sediment shall be analyzed in accordance with *Standard Test method for the Particle Size Analysis of Soils* ASTM D422 - 63(2007)	Test Sediment shall be analyzed in accordance with *Standard Test method for the Particle Size Analysis of Soils* ASTM D422 - 63(2007)e1	The ASTM procedure was updated.

3. Additional Information

Manufacturers should be aware that some jurisdictions in Canada, such as Quebec, may require that scour tests be done at a minimum of 200% of the maximum treatment flow rate (MTFR). The MTFR is defined as the maximum flow rate that can be conveyed through the device while still achieving a predefined performance claim for sediment removal (typically 50%, but the target may vary by jurisdiction). If the highest flow rate specified in the CETV Procedure is lower than 200% of the device MTFR being tested, it may be advisable to conduct additional testing at flow rates higher than those specified in the Procedure.

4. References

Memorandum regarding “Proposed Revisions to CETV OGS Procedure” from Tim Van Seters of TRCA to GLOBE Performance Solutions, April 23, 2014.