



Designation: C1893 – 24

## Standard Practice for Laboratory Performance Verification of Hydrodynamic Separators for the Treatment of Stormwater Runoff<sup>1</sup>

This standard is issued under the fixed designation C1893; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This practice covers the criteria for the laboratory verification of Hydrodynamic Separators (HDS) as it relates to the removal of suspended solids in stormwater runoff.

1.2 HDS manufactured treatment devices are placed as offline or online treatment devices along storm drain pipe lines to remove suspended solids and associated pollutants from stormwater runoff. These devices may be used to target removal of other pollutants which are not covered in this standard. The criteria in this standard specifically relate to the removal of silica particles in controlled laboratory conditions, which is considered an appropriate surrogate for predicting the removal of stormwater solids from actual stormwater runoff.

1.3 This practice provides guidelines for independent regulatory entities, collectively referred to as Authority Having Jurisdictions (AHJs), to streamline data requirements for the certification of HDS devices within their jurisdiction. For any given AHJ, additional criteria may also apply.

1.4 *Units*—The values stated in inch-pound units are to be regarded as standard, except for methods to establish and report sediment concentration and particle size. It is convention to exclusively describe sediment concentration in mg/L and particle size in mm or  $\mu\text{m}$ , both of which are SI units. The SI units given in parentheses are mathematical conversions, which are provided for information purposes only and are not considered standard. Reporting of test results in units other than inch-pound units shall not be regarded as non-conformance with this test method.

1.5 Acceptance of test results attained according to this specification may be subject to specific requirements set by a Quality Assurance Project Plan (QAPP), a specific verification protocol, or AHJ. It is advised to review one or all of the above to ensure compliance.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the*

*responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—This practice is also intended to ensure that the data resulting from completion of testing in accordance with the ASTM test methods referenced herein can be utilized to satisfy the requirements of the New Jersey Department of Environmental Protection's manufactured treatment device (MTD) certification process.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- C1745/C1745M Test Method for Measurement of Hydraulic Characteristics of Hydrodynamic Stormwater Separators and Underground Settling Devices
- C1746/C1746M Test Method for Measurement of Suspended Sediment Removal Efficiency of Hydrodynamic Stormwater Separators and Underground Settling Devices
- D3977 Test Methods for Determining Sediment Concentration in Water Samples
- D4959 Test Method for Determination of Water Content of Soil By Direct Heating
- D6913/D6913M Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
- D7928 Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis
- E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E3317 Specification for Silica-Based Sediments for the Evaluation of Stormwater Treatment Devices
- E3318 Terminology for Standards Relating to Stormwater Control Measures

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E64 on Stormwater Control Measures and is the direct responsibility of Subcommittee E64.01 on Lab Evaluation.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

## E3373 Test Method for Scour of Hydrodynamic Separators and Settling Devices

### 2.2 Additional References:

New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device” January 1, 2021

NJDEP Laboratory Test Protocols and Verification Procedure: NJCAT Interpretations”, NJDEP, August 4, 2021

## 3. Terminology

### 3.1 Definitions:

3.1.1 For definitions of common technical terms used in this standard, refer to Terminology E3318.

## 4. Significance and Use

4.1 This practice provides criteria for the verification of the silica sediment removal efficiency of hydrodynamic separators.

4.2 Verification can be used to support certification of the technology within different AHJs provided that:

4.2.1 HDS units are sized using the resulting performance data to treat the prescribed water quality flow rate or annual mass load requirement at the level of performance desired by the certifying entity.

4.2.2 Scaling of results to different MTD model sizes is in accordance with this standard.

4.2.3 The technology is designed consistently with the tested unit such that it operates within the specified limits determined by the verification as well as other restrictions placed by the certification entity.

## 5. Performance Evaluation Requirements

5.1 *Laboratory Qualifications*—The testing laboratory shall be capable of conducting all testing in strict accordance with the applicable laboratory test methods. Testing shall be conducted at either an independent test facility or at a manufacturer’s laboratory under the direct supervision of a qualified third party observer. There shall be no conflict of interest between the independent test facility or third party observer and the manufacturer. A conflict of interest is defined as any person employed as a third party observer or at an independent test facility that is directly engaged in the testing or verification process with the potential to undermine the quality of results for the MTD due to personal, professional, or financial interest. Elements of the supervision shall be outlined in a test QAPP and approved by the verification entity prior to commencing with the verification testing.

5.2 *Third Party Observer Qualifications*—Unless otherwise specified by the applicable verification entity this section provides guidance on suggested qualifications and professional experience for those serving as a qualified third party observers.

5.2.1 *Minimum Educational Requirements*—B.E., B.S., or B.A. in an engineering-based or science-based curriculum.

5.2.2 *Essential Experience*—Experience with hydraulic testing, water quality monitoring, and analytical measurements. Demonstrated knowledge and practice of experimental

design and setup, sampling methods, handling, sample security (that is, chain of custody), task documentation, and data management.

5.2.3 *Relevant Experiences*—Consulting or academic (reporting, general laboratory practices).

5.3 *Expectations for Third Party Observer*—The third party observer shall witness all active aspects of testing carried out at a manufacturers facility as described herein as well as any supplemental test runs, measurements, sampling and analysis:

5.3.1 Observe and document the preparation and collection of test sediment samples for PSD analysis, background suspended sediment concentration (SSC) samples, and effluent SSC scour test sediment samples.

5.3.2 Document test setup, including key dimensions, such as, pipe sizes including diameter, slopes, and condition, hopper location and height, false floor elevation, location of sediment injection point, and sediment scour preloading depth and time.

5.3.3 Observe/document influent sediment feed samples, initial and post run feed hopper sediment weights, and background sample collection and timing.

5.3.4 Record/verify times for sediment calibration samples, sediment feed start, feed stop and flow start/stop.

5.3.5 Observe and document the recovery and measurement of the mass of sediment captured in the sump and inlet pipe.

5.3.6 Document/observe hydraulic testing (flow path, water elevations, bypass, and head loss).

5.3.7 Check sample labeling, management, and security for transportation/shipping.

5.3.8 Ensure calibration of flow meters, scales, etc. per manufacturer’s requirement.

5.3.9 Review and confirm calculations, and adherence to protocol as well as the QAPP.

5.3.10 Maintain logbook and documentation of notes, measurements, etc.

5.4 *Quality Assurance Project Plan*—Prior to testing the laboratory shall submit a QAPP for approval to the verification entity. The QAPP format will be designated by the verification entity. Recommended minimum content for QAPP inclusion:

5.4.1 Applicant information.

5.4.2 Test scope and objectives.

5.4.3 *Description of the technology including* purpose, operation, MTD name/model ID being tested, limitations, methods of bypassing flow, and a standard detail drawing.

5.4.4 *Description of test setup including* flow path explanation, sampling/measurement locations, schematic and photos, lab MTD unit to be tested, key dimensions disclosed, and equipment to be used.

5.4.5 *Description of testing procedure including* sample times/spacing, collection and handling procedures, analysis to be performed, and treatment of data (calculations, statistics, exclusions).

5.4.6 *Lab information including* in-house or independent test lab, third party observer qualifications and duties, and analytical laboratory qualifications.

5.5 *Laboratory Evaluation of Performance of Hydrodynamic Separators and Settling Devices:*