



Total Dissolved Solids: Environmental Express StableWeigh™ Analytical Testing Vessels Method Equivalency Checklist

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Introduction

The method flexibility allowed in the EPA rules 40 CFR part 136.6 [1] lay out the requirements a modified analytical method must meet to be considered equivalent to a promulgated analytical method. These requirements are explained in detail in a memo authored by Richard Redding [2]:

40 CFR part 136.6 (b)1

(b) Method modifications. (1) If the underlying chemistry and determinative technique in a modified method are essentially the same as an approved Part 136 method, then the modified method is an equivalent and acceptable alternative to the approved method provided the requirements of this section are met.

Richard Redding Memo

The March 12th Methods Update Rule promulgated 136.6 which allows the regulated community more flexibility that includes:

1. Changes in equipment operating parameters such as minor changes.
2. Changes are only allowed, if the modified method produces equivalent performance for the analyte(s) of interest, and the equivalent performance is documented.
3. The modified method must be sufficiently sensitive and meet or exceed performance of the approved method(s) for the analyte(s) of interest, as documented by meeting the initial and ongoing quality control requirements in the method.
4. The modified method must be documented in a method write-up or an addendum that describes the modification(s) to the approved method prior to the use of the method for compliance purposes.

The method changes in the Environmental Express TSS Method for StableWeigh Vessels meets the requirements above and does not change the underlying chemistry or determinative techniques from the promulgated methods in 40 CFR part 136 [1]

This checklist will directly compare the Environmental Express StableWeigh™ Analytical Testing Vessels with the ASTM method D 5907-03 [3] and SM 2540 C-1997 [4] so as to allow a laboratory to establish method equivalency for their analyses and reporting to both users of the results and regulators.

Method Summary

The report Total Dissolved Solids: Environmental Express StableWeigh™ Analytical Testing Vessels [5] provides single laboratory comparison data. The significant areas covered in the report summarize the areas for laboratory quality control. Table 1 below outlines all significant determinative technique requirements of ASTM method D 5907-03 and SM 2540 C-1997 compared to the Environmental Express TSS Method for StableWeigh Vessels and shows there

is no change in any determinative technique between the Environmental Express method and the promulgated EPA methods.

The Total Dissolved Solids: Environmental Express StableWeigh™ Analytical Testing Vessels report [5] has provided the literature review information; EPA 40 CFR part 136.6 requirements and experimental data to support the use of Environmental Express Stable Weigh vessels for the analyses of TDS under CWA regulatory requirements outlined the promulgated 40 CFR part 136.

| Table 1: Methods Summary | | | |
|---------------------------------|---|--|---|
| Method Requirement | Environmental Express StableWeigh™ Analytical Testing Vessels | D 5907-03 Requirement | SM 2540 C-1997 Requirement |
| Filter Media | Whatman grade 934AH; Gelman type A/E; Millipore type AP40; E-D Scientific Specialties grade 161; Environmental Express Pro Weigh; or other products that give demonstrably equivalent results | Millipore AP-40, Whatman 934-AH, Gelman type A/E, or equivalent | Whatman grade 934AH; Gelman type A/E; Millipore type AP40; E-D Scientific Specialties grade 161; Environmental Express Pro Weigh; or other products that give demonstrably equivalent results |
| Oven Temperature | Drying Oven, capable of maintaining a temperature between 103 and 105°C for drying sample and between 178 and 182°C for final TSS drying. | Drying Oven, capable of maintaining a temperature between 103 and 105°C for nonfilterable matter and between 178 and 182°C for filterable matter | Drying oven, for operation at 180 ± 2°C. |
| Analytical Balance | Analytical balance, capable of weighing to 0.1 mg | Analytical Balance, capable of measuring to the nearest 0.1 mg. | Analytical balance, capable of weighing to 0.1 mg |

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|---------------------------------|--|---|--|
| Method Requirement | Environmental Express StableWeigh™ Analytical Testing Vessels | D 5907-03 Requirement | SM 2540 C-1997 Requirement |
| Vacuum Filtration System | Membrane filter funnel | A borosilicate glass, stainless steel, or plastic funnel with a flat, fritted, or grid base so as to provide uniform support and filterable surface. The top section of the funnel shall fit over the edge of the filter to provide a seal. The top should be removable to allow easy access for removing the filter. A Gooch crucible with a fritted bottom may be used in lieu of the funnel. | Filtration apparatus: One of the following, suitable for the filter disk selected: 1) Membrane filter funnel. 2) Gooch crucible, 25-mL to 40-mL capacity, with Gooch crucible adapter. 3) Filtration apparatus with reservoir and coarse (40- to 60-J.m) fritted disk as filter support.† |
| Drying Time | Transfer total filtrate (with washings) to a Stable weigh vessel and evaporate to dryness in a drying oven. If necessary, add successive portions to the same vessel after evaporation. Dry evaporated sample for at least 1 h in an oven at 180 ± 2°C, cool in a desiccator to balance temperature, and weigh. | Evaporate the liquid for the filterable matter on a steam bath or in an oven at 103 to 105°C. After the liquid is gone, dry the evaporating dish at 178 to 182°C for at least 1 h. The drying time should be long enough to ensure a constant weight. Place in a desiccator, cool, and weigh to the nearest 0.1 mg. | Transfer total filtrate (with washings) to a weighed evaporating dish and evaporate to dryness on a steam bath or in a drying oven. If necessary, add successive portions to the same dish after evaporation. Dry evaporated sample for at least 1 h in an oven at 180 ± 2°C, cool in a desiccator to balance temperature, and weigh. |

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|-----------------------------------|---|---|--|
| Method Requirement | Environmental Express StableWeigh™ Analytical Testing Vessels | D 5907-03 Requirement | SM 2540 C-1997 Requirement |
| Weighing Requirements | Repeat drying cycle of drying, cooling, desiccating, and weighing until a constant weight is obtained or until weight change is less than 4% of previous weight or 0.5 mg, whichever is less. | Place in a desiccator, cool, and weigh to the nearest 0.1 mg. NOTE 13—The drying time should be checked on new types of samples and periodically on familiar samples to be sure that it is sufficient for the mass to be constant; that is, the difference is less than 0.5 mg, or 4 % of the previous weighing, whichever is greater. | Repeat drying cycle of drying, cooling, desiccating, and weighing until a constant weight is obtained or until weight change is less than 4% of previous weight or 0.5 mg, whichever is less. |
| Drying Vessel Requirements | StableWeigh Vessels (bags) are inert to all aqueous chemical and thermally stable for the temperature range required for TDS. (Stable at 182°C for 12 hrs.) | NOTE 5—The dish should be as small as practical to contain the volume of the sample plus the rinses. The relative mass of the dish needs to be kept at a minimum in order to be able to measure small mass differences with any accuracy. NOTE 6—The dish should be made of a material that is inert to the sample. | Evaporating dishes: Dishes of 100-mL capacity made of one of the following materials: 1) Porcelain, 90-mm diam. 2) Platinum—Generally satisfactory for all purposes. 3) High-silica glass. (Vycor, product of Corning Glass Works, Corning, NY, or equivalent.) |

Conclusion

In conclusion, these changes in the Environmental Express TSS Method for StableWeigh Vessels produce an equivalent set of results compared to the current EPA promulgated Total dissolved Solids listed in the 40 CFR part 136.

Copies of the “Total Dissolved Solids: Environmental Express StableWeigh™ Analytical Testing Vessels” report or the “Environmental Express TSS Method for StableWeigh Vessels” can be obtained from the Environmental Express webpage.

References

1. EPA, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures*, 2012. p. 29758-29846.
2. Reding, R., *Flexibility to Modify CWA Methods*, E. Engineering & Analytical Support Branch, OST, Editor 2007, EPA.
3. ASTM, *Standard Test Method for Filterable and Nonfilterable Matter in Water*, 2003.
4. Eaton, E., Baird, R., Rice, E., , ed. *Standard Methods for the Examination of Water and Wastewater, 22nd Edition*. 22 ed. 2012, APHA, AWWA, WEF.
5. Askew, E.F., *Total Dissolved Solids: Environmental Express StableWeigh Analytical Testing Vessels Method Equivalency*, 2017, Askew Scientific Consulting LLC: Muscatine.