Solids, Total Suspended (TSS) - PBM

Parameters

Solids, Total Suspended (TSS)

Analytical Method

Filtration, Gravimetric, 103-105˚C

Introduction

Total suspended solids (TSS) is the term applied to the quantity of suspended material in a water sample retained by a glass fiber filter of standard pore size (nominal 1.5 µm).

Method Summary

The sample (whole bottle sample or well mixed sub-sample) is filtered, with rinsing, through a pre-weighed glass fiber filter, and the residue on the filter is dried to constant weight at 103°-105°C. The increase in weight of the filter is reported as nonfilterable residue. The filtrate may be used for measurement of Total Dissolved Solids (TDS).

MDL(s) and EMS Analyte Codes

Analyte	Approx. MDL (mg/L)	EMS Analyte Code	EMS Method Code
Solids, Total Suspended (TSS)	3	0008	F043

***Refer to EMS Parameter Dictionary on the ministry website for all current EMS codes.

Matrix

Drinking water, surface water, saline and marine waters, wastewater

Interferences and Precautions

Large, non-representative particulates such as leaves, sticks, fish, or lumps of fecal matter should be excluded from the sample if it is determined that their inclusion is not representative of the bulk sample. Mechanical blending is recommended to assist with homogenization of extremely heterogenous samples containing large agglomerates of organic material which is considered representative of the sample (e.g. using a handheld or laboratory grade dispersing homogenizer).

Samples high in dissolved solids such as brines or saline waters may cause positive interference due to the weight of residual TDS on the filter. Select filtering apparatus and design rinsing protocols carefully to control this interference.

Excessive amounts of residue can form a water-entrapping crust, preventing complete drying. Select appropriate sample amounts for filtration to limit sample residues to 200 mg.

Sample Handling and Preservation

Container: Plastic or Glass.

Preservation: None.

Stability

Holding Time: 7 days.

Storage: Sample temperature should be chilled to ≤ 10°C immediately after sampling and during transit to the laboratory. In the laboratory, samples must be refrigerated at ≤ 6°C. Avoid freezing to prevent sample breakage.

Procedure

Pre-wash glass fiber filters (nominal 1.5 µm pore size) with de-ionized water, bake at 103-105°C (or hotter) for at least 1 hour, and pre-weigh using an analytical balance (4-place minimum).

Homogenize water sample well by vigorous mixing immediately prior to sub-sampling (or use whole bottle if whole bottle sampling is requested). Accurately measure the required sample volume, and transfer to a filtration apparatus containing a pre-weighed filter. Under optimal conditions, a 200 mL sample size can typically support an MDL of 3 mg/L using a 4-place balance.

Rinse filter with 3 volumes of 10 mL deionized water, or as-required to ensure full rinsing of dissolved salts from all portions of the filter paper using the selected apparatus.

Dry the filter to constant weight in an oven at 103° - 105°C. Cool and accurately measure the post-weight of the filter. Report the mass increase of the filter per litre of sample as TSS (mg/L).

Consult APHA Method 2540 D for more details.

Performance Requirements

Any analytical method options selected for this analysis must meet or exceed the performance requirements specified below.

Accuracy and Precision requirements are distinct from daily QC requirements, and apply to measures of long term method performance (averages and standard deviations). Achievement of these requirements is to be demonstrated during initial and ongoing method re-validation studies. For Initial Validations, averages of at least 8 Laboratory Control Samples must be assessed. Ongoing Re-validations (performance reviews) should assess QC data encompassing longer timeframes (e.g. 6 months to 1 year). A minimum frequency of 2 years is recommended for Ongoing Re-validations.

Accuracy Requirement: Laboratories must demonstrate method accuracy (measured as average recovery) of 90-110% for Laboratory Control Samples (at concentrations ≥ 10x the laboratory's reported detection limit).

Precision Requirement: Laboratories must demonstrate method precision equal to or better than 10% RSD (at concentrations ≥ 10x the laboratory's reported detection limit).

Sensitivity Requirement: Where possible, the method should support Reporting Limits (and MDLs) that are less than 1/5 of applicable numerical standards. The method is not fit-for-purpose if an MDL exceeds a guideline, standard, or regulatory criteria against which it will be used for evaluation of compliance.

Quality Control

Summary of QC Requirements

QC Component	Minimum Frequency	Minimum Data Quality Objectives
Method Blank (MB)	One per batch (max 20 samples)	Less than reported DL
Lab Control Sample (LCS)	One per batch (max 20 samples)	80 – 120%
Lab Duplicate (DUP)	One per batch (max 20 samples)	20% RPD [or within 2x reported DL for low level results]

If DQOs are not met, repeat testing or report qualified test results.

Prescribed Elements

The following components of this method are mandatory:

1. Performance Requirements and Quality Control requirements must be met.
2. Filtration must utilize a glass fiber filter with nominal pore size of ~ 1.5 µm, e.g. using filters such as Whatman 934AH, Gelman A/E, Millipore AP40, Ahlstrom 161, Environmental Express Pro Weigh, or equivalent.
3. Drying of filters must be conducted at 103 - 105˚C.
4. The maximum sample residue permitted for this method is 200 mg (excessive residue amounts may form a water-entrapping crust). Repeat test with smaller sample amount if maximum residue amount is exceeded.

Apart from these limitations, and provided performance requirements are met, laboratories may introduce modifications to this method in order to improve quality or efficiency.

References

1. Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, Method 2540 D (2015), Total Suspended Solids Dried at 103–105°C.
2. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, USEPA, Revised March 1983, Method 160.2.

Revision History

Dec 17, 2020 Updated to PBM format. Added QC sample DQOs and validation requirements. Updated hold time requirements for consistency with latest approved BC ENV protocols. Changed name of method to Solids, Total Suspended from Residue, Non-Filterable. Upon director approval, this method will supercede and replace the "Residue, Nonfilterable (TSS)" method from the 2020 BC Lab Manual.

Dec 31, 2000 SEAM codes replaced by EMS codes.