# Solids, Total Filterable (Total Dissolved)

## USEPA[1] Gravimetric Method[2] — Method 8163

**Scope and application:** For water and wastewater.

[1] USEPA accepted
[2] Adapted from *Standard Methods for the Examination of Water and Wastewater, Part 2540C*.

## Test preparation

### Before starting

| |
|---|
| Total Filterable Solids = Total Dissolved Solids (TDS) |
| Dry samples with high bicarbonate concentrations at 180 °C (356 °F) to make sure that the conversion of bicarbonate to carbonate is complete. |
| Limit the sample size to lessthan 200 mg residue. |
| When measuring volatile dissolved solids, heat the evaporating dish for 1 hour at 550 °C (1022 °F) before use. |
| If applicable, use sample residue from this procedure directly in Method 8277, Solids, Total Volatile and Fixed. |
| Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment. |
| Dispose of reacted solutions according to local, state and federal regulations. Refer to the Safety Data Sheets for disposal information for unused reagents. Refer to the environmental, health and safety staff for your facility and/or local regulatory agencies for further disposal information. |

### Items to collect

| Description | Quantity |
|---|---|
| Evaporating dish | 1 |
| Filter flask | 1 |
| Filter holder | 1 |
| Filter, 47 mm | 1 |
| Graduated cylinder, 100 mL | 1 |
| Hot plate | 1 |
| Steam bath, 8" diameter | 1 |
| Analytical balance | 1 |
| Desiccator | 1 |
| Tongs | 1 |
| Tweezers | 1 |
| Drying oven | 1 |
| Deionized water | varies |

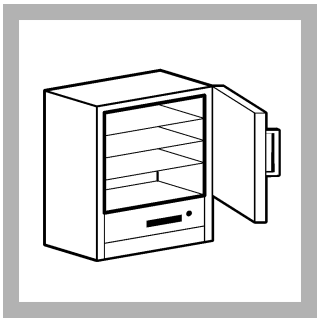
Refer to Consumables and replacement items on page 4 for order information.

### Sample collection preservation and storage

- Collect samples in clean glass or plastic bottles.
- Analyze the samples as soon as possible for best results.

- If prompt analysis is not possible, keep the samples at or below 4 °C (39 °F) for up to 7 days.
- Let the sample temperature increase to room temperature before analysis.

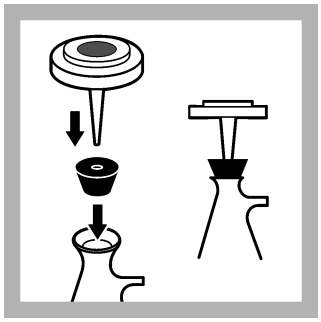
## Test procedure



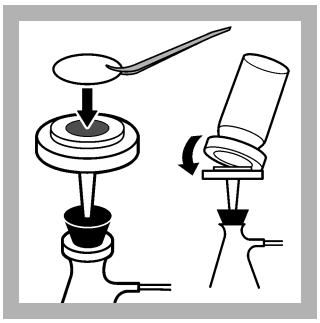
**1.** Put a clean evaporating dish in a drying oven at 180 °C (356 °F) for 1 hour.

**2.** Remove the dish from the oven. Let the dish temperature decrease to room temperature in a desiccator.

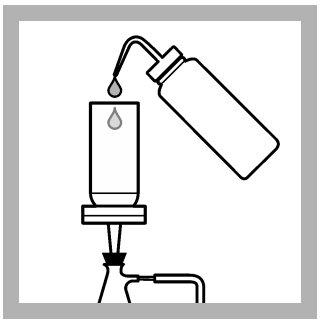
**3.** Remove all of the residue from the flask with a dilute solution of ammonium hydroxide. Rinse with deionized water.



**4.** Assemble the filter holder/flask assembly using a clean filter flask.



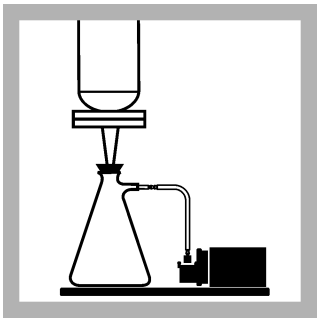
**5.** Use tweezers to put a 47-mm filter disc in the filter holder. Put the filter holder assembly in the filtering flask.



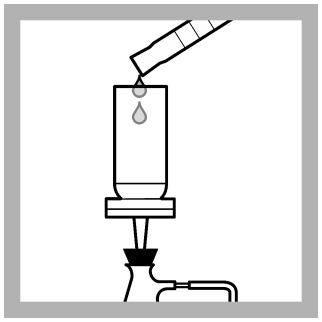
**6.** Connect vacuum to the filter holder/flask assembly and wash the filter with three separate 20-mL volumes of deionized water.

**7.** Apply vacuum for 2 to 3 minutes after the water has passed through the filter.

**8.** Disconnect the vacuum. Discard the washings from the flask.



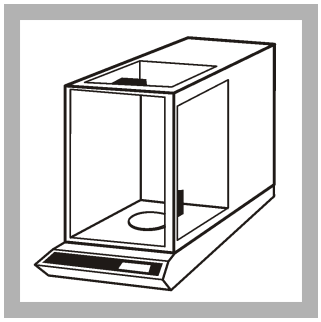
**9.** Connect vacuum to the filter holder/flask assembly again.



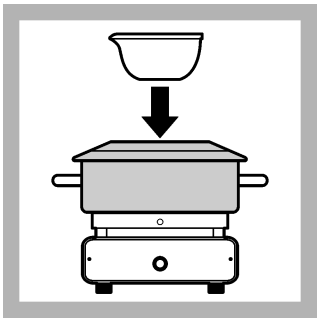
**10.** Use a clean 100-mL graduated cylinder to pour 100 mL (or more) of a well-mixed, representative water sample into the filter holder.

***Note:*** *For best accuracy, filter as much sample as possible. A sample that contains more than 15 mg of solids can clog the filter. Adjust the volume of the water sample to get the optimum condition. 5-10 completed tests will show if an adjustment is necessary.*

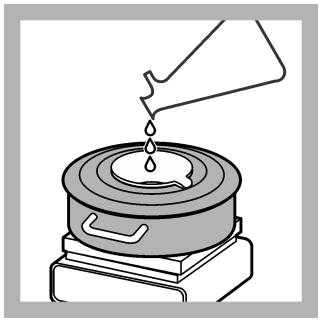
**11.** Apply vacuum for 2 to 3 minutes after the sample has passed through the filter. Disconnect the vacuum.



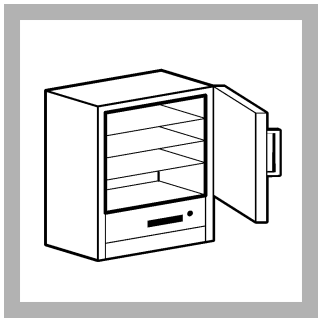
**12.** Use an analytical balance to weigh the dish to the nearest 0.1 mg (0.0001 g). Record this mg value as B.



**13.** Put the steam bath on the hot plate. Add water to the steam bath. Put the evaporating dish in the steam bath.

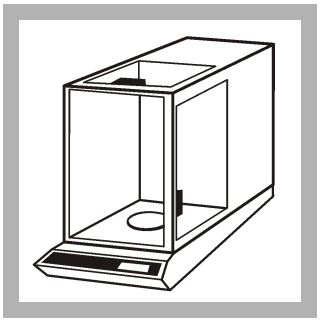


**14.** Pour the 100-mL filtrate sample from the filter flask into the evaporating dish. Dry for 4 hours. Examine the reservoir of the water bath at regular intervals. Add more water if necessary.

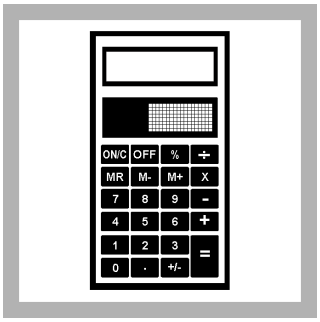


**15.** Put the evaporating dish in a drying oven at 180 °C (356 °F) for 1 hour.

**16.** Remove the dish from the oven. Let the dish temperature decrease to room temperature in a desiccator.



**17.** Use an analytical balance to weigh the dish to the nearest 0.1 mg (0.0001 g). Record this mg value as A. Do steps 15-16 again, until the difference between two successive sample weighings is less than 4% or 0.5 mg, whichever is less. If applicable, use the solid residue directly in method 8277 to determine Volatile Dissolved Solids.




**18.** Calculate the Total Filterable Residue (TFR).

A – B ÷ Sample volume in liters = mg/L TFR

## Summary of method

A well-mixed sample is filtered through a standard glass fiber filter. The filtrate is evaporated in a weighed dish and dried to a constant weight at 180 °C (356°F). The increase in the weight of the dish after drying is the total filterable solids (total dissolved solids).

## Consumables and replacement items

| Description | Quantity/test | Unit | Item no. |
|---|---|---|---|
| Aspirator, vacuum pump | 1 | each | 213100 |
| Balance, Analytical, 115 VAC, 60 Hz | 1 | each | 2936701 |
| Bottle, wash, 500 mL | 1 | each | 62011 |
| Cylinder, graduated, 100 mL | 1 | each | 50842 |
| Desiccant, indicating Drierite | 1 | each | 2088701 |
| Desiccator, without stopcock | 1 | each | 1428500 |
| Desiccator plate, ceramic | 1 | each | 1428400 |
| Evaporating dish, porcelain, w/lip, 120-mL, 90-mm | 1 | each | 52561 |
| Filter disc, 47 mm, glass fiber | 1 | 100/pkg | 253000 |
| Filter holder, 47-mm, magnetic base | 1 | each | 1352900 |
| Flask, filtering, 1000 mL | 1 | each | 54653 |
| Hot plate/stirrer, 7 x 7 inch, 115 VAC | 1 | each | 2881600 |
| Hot plate, stirrer, 220–240 VAC | 1 | each | 2881602 |
| Oven, drying, 240 VAC | 1 | each | 1428902 |
| Oven, drying, 120 VAC | 1 | each | 1428900 |
| Steam bath, 8-inch diameter | 1 | each | 2347900 |
| Stopper, rubber, one-hole, No. 8 | 1 | each | 211908 |

## Consumables and replacement items (continued)

| Description | Quantity/test | Unit | Item no. |
|---|---|---|---|
| Tongs, crucible, 9 inch | 1 | each | 56900 |
| Tubing, rubber, 7.9 mm x 2.4 mm | varies | 12 ft | 56019 |
| Tweezers, plastic | 1 | each | 1428200 |
| Water, deionized | varies | 4 L | 27256 |

### Optional reagents and apparatus

| Description | Unit | Item no. |
|---|---|---|
| Ammonium Hydroxide, 58% | 500 mL | 10649 |
| Sampling bottle with cap, low density polyethylene, 500-mL | 12/pkg | 2087079 |
| Brush | each | 68700 |
| Pump, vacuum, hand-operated | each | 1428300 |
| Pump, vacuum, 1.2 CFM, 220 VAC, European plug | each | 2824802 |
| Vacuum Pump, 1.2 CFM 115 V | each | 2824800 |
| Stirring rod, glass | 3/pkg | 177001 |

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