Solids, Nonfilterable Suspended Solids; Total and Volatile

DOC316.53.001204

USEPA[1] Gravimetric Method[2]

Methods 8158 and 8164

Scope and Application: For water and wastewater.

[1] USEPA accepted.

[2] Adapted from *Standard Methods for the Examination of Water and Wastewater* Section 2450

Test preparation

Before starting the test:

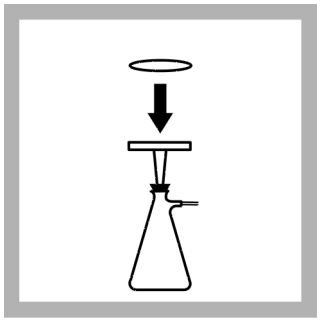
The Total Nonfilterable Solids are the same as the Total Suspended Solids (TSS)

Collect the following items:

Description	Quantity
Filter flask	1
Filter holder	1
Filter, 47-mm	1
Graduated cylinder, 100-mL	1
Tongs	1
Tweezers	1
Watch glass	1
Desiccator with desiccant	1
Muffle Furnace	1
Drying Oven	1
Deionized Water	varies

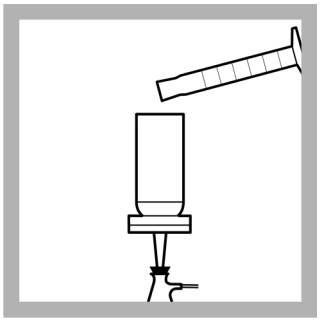
See *Consumables and replacement items* for reorder information.

Gravimetric Method—Total Nonfilterable Residue, Method 8158

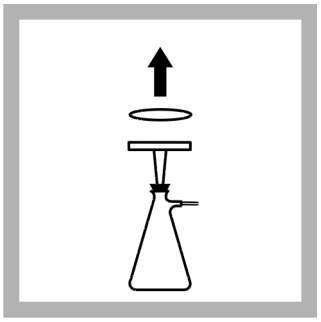


1. Use tweezers to place a 47-mm glass fibre filter disc in the filter holder. Always use tweezers to handle filter discs.

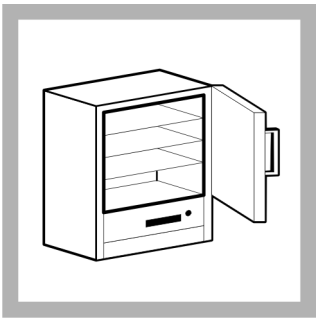
Moisture from fingers can add moisture to the disc and cause a weighing error.



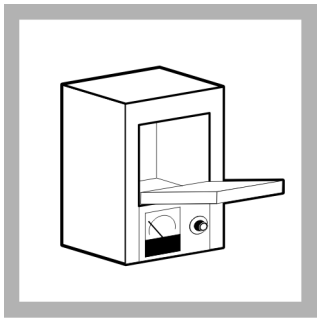
2. Place the filter holder assembly in the filtering flask and add 100 mL of deionized water. Apply vacuum to the flask until all the water is drawn through the filter.



3. Slowly release the vacuum from the filtering system and remove the disc from the filter holder and transfer to a watch glass.



4. Place the disc in a preheated drying oven at 103 °C for one hour.

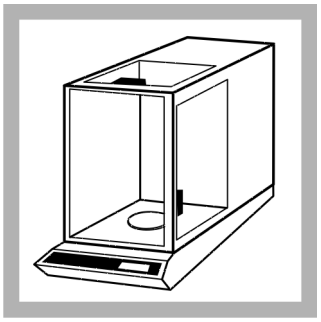


5. If volatile nonfilterable solids are also being measured, use tongs to place the watch glass with the disc into a muffle furnace and ignite at 550 °C for 15 minutes. If not, omit this step.

Partially preheat the muffle furnace before inserting the watch glass. Placing the watch glass in a 550 °C furnace could cause it to shatter. Bring the temperature up to 550 °C 15 minutes after placing the filter and watch glass in the furnace.

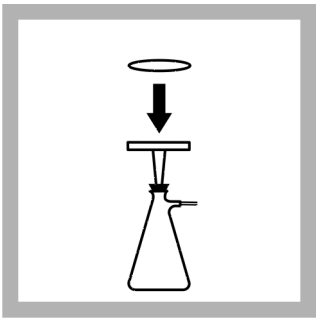
6. Use metal tongs to remove the disc and watch glass from the oven or furnace and place in a desiccator. Cover immediately. Allow the watch glass to cool slightly before sealing the desiccator as pressure from the heated air inside the desiccator can force the cover off.

Allow the filter and glass to cool to room temperature.



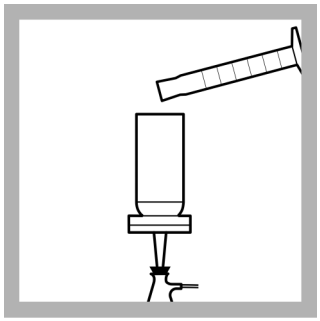
7. Remove the watch glass and disc from the desiccator as a unit and place beside the analytical balance.

Use plastic tweezers to remove the disc from the watch glass and weigh to the nearest 0.1 mg (0.0001 g). Record this value as B.



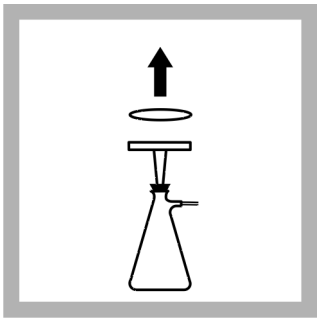
8. Again, place the disc in the filter holder/flask assembly. Wet the disc with deionized water to ensure adhesion to the holder.

Gravimetric Method—Total Nonfilterable Residue, Method 8158 (continued)



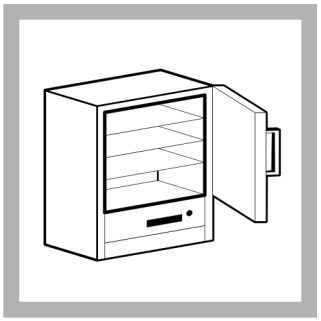
9. Filter 100 mL (or more, if solids content is low) of well-mixed, representative water sample by applying vacuum to the flask. Follow with three separate 10-mL washings of deionized water.

For greatest accuracy, filter as much sample as possible. However, using a sample that contains more than 15 mg of solids will clog the filter prematurely. Adjust the exact volume of the water sample to achieve the optimum condition. Several completed tests will show whether any adjustment is necessary.



10. Remove any residue that remains on the sides or bottom lip of the filter holder. A rubber policeman on the end of a stirring rod is very helpful to scrape the residue loose. Small amounts of deionized water will help wash the residue down onto the filter disc.

Slowly release the vacuum from the filtering system and gently remove the filter disc from the holder. Place the disc on a watch glass. Inspect the filtrate (filtered water in flask) to make sure that the solids are properly trapped on the disc.

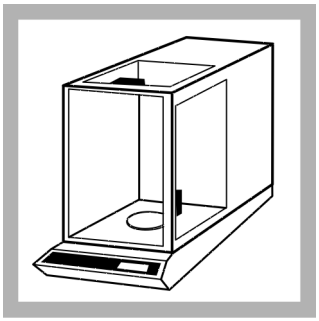


11. Place the watch glass and filter in a drying oven at 103 °C for one hour.

12. Use metal tongs to remove the disc and watch glass from the oven or furnace and place in a desiccator. Cover immediately. Allow the watch glass to cool slightly before sealing the desiccator as pressure from the heated air inside the desiccator can force the cover off.

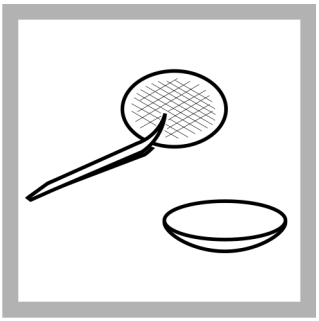
Allow the filter and glass to cool to room temperature.

Gravimetric Method—Total Nonfilterable Residue, Method 8158 (continued)



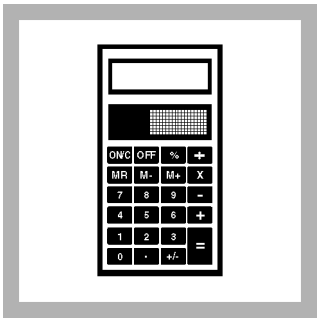
13. Remove the watch glass and disc from the desiccator as a unit and place beside the analytical balance.

Use plastic tweezers to remove the disc from the watch glass and weigh to the nearest 0.1 mg (0.0001 g). Record this mg value as A.



14. Return the disc to the watch glass if the mg/L Volatile Nonfilterable Residue is to be determined. If not, discard the disc.

If Volatile Nonfilterable Residue is to be determined, do not lose any of the suspended matter on the disc.



15. Calculate Total Non-filterable Residue (TNR):

$$\frac{A - B}{\text{Sample Volume in Liters}} = \text{mg/L TNR}$$

Where:

A = Weight (mg) of disc with residue

B = Weight (mg) of disc

Example:

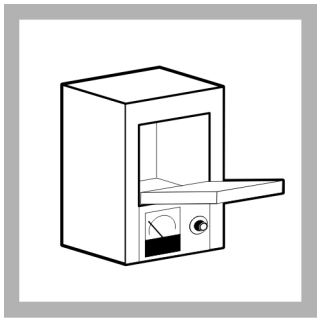
A = 95.5 mg

B = 81.5 mg

Volume of sample = 0.1 L

$$\frac{95.5\text{ mg} - 81.5\text{ mg}}{0.1\text{ L}} = 140\text{ mg/L TNR}$$

Gravimetric Method—Volatile Nonfilterable Solids, Method 8164

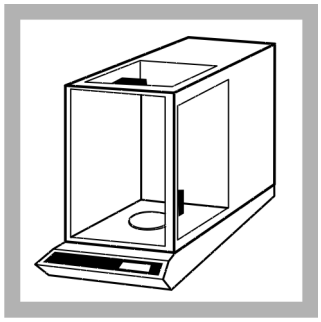


1. Place the watch glass and filter disc from the Total Nonfilterable Residue procedure (step 14) in the muffle furnace and ignite at 550 °C for 15 minutes.

Partially preheat the muffle furnace before inserting the watch glass. However, placing the watch glass in a 550 °C furnace could cause it to shatter. Bring the temperature up to 550 °C 15 minutes after placing the filter and watch glass in the furnace.

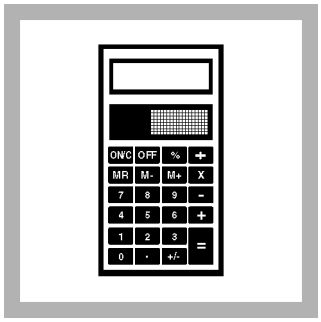
2. Use metal tongs to remove the disc and watch glass from the oven or furnace and place in a desiccator. Cover immediately. Allow the watch glass to cool slightly before sealing the desiccator as pressure from the heated air inside the desiccator can force the cover off.

Allow the filter and glass to cool to room temperature.



3. Remove the watch glass and disc from the desiccator as a unit and place beside the analytical balance.

Use plastic tweezers to remove the disc from the watch glass and weigh to the nearest 0.1 mg (0.0001 g). Record this mg value as C.



4. Calculate Volatile Non-filterable Residue (VNR):

$$\frac{A - C}{\text{Sample Volume in Liters}} =$$

mg/L VNR

where:

A = Weight (mg) of disc with residue

C = Weight (mg) of disc and residue after ignition

Example:

A = 95.5 mg

C = 91.2 mg

Volume of sample = 0.1 L

$$\frac{95.5\ \text{mg} - 91.2\ \text{mg}}{0.1\ \text{L}} =$$

43 mg/L VNR

Sample collection, preservation and storage

- Collect samples in clean plastic or glass bottles.
- Samples should be analyzed as soon as possible after collection but can be stored up to seven days by cooling to 4 °C (39 °F).

Consumables and replacement items

Required apparatus

Description	Unit	Catalog number
Aspirator, vacuum	each	213100
Balance, Analytical, 115 VAC, 60 Hz	each	2936701
Bottle, wash, 500-mL	each	62011
Cylinder, graduated, 100-mL	each	50842
Desiccant, indicating Drierite	each	2088701
Desiccator, without stopcock	each	1428500
Desiccator Plate, ceramic	each	1428400
Filter disc, glass fiber, 47-mm	100/pkg	253000
Filter Holder, magnetic	each	1352900
Flask, filtering, 1000-mL	each	54653
Furnace, muffle 240 VAC, 50/60 Hz	each	1429624
Furnace, muffle, 120 VAC, 50/60 Hz	each	1429600
Oven, laboratory, 240 VAC, 50 Hz	each	1428902
Oven, laboratory, 120 VAC, 60 Hz	each	1428900
Stopper, rubber, one-hole, No. 8	6/pkg	211908
Tongs	each	56900
Tubing, rubber, 7.9 x 2.4 mm	3.6 m	56019
Tweezers, plastic	each	1428200
Watch Glass, 100-mm	each	57870
Water, deionized	4 L	27256

Optional reagents and apparatus

Description	Unit	Catalog number
Ammonium Hydroxide, approx.. 58% ACS	500 mL	10649
Bottle, w/cap, wide mouth 500 mL poly	12/pkg	2087079
Brush	each	68700
Pump, vacuum, hand-operated	each	1428300
Pump, vacuum, 1.2 CFM, 220 VAC, w/Europeon plug	each	—
Pump, vacuum, 1.2 CFM, 115 VAC, 60 Hz	each	2824800
Rubber policeman for $^{3}/_{16}$" rod	each	1430900
Stirring rod, glass	3/pkg	177001

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