

GDT 109

A. Scope

For a complete list of GDTs, see the Table of Contents.

Use this test method to determine water turbidity with the nephelometric method. This method compares light scattered at 32 °C (90 °F) by the suspended solids in the sample with the light scattered at 32 °C (90 °F) by a standard reference suspension.

Turbidity is an indication of the amount of suspended solids in the water.

The standard reference suspension is a Formazin polymer solution. Test results are reported in Nephelometric Turbidity Units (NTUs).

B. Apparatus

The apparatus consists of the following:

1. Portalab Hach 16800 Turbidimeter with Standards

To ensure consistently accurate results, standardize the unit before each set of tests.

- a. Turn the instrument off and check the mechanical zero setting. Adjust the screwdriver adjustment control on the meter face if necessary to obtain a zero-NTU reading.
 - b. Press the power switch to ON. Perform a battery check by pressing the BATT CHECK switch and verifying that the meter indicates in the BATTERY CHECK area. If not, charge the battery pack.
 - c. Place the focusing template into the cell holder. The focusing template will block all light from reaching the detector and allow the instrument to be zeroed electronically in [steps d and e](#). Refer to manual for focusing instructions.
 - d. Press the 1.0 range switch and adjust the ZERO control for a reading of zero NTU.
 - e. Press the 10 range switch and adjust the ZERO control for a reading of zero NTU.
 - f. Remove the focusing template and place the appropriate Gelex for the turbidity range to be used into the cell holder. Eliminate variation in the tests by using the index mark on the standard to orient the vial in the same position.
2. Calibrate the apparatus monthly with Formazin, a polymer whose light-scattering properties can be reproduced accurately and precisely. The highly irregular surfaces of the Formazin polymer particle partially account for its good reproducibility and makes Formazin a very efficient light-scatterer on a weight percent basis.

C. Sample Size and Preparation

1. Preparing Turbidity Standards

To achieve the most accurate turbidity readings, or to check the value of your secondary turbidity standard, use the following formula to prepare a proper Formazin stock suspension. The suspension is rated at 4000 NTU.

- a. Dissolve 161oz (5,000 g) of reagent grade hydrazine sulfate in about 0.1 gal (400 ml) of distilled water.
- b. Dissolve 161oz (5,000 g) of pure hexamethylenetetramine in about 0.1 gal (400 ml) of distilled water.
- c. Pour the two solutions into a 0.3 gal (1 L) volumetric flask and dilute to volume with distilled water.
- d. Allow the solution to stand for 48 hours at 77 °F (25 °C). During this time the 4,000 NTU stock suspension will develop.
- e. The following table gives the dilutions for preparing 100, 10 and 0.75-NTU solutions from the 4,000-NTU stock suspension. When diluting the suspension, use filtered distilled or demineralized water. Be sure to adequately mix the stock suspension prior to removing a portion for dilution.

Use this Stock Suspension	Diluted to	NTU Value
0.0013 gal (5 ml) of 4000 NTU	.05 gal (200 ml)	100
0.005 gal (20 ml) of 100 NTU	.05 gal (200 ml)	10
0.004 gal (15 ml) of 10 NTU	.05 gal (200 ml)	0.75

D. Procedures

1. Precautions
 - a. Use a well-mixed sample in the sample cell. Do not take readings until finely dispersed bubbles have disappeared.
 - b. Protect the sample cell from nicks, scratches, and fingerprints. If any nicks or scratches develop, discard the sample cell.
 - c. Floating debris and coarse sediments which settle out rapidly will give incorrect high readings. Finely divided air bubbles will also affect the results.
 - d. True color—the color of water due to dissolved substances that absorb light—is not a measure of turbidity. For example, the turbidity of tea is about 1 NTU.
 - e. Maintain a spare parts kit with the instrument to include extra lamps, lens, and sample cells.
2. Testing for Turbidity
 - a. Ensure that the instrument has been standardized and that the SPAN control has not been changed since standardization. With the instrument turned off, check the mechanical zero setting.
 - b. Press the power switch and BATT CHECK switch and verify that the meter indicates within the BATTERY CHECK area. If it does not, recharge the battery pack.
 - c. Select the range that will exceed the expected turbidity of the sample under test by pressing the appropriate range switch.
 - d. Place the focusing template into the cell holder and adjust the ZERO control for a reading of zero NTU. Remove the focusing template.

Note: If using the instrument in the 100 range, place the cell riser into the cell holder before inserting the test sample. When using the 1 and 10 ranges, do not use the cell riser.

- e. Fill a clean sample cell to the white line with the sample to be measured and place it into the cell holder.
- f. Use the white dot on the sample cell to orient the cell in the same position each time. Cover the sample cell in the same position each time.
- g. Cover the sample cell with the light shield and allow the meter to stabilize.
- h. Read the turbidity of the sample.
- i. Dilute samples with turbidity readings in excess of 40 NTUs with one or more volumes of turbid-free water.

E. Calculations

Compute the turbidity of the original sample from the turbidity of the diluted sample and the dilution factor:

$$\text{Turbidity Units} = \frac{(A)(B+C)}{C} \text{ where:}$$

A = turbidity of diluted sample

B = volume of dilution water

C = volume of sample diluted

F. Report

Report turbidity readings on Form OMT 152 according to the following schedule:

Turbidity Range (NTU)	Record to the Nearest NTU
0-1	0.5
0-10	0.1
10-40	1.0
40-100	5.0