



Standard Test Methods for Selenium in Water¹

This standard is issued under the fixed designation D 3859; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 These test methods cover the determination of dissolved and total recoverable selenium in most waters and wastewaters. Both test methods utilize atomic absorption procedures, as follows:

	Sections
Test Method A—Gaseous Hydride AAS ²	7 to 16
Test Method B—Graphite Furnace AAS	17 to 26

1.2 These test methods are applicable to both inorganic and organic forms of dissolved selenium. They are applicable also to particulate forms of the element, provided that they are solubilized in the appropriate acid digestion step. However, certain selenium-containing heavy metallic sediments may not undergo digestion.

1.3 These test methods are most applicable within the following ranges:

Test Method A	1 to 20 µg/L
Test Method B	2 to 100 µg/L

These ranges may be extended (with a corresponding loss in precision) by decreasing the sample size or diluting the original sample, but concentrations much greater than the upper limits are more conveniently determined by flame atomic absorption spectrometry.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazard statements, see 11.12 and 13.14.

2. Referenced Documents

2.1 ASTM Standards:

D 1129 Terminology Relating to Water³

D 1193 Specification for Reagent Water³

D 2777 Practice for Determination of Precision and Bias of

Applicable Methods of Committee D19 on Water³

D 3370 Practices for Sampling Water from Closed Conduits³

D 3919 Practice for Measuring Trace Elements in Water by Graphite Furnace Atomic Absorption Spectrophotometry³

D 4841 Practice for Estimation of Holding Time for Water Samples Containing Organic and Inorganic Constituents³

D 5810 Guide for Spiking into Aqueous Samples³

D 5847 Practice for Writing Quality Control Specifications for Standard Test Methods for Water Analysis⁴

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in these test methods, refer to Terminology D 1129.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *total recoverable selenium*—an arbitrary analytical term relating to the recoverable forms of selenium that are determinable by the digestion procedures included in these test methods.

4. Significance and Use

4.1 In most natural waters selenium concentrations seldom exceed 10 µg/L. However, the runoff from certain types of seleniferous soils at various times of the year can produce concentrations as high as several hundred micrograms per litre. Additionally, industrial contamination can be a significant source of selenium in rivers and streams.

4.2 High concentrations of selenium in drinking water have been suspected of being toxic to animal life. Selenium is a priority pollutant and all public water agencies are required to monitor its concentration.

4.3 These test methods determine the dominant species of selenium reportedly found in most natural and wastewaters, including selenities, selenates, and organo-selenium compounds.

5. Purity of Reagents

5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such

¹ These test methods are under the jurisdiction of ASTM Committee D19 on Water and are the direct responsibility of Subcommittee D19.05 on Inorganic Constituents in Water.

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² Lansford, M., McPherson, E. M., and Fishman, M. J., *Atomic Absorption Newsletter*, Vol 13(4), 1974, pp. 103–105. Pollack, E. N., and West, S. J., *Atomic Absorption Newsletter*, Vol 12(1), 1973, pp. 6–8.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ *Annual Book of ASTM Standards*, Vol 11.02.

*A Summary of Changes section appears at the end of this standard.

