Designation: D887 – 13 (Reapproved 2022)

Standard Practices for Sampling Water-Formed Deposits[1]

This standard is issued under the fixed designation D887; 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 practices cover the sampling of water-formed deposits for chemical, physical, biological, or radiological analysis. The practices cover both field and laboratory sampling. It also defines the various types of deposits. The following practices are included:

	Sections
Practice A—Sampling Water-Formed Deposits From Tubing of Steam Generators and Heat Exchangers	8 to 10
Practice B—Sampling Water-Formed Deposits From Steam Turbines	11 to 14

1.2 The general procedures of selection and removal of deposits given here can be applied to a variety of surfaces that are subject to water-formed deposits. However, the investigator must resort to his individual experience and judgment in applying these procedures to his specific problem.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*See Section 7, 9.8, 9.8.4.6, and 9.14 for specific hazards statements.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D512 Test Methods for Chloride Ion In Water (Withdrawn 2021)[3]

D934 Practices for Identification of Crystalline Compounds in Water-Formed Deposits By X-Ray Diffraction (Withdrawn 2022)[3]

D1129 Terminology Relating to Water

D1193 Specification for Reagent Water

D1245 Practice for Examination of Water-Formed Deposits by Chemical Microscopy

D1293 Test Methods for pH of Water

D2331 Practices for Preparation and Preliminary Testing of Water-Formed Deposits

D2332 Practice for Analysis of Water-Formed Deposits by Wavelength-Dispersive X-Ray Fluorescence

D3483 Test Methods for Accumulated Deposition in a Steam Generator Tube

D4412 Test Methods for Sulfate-Reducing Bacteria in Water and Water-Formed Deposits

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *biological deposits, n*—water-formed deposits of organisms or the products of their life processes.

3.1.1.1 Discussion- The biological deposits may be composed of microscopic organisms, as in slimes, or of macroscopic types such as barnacles or mussels. Slimes are usually composed of deposits of a gelatinous or filamentous nature.

3.1.2 *corrosion products, n*—a result of chemical or electrochemical reaction between a metal and its environment.

3.1.2.1 Discussion—A corrosion deposit resulting from the action of water, such as rust, usually consists of insoluble material deposited on or near the corroded area; corrosion

[1] These practices are under the jurisdiction of ASTM Committee D19 on Water and are the direct responsibility of Subcommittee D19.03 on Sampling Water and Water-Formed Deposits, Analysis of Water for Power Generation and Process Use, On-Line Water Analysis, and Surveillance of Water.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

products may, however, be deposited a considerable distance from the point at which the metal is undergoing attack.

3.1.3 *scale, n*—a deposit formed from solution directly in place upon a surface.

3.1.3.1 Discussion—Scale is a deposit that usually will retain its physical shape when mechanical means are used to remove it from the surface on which it is deposited. Scale, which may or may not adhere to the underlying surface, is usually crystalline and dense, frequently laminated, and occasionally columnar in structure.

3.1.4 *sludge, n*—a water-formed sedimentary deposit.

3.1.4.1 Discussion—The water-formed sedimentary deposits may include all suspended solids carried by the water and trace elements which were in solution in the water. Sludge usually does not cohere sufficiently to retain its physical shape when mechanical means are used to remove it from the surface on which it deposits, but it may be baked in place and be hard and adherent.

3.1.5 *water-formed deposits, n*—any accumulation of insoluble material derived from water or formed by the reaction of water upon surfaces in contact with the water.

3.1.5.1 Discussion—Deposits formed from or by water in all its phases may be further classified as scale, sludge, corrosion products, or biological deposit. The overall composition of a deposit or some part of a deposit may be determined by chemical or spectrographic analysis; the constituents actually present as chemical substances may be identified by microscope or x-ray diffraction studies. Organisms may be identified by microscopic or biological methods.

3.2 *Definitions*—For definitions of other terms used in these practices, refer to Definitions D1129.

4. Summary of Practices

4.1 These practices describe the procedures to be used for sampling water-formed deposits in both the field and laboratory from boiler tubes and turbine components. They give guidelines on selecting tube and deposit samples for removal and specify the procedures for removing, handling, and shipping of samples.

5. Significance and Use

5.1 The goal of sampling is to obtain for analysis a portion of the whole that is representative. The most critical factors are the selection of sampling areas and number of samples, the method used for sampling, and the maintenance of the integrity of the sample prior to analysis. Analysis of water-formed deposits should give valuable information concerning cycle system chemistry, component corrosion, erosion, the failure mechanism, the need for chemical cleaning, the method of chemical cleaning, localized cycle corrosion, boiler carryover, flow patterns in a turbine, and the rate of radiation build-up. Some sources of water-formed deposits are cycle corrosion products, make-up water contaminants, and condenser cooling water contaminants.

6. Reagents and Materials

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all cases. 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 specifications are available.[4] Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of analysis.

6.1.1 *Purity of Water*—Reference to water that is used for reagent preparation, rinsing or dilution shall be understood to mean water that conforms to the quantitative specifications of Type III reagent water of Specification D1193.

6.2 *Materials:*

6.2.1 The highest purity material available should be used for removing the deposit samples.

6.2.2 *Filter Paper* may contain water leachable contaminants (chloride, fluoride, and sulfur) which can be removed by pretreatment prior to sampling.

6.2.3 *Polyester Tape* may contain impurities of antimony and cadmium which must be considered during analysis.

7. Hazards

7.1 *Warnings:*

7.1.1 Special safety precautions are necessary in using acetone on a wipe material for removing water-formed deposits (see 9.8.4.6).

7.1.2 Special handling precautions may be required for working with water-formed deposits containing radioactive nuclides (see 9.14).

7.2 *Cautions:*

7.2.1 Extreme care must be taken not to damage the underlying surface when removing water-formed deposit samples from equipment in the field (see 9.8).

7.2.2 The selection of samples necessarily depends on the experience and judgment of the investigator. The intended use of the sample, the accessibility and type of the deposit, and the problem to be solved will influence the selection of the samples and the sampling method.

7.2.3 The most desirable amount of deposit to be submitted as a sample is not specific. The amount of deposit should be consistent with the type of analysis to be performed.

7.2.4 The samples must be collected, packed, shipped, and manipulated prior to analysis in a manner that safeguards against change in the particular constituents or properties to be examined.

7.2.5 The selection of sampling areas and number of samples is best guided by a thorough investigation of the problem. Very often the removal of a number of samples will result in more informative analytical data than would be obtained from one composite sample representing the entire mass of deposit. A typical example is the sampling of deposits from a steam turbine. Conversely, in the case of a tube failure in a steam generator, a single sample from the affected area may suffice.

[4] *Reagent Chemicals, American Chemical Society Specifications,* American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals,* BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary,* U.S. Pharmaceutical Convention, Inc. (USPC), Rockville, MD.