



Designation: ~~D3415 – 98 (Reapproved 2011)~~ D3415 – 98 (Reapproved 2017)

Standard Practice for Identification of Waterborne Oils¹

This standard is issued under the fixed designation D3415; 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*Scope

1.1 This practice covers the broad concepts of sampling and analyzing waterborne oils for identification and comparison with suspected source oils. Detailed procedures are referenced in this practice. A general approach is given to aid the investigator in planning a program to solve the problem of chemical characterization and to determine the source of a waterborne oil sample.

1.2 This practice is applicable to all waterborne oils taken from water bodies, either natural or man-made, such as open oceans, estuaries or bays, lakes, rivers, smaller streams, canals; or from beaches, marshes, or banks lining or edging these water systems. Generally, the waterborne oils float on the surface of the waters or collect on the land surfaces adjoining the waters, but occasionally these oils, or portions, are emulsified or dissolved in the waters, or are incorporated into the sediments underlying the waters, or into the organisms living in the water or sediments.

1.3 This practice as presently written proposes the use of specific analytical techniques described in the referenced ASTM standards. As additional techniques for characterizing waterborne oils are developed and written up as test methods, this practice will be revised.

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 ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

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

[D1129 Terminology Relating to Water](#)

[D3325 Practice for Preservation of Waterborne Oil Samples](#)

[D3326 Practice for Preparation of Samples for Identification of Waterborne Oils](#)

[D3328 Test Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography](#)

[D3414 Test Method for Comparison of Waterborne Petroleum Oils by Infrared Spectroscopy](#)

[D3650 Test Method for Comparison of Waterborne Petroleum Oils By Fluorescence Analysis](#)

[D4489 Practices for Sampling of Waterborne Oils](#)

[D4840 Guide for Sample Chain-of-Custody Procedures](#)

[D5037 Test Method for Comparison of Waterborne Petroleum Oils by High Performance Liquid Chromatography \(Withdrawn 2002\)³](#)

[D5739 Practice for Oil Spill Source Identification by Gas Chromatography and Positive Ion Electron Impact Low Resolution Mass Spectrometry](#)

[E620 Practice for Reporting Opinions of Scientific or Technical Experts](#)

3. Terminology

3.1 *Definitions:*

¹ This practice is under the jurisdiction of ASTM Committee [D19](#) on Water and is the direct responsibility of Subcommittee [D19.06](#) on Methods for Analysis for Organic Substances in 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](#).

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

3.1.1 *waterborne oil*—any oil, whether or not derived from petroleum, carried by a water system (for example, ocean, bay, lake, river, etc.) usually at the surface but occasionally emulsified or dissolved in the water. The waterborne oil can also be found on beaches or banks edging the water body, in the sediments underlying the water, or in the organisms living in the water or in the sediments.

3.1 *Definitions—Definitions:* For definitions of other terms used in this practice, refer to Terminology [D1129](#), and to Practices [D3325](#), [D3326](#), [D4489](#), and [D5739](#), and Test Methods [D3328](#), [D3650](#), and [D5037](#).

3.1.1 For definitions of terms used in this standard, refer to Terminology [D1129](#), and to Practices [D3325](#), [D3326](#), [D4489](#), and [D5739](#), and Test Methods [D3328](#), [D3650](#), and [D5037](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *waterborne oil, n*—any oil, whether or not derived from petroleum, carried by a water system (for example, ocean, bay, lake, river, etc.) usually at the surface but occasionally emulsified or dissolved in the water. The waterborne oil can also be found on beaches or banks edging the water body, in the sediments underlying the water, or in the organisms living in the water or in the sediments.

4. Significance and Use

4.1 Oil from one crude oil field is readily distinguishable from another, and differences in the makeup of oils from the same crude oil field can often be observed as well. Refined oils are fractions from crude oil stocks, usually derived from distillation processes. Two refined oils of the same type differ because of dissimilarities in the characteristics of their crude oil feed stocks as well as variations in refinery processes and any subsequent contact with other oils mixed in during transfer operations from residues in tanks, ships, pipes, hoses, and so forth. Thus, all petroleum oils, to some extent, have chemical compositions different from each other.

4.2 Identification of a recovered oil is determined by comparison with known oils selected because of their possible relationship to the particular recovered oil, for example, suspected sources. Thus, samples of such known oils must be collected and submitted along with the unknown for analysis. Identification of the source of an unknown oil by itself cannot be made without comparison to a known oil. The principles of oil spill identification are discussed in Ref (1).⁴

4.3 Many similarities (within uncertainties of sampling, analysis and weathering) will be needed to establish the identity beyond a reasonable doubt. The analyses described will distinguish many, but not all samples. Examples of weathering of various classes of oils are included in Ref (2).

4.4 This practice is a guide to the use of ASTM test methods for the analysis of oil samples for oil spill identification purposes. The evaluation of results from analytical methods and preparation of an Oil Spill Identification Report are discussed in this practice. Other analytical methods are described in Ref (3).

4.5 A quality assurance program for oil spill identification is specified.

5. Plan for Identification of Waterborne Oils

5.1 *Sampling*—Collect a representative sample of oil according to ~~Practice~~Practices [D4489](#), [Guide D4840](#). Because of the wide variety of oils carried and used by shipping and because of the possibility of pollution also arising from industrial activity, samples of suspected source oils must be collected at this time so that comparisons can be made between the waterborne oil in question and the suspected source oils. Chain of Custody procedures, such as ~~Practice~~Guide [D4840](#), should be followed.

5.2 *Preservation of Sample*—Protect the waterborne oil, as well as the suspected source oils, against possible contamination or microbial degradation, or both, by proper preservation methods as described in Practice [D3325](#).

5.3 *Preparation of Sample*—Prepare the waterborne oil, as well as the quality control sample (described in 5.4) and any suspected source oils, as described in Practice [D3326](#).

5.4 *Quality Assurance Procedures:*

5.4.1 In addition to procedures specified within each test method to monitor instrument performance, a quality control sample is analyzed with samples for each spill case. This monitors both sample preparation and instrument performance.

5.4.2 Remove an aliquot of one of the samples for each case prior to sample preparation and treat it as a separate sample. This ~~QC~~quality control (QC) sample should be taken from a spill sample if there is sufficient sample volume to do so. Otherwise, a suspected source sample may be used.

5.4.3 Evaluate the data for the QC sample and its duplicate aliquot according to the guidelines described for each Test Method (refer to 5.5). If the data do not meet the criteria for a match, investigate the problem. If there is a problem with one instrument, the analysis must be repeated for that test method after the problem is corrected. If there is a sample preparation problem, the analysis should be repeated after the problem is identified.

⁴ The boldface numbers in parentheses refer to a list of references at the end of this standard.