



Designation: D6046 – 24

Standard Classification of Hydraulic Fluids for Environmental Impact¹

This standard is issued under the fixed designation D6046; 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 This classification covers all unused fully formulated hydraulic fluids in their original form.

1.2 This classification establishes categories for the impact of hydraulic fluids on different environmental compartments as shown in [Table 1](#). Fluids are assigned designations within these categories; for example PwL, Pwe, and so forth, based on performance in specified tests.

1.3 This classification includes environmental persistence and acute ecotoxicity as aspects of environmental impact. Although environmental persistence is discussed first, this classification does not imply that considerations of environmental persistence should take precedence over concerns for ecotoxicity.

1.3.1 Environmental persistence describes long term impact of hydraulic fluids to the environment. Environmental persistence is preferably measured by ultimate biodegradation but can also be measured by other means.

1.3.2 Acute toxicity describes the immediate toxic impact of hydraulic fluids to the environment. Acute toxicity is preferably measured by the three trophic levels of aquatic organisms (Algae, Crustacea, and Fish).

1.4 Another important aspect of environmental impact is bioaccumulation. This aspect is not addressed in the present classification because adequate test methods do not yet exist to measure bioaccumulation of hydraulic fluids.

1.5 The present classification addresses the fresh water and soil environmental compartments. At this time marine and anaerobic environmental compartments are not included, although they are pertinent for many uses of hydraulic fluids. Hydraulic fluids are expected to have no significant impact on the atmosphere; therefore that compartment is not addressed.

1.6 This classification addresses releases to the environment which are incidental to the use of a hydraulic fluid. The

classification is not intended to address environmental impact in situations of major, accidental release. Nothing in this classification should be taken to relieve the user of the responsibility to properly use and dispose of hydraulic fluids.

1.7 This classification does not cover any performance properties of a hydraulic fluid which relate to its performance in a hydraulic system.

1.8 *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.*

1.9 *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

- [D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants](#)
- [D5291 Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants](#)
- [D5864 Test Method for Determining Aerobic Aquatic Biodegradation of Lubricants or Their Components](#)
- [D6006 Guide for Assessing Biodegradability of Hydraulic Fluids](#)
- [D6081 Practice for Aquatic Toxicity Testing of Lubricants: Sample Preparation and Results Interpretation](#)
- [E943 Terminology Relating to Biological Effects and Environmental Fate](#)
- [E1440 Guide for Acute Toxicity Test with the Rotifer Brachionus](#)

¹ This classification is under the jurisdiction of ASTM Committee [D02](#) on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee [D02.N0](#) on Hydraulic Fluids.

Current edition approved March 1, 2024. Published April 2024. Originally approved in 1996. Last previous edition approved in 2018 as D6046 – 18. DOI: 10.1520/D6046-24.

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.

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

TABLE 1 Overview of Extended Classification

Environmental Compartment	Categories of Environmental Impact		
	Environmental Persistence	Ecotoxicity	Bioaccumulation
Fresh Water	Pw	Tw	Bw
Marine	Pm	Tm	Bm
Soil	Ps	Ts	Bs
Anaerobic	Pa	Ta	Ba

2.2 ISO Standards:³

International Standard ISO Test 9439:1990 Technical Corrigendum 1, Water Quality—Evaluation in An Aqueous Medium of the “Ultimate” Biodegradability of Organic Compounds—Method by Analysis of Released Carbon Dioxide

2.3 OECD Standards:⁴

OECD 301B CO₂ Evolution Test (the Modified Sturm Test)

OECD 301C Modified MITI Test (I)

OECD 301F Manometric Respirometry Test

OECD 201 Alga, Growth Inhibition Test

OECD 202 Daphnia sp., Acute Immobilisation Test and Reproduction Test

OECD 203 Fish, Acute Toxicity Test

OECD 207 Earthworm Acute Toxicity Test

OECD 208 Terrestrial Plants Growth Test

2.4 US EPA Tests:⁵

Aerobic Aquatic Biodegradation Test, 40 CFR 796.3100 (Also available as EPA publication 560/6-82-003, number CG-2000)

Toxic Substances Control Act (TSCA), 40 CFR Parts 796 and 797—Environmental Effects Testing Guidelines, Federal Register, Vol 50, No. 188, September 27, 1985, p. 39321

2.5 Environmental Canada Test Methods:⁶

Biological Test Method: Acute Lethality Test Using Rainbow Trout, Report EPS 1/9, Environment Canada, July 1990

Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, Reference Method EPS 1/RM/13, Environment Canada, July 1990

Biological Test Method: Growth Inhibition Test Using the Freshwater Alga *Selenastrum capricornutum*, Report EPS 1/RM/25, Environment Canada, November 1992

Biological Test Method: Acute Lethality Test Using *Daphnia* spp., Report EPS 1/RM/11, Environment Canada, July 1990

Biodegradability of Two-Stroke Cycle Outboard Engine Oils in Water, CEC L-33-A-93, Co-Ordinating European Council, 1994 (Formerly L-33-T-82)

Toxic Substances Control Act (TSCA), Good Laboratory Practice Standards, Final Rule, U.S. Federal Register, 40 CFR Part 792, August 17, 1989

2.6 Other Standards:

MENVIQ 92.03/800—D.mag. 1.1, March 1992⁷

29 CFR 1910 OSHA Regulated Carcinogens and Potential Carcinogens⁵

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this classification not given below, refer to Terminology D4175.

3.1.2 *acute ecotoxicity, n*—the propensity of a material to produce adverse behavioral, biochemical, or physiological effects in non-human organisms or populations in a short period of time, usually not constituting a substantial portion of the life span of the organism.

3.1.3 *aerobic, adj*—(1) taking place in the presence of oxygen, (2) living or active in the presence of oxygen.

3.1.4 *anaerobic, adj*—(1) taking place in the absence of oxygen, (2) living or active in the absence of oxygen.

3.1.5 *biodegradation, n*—the process of chemical breakdown or transformation of a material caused by organisms or their enzymes.

3.1.5.1 *Discussion*—Biodegradation is only one mechanism by which materials are transformed in the environment.

3.1.6 *ecotoxicity, n*—the propensity of a material to produce adverse behavioral, biochemical, or physiological effects in non-human organisms or populations.

3.1.7 *effect load XX (ELXX), n*—a statistically or graphically estimated loading rate of test material that is expected to cause one or more specified effects in XX % of a group of organisms under specified conditions for a specified time.

3.1.7.1 *Discussion*—This terminology should be used for hydraulic fluids instead of the standard effect concentration (ECXX) when the hydraulic fluid is not completely soluble under test conditions.

3.1.8 *environmental compartment, n*—a subdivision of the environment based on physical or chemical properties, or both.

3.1.8.1 *Discussion*—Examples of environmental compartments are aerobic fresh water, aerobic marine, aerobic soil, and anaerobic media. The results of test procedures may be applied to environmental compartments, but the test systems do not constitute an environmental compartment.

3.1.9 *fresh water environment, n*—the aerobic, fresh water environmental compartment.

3.1.10 *good laboratory practices (GLP), n*—guidelines for the management of laboratory experiments which are published by regulatory agencies or other recognized groups and are concerned with the organizational process and the conditions under which laboratory studies are planned, performed, monitored, recorded, and reported.

3.1.10.1 *Discussion*—The major GLPs used are

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>. All standards referenced are from the OECD Guidelines for Testing of Chemicals.

⁴ Available from Organization for Economic Cooperation and Development (OECD), 2, Rue Andre Pascal, S-75775, Paris CEDEX 16, France. May also be found in U.S. Federal Register, Vol 50, No. 188, September 27, 1965, paragraph 796.3260.

⁵ Available from U.S. Government Printing Office, Washington, DC.

⁶ Available from CEC, Madou Plaza, Place Madou 1, B-1030 Brussels, Belgium.

⁷ Available from Ministere de l'Environnement, Gouvernement du Quebec.