



Standard Test Method for Determining Carcinogenic Potential of Virgin Base Oils in Metalworking Fluids¹

This standard is issued under the fixed designation E1687; 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 test method covers a microbiological test procedure based upon the *Salmonella* mutagenesis assay of Ames et al (1)² (see also Maron et al (2)). It can be used as a screening technique to detect the presence of potential dermal carcinogens in virgin base oils used in the formulation of metalworking oils. Persons who perform this test should be well-versed in the conduct of the Ames test and conversant with the physical and chemical properties of petroleum products.

1.2 The test method is not recommended as the sole testing procedure for oils which have viscosities less than 18 cSt (90 SUS) at 40°C, or for formulated metalworking fluids.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information only.

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.* Section 7 provides general guidelines for safe conduct of this test method.

2. Referenced Documents

2.1 ASTM Standards:³

E2148 [Guide for Using Documents Related to Metalworking or Metal Removal Fluid Health and Safety](#)
E2523 [Terminology for Metalworking Fluids and Operations](#)

¹ This test method is under the jurisdiction of ASTM Committee E34 on Occupational Health and Safety and is the direct responsibility of Subcommittee E34.50 on Health and Safety Standards for Metal Working Fluids.

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² The boldface numbers refer to the list of references at the end of this standard.

³ 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.

2.2 Other Standards:

29 CFR 1910.1450 [Occupational Exposure to Hazardous Chemical in Laboratories](#)⁴

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:* (See also Terminology E2523.)

3.1.1 *base stock, n*—the refined oil component of metalworking fluid formulations.

3.1.2 *PAC (Polycyclic Aromatic Compounds), n*—For the purposes of this test method, PAC refers to fused-ring polycyclic aromatic compounds with three or more rings. For example, the hydrocarbon series is represented by phenanthrene (3), pyrene (4), benzopyrene (5), dibenzopyrene (6), coronene (7). Heterocyclic polynuclear compounds are also included in the definition.

3.1.3 *promutagenic compounds, promutagens, n*—compounds that are not directly mutagenic but require metabolism for expression of mutagenic activity.

3.1.4 *Reference Oil 1, n*—straight-run naphthenic vacuum distillate (heavy vacuum gas oil) of known MI and PAC content recommended for use as a reference standard for the modified Ames test.

3.2 Abbreviations:

3.2.1 *DMSO (Dimethyl Sulfoxide), n*—extraction agent used in the preparation of aromatic-enriched oil fractions for mutagenicity testing.

3.2.2 *G-6-P (Glucose-6-Phosphate), n*—substrate required for the operation of the NADPH generating system involved in the biological oxidations described above.

3.2.3 *MI (Mutagenicity Index), n*—the slope of the dose-response curve for mutagenicity in the modified Ames test.

3.2.3.1 *Discussion*—MI is an index of relative mutagenic potency.

3.2.4 *NADP (Nicotinamide Adenine Dinucleotide Phosphate)*—required cofactor for the biological oxidations involved in activation of PAC to their mutagenic forms.

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.