



Designation: ~~D4740 – 04 (Reapproved 2009)~~ **D4740 – 04 (Reapproved 2014)**

# Standard Test Method for Cleanliness and Compatibility of Residual Fuels by Spot Test<sup>1</sup>

This standard is issued under the fixed designation D4740; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method covers separate procedures for determining the cleanliness of residual fuel oil and the compatibility of a residual fuel oil with a blend stock. It is applicable to residual fuel oils with viscosities up to 50 cSt (1 cSt = 1 mm<sup>2</sup>s) at 100°C.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[D4057 Practice for Manual Sampling of Petroleum and Petroleum Products](#)

[D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products](#)

2.2 *ASTM Adjuncts:*<sup>3</sup>

Reference Spot Sheet

## 3. Terminology

3.1 *Descriptions of Terms Specific to This Standard:*

3.1.1 *blend stock, n*—a finished residual fuel oil or fuel oil component, including petroleum streams ranging from kerosine to residuals and asphalt.

3.1.2 *cleanliness, n*—of residual fuel, the absence of suspended solids in a finished sample.

3.1.3 *compatibility, n*—of residual fuel, the absence of suspended solids when equal volumes of a sample and a blend stock are mixed together.

## 4. Summary of Test Method

4.1 *Cleanliness Procedure*—A drop of the preheated and thoroughly mixed sample is put on a test paper and placed in an oven at 100°C. After 1 h, the test paper is removed from the oven and the resultant spot is examined for evidence of suspended solids and rated for cleanliness using the D4740 Adjunct Reference ~~Spots~~ Spot Sheet.

4.2 *Compatibility Procedure*—A blend composed of equal volumes of the sample fuel oil and the blend stock is tested in the same way as described in 4.1 and rated for compatibility against D4740 Adjunct Reference ~~Spots~~ Spot Sheet.

## 5. Significance and Use

5.1 The two procedures in this test method are used alone or in combination to identify fuels or blends that could result in excessive centrifuge loading, strainer plugging, tank sludge formation, or similar operating problems.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee [D02](#) on Petroleum ~~Products~~ Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee [D02.14](#) on Stability and Cleanliness of Liquid Fuels.

Current edition approved ~~June 1, 2009~~ May 1, 2014. Published ~~August 2009~~ July 2014. Originally approved in 1992. Last previous edition approved in ~~2004~~ 2009 as ~~D4740~~ D4740 – 04 (2009) – 04. DOI: ~~10.1520/D4740-04R09~~ 10.1520/D4740-04R14.

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

<sup>3</sup> Available from ASTM International Headquarters. Order Adjunct No. [ADJD4740](#). Original adjunct produced in 2000.

5.2 A spot rating of Number 3 or higher on a finished fuel oil by the cleanliness procedure indicates that the fuel contains excessive suspended solids and is likely to cause operating problems.

5.3 Although a fuel may test clean when subjected to the cleanliness procedure, suspended solids may precipitate when the fuel is mixed with a blend stock. Evidence of such incompatibility is indicated by a spot rating of Number 3 or higher in the compatibility procedure.

**6. Apparatus**

6.1 *Test Paper*—Chromatographic or filter paper cut or divided into appropriately sized squares, strips, or circles. Whatman #2 Qualitative filter paper<sup>4</sup> has been found to be suitable and was used in the interlaboratory round robin study. In case of dispute, use Whatman #2 Qualitative filter paper. Store the paper, without folding, rolling, or bending, in a tightly closed container.

6.2 *Test Paper Support*—Fig. 1 shows a suitable support for multiple samples spotted on the same test paper, which shall be supported in a horizontal position so nothing touches test areas of the paper.

6.3 *Oven*—Any convection oven capable of maintaining an air temperature of  $100 \pm 2^\circ\text{C}$ .

6.4 *Reference Spot Sheet*—Adjunct for D4740.

6.5 *Conical Flask*, 100-mL capacity.

6.6 *Heating Bath or Hot Plate*, capable of heating sample to a temperature between 90 and 95°C.

6.7 *Temperature Measuring Device*, capable of accurately measuring the temperature within the tolerances required in 6.3 and 6.6, such as ASTM 1C thermometer, or liquid-in-glass thermometers, thermocouples, or platinum-resistance thermometers that provide equivalent or better accuracy and precision may be used.

**7. Sampling**

7.1 Samples for this test can come from tanks, lines, drums, or small containers. Use the applicable apparatus and techniques described in Practices D4057 or D4177.

<sup>4</sup> The sole source of supply of Whatman paper No. 2 known to the committee at this time is Whatman, Inc., 9 Bridewell Place, Clifton, NJ 07014. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,<sup>1</sup> which you may attend.

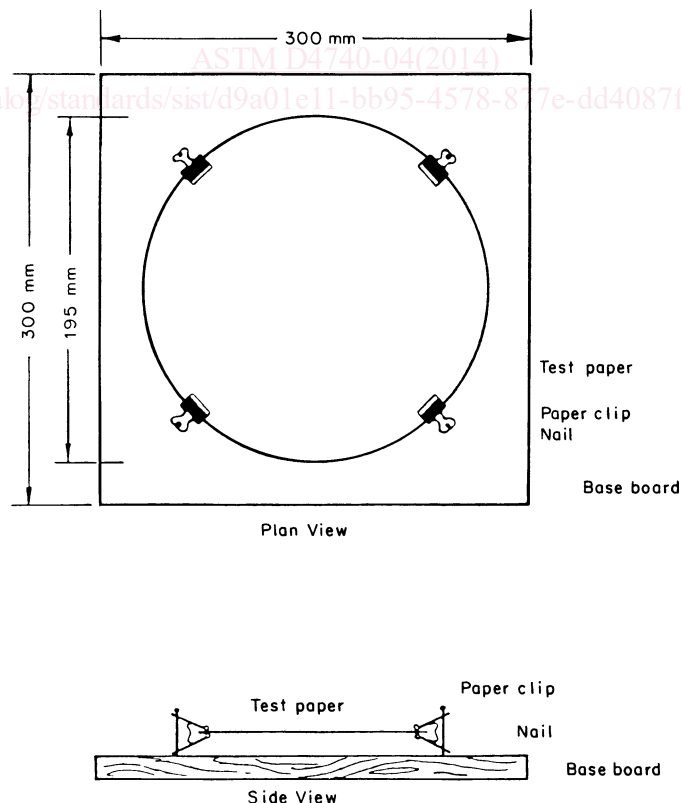


FIG. 1 Support for Test Paper