Designation: E2680 – 16

Standard Test Method for Appearance of Clear, Transparent Liquids (Visual Inspection Procedure)[1]

This standard is issued under the fixed designation E2680; 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 describes the visual assessment of the appearance of clear, transparent liquids for clarity and the presence of undesirable components (contamination) such as suspended matter, free water (or oil) and particulates when examined by transmitted light. Measurements requiring instrumentation are not included in this method. This test method was originally designed for application to glycols and methanol wall washes of marine vessels but may be applicable to other clear transparent liquids.

1.1.1 This method can be used as a field test at storage temperatures or as a laboratory test at room temperatures.

1.1.2 This method provides a rapid pass/fail test for clarity and contamination of clear, transparent liquids. It is a qualitative assessment only.

1.2 Review the current appropriate Safety Data Sheets (SDS) for detailed information concerning toxicity, first aid procedures, and safety precautions.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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 and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazards statements are given in the section on Hazards, Section 8.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D4176 Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures)

E300 Practice for Sampling Industrial Chemicals

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *appearance, n*—the visual perception of a clear, transparent liquid.

3.1.2 *clear and bright (also referred to as clean and bright), n*—a condition in which the liquid is free of haze, particulates or suspended matter particles.

3.1.2.1 *bright, n*—a condition in which the liquid is transparent with no haze or visible fee water (or free oil) in organic (or aqueous) liquids.

3.1.2.2 *clear, n*—a condition in which the liquid contains no visible contaminants (not more than the maximum allowed number of suspended matter particles no greater than 1 mm in diameter or particulates of sufficient size to be easily noted).

3.1.3 *free water (or free oil), n*—water or oil in excess to that soluble in the liquid at ambient temperature which may appear as haze, cloudiness, droplets or a water or oil layer in an organic sample.

3.1.3.1 *Discussion*—For aqueous samples, the determination of free oil is equally important and may have an appearance similar to that of free water or oil in organic samples.

3.1.4 *haze or cloudiness, n*—is a scatter of light from an accumulation of tiny suspended particles in the liquid.

3.1.4.1 *Discussion*—Cloudiness is considered synonymous with haze. Quantification of haze requiring instrumentation is out of the scope of this standard.

3.1.5 *particulates, n*—any foreign material of any color in the liquid that floats or settles to the bottom of the sample bottle.

3.1.5.1 *Discussion*—These particulates may be small solid or semi-solid particles, sometimes referred to as silt or sediment and may be the result of contamination by dust, corrosion, protective coating deterioration or product instability.

3.1.6 *suspended matter particles, n*—any foreign material of any color that is in suspension in the liquid (does not float or sink) and is insoluble or separated matter.

3.1.6.1 *Discussion*—This usually refers to things like filter

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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.

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fibers, droplets, lint from materials used to dry compartments, prior cargo material or fine pieces of tank or vessel coating.

3.1.7 *transparent, n*—liquid is translucent to transmitted light.

4. Summary of Test Method

4.1 An amount of liquid sample at storage or room temperature is visually examined for clarity and presence of contaminants. The sample is collected in a transparent glass container and held against a bright, transmitted light to examine for clarity, suspended matter, haze and the presence of free water (or oil) and subsequently swirled to create a vortex to detect the presence of particulate matter. For different categories of clear, transparent liquids, the recommended maximum number of allowed particles (either floating, settling, 3.1.5, or suspended, 3.1.6) to qualify for a pass is defined. (Table 1). For other clear, transparent liquids, other numbers may be defined (for example, on the relevant product specifications).

5. Significance and Use

5.1 This method provides a pass/fail test for appearance of clear, transparent liquids. Many liquid organic products have a product specification requiring them to be clear and bright and free of visible particulate matter and of liquid phases other than the main liquid. Producers of these liquid organic products need a test method to confirm the quality of their products meets product specifications for appearance. Appearance is a manufacturing and sales specification test for ethylene and propylene glycol and polyol products and a loading specification test for methanol wall washes of marine vessels. This test method was originally designed for application to glycols and methanol wall washes of marine vessels, but may be applicable to other clear, transparent liquids. Individuals using this test method for other clear transparent liquids should assure themselves that the method is sufficient for use.

5.2 There are many factors that could affect the appearance during and after sampling of a liquid product. These factors may include transferring of the liquid into a different sample container, contamination by the sample container or contamination by ambient atmosphere. Sampling and evaluation procedures need to be followed to avoid undesirable effects and assure the appearance of the sample is typical for the liquid as manufactured.

TABLE 1 Recommended Maximum Number of Particles Allowed for a Sample to Pass

Sample Type	Number of Particles	Typical Sample Volume (mL)
Ethylene Glycol	6	500
Diethylene Glycol	6	500
Triethylene Glycol	6	500
Propylene Glycol,	6	500
(Polyether) Polyol	6	500
Tetraethylene Glycol	6	500
Methanol Wall Wash	20	400

6. Interferences

6.1 The sample containers must be clean and free of dust or other particulates.

6.2 If an attempt is made to test the appearance of a liquid that is darker than a color rating of 5 on the ASTM Color scale (Test Method D4176) or 60 Pt-Co units, the presence of free water (or oil) or particulates could be obscured and missed by the analyst.

7. Apparatus

7.1 *Sample Container,* clear glass with a screw cap (not containing a gasket) capable of holding sample volumes of up to 1 L. The volume of the sample tested should be in accordance with the requirements of the product specification. Typical volumes are 250, 500 and 1000 mL. It is recommended to use a wide neck bottle with a diameter of approximately 10 cm. The volume of the container should be large enough for the recommended volume of liquid to fill the container not more than 75% full to allow for space to swirl the sample without spilling. Sample containers should be checked for cleanliness since they are a likely source of contamination. It is recommended to use only new bottles.

7.2 *Temperature Sensing Device (TSD),* capable of monitoring the observed test temperature to within an accuracy of ±0.5°C for laboratory tests that require measurements to be made at a specific temperature (product specifications).

7.3 *Temperature-Controlled Bath,* of suitable dimensions and capable of controlling the sample container temperature within ±0.5°C of the desired temperature for laboratory tests that require measurements to be made at a specific temperature (product specifications).

8. Hazards

8.1 Each analyst must be acquainted with the potential hazards of the equipment, reagents, products, solvents and procedures before beginning laboratory work. Sources of information include: operation manuals, SDS, literature, and other related data. Safety information should be requested from the supplier. Disposal of waste materials, reagents, reactants, and solvents must be in compliance with laws and regulations from all applicable governmental agencies.

8.2 Glycol and polyol products are intended for industrial use only. Before handling or using these products, read the current SDS for each product (8.1).

8.3 The following hazards are associated with the application of this test method.

8.3.1 *Chemical Hazard:*

8.3.1.1 Methanol is a flammable and toxic solvent. Methanol is absorbed through the skin and by breathing the vapors. Be careful when handling a flammable solvent and work in a well-ventilated area away from sources of ignition. Use the proper Personal Protective Equipment to minimize exposure.

8.3.1.2 Flammable liquids (General); see warning statement in A1.1.

9. Sampling

9.1 Follow the relevant instructions for sampling of liquids as given in Practice E300.

9.2 It is recommended that a sample be taken from the process stream, storage tank or vessel in a clear-glass sample bottle (7.1) and examined for visual appearance as soon as possible after sampling.

9.3 Do not sub-sample or transfer the sample to a second container, unless the original sample was not contained in a clear-glass sample bottle or delivered in a volume too large to lift for visual inspection.

9.4 If the sample is delivered in a volume too large to lift, homogenize the sample before sub-sampling. When sub-sampling, do not fill the container to the top. Fill the container approximately 75 % full to allow enough space to swirl the sample without spilling.

10. Procedure

10.1 Allow the sample to equilibrate to room temperature (or to the storage temperature or the temperature at which the sample is used) prior to visual inspection. A temperature-controlled water bath can be used to bring the sample to the desired temperature if measurements must be made at a specific temperature according to product specifications.

10.2 When using a water bath, replace the sample container's cap with an airtight closure through which a calibrated temperature-sensing device is immersed in the sample. Periodically agitate the sample in a manner sufficient to homogenize the bulk of the sample. Remove the sample container from the water bath and wipe dry. Remove the temperature-sensing device and replace the original cap before proceeding with the visual inspection.

10.3 Hold the sample up to a bright light source and visually examine the sample at arm's length for haze or cloudiness (3.1.4), floating or settling particulates (3.1.5), suspended matter particles (3.1.6) and any free water (or free oil 3.1.3) droplets or layers.

10.4 Swirl the sample gently to form a vortex and avoid formation of bubbles. Examine the bottom of the vortex at arm's length for particulates (3.1.5) and free water (or oil, 3.1.3).

10.5 Record the visual clarity as either "Clear and Bright" if not more than the maximum allowed number of particles (either floating, settling, or suspended) no greater than 1 mm in diameter and no free water (or oil) were found or as "Not Clear and Bright" if the number and size of the particles exceed the maximum allowed greater than 1 mm in diameter or free water (or oil) is found.

10.6 Record if particulates (of sufficient size and quantity to be easily noted) were or were not viewed at the bottom of the vortex.

11. Report

11.1 Report the following information:

11.1.1 Report the appearance as "Pass" if the visual clarity was found to be "Clear and Bright" with no more than the maximum number of any particles no greater than 1 mm in diameter and no free water (or oil) were found and the particulate matter had no particulates of sufficient size and quantity to be easily noted at the bottom of the vortex.

11.1.2 Report the appearance as "Fail" if the visual clarity was found to be "Not Clear and Bright" with more than the maximum number of any particles greater than 1 mm in diameter and/or free water (or oil) were found and/or particulate matter was found with particulates of sufficient size and quantity to be easily noted at the bottom of the vortex.

12. Precision and Bias

12.1 No information is presented about either the precision or bias of Test Method E2680 since the test result is nonquantitative.

13. Keywords

13.1 appearance; bright; clear; cloudiness; free oil; free water; haze; particulates; suspended matter; visual inspection

ANNEX

(Mandatory Information)

A1. WARNING STATEMENT

A1.1 Flammable Liquid (General)

A1.1.1 (**Warning—**Flammable. Keep away from heat, sparks, and open flame. Keep container closed when not in use. Use only with adequate ventilation. Avoid prolonged breathing of vapor or spray mist. Avoid prolonged or repeated contact with skin. Spillage and fire instructions will depend on nature of liquid.)

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