



Designation: **E133–92 (Reapproved 2010) E133 – 92 (Reapproved 2016)**

Standard Specification for Distillation Equipment¹

This standard is issued under the fixed designation E133; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers distillation equipment used in the following ASTM test methods: **D86**, **D850**, and (for approved alternative requirements only) Test Method **D1078**.

1.2 Some items of equipment included in this specification are common to all methods; other items are not. Therefore, those portions of this specification pertinent to the need must be selected.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 ASTM Standards:²

D86 Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure

D850 Test Method for Distillation of Industrial Aromatic Hydrocarbons and Related Materials

D1078 Test Method for Distillation Range of Volatile Organic Liquids

E1 Specification for ASTM Liquid-in-Glass Thermometers

E1272 Specification for Laboratory Glass Graduated Cylinders

E1405 Specification for Laboratory Glass Distillation Flasks

3. Apparatus Assembly

3.1 Typical assemblies of the apparatus are shown in **Fig. 1** and **Fig. 2**.

4. Distillation Flasks

4.1 Flasks of heat-resistant glass shall be provided as indicated in **Fig. 3** and shall comply with the requirements of Specification **E1405**.

5. Condenser and Cooling Bath

5.1 Typical approved types of condenser and cooling bath are included in **Fig. 1** and **Fig. 2**. These items are common to all methods covered by this specification.

5.2 The condenser shall be made of seamless brass tubing, 22 in. (55.88 cm) in length. It shall be $\frac{9}{16}$ in. (14.29 mm) in outside diameter, and shall have a wall thickness of 0.031 to 0.036 in. (0.08 to 0.09 cm).

5.3 The condenser shall be set so that approximately 15.5 in. (39.4 cm) of the tube will be in contact with the cooling medium, with about 2 in. (5 cm) outside the cooling bath at the upper end, and about 4½ in. (11 cm) outside at the lower end. The length of tube projecting at the upper end shall be straight and shall be set at an angle of 75° with the vertical. The section of the tube inside the cooling bath may be either straight or bent in any suitable continuous, smooth curve. The average gradient shall be 0.26 in. (0.66 cm)/linear in. (2.54 cm) of condenser tube (sine of angle of 15°), and no section of the immersed portion of the condenser tube shall have a gradient less than 0.24 in. (0.61 cm) nor more than 0.28 in. (0.71 cm)/linear in. of tube. The projecting lower

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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.

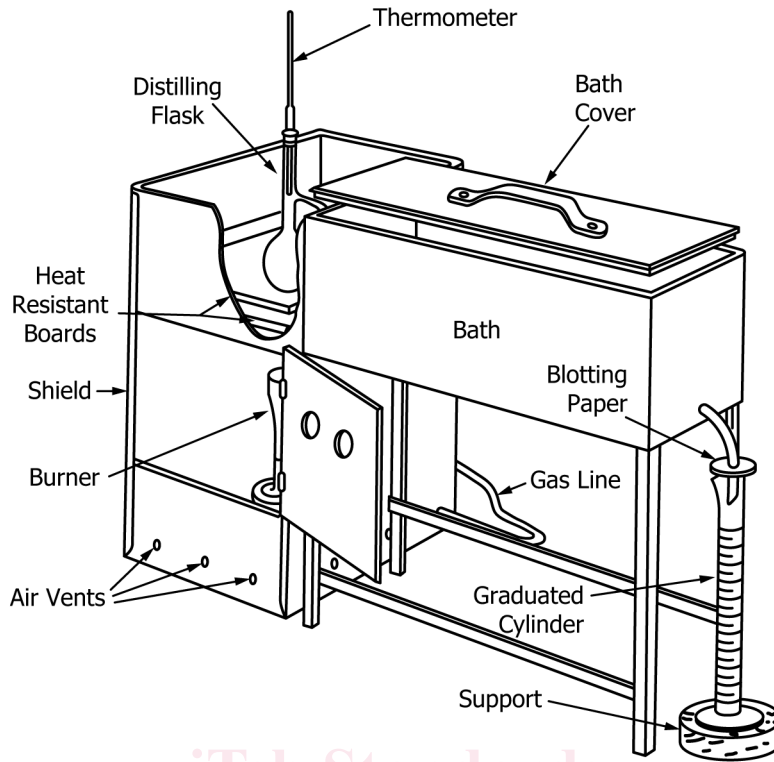


FIG. 1 Apparatus Assembly Using Gas Burner

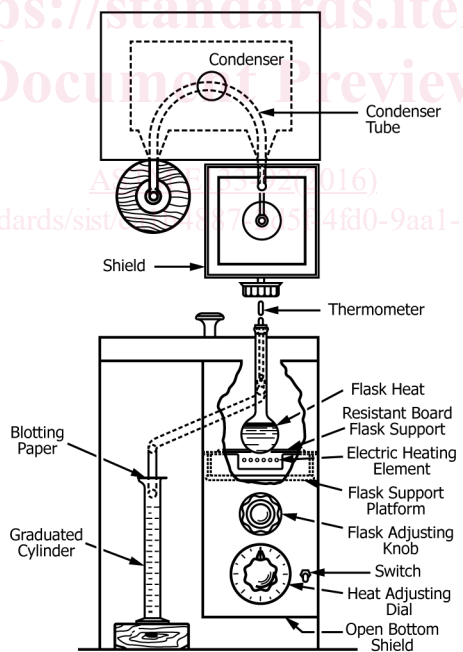


FIG. 2 Apparatus Assembly Using Electric Heater

portion of the condenser tube shall be curved downward for a length of 3 in. (7.62 cm) and slightly backward so as to ensure contact with the wall of the receiving graduate at a point approximately 1 to 1 ¼ in. (2.54 to 3.18 cm) below the top of the graduate when it is in position to receive the distillate. The lower end of the condenser tube shall be cut off at an acute angle so that the tip may be brought into contact with the wall of the cylinder.

5.4 The capacity of the cooling bath shall be not less than 340 in.³ (5.55 L) of cooling medium. The arrangement of the tube in the cooling bath shall be such that its center line shall be not less than 1 ¼ in. (3.18 cm) below the plane of the top of the bath at its point of entrance and not less than ¾ in. (1.91 cm) above the floor of the bath at its exit.