Designation: D 1860 – 95 (Reapproved 2000)

Standard Test Method for Moisture and Creosote-Type Preservative in Wood[1]

This standard is issued under the fixed designation D 1860; 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 the determination of the moisture content in wood and is an alternative procedure for the oven drying method given in Sections 124 to 127 of Methods D 143. Its use is required when the wood contains volatile oils or oil preservative. The test method also covers the determination of the quantity of creosote or creosote-base preservative in treated wood.

1.2 *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:*

D 143 Methods of Testing Small Clear Specimens of Timber[2]

D 841 Specification for Nitration Grade Toluene[3]

D 846 Specification for Ten-degree Xylene[3]

2.2 *Other Standard:*

AWPA A6 Method for the Determination of Oil-Type Preservatives and Water in Wood[4]

3. Summary of Test Method

3.1 A weighed sample is extracted by refluxing in toluene, xylene, or a mixed toluene-xylene solvent. Water separates from the condensed vapors in a water trap, forming a separate layer with the solvent, and the volume is measured in the water trap.

3.2 The completely extracted wood sample is weighed. The preservative content is determined from the total loss of weight less the water content.

4. Significance and Use

4.1 The moisture content of wood is a criteria for treatability.

4.2 The preservative content of treated material is a measure of preservative penetration in new stock or permanence of the preservative during the service life of the wood.

5. Apparatus

5.1 *Extraction Flask*—A 500-mL flask and thimble holder as shown in Fig. 1. The flask and holder may be combined in one unit.

5.2 *Condenser*—A water-cooled condenser of the cold-finger type illustrated in Fig. 1 or of the straight-tube, Liebig type.

5.3 *Water Trap*—A glass tube, preferably having an inside diameter of 9.0 to 10.0 mm and sealed at one end as shown in Fig. 1. If a trap with a stopcock is used, the stopcock shall be securely held in place by means of a wire. The graduated portion of the tube shall have a capacity of 10 mL. The smallest graduation should be not greater than 0.1 mL, with the major divisions marked 1 to 10. The water trap should be chemically clean so that the shape of the meniscus at the end of the test is the same as at the beginning.

NOTE 1—The trap may be coated with a silicone resin to give a uniform meniscus. To coat the trap, first clean it with sulfuric acidchromic acid mixture. Rinse the clean trap with a silicone resin[5] and, after draining for a few minutes, bake for 1 h at approximately 200°C.

5.4 *Extraction Cup*—Either a siphon cup of suitable size or a basket made of approximately 45-mesh, stainless steel gauze and having the approximate dimensions of 42 mm (1 11/16 in.) in outside diameter and 127 mm (5 in.) in length. The siphon cup is recommended for borings from heavily treated piling. When a siphon cup is used, the loss of wood particles should be prevented either by placing a conical screen at the bottom of the siphon cup or by putting the chips or borings in a wire gauze basket which is then placed inside the siphon cup.

5.5 *Weighing Bottle*—The weighing bottle shall have a ground-glass stopper and be of sufficient size to contain the wire extraction cup or siphon cup described in 5.4.

5.6 *Rod*—A rod of approximately 3-mm (⅛-in.) diameter made of some material to which water does not adhere such as tetrafluoroethylene.

---

[1] This test method is under the jurisdiction of ASTM Committee D-7 on Wood and is the direct responsibility of Subcommittee D07.06 on Treatments for Wood Products.

Current edition approved July 15, 1995. Published September 1995. Originally published as D 1860 – 61 T. Last previous edition D 1860 – 87 (1994) ε1.

This method is substantially the same as the American Wood-Preservers' Assn. Method for the Determination of Water and Oil-Type Preservatives in Wood (A6-93). Acknowledgment is made to the American Wood-Preservers' Association for its development of the subject matter covered in this standard.

[2] *Annual Book of ASTM Standards*, Vol 04.10.

[3] *Annual Book of ASTM Standards*, Vol 06.04.

[4] Available from American Wood-Preservers' Association, P.O. Box 286, Woodstock, MD 21163-0286.

[5] Dow-Corning 1107 silicone resin has been found satisfactory for this purpose.

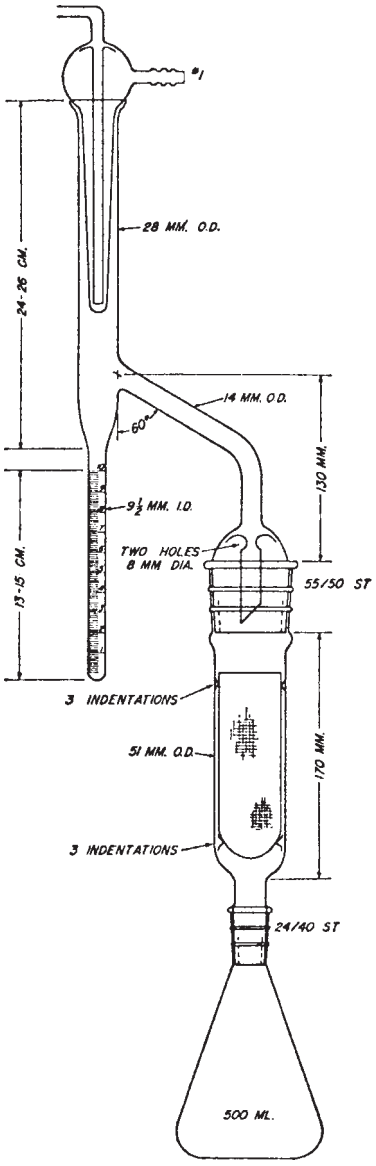

FIG. 1 Extraction Apparatus

5.7 *Oven*, having a sensitivity of ±5°C at 125°C.

5.8 *Balance*, having a sensitivity of 0.01 g.

5.9 *Swedish Increment Borer*.

6. Reagents

6.1 *Toluene*, in accordance with Specification D 841 for nitration grade toluene.

6.2 *Xylene*, in accordance with Specification D 846 for 10 degree xylene.

6.3 *Toluene-Xylene Mixed Solvent*—A mixture of the specified toluene and xylene in any desired proportion.

7. Preparation of Apparatus

7.1 Place about 200 mL of toluene, xylene, or mixed toluene-xylene solvent in the extraction flask and add 1 to 2 mL of water. Assemble the apparatus on a hot plate, apply heat, and reflux for about 30 min. Allow the contents of the water trap to cool to room temperature, then using the rod transfer any water adhering to the walls of the condenser or to the walls of the water trap to the water layer in the trap. Read and record the volume of water in the trap to the nearest 0.01 mL. This procedure may be dispensed with if at the start of the determination the flask, water trap, and inner walls of the condenser are carefully dried and dry solvent is used for the extraction.

7.2 Before using the increment borer to take a sample for moisture or preservative determination, calibrate the borer. Take 20 borings from material of like species. Measure each boring at its midpoint to the nearest 0.025 mm (0.001 in.), once in the transverse grain direction and once in the longitudinal grain direction. Average these two measurements and square the result. Calculate the sum of the 20 squares and divide the total by 20. Calculate the square root of the quotient to the nearest 0.025 mm (0.001 in.). Use this result as the calibrated diameter of the borer.

8. Procedure

8.1 Weigh the wire extraction basket or the siphon cup and the weighing bottle separately to the nearest 0.01 g. Place the basket or siphon cup in the weighing bottle.

8.2 Using the Swedish increment borer, take a minimum of 20 borings from the wood to be sampled. As each boring is taken, carefully measure and cut the desired portion for test. Place each boring section in the extraction basket or siphon cup as it is cut. Stopper the weighing bottle at all times except when actually placing or removing borings from it.

8.3 Weigh the bottle, container, and contents to the nearest 0.01 g. Transfer the container and contents to the extraction section of the apparatus. Weigh the empty, stoppered weighing bottle to the nearest 0.01 g without removing any condensate from it. The difference between this weight and the original tared weight of the weighing bottle represents the first portion of water in the sample.

8.4 Apply heat to the extraction apparatus and reflux the toluene at a rate of at least 1 drop/s from the tip of the condenser. With freshly creosoted wood, continue the refluxing for at least 2 h. An extraction of at least 5 h should be used for wood freshly treated with creosote-coal tar solutions. After the appropriate reflux period allow the contents of the trap to cool to room temperature. By means of the rod, transfer any water adhering to the walls of the condenser or to the walls of the water trap to the water layer in the trap, then read and record the volume of water in the trap to the nearest 0.01 mL. The difference between this reading and the first reading represents the second and final portion of water in the sample.

8.5 Remove the extraction container and contents from the extraction flask and place under a hood for 15 min; then place in the oven preheated to 125°C. Dry for 2 ± 0.5 h.

8.6 While the extraction is in process, clean the weighing bottle by rinsing with acetone, dry in the oven, cool in a desiccator, and then reweigh and replace in the desiccator.

8.7 When the container and borings have dried for the prescribed period, transfer them to the weighing bottle. Cool the uncovered weighing bottle and contents to room temperature in a desiccator; then weigh with cover to the nearest 0.01 g. Calculate and record the weight of dry extracted wood.

9. Calculation

9.1 Calculate the moisture content as a percentage of extracted wood as follows:

$$\text{Moisture content, extracted wood, \%} = [(W1 + W2)/W3] \times 100 \quad (1)$$

where:

W_1 = weight of first portion of water, (8.3),
W_2 = water measured in the trap, mL, and
W_3 = weight of extracted wood, g, (final weight of bottle plus container plus contents minus final tared weight of bottle minus tared weight of container).

9.2 Calculate the weight of preservative in the sample, in grams, as follows:

$$\text{Weight of preservative, g} = W_4 - W_3 - W_2 - W_1 \quad (2)$$

where:

W_4 = original weight of bottle plus container plus contents minus original tared weight of container, g.

9.3 Calculate the volume of the sample, in cubic feet, as follows:

$$\text{Volume, ft}^3 = \left(L \times \pi \frac{D^2}{4}\right)/1728 \quad (3)$$

where:

L = total length of borings, in., and
D = calibrated diameter of borings, in.
1 ft^3 = 28.3 dm^3.

9.4 Calculate the content of preservative in the sample, in pounds per cubic foot, as follows:

$$\text{Content of preservative, lb/ft}^3 = W/V \quad (4)$$

where:

W = weight of preservative, lb, and
V = volume of sample, ft^3.

10. Precision and Bias

10.1 Data are not currently available with which to develop a precision and bias statement.

11. Keywords

11.1 creosote type; moisture; preservative