Designation: D1494 – 12

An American National Standard

Standard Test Method for Diffuse Light Transmission Factor of Reinforced Plastics Panels[1]

This standard is issued under the fixed designation D1494; 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.

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

1. Scope*

1.1 This test method covers the determination of the diffuse light transmission factor of translucent reinforced plastics building panels.

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

1.3 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in Tables and Figures) shall not be considered as requirements of 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.*

NOTE 1—There is no know ISO equivalent to this standard..

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D618 Practice for Conditioning Plastics for Testing

D883 Terminology Relating to Plastics

D1600 Terminology for Abbreviated Terms Relating to Plastics

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

2.2 *ASTM Adjuncts:*

Test Cabinet for Diffuse Light Transmission Factor of Reinforced Panels[3]

3. Terminology

3.1 *Definitions:*General—Definitions are in accordance with Terminology D883 and abbreviations with Terminology D1600, unless otherwise indicated.

4. Significance and Use

4.1 The purpose of this test method is to obtain the diffuse light transmittance factor of both flat and corrugated translucent building panels by the use of simple apparatus and by employing as a light source a combination of fluorescent tubes whose energy distribution closely approximates CIE Source C.

5. Apparatus

5.1 The apparatus for this test method shall consist of a transmissometer, Fig. 1, comprising essentially the following:

5.1.1 *Light Source*—The illumination shall consist of twelve 20-W fluorescent tubes which are assembled in three banks of four tubes each, according to the following schedule: daylight, deluxe cool white, blue, and daylight.

5.1.2 *Photometer*—The photometer shall consist of a photocell and of a galvanometer. The photocell shall be of the barrier-layer type and shall contain a visual correction filter. The assembly preferably should be hermetically sealed into plastic as a protection against moisture. The indicating galvanometer should contain one scale graduated from 0 to 100, and a circuit with sufficient variable resistance so that the sensitivity of the photometer can be adjusted over the range of 50 to 100 footcandles.

5.1.3 *Test Cabinet,* constructed in accordance with the following dimensions.[3]

[1] This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.24 on Plastic Building Products.

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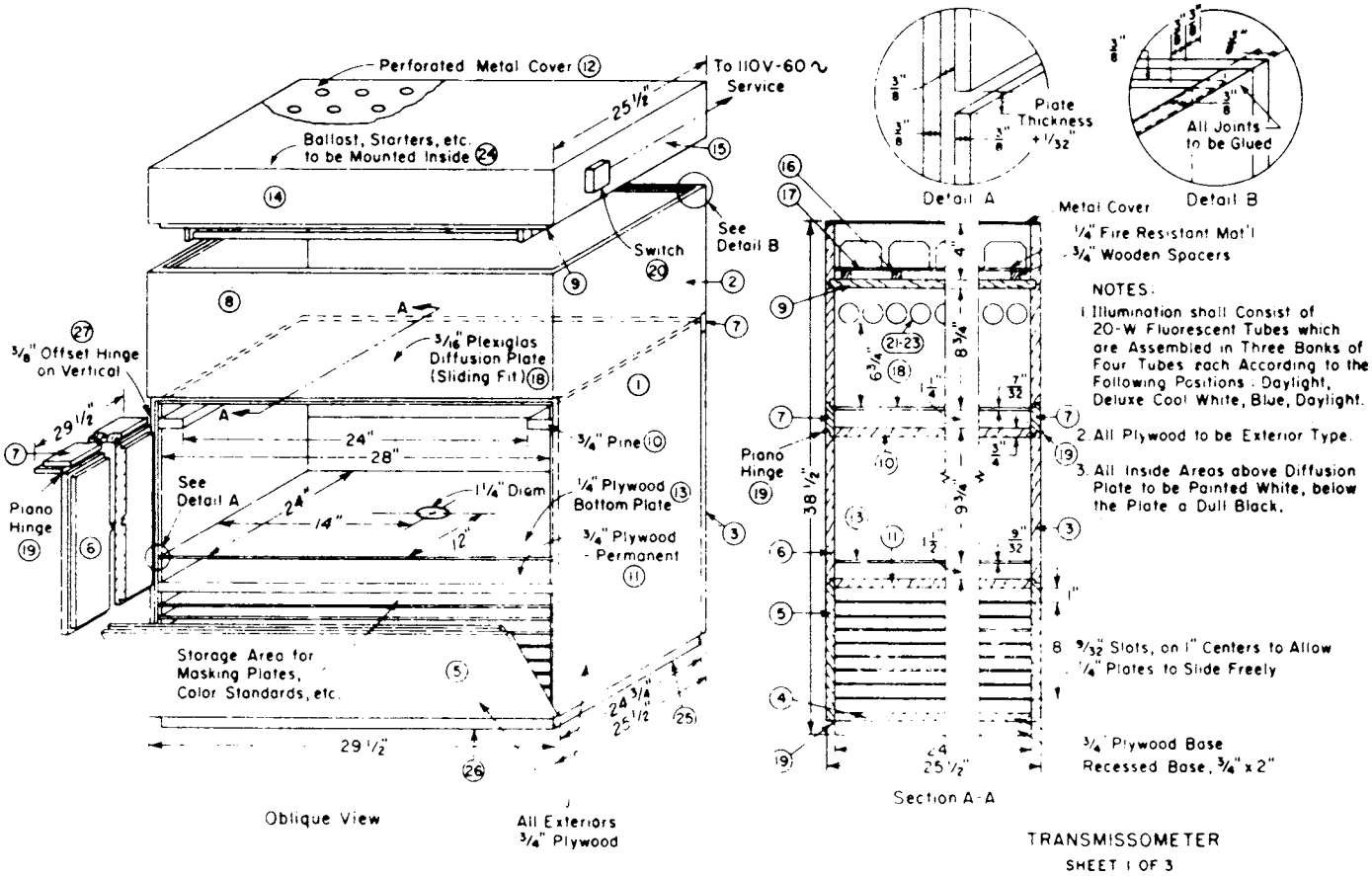
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Detailed working drawings and a bill of materials for this equipment can be obtained at a nominal charge from ASTM Headquarters, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428–2959. Order Adjunct: ADJD1494.

***A Summary of Changes section appears at the end of this standard**



Metric Equivalents

in.	mm	in.	mm	in.	mm	in.	mm
1/32	0.8	3/4	19.1	8 3/4	222	24 3/4	634
3/16	4.8	1 1/4	31.8	9 3/4	248	25 1/2	648
7/37	5.6	1 1/2	38.1	12	305	28	711
1/4	6.4	2	50.8	14	356	29 1/2	749
9/32	7.1	6 3/4	172	24	610	38 1/2	978
3/8	9.5						

FIG. 1 Assembly Drawing of Transmissometer

5.1.3.1 The transmitted area of the test specimen shall be 610.0 ± 1.6 mm by 610.0 ± 1.6 mm (24 ± 1/16 in. by 24 ± 1/16 in.).

5.1.3.2 The distance from the bottom of the fluorescent tubes to the bottom of the test specimen shall be 203.0 ± 0.8 mm (8 ± 1/32 in.).

5.1.3.3 A 4.8-mm (3/16-in.) thick, white, standard outdoor, translucent diffusing plate shall be placed between the light source and the test specimen so that the distance from the bottom of the diffusing plate to the bottom of the test specimen is 31.8 ± 0.8 mm (1 1/4 ± 1/32 in.).

5.1.3.4 The photocell shall be positioned below the center axis of the test specimen so that the distance from the bottom of the specimen to the top of the cell is 283.0 ± 0.8 mm (11 1/8 ± 1/32 in.).

5.1.3.5 A masking plate containing a 31.8-mm (1 1/4-in.) diameter hole in its center shall be placed between the test specimen and the photocell so that the distance from the bottom of the test specimen to the bottom of the masking plate shall be 233.0 ± 0.8 mm (9 3/4 ± 1/32 in.).

6. Standardization of Transmissometer

6.1 Center the photocell beneath the 31.8-mm (1 1/4-in.) diameter hole in the bottom masking plate. Place the galvanometer in a flat level position. Ensure that no current flows in the electrical circuit by opening the circuit. Adjust the position of the indicating needle on the galvanometer to read "0'' by means of the zero adjustment knob. Close the galvanometer circuit. Turn on the illumination in the transmissometer. Wait a minimum of 20 min to permit the transmissometer to reach equilibrium conditions. Adjust the galvanometer to read "100.'' The instrument is now ready to be used for measurements of diffuse light transmission factor.

TABLE 1 Precision Values in the Units of Percent

Material	Average	Sr^A	SR^B	Ir^C	IR^D
Sample #4	6.1	0.36	1.08	1.02	3.06
Sample #5	24.1	0.59	2.48	1.67	7.02
Sample #1	59.7	0.45	5.01	1.27	14.18
Sample #3	73.0	0.76	3.19	2.16	9.03
Sample #2	95.6	0.64	1.61	1.81	4.56

[A] *Sr* is the within-laboratory standard deviation of the average.
[B] *SR* is the between-laboratory standard deviation of the average.
[C] *Ir* = 2.83 *Sr*, and
[D] *IR* = 2.83 *SR*.

7. Test Specimens

7.1 The test specimens shall consist of translucent reinforced plastic panels having a minimum length of 610 mm (24 in.) and a width greater than 610 mm (24 in.), but not exceeding 711 mm (28 in.).

8. Conditioning

8.1 *Conditioning*—Condition the test specimens at 23 ± 2°C (73 ± 4°F) and 50 ± 10 % relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice D618, for those test methods where conditioning is required. In cases of disagreement, the tolerances shall be ±1°C (±2°F) and ±2 % relative humidity.

8.2 *Test Conditions*—Conduct tests in the Standard Laboratory Atmosphere of 23 ± 2°C (73 ± 4°C) and 50 ± 10 % relative humidity, unless otherwise specified in the test methods or in this specification. In cases of disagreement, the tolerances shall be ±1°C (±2°F) and ±2 % relative humidity.

9. Procedure

9.1 In making a measurement, place the test specimen in the test cabinet so that it completely covers the 610 by 610-mm (24 by 24-in.) space. The transmittance is read on the galvanometer in percent.

10. Report

10.1 The report shall include the following:
10.1.1 The source and identity of test specimens.
10.1.2 The percent transmission of the test specimen.
10.1.3 The average thickness of the test specimen in inches expressed to the nearest 0.025 mm (0.001 in.) and comprising at least ten individual measurements.

11. Precision and Bias[4]

11.1 Table 1 is based on a round robin conducted in 1987 in accordance with Practice E691, involving five materials tested by seven laboratories. Because of the nonuniform nature of large corrugated sheets, the five samples were sequentially sent to the seven participating laboratories. Each test result is an individual determination. Each laboratory obtained three test results for each material.

NOTE 2—The explanation of *Ir* and *IR* (11.2 through 11.2.3) are only intended to present a meaningful way of considering the *approximate* precision of this test method. The data in Table 1 should not be vigorously applied to acceptance or rejection of materials as these data specific to the round robin and may not be representative of other lots, conditions, materials, or laboratories.

11.1.1 Users of this test method should apply the principles outlined in Practice E691 to generate data specific to their laboratory and materials or between specific laboratories. The principles of 11.2 through 11.2.3 then would be valid for such data.

11.2 *Concept of Ir and IR*—If *Sr* and *SR* have been calculated from a *large enough body of data*, and for test results that are the individual result from testing one specimen:

11.2.1 *Ir: Repeatability* (comparing two test results for the same material, obtained by the same operator using the same equipment on the same day)—the two test results should be judged not equivalent if they differ by more than the *Ir* value for that material.

11.2.2 *IR: Reproducibility* (Comparing two test results for the same material, obtained by different operators using different equipment on different days)—the two test results should be judged not equivalent if they differ by more than the *IR* value for that material.

11.2.3 Any judgment per 11.2.1 and 11.2.2 would have an approximate 95 % (0.95) probability of being correct.

11.3 Bias is systematic error which contributes to the difference between a test result and a true (or reference) value. There are no recognized standards on which to base an estimate of bias for this test method.

12. Keywords

12.1 building panels; diffuse light transmission factor; reinforced plastics

[4] Supporting data are available from ASTM Headquarters. Request RR: D20 – 1145.

SUMMARY OF CHANGES

Committee D20 has identified the location of the following changes to this standard since the last issue (D1494-97(2008)$^{\varepsilon 1}$) that may impact the use of this standard.

(1) Removed D4968 reference in Section 2.
(2) Removed C618 reference from Section 2.
(3) Added D618 reference in Section 2.
(4) Updated section 8.1 per D618-08.
(5) Updated section 8.2 per D618-08.

Committee D20 has identified the location of the following changes to this standard since the last issue (D1494-97(2000)$^{\varepsilon 1}$) that may impact the use of this standard.

(1) Reworded ISO equivalency statement per Guide D4968.
(2) Adjusted significant digits in 5.1.3.1, 5.1.3.2, 5.1.3.4 and 5.1.3.5.