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Designation: D 2493 – 95a

Standard Viscosity-Temperature Chart for Asphalts[1]

This standard is issued under the fixed designation D 2493; 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 The viscosity-temperature chart covered by this standard is a convenient means of plotting data for estimating the viscosity of asphalts at any temperature within a limited range. Conversely, the chart may be used to ascertain the temperature at which a desired viscosity is attained.

1.2 The chart is suitable for original asphalt cements and for asphalts recovered from laboratory aging tests or extracted from pavements.

1.3 The range of the chart is sufficient for roofing asphalts.

1.4 The range of the chart is sufficient for liquid asphalts (bitumens) whose viscosity exceeds 0.1 poise (10 centipoise).

2. Referenced Documents

2.1 *ASTM Standards:*

D 341 Viscosity-Temperature Charts for Liquid Petroleum Products[2]

D 2170 Test Method for Kinematic Viscosity of Asphalts (Bitumens)[3]

D 2171 Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer[3]

D 3205 Test Method for Viscosity of Asphalt with Cone and Plate Viscometer[3]

D 4957 Test Method for Apparent Viscosity of Asphalt Emulsion Residues and Non-Newtonian Bitumens by Vacuum Capillary Viscometer[3]

3. Significance and Use

3.1 The viscosity-temperature chart is a convenient means of plotting the viscosity data for estimating the viscosity of asphalts, recovered asphalts, and roofing asphalts at any temperature within a limited range. It is also a convenient means to estimate the temperature at which a desired viscosity is attained.

3.2 Kinematic viscosity-temperature charts are described in Charts D 341.

4. Description

4.1 For Fig. 1 the chart coordinates are logarithm of the logarithm of the viscosity in centipoise as the ordinate, and logarithm of the temperature in Degrees Rankine (degrees F + 459.7) as the abscissa. However, the viscosity in poise and the temperature in degrees Fahrenheit is shown in the chart for convenience.[4]

4.1.1 The range of the chart is 10^{-1} to 10^{24} poise and 0 to 400°F, as shown in Fig. 1. Its size is 16 by 17 in. (406 by 432 mm).

4.2 For Fig. 2 the chart coordinates are logarithm of the logarithm of the viscosity in mPa.s as the ordinate, and logarithm of the absolute temperature in degrees Kelvin (degrees C + 273.2) as the abscissa. However, viscosity in Pascal-seconds, and the temperature in degrees Celsius is shown in the chart for convenience.

$$(1\ \text{Pa.s} = \text{mPa.s} \times 10^{3}) \quad (1)$$

4.2.1 The range of the chart is 10^{-2} to 10^{23} Pa.s and − 20 to 200°C, as shown in Fig. 2.

4.3 The temperature range of the charts may be extended to lower temperatures by renumbering the temperature scale of a second chart, according to Table 1, discarding the portion above 230°F (110°C), and placing the 230°F (110°C) axis along the 0°F (-17.8°C) axis of an original chart.

5. Procedure

5.1 For temperatures above 140°F (60°C) plot two viscosity-temperature points and carefully draw a straight line through the points. Plot at least three viscosity-temperature points if the included temperature range is below 140°F. Carefully draw a straight line or curve through the points. A point on this line, within the temperature range of the points plotted, shows the viscosity at the corresponding desired temperature.

5.2 Some asphalts have viscosity-temperature relationships too complex to be represented by only three points, as shown in Fig. 1. In this case determine the viscosity at sufficient temperatures to produce a curve adequate for the purpose intended.

5.3 If the viscosities are not known they should be determined in accordance with Test Methods D 2170, D 2171, D 3205, and D 4957. Viscosities determined at temperatures other than the temperatures specified in each of these test

[1] This chart is under the jurisdiction of ASTM Committee D-4 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.44 on Rheological Tests.

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[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] *Annual Book of ASTM Standards*, Vol 04.03.

[4] The chart is available at a nominal charge. Contact ASTM Headquarters at 100 Barr Harbor Drive, West Conshohosken, PA 19428. Request Adjunct No. ADJD2493.

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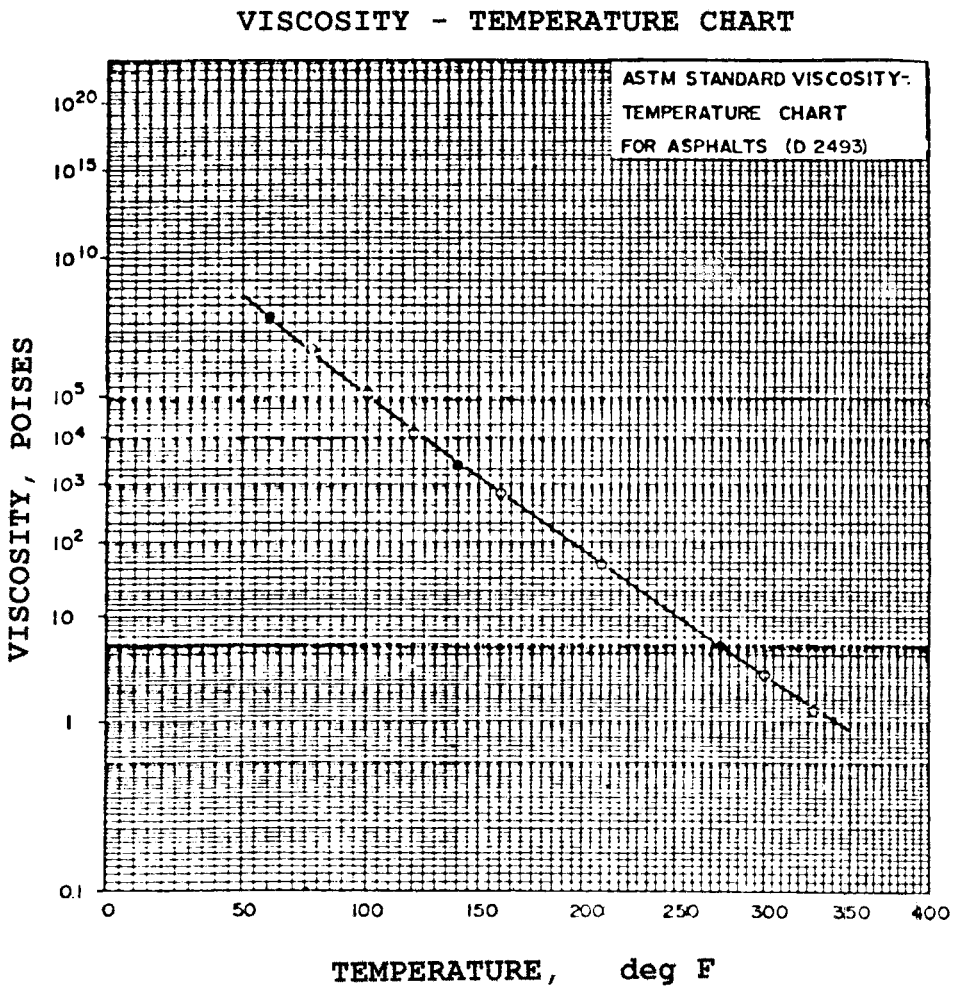


FIG. 1 Facsimile of Viscosity-Temperature Chart on Which a Typical Experimental Curve Has Been Plotted

methods may be used.

5.4 Viscosities determined by extrapolation of data may be unreliable.

5.5 The viscosity values represented by the data points may have been obtained at different shear rates. This chart does not reflect the shear rate at which the viscosities were determined.

6. Keywords

6.1 asphalt; rheology; viscosity; viscosity-temperature chart

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