Designation: D3291 – 22

Standard Practice for Compatibility of Plasticizers in Poly(Vinyl Chloride) Plastics Under Compression[1]

This standard is issued under the fixed designation D3291; 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 practice determines the compatibility of plasticizers in poly(vinyl chloride) plastics by rating the amount of plasticizer that spews due to compressional stress set up inside a 180° loop bend.

NOTE 1—Ingredients other than plasticizer can spew from a total formulation.

1.2 The text of this practice references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this practice.

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

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 2—There is no known ISO equivalent to this standard.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D883 Terminology Relating to Plastics

D1600 Terminology for Abbreviated Terms Relating to Plastics

3. Terminology

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

4. Summary of Practice

4.1 Test specimens of plasticized poly(vinyl chloride) sheet are bent through an arc of approximately 180°. The inner radius of the bend is equal to the thickness of the specimen. These bent specimens are secured in a jig designed to hold them in the desired conformation. At specified intervals of time, a specimen is removed, bent 360° in the opposite direction, and the former inside of the loop (now the outside) is examined for evidence of plasticizer spew.

5. Significance and Use

5.1 It is possible for plasticizers to become less compatible in poly(vinyl chloride) resin when fused compound is subjected to compressive stress.

5.1.1 This test subjects a standard test specimen to a definite deformation and allows qualitative determination of the amount of spew that is capable of occurring over a period of time.

5.1.2 An apparent decrease in compatibility of plasticizers with subsequent exudation can cause excessive dirt pickup, marring of lacquered or varnished surfaces, sticky feel, and a number of other associated problems.

5.1.3 When a plasticized poly(vinyl chloride) sheet is stressed in compression by bending it through 180°, one way to relieve the stress is by migration of the plasticizer from the compressed area (inside of bend) to the area in tension (outside of bend). If these compressive stresses cannot be relieved rapidly by internal migration of plasticizer, then plasticizer will spew. The internal migration of plasticizer will continue and when a deficiency of plasticizer occurs at the compressed area spewed plasticizer will be reabsorbed. It is possible for certain plasticizers to spew and be reabsorbed quite rapidly. Less compatible plasticizers are capable of spewing early and continuing to spew throughout the test. A test of one week's duration is used for screening, while an extended test of seven weeks' duration is used for a complete profile.

NOTE 3—It is permissible for the seller and the purchaser to agree upon

[1] This practice is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

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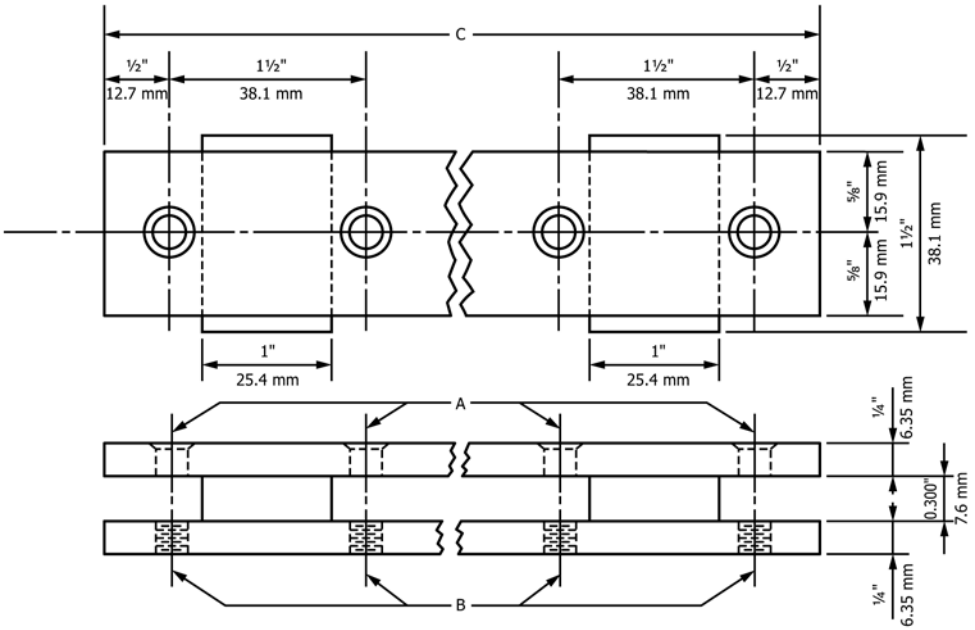
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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



A Drill and countersink for 6.35-mm (¼-in.) flat head machine screw
B Drill and tap to receive 6.35-mm (¼-in.) machine screw
C Permitted to be any convenient length up to 457 mm (18 in.)
Material—Oil-hardening precision ground tool and die steel

FIG. 1 Bending Test Jig

other test conditions of time, temperature, or relative humidity.

6. Apparatus

6.1 *Bending Test Jig,* as shown in Fig. 1.

6.2 *Cigarette Papers,* cut in half to be approximately square.[3]

7. Specimen Preparation

7.1 Cut test specimens 12.7 by 25.4 mm (½ by 1 in.) from a plasticized poly(vinyl chloride) sheet 1.9 ± 0.1 mm (0.075 ± 0.005 in.) thick, taking care to ensure the long edges are parallel.

NOTE 4—Optimum fusion conditions of temperature and time vary with plasticizer and resin type as well as other additives. The processing conditions must be agreed upon by the seller and the purchaser.

8. Conditioning

8.1 Test specimens shall be conditioned at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 10 % relative humidity for 24 h prior to testing.

[3] An example of a satisfactory brand is white OCB paper from Reynolds.

9. Procedure

9.1 Fold the conditioned specimens in half, short ends together and place the loop end in the jig with the spacer bar equal to four times the nominal specimen thickness—7.6 mm (0.300 in.)—as shown in Fig. 2. Leave about 4.75 mm (3⁄16 in.) of the ends outside jig. The loop inside the jig needs to be smooth and continuous and no evidence of cracking is allowed to be seen on the outside of the loop.

9.2 Specimens must be thoroughly fused to give meaningful results. Collapse of the loop is one indication of incomplete fusion.

9.3 Mark the time of starting the test.

9.4 Store the loop jig containing the specimens at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 10 % relative humidity.

9.5 Test individual specimens for 4 h, 24 h, and 7 days.

9.6 At the end of the testing period, remove a specimen from the jig and fold the loop in the opposite direction around index finger, so that the inside of the loop in the jig is now outside. Examine the loop area for evidence of spew by wiping the loop area thoroughly with a cigarette paper held around a clean, *dry* finger.