



Standard Specification for Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings¹

This standard is issued under the fixed designation D 3122; 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 specification provides general requirements for styrene-rubber solvent cements to be used in joining styrene-rubber (SR) plastic pipe and fittings.

1.2 A recommended procedure for joining styrene-rubber pipe and fittings is given in the appendix.

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

1.4 The following safety hazards caveat pertains only to the test methods portion, Section 6, of this specification: *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 618 Practice for Conditioning Plastics for Testing²

D 1084 Test Methods for Viscosity of Adhesives³

D 1600 Terminology for the Abbreviated Terms Relating to Plastics²

D 2852 Specification for Styrene-Rubber (SR) Plastic Drain Pipe and Fittings⁴

F 402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings⁴

F 412 Terminology Relating to Plastic Piping Systems⁴

F 493 Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings⁴

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F 412, and abbreviations are in accordance with Terminology D 1600, unless otherwise specified.

4. General Requirements

4.1 The solvent cement shall be a solution of styrene-rubber (SR) plastic compound or resin meeting the following requirements.

4.1.1 The SR plastic compounds or resin shall contain at least 50 % styrene plastics, combined with rubbers to a minimum rubber content of 5 %, and compounding materials such as antioxidants and lubricants, and may contain up to 15 % acrylonitrile combined in the styrene plastics or rubbers, or both. The rubbers shall be of the polybutadiene or butadiene-styrene type, or both, with a maximum styrene content of 25 % or nitrile type or both. The combined styrene plastics and rubber content shall be not less than 90 %. No filler may be used. (See Specification D 2852.)

4.2 Either virgin or clean rework material may be used provided that the rework material is generated from the solvent cement manufacturer's own production, is compatible with virgin material, and will produce a cement that meets the requirements of this specification.

4.3 The cement shall be free-flowing and shall not contain lumps, macroscopic undissolved particles, or any foreign matter that will adversely affect the ultimate joint strength or chemical resistance of the cement.

4.4 The cement shall show no gelatin. It shall show no stratification or separation that cannot be removed by stirring.

4.5 The cement shall be a solution of styrene-rubber (SR) plastic compound or resin meeting the requirements of 4.1.1 dissolved in one of the following solvents:

4.5.1 Methyl ethyl ketone.

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² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 15.06.

⁴ *Annual Book of ASTM Standards*, Vol 08.04.

4.5.2 Toluene.

NOTE 1—It is recommended that solvent cements made to this specification *not* be orange since that color is being recommended for use with CPVC solvent cement under Specification F 493.

5. Detail Requirements

5.1 *Resin Content*—The SR resin compound shall be 20 % minimum by mass with methyl ethyl ketone as the solvent or shall be 15 % minimum by mass with toluene as the solvent, when tested in accordance with 6.3.

5.2 *Dissolution*—The cement shall be capable of dissolving an additional 10 % by mass of styrene-rubber (SR) resin or compound meeting the requirements of 4.1.1 at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) without evidence of gelation.

5.3 *Viscosity*—The minimum viscosity at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) shall be 90 mPa·s (90 cP) when tested in accordance with 6.2.

NOTE 2—Cements approaching the minimum viscosity of this specification generally are not recommended for noninterference-type fit (where gap exists between the pipe and fitting socket).

5.4 Lap Shear Strength:

5.4.1 The minimum lap shear strength of a cement made with methyl ethyl ketone as the solvent when tested in accordance with 6.4 shall be 3.5 MPa (500 psi) after a 16-h curing time and 6.0 MPa (900 psi) after a 48-h curing time.

5.4.2 The minimum lap shear strength of a cement made with toluene as the solvent when tested in accordance with 6.4 shall be 1.6 MPa (230 psi) after a 16-h curing time and 2.4 MPa (350 psi) after a 48-h curing time.

NOTE 3—These values should not be used for designing pipe joints.

6. Test Methods

6.1 The properties enumerated in this specification shall be determined in accordance with the following methods:

6.1.1 *Conditioning*—Condition the test specimens at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) for not less than 40 h prior to test in accordance with Procedure A of Practice D 618, for those tests where conditioning is required.

6.1.2 *Test Conditions*—Conduct tests at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$), unless otherwise specified in the test methods or in this specification.

6.2 Viscosity:

6.2.1 The samples for test shall be representative of the material under consideration. One sample for every batch shall be tested in accordance with 6.2.2 unless otherwise agreed upon by the supplier and the purchaser.

6.2.2 Measure the viscosity in accordance with Method B of Test Methods D 1084, except that conditioning to temperature equilibrium only is required. Use a Model RVF viscometer,⁵ a speed of 10 r/min, and the spindle that, by trial, gives the closest reading to center range of scale for the cement being tested.

⁵ The sole source of supply of the apparatus known to the committee at this time is Brookfield Engineering Laboratories, Stoughton, MA 02072. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee¹, which you may attend.

6.3 Total Solids:

6.3.1 Apparatus:

6.3.1.1 *Ointment Tins*—Style No. 12, 30 mL (1 oz) all metal.

6.3.1.2 *Vacuum Oven*.⁶

6.3.1.3 *Desiccator*.

6.3.1.4 *Analytical Balance*.

6.3.2 *Procedure*—Stir the sample thoroughly with a spatula before weighing (Note 4). Weigh 3.0 ± 0.5 g of the sample to the nearest 1 mg into a tared ointment tin. Place tin into the vacuum oven (Note 5) and heat at 120°C for 45 min (Note 6). Vacuum must be continually in operation to draw off flammable solvents and should be maintained at 15 mm Hg maximum. Remove the tin from the oven and cap immediately. Place in a desiccator until cooled to room temperature. Weigh the tin and dried sample to the nearest 1 mg.

NOTE 4—This material is usually nonhomogeneous and shall be thoroughly stirred before weighing. The weighing shall also be accomplished quickly to avoid loss of solvent by volatilization.

NOTE 5—The use of a vacuum oven is mandatory for drying the specimen because this oven has no exposed heating surface nor an open flame, thus avoiding the danger of flashing. The oven also provides an open vacuum to exhaust solvent fumes.

NOTE 6—The specimen shall be left in the oven for 45 min and no longer. Specimens left in for 1 h or more show a definite increase in weight.

6.3.3 *Calculation*—Calculate the percentage total solids, TS, as follows:

$$TS, \% = ((B - A)/(C - A)) \times 100$$

where:

A = weight of ointment tin,

B = weight of tin and specimen after drying, and

C = weight of tin and specimen before drying.

6.3.4 *Precision*—Duplicate samples shall be tested for best results. Duplicate results obtained by the same analyst, on the same material, on the same day, in the same laboratory are suspect if they differ by more than 0.52 % absolute. This procedure has a standard deviation of 0.13.

6.4 Lap Shear Strength:

6.4.1 *Number of Specimens*—A minimum of five specimens shall be tested for the requirement specified in 5.4.

6.4.2 Cut 25 by 25-mm (1 by 1-in.) and 25 by 50-mm (1 by 2-in.) sections from a 6-mm ($\frac{1}{4}$ -in.) thick rigid styrene-rubber plastic (SR) sheet. One section of each size is required for each test specimen (Fig. 1).

6.4.3 Clean the surfaces to be adhered with a cloth dampened with the solvent (see 4.5) used to make the solvent cement.

6.4.4 Using a 25-mm (1-in.) natural bristle brush, apply two layers of cement in immediate succession to the complete surface of a 25 by 25-mm (1 by 1-in.) sheet section and to the center of a 25 by 50-mm (1 by 2-in.) sheet section.

⁶ Labline Duo-Vac vacuum oven, or equivalent, has been found satisfactory for this purpose.

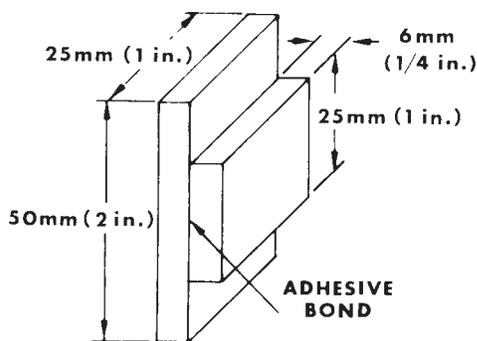


FIG. 1 Compressive Shear Specimen

6.4.5 Assemble these sections immediately and rotate the 25 by 25-mm (1 by 1-in.) section 180° on the 25 by 50-mm (1 by 2-in.) section within 5 s using light hand pressure (approximately 2 N (1/2 lbf)).

6.4.6 Place the assembled test specimen on a clean, level surface, by using the 25 by 50-mm (1 by 2-in.) section as a base. After 30 s, place a 2-kg weight on the test specimen for a period of 3 min, and then remove.

6.4.7 Store the assembled test specimens at 23 ± 2°C (73.4 ± 3.6°F) for 16-h or 48-h and test them in a holding fixture similar to that shown in Fig. 2.

6.4.8 Place the specimen in the holding fixture and adjust the screws to bring the sample to a vertical position with the face of the 50-mm (2-in.) specimen in contact with the test jig as shown in Fig. 2 (Note 7). Back off the screw in contact with the 50-mm (2-in.) specimen until a 0.02-mm (0.001-in.) shim can be inserted between the screw plate and the specimen. Then bring the bearing plate of the test machine into contact with the top of the 50-mm (2-in.) specimen, using care to ensure that the plate is on a horizontal plane.

6.4.9 Apply the compressive shear at a speed of 1.25 mm (0.05 in.)/min. Express the results in megapascals (or pounds-force per square inch).

NOTE 7—Alternative jigs may be used if they can be shown to be equivalent.

7. Retest and Rejection

7.1 If the results of any test(s) do not meet the requirements of this specification, the test(s) may be conducted again in accordance with an agreement between the purchaser and the seller. There shall be no agreement to lower the minimum requirement of the specification by such means as omitting tests that are a part of the specification, substituting or modifying a test method, or by changing the specification limits. In retesting, the product requirements of this specification shall be met, and the test methods designated in the specification shall be followed. If, upon retest, failure occurs,

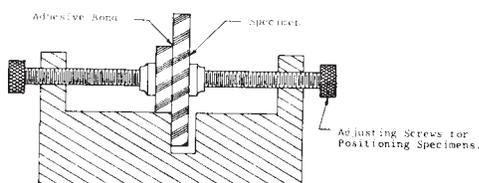


FIG. 2 Typical Specimen Holding Fixture

the quantity of product represented by the test(s) does not meet the requirements of this specification.

8. Report

8.1 Report the following information:

8.1.1 Name of cement manufacturer,

8.1.2 Lot number, if given,

8.1.3 Total solids, in percent,

8.1.4 Dissolution, pass or fail,

8.1.5 Viscosity, and

8.1.6 Average lap shear strength at each cure time and complete identification of SR sheet stock used for tests.

9. Certification

9.1 When specified in the purchase order, the manufacturer shall certify to the purchaser or to his nominee that the products in the specified lots meet all the requirements of this specification, and when requested, shall include a copy of the manufacturer's routine quality control tests results to document that the specification requirements have been met. Each certification so furnished shall be signed by an authorized agent of the manufacturer.

10. Container Labeling and Marking

10.1 Container labeling of cement shall include the following:

10.1.1 Manufacturer's or supplier's name and address and tradename or trademark or both.

10.1.2 This designation: "ASTM D 3122."

10.1.3 Function of material (Cement for SR pipe.)

10.1.4 Procedure or instructions for application and use.

10.1.5 Lot number of batch on container (not on closure or lid).

10.1.6 End use application (example: nonpressure uses).

10.1.7 All warnings and cautions necessitated by:

10.1.7.1 Ingredients,

10.1.7.2 Handling and distribution of the product,

10.1.7.3 Intended use, and

10.1.7.4 Requirements of law (such as the Federal Hazardous Substance Act.) These are intended to warn those who handle or use the product against potential hazards, such as flammability, toxicity, etc.

NOTE 8—It is recommended that the color of the contents also be indicated on the label.

11. Safe Handling of Solvent Cement

11.1 Solvent cements for plastic pipe are made from flammable liquids and should be kept away from all sources of ignition. Good ventilation should be maintained to reduce fire hazard and to minimize breathing of solvent vapors. Avoid contact of cement with skin and eyes.

11.2 Refer to Practice F 402 for additional information.

12. Quality Assurance

12.1 When the product is marked with this designation, D 3122, the manufacturer affirms that the product was manufactured, inspected, sampled, and tested in accordance with this specification and has been found to meet the requirements of this specification.

APPENDIX

(Nonmandatory Information)

X1. RECOMMENDED PROCEDURE FOR JOINING STYRENE-RUBBER (SR) PLASTIC PIPE AND FITTINGS WITH STYRENE-RUBBER SOLVENT CEMENT

X1.1 Cut the pipe using a fine-tooth hand saw and a mitre box or a fine-toothed power saw with a suitable guide. Use a rotary cutter if the cutting blades are specially designed for cutting plastic in such a way as not to raise a burr or ridge (flare) at the cut end of the pipe. Remove all burrs with a knife, file, or abrasive paper.

X1.2 Test fit the joint. Wipe both the outside of the pipe and the inside of the fitting socket with a clean, dry cloth to remove moisture and foreign matter. Mate the two parts without forcing. The pipe should enter the socket one quarter to three quarters of the socket depth. Avoid very tight fits (pipe will not enter socket without forcing) and loose fits (pipe bottoms easily in socket with slop).

X1.3 Surfaces to be joined should be clean and free of moisture before application of the cement. Apply a cleaner if recommended by the cement manufacturer to the mating surfaces of the pipe and fitting.

X1.4 Apply the cement with a 1-in. natural bristle or nylon brush for pipe sizes up to 2 in. and a brush width at least one half of the pipe diameter for the larger size pipe. Other applicators may be used effectively provided their use results in an equivalent amount of cement applied to the joining surfaces.

Apply a uniform moderate coat of cement to the fitting socket. Avoid puddling of cement in the socket. Without delay, apply a liberal amount of cement to the pipe to the depth of the fitting socket. Cement layers should be sufficient to fill any gap between pipe and fitting.

X1.5 Immediately after applying the last coat of cement, insert the pipe into the fitting until it bottoms. If possible turn the pipe during assembly one quarter of a turn (but not after the pipe is bottomed) to evenly distribute the cement. If there are signs of drying of the cement surfaces, due to delay in assembly, recoat the surfaces, taking care again to avoid puddling of cement in the socket. Hold the pipe and fitting in place for approximately 1 min to keep the pipe from backing out of the socket. Wipe excess cement from the pipe at the end of the socket with a clean dry cloth. Allow the joint to set to develop good handling strength. Follow cement manufacturer's recommendations for set time necessary.

X1.6 Follow solvent cement manufacturer's recommendations for cure time necessary.

NOTE X1.1—The procedure given above is a general one. Consult cement manufacturers for specific detailed instructions for their particular product.

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