



Standard Practice for the One-Step (Solvent Cement Only) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets¹

This standard is issued under the fixed designation F3328; 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 describes a one-step (solvent cement only) method of joining pipe to fittings (and or piping components) that employ tapered sockets that provide an interference fit $\frac{1}{3}$ to $\frac{2}{3}$'s of the socket depth. This practice applies to poly(vinyl chloride) (PVC), or chlorinated poly(vinyl chloride) (CPVC).

1.2 This practice shall only be used with products (pipe, fitting, fitting component and solvent cement) where manufacturer's literature and local codes reference this ASTM standard practice: ASTM F3328.

NOTE 1—Where conflicts occur between the code and the manufacturer's installation instructions, the more restrictive provisions apply.

1.3 Due to inherent hazards associated with testing components and systems with compressed air or other compressed gases, some manufacturers do not allow pneumatic testing of their products. Consult with specific product/component manufacturers for their specific testing procedures prior to pneumatic testing.

NOTE 2—Pressurized (compressed) air or other compressed gases contain large amounts of stored energy which present serious safety hazards should a system fail for any reason.

1.4 Techniques covered are applicable to joining PVC to PVC, or CPVC to CPVC pipe and piping components with tapered sockets. In the remainder of this standard practice, the term "piping components with tapered sockets", whether it be bell end pipe, spigot connections, or any other type of tapered connections, will be referred to as "fittings."

1.5 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 the practice.

1.6 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

¹ This test method is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.20 on Joining. Current edition approved Aug. 1, 2018. Published August 2018. DOI: 10.1520/F3328-18

1.7 *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.*

1.8 *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

- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
- F402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
- F412 Terminology Relating to Plastic Piping Systems
- F493 Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F412, and abbreviations are in accordance with Terminology D1600, unless otherwise specified.

4. Summary of Practice

4.1 In order to achieve consistently strong and leak-free joining of Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride) (CPVC) pipe and fittings, the following principles need to be clearly understood and followed:

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.

4.1.1 By the use of an applicator, solvent cement shall be worked into the surfaces to be joined to promote softening. (See Fig. 1.)

4.1.2 Solvent cement shall be applied to the pipe end and fitting socket to fill the gap between pipe and fitting socket. (See Fig. 2.)

4.1.3 Pipe and fitting shall be assembled immediately after the application of solvent cement. (See Fig. 3.)

4.1.4 Joint strength develops as the solvents evaporate from the joint. At the socket bottom where there is an interference fit, the surfaces will fuse together; at the socket entrance where there is a gap, the solvent cement will fill the gap and bond both surfaces. (See Fig. 4.)

4.1.5 As the solvents evaporate, softened surfaces will harden with a corresponding increase in joint strength over time. A properly assembled joint will withstand the required working pressure long before the joint has fully cured. Assembled joints shall not be disturbed until the initial set time has been achieved (See Section 8, Installation), in accordance with solvent cement manufacturers' recommendations.

5. Significance and Use

5.1 Solvent cement bonder/installers shall follow all procedures to produce consistently strong and leak-free joints, either in shop operations or in the field.

6. Materials

6.1 *Pipe and Fittings*—Pipe and fittings shall meet the requirements of current applicable PVC, or CPVC pipe and piping components standards.

6.2 *Solvent Cement:*

6.2.1 *Specification*—Solvent cement shall meet the requirements of Specification D2564 for PVC solvent cement, Specification F493 for CPVC solvent cement

6.2.2 *Selection*—Solvent cements are available in a variety of viscosities and wet film thicknesses to cover the range of pipe sizes.

6.2.3 *Storage*—Solvent cements shall be stored in a cool, dry place. All solvent cements have a limited shelf life. Consult the solvent cement manufacturer for specific recommendations on storage conditions and shelf life. The solvent cement is

unsuitable for use if it exhibits an appreciable change from the original viscosity, or if signs of gelation (jelly-like) are apparent. Restoration of the original viscosity or removal of gelation by adding solvents shall not be allowed.

6.3 *Chemical Cleaners*—Chemical cleaners, only those recommended by solvent cement manufacturers shall be used to remove surface debris (for example, oil, dirt, grease, paint, etc.).

6.3.1 Sandpaper or similar abrasive cloths or grinders shall not be used to clean pipe or fittings.

NOTE 3—This practice can remove a significant amount of material from the surfaces to be joined which will adversely affect the interference fit and reduce joint strength.

7. Procedure

7.1 *Cutting*—Using a suitable cutter, cut the pipe perpendicular (square) to the pipe axis (see Fig. 5).

NOTE 4—It is important to cut the pipe perpendicular (square) to the pipe axis. A square cut provides maximum bonding area. Tools used to cut plastic pipe must be in good condition and used in accordance with the tool manufacturer's recommendations. If there is any indication of damage or evidence of cracking after cutting the pipe, cut off at least 2 in. (50.8 mm) beyond any visible crack. Care must be exercised when using ratchet cutters, especially at 50 °F (10 °C) or lower temperatures, as they may split the pipe if not maintained and used properly. When using wheel-type plastic tubing cutters with a blade made for cutting plastic pipe, material displacement from the downward force of the cutting wheel will create ridges, which shall be removed with a chamfering tool or file

7.2 *Chamfering and Deburring:*

7.2.1 *Chamfering*—Exterior pipe edges shall be chamfered with a chamfering tool specifically designed for plastic pipe or a file. (See Fig. 6 for tolerances and Fig. 7 for tools) Chamfering is necessary to remove burrs and sharp edges created by the cutting process.

NOTE 5—Chamfering allows the pipe to enter the fitting socket cleanly and uniformly. Sharp edges, if not removed, will scrape away softened socket material, depositing it and solvent cement into the fitting or pipe waterway, creating a potential leak path. Accumulation of softened socket material and solvent cement inside the waterway must be avoided.

7.2.2 *Deburring*—Burrs on the inside pipe edge shall be removed with a deburring tool or half-round file (See Fig. 7).

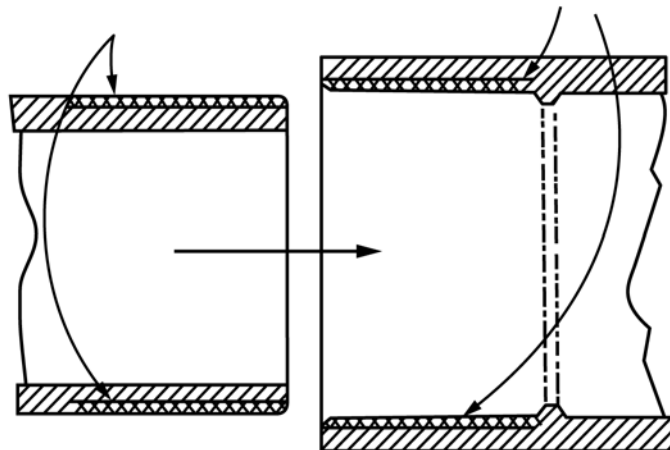


FIG. 1 Penetrated and Softened Areas

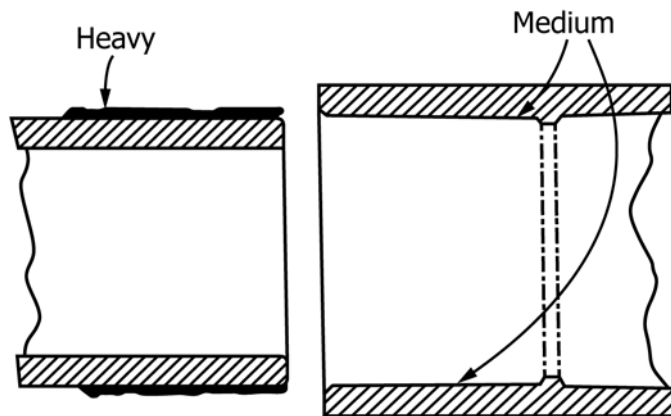


FIG. 2 Solvent Cement-Application

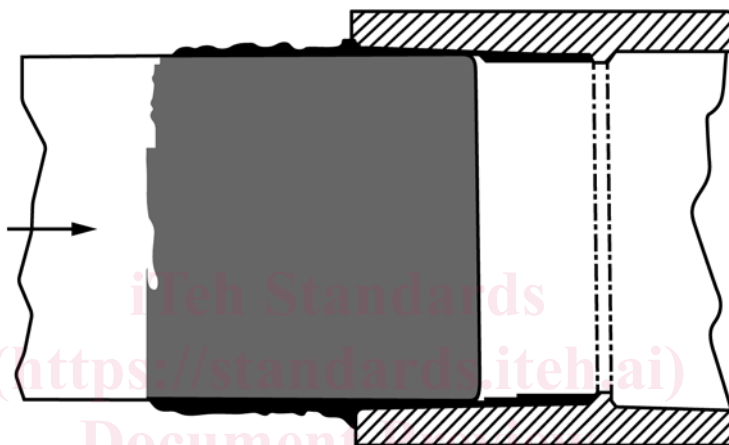


FIG. 3 Assemble Immediately while Cement is Wet and Fluid

BONDED SURFACES 18

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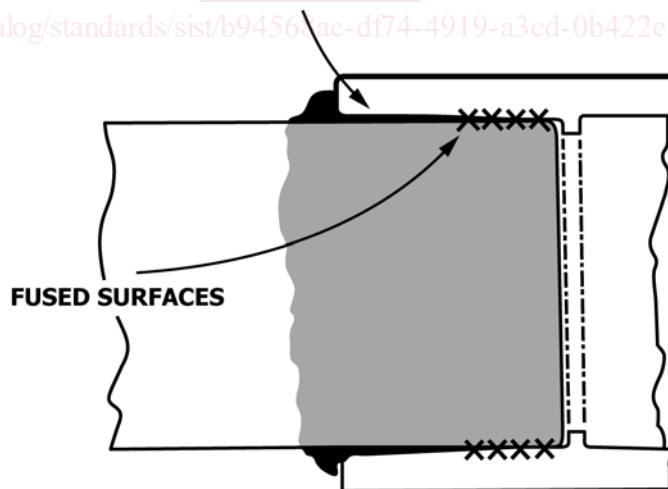


FIG. 4 Assembled Joint

NOTE 6—Removing burrs from the interior (waterway) prevents obstructions and enhances fluid flow.

7.3 *Dry Joint Tightness Test*—Prior to applying solvent cement, insert the pipe gently and slowly into the socket until the first sign of resistance is detected to determine the point of

interference. Check for an interference fit between the pipe and fitting, occurring at approximately $\frac{1}{3}$ to $\frac{2}{3}$ of the socket depth. Do not force components together. If the pipe end or fitting socket, prior to dry fitting, shows indications of surface contamination refer to 7.4, *Cleaning*.



FIG. 5 Cut Pipe Square

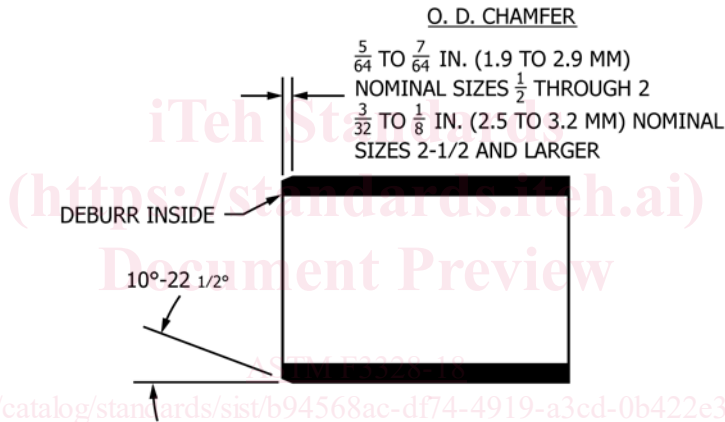


FIG. 6 Pipe Chamfer

NOTE 7—Pipe and fittings are designed to have an interference fit (See Fig. 8). An interference fit occurs when the outside pipe diameter contacts (interferes) with the inside tapered fitting socket diameter. Dimensional conformance is essential for an interference fit, to make strong leak free joints. If the fit is loose, replace the pipe or fittings in order to obtain a proper interference fit. Do not attempt to join pipe and fittings that do not have an interference fit.

7.4 *Cleaning*—Use a clean, dry cloth or paper towel to clean the surfaces of pipe and fittings (See Fig. 9). If joining surfaces cannot be cleaned by wiping with a clean, dry cloth or paper towel, a chemical cleaner recommended only by the solvent cement manufacturer shall be used.

NOTE 8—Proper surface preparation is required to maximize the integrity of the joint. Foreign materials can impede the solvent cementing process. Surfaces to be joined must be free of foreign materials (that is, oil, dirt, grease, paint, etc.).

NOTE 9—Chemical cleaners only clean pipe and fittings and will not sufficiently soften joining surfaces. Follow proper handling procedures provided by solvent cement manufacturers.

7.5 *Mark Pipe*—First time operators or users may want to measure the socket depth and transfer this measurement to the

pipe O.D. with a mark. From this mark, place a second mark 2 in. (50.8 mm) (See Fig. 10) further up the pipe.

NOTE 10—First mark is the solvent cement application area. Second mark is a reference point used after joint assembly to verify that the pipe was fully bottomed out in the socket and did not back out during the initial hold time.

7.6 *Applicator Size*—Use an applicator approximately half (1/2) the nominal pipe size being joined.

NOTE 11—Can-lid dauber may not be of appropriate size for the specific pipe diameter and fittings being joined. A variety of applicators are commercially available.

7.7 *Assembly Procedure for Joining Plastic Pipe and Fittings with one-step Solvent Cement:*

7.7.1 *Solvent Cement Standards for Joining PVC, or CPVC Plastic Pipe and Fittings:*—(1) Use PVC solvent cement that meets Specification D2564 for joining PVC to PVC (2) Use CPVC solvent cement that meets Specification F493 for joining CPVC to CPVC.

NOTE 12—Formulation of one-step solvent cement is specifically