

Solvent Cementing Instructions for Plastic Pipe & Fittings

Description

Solvent cementing is the process of fusing plastic pipe and fittings using an adhesive containing a suitable active solvent system and an appropriate resin. This process is referred to as solvent welding.

Summary of Practice of Solvent Cementing

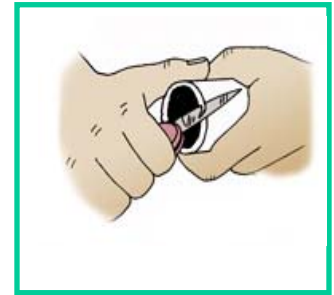
Plastic piping systems are easy to install, but larger sizes (more than 2 inches) require a degree of expertise to produce a leak-free joint. We may have seen papers, pamphlets and instruction sheets that discuss cutting the pipe square, deburring, cleaning and priming the pipe prior to applying solvent cement. However, most of these publications do not emphasize the most important aspects of proper solvent joining of pipe and fittings.

Solvent Cementing Procedure

These procedures apply to all types of plastic: ABS, PVC, and CPVC.

1. Pipe Preparation

- (a) **Cutting.** Cut pipe square using a hand hacksaw and mitre box or a power circular or hand saw with a suitable guide or a rotary cutter if the cutting wheel is specifically designed for cutting plastic pipe.
- (b) **Deburring and Beveling.** Using a knife, deburring tool, or a coarse file, remove all burrs and sharp edges from the pipe. All pipe ends should be bevelled with a coarse file or bevelling tool. This will minimize the chance of wiping the solvent cement from the fitting socket during installation, which could result in a leaking joint. Do not use sandpaper on plastic pipes. It may remove too much material for successful joining.



2. Fitting Preparation.

Prior to solvent cementing, all fittings should be inspected for cracks or damages. Fittings should be exposed to the same temperature as the pipe for at least an hour, to ensure that they are thermally balanced before joining.

3. Cleaning.

Using Cleaner 33, clean the pipe end and fitting socket (omit this entire step with ABS). Apply the Cleaner 33 with a dauber, brush or clean cloth to remove grease, oil and dirt, and to prepare the plastic mating surfaces for solvent cement action. The surfaces to be joined should be clean and free of dirt and grease. Pipes and fittings should be dry before applying cement.

4. Dry Fitting

The solvent cement joint is designed so that there will generally be interference of pipe wall with the fitting socket before the pipe is fully inserted. Usually this occurs when the pipe is inserted 1/3 to 2/3 of the socket depth. Sometimes, when the pipe and fittings are at their tolerance extremes or when Schedule 80 pipe is used, it may be possible to fully insert the dry pipe into the fitting until it bottoms. If this occurs the fit should be snug. If the fit is loose or wobbly other fittings or pipe should be selected to give a proper fit.

5. Priming

ABS, PVC and CPVC are different materials. Although their cementing procedures are similar, they are different and are outlined separately, below.

- (a) **ABS.** Our Cleaner 33 may be used to prime the mating surfaces. However, in most cases experienced installers can achieve successful bonding without the use of a primer.
- (b) **PVC and CPVC.** The use of a primer such as 3 Primer (Clear) or 3V Primer (Purple) is recommended and mandatory for all pressure applications. Our PVC-1, which is a "one-step" cement, does not require the use of a primer and can only be used on non-pressure applications. The function of the primer is to penetrate and soften the bonding surfaces, especially the high gloss and hard glaze surfaces of the pipe and fittings, prior to applying the cement. Apply primer to the fitting with a dauber or brush.

6. Solvent Cementing

(a) Choose the proper CSA certified solvent cement:

ABS to ABS (Non-Pressure):	ABS 55Y or ABS 66Y
PVC to PVC (Schedule 40 - Pressure):	PVC S-40
PVC to PVC (Schedule 80 - Pressure):	PVC S-80
PVC to PVC (Non-Pressure):	PVC DWV or PVC-1
CPVC to CPVC:	CPVC 77
PVC to ABS:	PVC/ABS Transition Cement

- (b) Using an applicator, evenly apply a heavy coating of solvent cement to the pipe and a light coating to the socket. Now apply a second coating to the pipe ensuring that sufficient material is present to fill all gaps.
- (c) Making certain that the cement on the pipe and fitting is still "wet"; insert the pipe into the fitting until it bottoms in the socket. Then give it a 1/4 turn to ensure complete and even distribution of the cement. Make sure that the joint is positioned correctly as the cement sets in a few seconds.
- (d) If the pipe does not insert smoothly or does not twist easily, take the joint apart immediately. Apply more cement and rejoin. The use of a cleaner or primer will extend the open time and setting time.
- (e) Hold the joint together until the cement has set. This may take up to 2 minutes depending upon pipe size. Avoid disturbing the joint until it is fully cured.
- (f) Immediately after joining, wipe off all excess cement. A properly made joint will show a bead around its entire perimeter. Gaps may indicate a defective assembly resulting from insufficient cement.



Joint Integrity

Joint integrity depends upon a tremendously wide variety of product and environmental conditions. These include size of pipe, ambient temperature, surface temperature of the joint, humidity, dry joint interference fit, and others. In general drying times, will be faster with smaller diameter pipe, higher surface temperatures, tighter interference fits, and lower humidity.

Drying times will be slower when the opposite conditions exist.

For assurance of success we recommend that:

1. Actual joining should not be done at atmospheric temperatures below 5°C or above 32°C when exposed to direct sunlight. For work, outside of this preferred range refer to the sections on hot, cold, and wet weather cementing.
2. At least 48 hours of joint drying time should elapse before a joint is moved or subjected to any appreciable internal or external pressure

When in doubt about proper cementing techniques under conditions, please contact Sluyter Company Ltd, who will be glad to provide expert advice.

Cementing Under Wet Conditions

Moisture inhibits the bonding of plastic pipes and fittings. In failed joints a white film or residue often appears indicating the presence of water during the joining process. Cementing can be done in wet weather and in wet environments but it is imperative that the mating surfaces be dry when the joint is made.

The following suggestions may help in wet situations:

1. Work under a cover or canopy to keep rain off the pipe and fittings.
2. The use of a cleaner or primer will aid in the removal of moisture.
3. Work quickly after drying the pipe and fitting to avoid condensation.

4. The use of a very fast drying and setting cement will limit the period when the joint is vulnerable to moisture. A fast setting cement requires the worker to apply more cement and to work very quickly to ensure that the cement is still fluid when the pipe is inserted into the fitting.
5. Allow a longer cure time before the system is tested or used.

Hot Weather Cementing

When atmospheric temperatures are above 32°C certain precautions must be taken to avoid excessive solvent evaporation from the cement. Such evaporation may cause the cement to set prematurely and adversely affect joint integrity. The following steps can reduce the chance of problems:

1. The surface temperature of the mating surfaces should not exceed 45°C at the time of assembly. Shade or shelter the joint surfaces from direct sunlight for at least an hour prior to joining and during the joining process. Swabbing the surface to be cemented with Cleaner may reduce the pipe temperature; wet rags provided the parts are thoroughly dried before primer or cement are applied.
2. Make cement joints during the cooler, early morning hours.
3. Apply cement quickly. On 6" and larger pipe, it is recommended that two workers apply cement to the pipe surface while a third applies it to the fitting socket.
4. Join pipe to the fitting as quickly as possible after applying cement.
5. To minimize solvent loss, keep cement container closed or covered when not in use.

Cold Weather Cementing

Working in freezing temperatures is never easy. However, if the job of solvent cement welding is necessary, you can do it successfully with Sluyter Solvent Cements. By following our standard instructions and using a little extra care and patience, successful solvent cemented joints can be made at temperatures even as low as -26°C. In cold weather, solvents penetrate and soften the plastic pipe and fitting surfaces slower than in warm weather. In addition, the plastic is more resistant to solvent attack, making it more important to pre-soften surfaces with an aggressive primer. Because of the slower evaporation, a longer cure time is necessary. Our cure schedules allow a margin for safety, but for colder weather, more time should be allowed.

TIPS TO FOLLOW

1. Prefabricate as much of the system as is possible in a heated work area.
2. Store cements, cleaners and primers in a warmer area when not in use and make sure they remain fluid.
3. Joints that must be made outside should be protected with a portable shelter and heated with indirect heat to surface temperatures above 5°C before joining. The shelter and heat should remain in place for at least two hours after joint assembly.
4. Although **PVC-1 (One-Step)** cement can be used in cold weather, it is extremely important that extra care be taken when applying the cement, so that proper penetration and softening of the pipe and fitting surfaces is achieved. The use of a Primer when using PVC-1 during an extremely cold weather installation will be beneficial to the results if shelters and heating set ups cannot be done in the welding area.
5. Take special care to remove moisture including ice and snow from the surfaces to be joined. On PVC and CPVC pipe and fittings the surfaces must be cleaned with **Sluyter Cleaner 33**.
6. Before assembly, after the pipe has been cut, cleaned and dry fitted as per the instructions on the label, **Sluyter 3 Primer or 3V Primer** must be used to soften the joining surfaces on PVC or CPVC installations before applying cement. On ABS installations **Sluyter Cleaner 33** must be used as the primer. More than one application may be necessary.
7. Allow a longer cure period before the system is used. A heat blanket may be used to speed up the set and cure times.
8. It is extremely important to read and follow all our directions carefully before installation. For all practical purposes, good solvent-cemented joints can be made in very cold conditions with proper care and a little common sense.

CAUTION: DO NOT ATTEMPT TO SPEED THE SETTING OR DRYING OF THE CEMENT BY APPLYING DIRECT HEAT TO THE SOLVENT WELDED JOINT. Forced rapid drying by heating will cause the cement solvents to boil off, forming porosity, bubbles and blisters in the cement film.

Estimated Solvent Cement Requirements

The estimates in Tables 1 and 2 below, provides a guideline for usage.

The actual number of joints can vary considerably due to installation conditions and techniques, tolerance variations, and socket depths. Since the cement is the least expensive material being used, it is better to use too much cement than not enough.

TABLE 1: ESTIMATED CEMENT REQUIREMENTS

AVERAGE NUMBER OF JOINTS PER LITRE OF SLUYTER CEMENT													
Pipe Diameter	½"	¾"	1"	1½"	2"	3"	4"	6"	8"	10"	12"	15"	18"
Number of Joints	300	200	125	90	60	40	30	10	5	2-3	1-2	¾	½

TABLE 2: ESTIMATED PRIMER REQUIREMENTS

AVERAGE NUMBER OF JOINTS PER LITRE OF SLUYTER PRIMER													
Pipe Diameter	½"	¾"	1"	1½"	2"	3"	4"	6"	8"	10"	12"	15"	18"
Number of Joints	600	400	250	180	120	80	60	20	10	4-6	2-4	1½	1

Set Times and Joint Cure Schedules

During the initial setting of the cement (approx. 2 min.) the joint should not be moved or disturbed. The cure schedules listed here in Table 3 and 4 are suggested guidelines only based on past field experience and laboratory testing and should not be taken as absolutes. Numerous factors, such as application conditions and the specific cement used affect the actual cure rates, which may be faster or slower than the times indicated. In damp or humid weather allow 50% more set time and cure time; extended set times are required for chemical applications.

Important – The initial set schedule is the necessary time needed before the joint can be carefully handled.

TABLE 3: SET TIMES (The initial set schedule is the necessary time needed before the joint can be carefully handled)

AVERAGE INITIAL SET TIMES FOR SLUYTER PVC/CPVC SOLVENT CEMENTS					
Temperature Range	Pipe Sizes ½" to 1¼"	Pipe Sizes 1½" to 2"	Pipe Sizes 2½" to 8"	Pipe Sizes 10" to 15"	Pipe Sizes 15"+
15° to 40°C	2 min	5 min	30 min	2 hrs	4 hrs
5° to 15°C	5 min	10 min	2 hrs	8 hrs	16 hrs
-16° to 5°C	10 min	15 min	12 hrs	24 hrs	48 hrs

TABLE 4: JOINT CURE SCHEDULE (Joint cure schedule is the necessary time needed before pressurizing system)

AVERAGE JOINT CURE SCHEDULE FOR SLUYTER PVC/CPVC SOLVENT CEMENTS								
Temperature Range During Assembly and Cure Periods	Cure Time Pipe Sizes ½" to 1¼"		Cure Time Pipe Sizes 1½" to 2"		Cure Time Pipe Sizes 2½" to 8"		Cure Time Pipe Sizes 10" to 15"	Cure Time Pipe Sizes 15"+
	up to 160 psi	160-370 psi	up to 160 psi	160-315 psi	up to 160 psi	160-315 psi	up to 100 psi	up to 100 psi
15° to 40°C	15 min	6 hrs	30 min	12 hrs	1½ hrs	24 hrs	48 hrs	72 hrs
5° to 15°C	20 min	12 hrs	45 min	24 hrs	4 hrs	48 hrs	96 hrs	6 days
-16° to 5°C	30 min	48 hrs	1 hr	96 hrs	72 hrs	8 days	8 days	14 days

Safe Storage and Handling

Primers, cleaners, and solvent cements contain highly flammable solvents. Specific safety information on each product may be found either on the container label or the Material Safety Data Sheet. In general: Keep cleaners, primers, and cements away from heat, sparks and open flame. Keep containers tightly closed except when in use. If the cement has become lumpy or stringy it has lost some of the solvent and has started to set. The product is no longer suitable for use and should be disposed of. Ensure proper ventilation of work area and avoid inhaling solvent vapours. Wear proper eye protection or a face shield where the possibility of splashing exists. Avoid contact with skin. Wear proper gloves if necessary.

Sluyter Commitment

Sluyter Company Ltd. takes great care and pride in developing, manufacturing and marketing a large variety of primers, cleaners and cements for joining all types of plastic pipes and fittings. Our stringent quality assurance program ensures that you always receive products that are of a consistently and uniformly high quality. Our products have been certified by CSA and conform to ASTM requirements and will provide superior results when used properly for the intended applications. Our technical staff is always ready to assist you in selecting the right products for the job and in providing proper cementing procedures. We are committed to Total Customer Satisfaction.