

WORK PROCEDURE	Document No. WP101
Solvent Cementing PVC Pipes	

References - ISO 9001:2008 – 4.2.4

Normal Responsibility of: Plumber, Roof Plumber or apprentice plumber or roof plumber

Essential Procedures for this function:

It looks easy doesn't it? And the instructions on the can are pretty simple. What's the problem? Actually it is simple, but for the unwary, there are some traps. A solvent joint has about eight times the strength that it needs, if everything is right. The trouble is, that factor of safety can be reduced to 4:1 with one mistake, 2:1 with two, and disaster with three.

Firstly -your health

DON'T WORK IN CONFINED SPACES OR NEAR NAKED FLAMES OR NON-FLAMEPROOF ELECTRICAL MACHINERY

- Solvent vapors are toxic and flammable.
- Do not breath vapor
- Avoid contact with the skin and eyes
- Wear suitable Personal Protective equipment
 - Gloves
 - Eye/ Face protection
 - In case of insufficient ventilation, wear suitable respiratory equipment.

Refer to the manufacturers SDS for detailed information

If you want to make sure you have a reliable joint study AS/NZS 2032 and the [PIPA Industry Guidelines](#). All the points are covered, but the reasons and consequences are sometimes obscure.

Here are some pointers:

Solvent cement is not just a glue. It works by dissolving the surfaces of the spigot and socket, and together with the PVC filler in the cement, forms an integral matrix of PVC across the interface. This can only work properly if the surfaces are scrupulously clean and all traces of lubricants (used in processing) are removed.

1. PRIMING FLUID MUST BE USED

- 1.1. Do not substitute. If you don't use the pipe maker's specification, you can't expect sympathy. Further, a greasy rag will undo all your efforts.

2. SELECT THE APPROPRIATE SOLVENT CEMENT

- 2.1. Type P – Pressure Solvent cement is required for tapered or interference fit pressure joints
- 2.2. The integral matrix across the interface is only a few microns thick. In this type of joint the real strength of the joint comes from the interference section of the spigot and socket. Since the socket is tapered, this is only the last few millimeters at the end of the spigot. Tolerances are designed so that:
 - (a) interference will always occur before the last 10% of spigot penetration, and
 - (b) heaviest interference when fully homed will not cause excess socket stress.

2.3. Type G – Gap filling solvent cement is required for parallel sockets.

3. ALWAYS FORCE THE SPIGOT FULLY HOME

3.1. You can't be sure you've done this unless you mark the socket length on the spigot. You may not be able to get a large diameter heavy walled pipe home without mechanical aid. If you use a mechanical aid, don't go past the mark. Experience comes in here. Pretest the fit. All pipes and fittings are oval. The ovality corrects itself when the joint is made. Small light wall pipes are no problem. A large heavy walled joint with ovality can take a lot of force -and if you don't get it first time, you don't get a second chance.

4. CUT THE PIPE SQUARE – USE A MITRE BOX

4.1. If the pipe is not cut square, full interference at the end of the spigot may not be developed in a tapered socket. Remember it's the last few millimeters of spigot that count.

5. ENSURE SOLVENT CEMENT COVERS THE ENTIRE SOCKET SURFACE

5.1. The solvent 'lubricates' the surfaces for jointing. You won't get the spigot fully home if it runs dry of solvent part way down the socket.

6. ENSURE SOLVENT CEMENT COVERS THE ENTIRE SPIGOT SURFACE

6.1. Proper action at the interface depends on an effective layer of solvent between the surfaces. The layer on the spigot is most important from this point of view.

7. DE-BURR THE SPIGOT

7.1. A sharp edge on the spigot will pick up the solvent in the socket and push it towards the back of the socket. This reduces the layer of cement in the interface. It also causes dangerous 'pooling' at the back of the socket (see later).

8. WORK FAST BUT DON'T RUSH

8.1. Proper action at the interface will not proceed with half dry solvent. Nor will it be easy to get the spigot fully home. Solvent cement consists of a mixture of solvents of various volatilities. The solvents all start evaporating as soon as they hit the air, some fast, some slow. The fast ones generally have the greatest solvent power. If you lose these, the strength of the joint will diminish.

9. COAT THE SOCKET FIRST

9.1. The solvents will evaporate faster from the exposed spigot than from the socket.

10. DON'T WORK ON HOT, WINDY DAYS

10.1. Speed of evaporation is affected greatly by temperature and air movement. On a hot, windy day, evaporation can increase more than 10 times. Coating a hot pipe will worsen the effect too.

11. DON'T USE TOO SMALL A BRUSH

11.1. The time taken to coat the surfaces is obviously important. A small brush is supplied with many small cans of solvent cement for convenience. Do not attempt to coat large pipes with this. Buy a cheap large brush, and decant the cement into a tin – not more than required for one joint at a time.

11.2. A brush size 1/3 the pipe size is a good guide.

12. TOO MUCH SOLVENT CEMENT IS ASKING FOR TROUBLE

12.1. Solvent cements are exactly what the name says -solvents. They dissolve PVC. Clearly if you apply enough they will dissolve the pipe. Pooling of cement at the bottom of the joint at the root of the socket can significantly weaken the socket at that point.

The effect is worse on thin walls. Some authorities suggest that only the front half of the inside of the socket be coated for pipes up to 40mm, but watch the other factors.

13. TOO LITTLE SOLVENT CEMENT IS ASKING FOR TROUBLE

13.1. At the same time, insufficient cement can cause problems too, bearing in mind the previous factors. How much is too much? How much is not enough? Experience comes in here strongly. It depends on all the

other factors. Pipe size, temperature, fit. Larger pipes have larger tolerances and require a thicker layer. Test the fit. A double layer is advisable if the fit is a loose one (don't be fooled by ovality) or the solvent cement is not very viscous. Viscosity changes with temperature.

14. HOLD THE JOINING FORCE FOR 30 SECONDS

14.1. Whilst the action of solvent cement is quite fast, it stands to reason that the surfaces must not move relative to each other during the "knitting" period. The taper on the socket can "expel" the spigot, even minutely, from the socket.

15. DO NOT MOVE JOINTS FOR 5 MINUTES

15.1. After this, no external strain should be placed on the joint until significant strength is developed.

16. DO NOT STRAIN JOINTS FOR 24 HOURS

16.1. Even then it is not all over. Solvents evaporate slowly from the interface and strength develops slowly. At least 24 hours should elapse before pressure testing and longer if slow drying cement is used. The times above depend on temperature and humidity. Curing will be very much retarded if the pipe is filled with water.

17. DON'T JOINT WARM PIPES

17.1. One trap is to joint warm pipe from the side of the trench, and place it immediately in the cool trench. Contraction of the pipe is considerable and places the joint under axial strain. Leave the pipe in the trench before jointing for a suitable period depending on thickness, 5 minutes per mm of wall.

18. KEEP THE LID ON THE CAN

18.1. Solvents evaporate at various speeds and the constituents of a can of cement change if it is left open. It will get thicker and may even go "stringy". It's no good stirring it up the vital fast solvents are gone. Throw it away (disposing of it properly of course).

19. DON'T USE SOLVENT OVER 12 MONTHS OLD

19.1. After long periods of time the constituents can change even through a "sealed" can. When opening a new or used can inspect the contents carefully.
19.2. Check the "use by" date and discard if expired.