PIPA
PLASTICS INDUSTRY PIPE ASSOCIATION OF AUSTRALIA LIMITED

INDUSTRY GUIDELINES - PVC

POP102

Solvent Cement Jointing of PVC Pipe

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1. INTRODUCTION

Solvent cement jointing (also referred to as solvent welding) is a common jointing method for plastic pipe and fittings systems. It is used for both pressure and non-pressure applications and has proven long term performance. The principle of solvent cement jointing is simple. However, to achieve strong, leak-free joints for PVC systems, it is recommended that the procedures outlined in this technical guideline are followed.

Unplasticised PVC (PVC-U) is the most common plastic pipe material routinely joined using the solvent weld process. However, other plastic pipe materials such as ABS, ASA, PVC-M, PVC-O and PVC-C also take advantage of this technique. It is important to only use the solvent cement and priming fluid applicable to the pipe material you are joining.

2. COLOUR IDENTIFICATION

Solvent cement types and priming fluid are colour coded for easy identification.

- **Type P** is for pressure applications, including potable water installations, designed to develop high shear strengths with an interference fit joint geometry (GREEN for Pressure PVC, GREY for ABS).
- **Type N** is for non-pressure applications, designed for joints which might not have an interference fit and where maximum strength is not a requirement. (BLUE for Non-Pressure PVC).
- **Type G** is for pressure or non-pressure applications, designed for its gap filling properties in parallel or clearance fit joints (CLEAR).
- **Priming fluid** is suitable for use in conjunction with Type P, N and G solvent cements (PINK).

Note: Each material requires a different type of solvent cement. Always use the correct solvent cement for the application.

Solvent cements designed for one type of pipe system may not achieve a good joint with a different system. Seek the advice of the supplier when joining these alternative materials.

3. HOW SOLVENT CEMENT WORKS

Solvent cement is a solution of resin in a mixture of solvents, which softens, swells, and dissolves the surfaces when applied to PVC pipes and fittings. When they are brought together the two surfaces bond into one solid material as they cure. **It is not a gluing process.**

IMPORTANCE OF PRIMING FLUIDS

Before applying the solvent cement, it is essential to use priming fluid to achieve a successful joint. The priming fluid not only prepares the surfaces being joined by cleaning and degreasing, but it also removes the glazed surfaces from the PVC. This process allows the solvent cement to permeate into the wall of the pipe or fittings. Priming fluid maximises the strength and longevity of the joint connection.

4. AUSTRALIAN STANDARDS

AS/NZS 1477: PVC pipes and fittings for pressure applications **and** ***AS/NZS 4765: Modified PVC (PVC-M) pipes for pressure applications*** specify the geometry of a tapered, interference-fit joint for solvent weld joints in pressure applications. These pipes and fittings should be joined using Type P solvent cements. The only exception is the case of larger diameter fittings (main diameter greater than DN150) where parallel sockets are permitted. These fittings are required to be labelled as having a parallel socket requiring the use of Type G, gap filling solvent cement.

PVC or PVC-M pipe and fittings or products not manufactured to AS/NZS 1477 or AS/NZS 4765 may not have the same joint geometry. If jointing pipes manufactured to another Standard, seek the advice of the supplier regarding which solvent cement should be used.

AS/NZS 1254: PVC-U pipes and fittings for stormwater and surface water applications and ***AS/NZS 1260: PVC-U pipes and fittings for drain, waste and vent applications*** specify tapered, interference-fit joints for pipes and either tapered or parallel type joints for moulded fittings. Pipes and fittings with tapered joints should be jointed with Type N solvent cement. Type G, gap filling cement is required when joining moulded fittings with parallel sockets and they are required to be labelled as such.

AS/NZS 3500 Plumbing and drainage Standards series provides that solvent cement shall not be used without priming fluid. Generally, the priming fluid is pink and conforming with AS/NZS 3879.

5. JOINTING PROCEDURE

Below outlines the key steps for a successful join.

Note: It is not possible to remake a solvent weld joint – it must be made right the first time.

1. PREPARE THE PIPE

Before jointing, check that the pipe has been cut square and all the burrs are removed from the inside and outside edge. Remove the sharp edge from the outside and inside of the pipe with a deburring tool. Do not create a large chamfer that will trap a pool of solvent cement.

Proper deburring of the pipe end avoids wiping the cement from the inside of the socket when the spigot is inserted to make the joint. Failure to properly deburr may result in inadequate pipe penetration and/or detrimental accumulation of solvent cement at the socket root. Remove all dirt, swarf, and moisture from spigot and socket.

Additional Tips:

- Cut the pipe using a fine-toothed saw and mitre box or circular saw with an abrasive disc. To ensure full interference fit, the last few millimetres of spigot count so the spigot must be cut square.
- Do not attempt to joint pipes at an angle. Curved lines should be jointed without stress, then curved after the joint is cured.

2. WITNESS MARK THE PIPE

It is essential to be able to determine when the spigot is fully home in the socket. Mark the spigot with a pencil line ('witness mark') at a distance equal to the internal depth of the socket.

Other marking methods may be used if they do not damage or score the pipe.

3. DRY FIT THE JOINT

Check the spigot and socket for an interference fit by dry fitting the joint. Any adjustments can be made now, not later. An interface fit must be reached between approximately one to two thirds of the socket depth determined by the witness mark position.

Note: An interface fit might not occur with non-pressure pipes. For pressure pipes the design is based on an interface fit between 10 and 90% of the socket length.

Do not attempt to make a pressure pipe joint that does not have an interference fit.

4. PREPARE WITH PRIMING FLUID

Priming fluid must be used to clean and prime all surfaces, it is vitally important to the jointing process. The priming fluid etches the PVC surface, removes the gloss, and softens for solvent cement's effective bond.

Ensure the spigot and sockets are clean and dry. Moisture contamination may lead to future joint failure.

Apply priming fluid to the spigot and socket with a lint-free cloth (natural fibres) dampened the joint with priming fluid. Always use the correct protective equipment.

5. BRUSH SELECTION

The brush should be large enough to apply the solvent cement to the joint in a maximum of 30 seconds.

Approximately one third the pipe diameter is a good guide. Do not use the brush attached to the lid for pipes over DN 100 in size.

Refer to Table 1 for Recommended size of brush.

For large diameter pipes, it may be necessary to decant solvent cement to an open vessel for a large brush to be used. Excess should never be returned to the can.

6. APPLY SOLVENT CEMENT

Using a suitably sized brush, apply a thin even coat of solvent cement to the internal surface of the socket first. Solvents will evaporate faster from the exposed spigot than from the socket, so the spigot should be coated last.

Special care should be taken to ensure that excess solvent cement isn't built up at the back of the socket as pools of solvent will continue to attack the PVC and weaken the pipe.

Next apply a similar even coat of solvent cement up to the witness mark on the spigot. Ensure the entire surface is covered.

A 'dry' patch will not develop a proper bond, even if the mating surface is covered, and may also make it difficult to obtain full insertion.

It is recommended to comply with all warnings and first aid notices displayed on container labels.

7. INSERT AND PUSH THE SPIGOT HOME

Make the joint immediately and in a single movement. Do not stop halfway, as the bond will start to set, and it will be almost impossible to insert further.

The spigot must be fully inserted to the full depth of the socket. The final 10% of spigot penetration is vital to the interference fit. Support the spigot clear of the ground when jointing, this will avoid contamination with soil or sand.

It may aid distribution of the solvent cement to twist the spigot into the socket so that it rotates about a 1/4 turn whilst (not after) inserting. Where this cannot be done, particular attention should be paid to uniform solvent cement application.

Mechanical force will be required for larger joints. Be ready in advance. Pipe pullers are commercially available for this purpose. Polyester pipe slings are very useful for gripping a pipe, to apply a winch or lever.

8. HOLD THE JOINT

Hold the joint against movement and rejection (i.e., pushback) of the spigot for a minimum of 30 seconds.

Disturbing the joint during this phase will seriously impair the strength of the joint.

9. WIPE OFF EXCESS SOLVENT CEMENT

For a neat professional joint, with a clean rag, immediately wipe off excess solvent cement from the outside of the joint.

10.CURE THE JOINT

Once the joint is made, do not disturb it for five minutes or rough handle it for at least one hour. Do not fill the pipe with water for at least one hour after making the last joint. Do not pressurise the line until fully cured.

The process of curing is a function of temperature, humidity, and time. Joints cure faster when the humidity is low, and the temperature is high. The higher the temperature, the faster the joints will cure.

As a guide for pressure applications, at a temperature of 16°C and above, 24 hours should be allowed, at 0°C, 48 hours is necessary.

Pressure testing can be completed once the joints have been cured and anchored properly.

6. WORKING WITH LARGE DIAMETER PIPES AND FITTINGS

Jointing of large diameter pipe and fittings (≥ DN150) in higher temperatures (above 30°C) should be performed in a shaded area, keeping the pipe surfaces cool. The appropriate selection of solvents is required, such as Type G solvents which are heavier bodied and lessens the effect of premature solvent evaporation. There are type N solvent cements available which are also heavier bodied, intended for large diameter joints.

It is also important to note that proper joint alignment during installation is critical and the use of specialised tools may be required to fully home larger diameter joints. Always select the proper size applicator and ensure the finished joint is not disturbed until cured.

7. TEMPERATURE

Special consideration should also be given to the temperature in which the joining will be performed. High temperatures may require a marginal increase in application thickness to allow for evaporation before the joint is made.

In cold weather, solvents penetrate and soften the plastic surfaces more slowly than in warm weather resulting in longer curing times. Prefabrication of the system in a heated and ventilated work area will also assist.

8. STORAGE

Solvent cement and priming fluids are highly flammable. When not in use, store them in a cool dry storage area, out of direct sunlight, away from heat and sparks. The product will experience chemical changes which will render it less effective if it is stored in places of high temperature. When storing an opened container, make certain the lid is firmly secured and sealed. PVC solvent cement and priming fluid have an expiration date. These dates indicate when the product will be at its most effective and are calculated from the date of manufacture. Discard product if expired or if it has changed in texture.

9. STANDARDS REFERENCES

AS/NZS 1254 *PVC-U pipes and fittings for stormwater and surface water applications*

AS/NZS 1260 *PVC-U pipes and fittings for drain, waste and vent applications*

AS/NZS 1477 *PVC pipes and fittings for pressure applications*

AS/NZS 2032 *Installation of PVC pipe systems.*

AS/NZS 3500 *Plumbing and drainage*

AS/NZS 3879 *Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS pipes and fittings*

AS/NZS 4441 *Oriented PVC (PVC-O pipes for pressure applications*

AS/NZS 4765 *Modified PVC (PVC-M) pipes for pressure applications*

HEALTH AND SAFETY

- Ensure directions on the containers of solvent cements and primers are followed at all times. Always refer to the manufacturer's Safety Data Sheets (SDS)
- Do not work in confined spaces without adequate ventilation. Forced ventilation may be necessary in confined trenches or manholes as solvent vapours are toxic and flammable.
- Do not add any ingredients to the solvent cement.
- They may be harmful if swallowed or inhaled. In some cases, may cause skin or eye irritation. If swallowed, give water to dilute, do not cause vomiting and seek medical attention immediately. Skin contact should be washed off immediately with soap and water and contact with eyes should be held opened and flooded with water for at least 15 minutes.

Table 1 – Recommended size of brush

DIAMETER SIZE OF PIPE (mm)	RECOMMENDED SIZE OF BRUSH
15-50	Use brush supplied
65-80	Use brush supplied
100-125	38
150	50
200	63
225-250	75
300-375	100

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