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INDUSTRY GUIDELINES
POP102
Solvent Cement Jointing of PVC Pipe

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SOLVENT CEMENT JOINTING OF PVC PIPE

1.0 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.

2.0 APPLICATIONS & IDENTIFICATION

Solvent cement types and priming fluids are colour-coded according to their application for easy identification.

Type P is for pressure applications

- Applicable pipe standards: *AS/NZS 1477: PVC pipes and fittings for pressure applications AS/NZS 4765: Modified PVC (PVC-M) pipes for pressure applications*. These standards specify the geometry of a tapered, interference-fit joint for solvent weld joints in pressure applications.
- Suitable for drinking water installations.
- Colour: GREEN for Pressure PVC

Exception: Fittings with a nominal diameter greater than DN150 may be manufactured with parallel sockets. These fittings shall be clearly labelled to indicate that they incorporate a parallel socket and require the use of Type G gap-filling solvent cement.

Note: PVC pipes, fittings, or products not manufactured in accordance with AS/NZS 1477 or AS/NZS 4765 may have differing joint geometries. When jointing pipes manufactured to an alternative Standard, advice should be sought from the supplier regarding the appropriate solvent cement to be used.

Type N is for non-pressure applications

- Applicable pipe standards 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*. These standards specify tapered, interference-fit joints for pipes and either tapered or parallel type joints for moulded fittings.
- Colour: BLUE is for non-pressure PVC
- Designed for joints that may not have an interference fit and where maximum joint strength is not required.

Exception: Type G gap-filling solvent cement is required when joining moulded fittings with parallel sockets. Such fittings shall be clearly labelled to indicate this requirement.

Type G is for pressure or non-pressure applications

- Colour: CLEAR
- Designed for its gap filling properties in parallel or clearance fit joints.

Priming fluid

- Colour: PINK
- Suitable for use in conjunction with Type P, N and G solvent cements

Note: Clear priming fluids are available for aesthetic purposes but are not included in the WaterMark scheme and therefore non-compliant for plumbing applications.

Note: Each pipe system 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.

3.0 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 prepares the surfaces being joined by cleaning and degreasing and removes surface gloss. This process allows the solvent cement to permeate into the wall of the pipe or fittings. Priming fluid is critical to optimal strength development and longevity of the joint.

4.0 JOINTING PROCEDURE

Prior to jointing please take note of the following health and safety notices:

- Check expiry dates on priming fluid and solvent cement containers – refer to section 8.
- 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.
- Always use the recommended personal protective equipment.
- Solvent cements and primers may be harmful if swallowed or inhaled. In some cases, may cause skin or eye irritation. Refer to manufacture's SDS.

The following key steps should be followed for a successful joint.

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

1. PREPARE THE PIPE

Check that the pipe spigot has been cut square. Remove burrs and any sharp edges 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.

Failure to properly deburr may result in inadequate pipe penetration and/or excessive accumulation of solvent cement at the socket root. 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 between non-pressure pipes and fittings. For pressure pipes and fittings, the design is based on an interface fit between 10 and 90% of the socket length. With the exception of moulded pressure fittings with parallel sockets.

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

4. PREPARE WITH PRIMING FLUID

Ensure the spigot and socket jointing surfaces are clean and dry. Moisture or dirt contamination may lead to joint failure.

Apply priming fluid to the spigot and socket with a lint-free cloth dampen the joint surfaces with priming fluid.

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.

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

6. APPLY SOLVENT CEMENT

Firstly, apply a thin even coat of solvent cement to internal surface of the socket. Start at the root of the socket, brushing the solvent cement toward the mouth. This technique will help to minimise solvent cement pooling at the root of the socket post spigot insertion.

Note: Special care should be taken to prevent excess solvent cement from accumulating at the back of the socket. Pooled solvent can continue to attack the PVC, leading to localised softening and, in certain conditions, may contribute to environmental stress cracking (ESC). For more information refer to section 5.

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.

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 (up to the witness mark). 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.

Where practical, solvent cement distribution may be aided by applying a ¼ turn twist to the spigot or socket just prior to reaching full insertion depth.

Note: Larger diameter joint (≥ DN150) -mechanical aids will be required for larger joints. Be ready in advance with the appropriate equipment. Pipe pullers / come-a longs are commercially available for this purpose. Polyester pipe slings are very useful for gripping a pipe, to apply a puller/ come along. Refer to sections 6 for further details.

8. HOLD THE JOINT

Hold the joint in position for a minimum of 30 seconds to prevent pipe spigot movement.

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.

Avoid bending or twisting of the pipe by allowing the pipe to lie undisturbed on a flat ground.

Keep pipe ends open for ventilation for at least 24 hours.

Do not fill the pipeline with water for at least one hour after making the last joint. Do not pressurise the pipeline for at least 24 hours after making the last joint.

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.

5.0 SOLVENT CEMENT POOLING AND ENVIRONMENTAL STRESS CRACKING (ESC)

Pooling typically occurs when surplus solvent cement accumulates at the lowest point in the socket. In smaller diameter pipes (less than DN80), the risk of localised softening and possible environmental stress cracking is higher due to the higher solvent cement-to-internal air volume ratio and restricted airflow, which slows solvent evaporation. In larger pipes (greater than DN80), the increased internal air volume allows solvent vapours to disperse more easily, reducing the risk of over-softening.

Environmental Stress Cracking (ESC)

Environmental Stress Cracking can occur when a polymer under stress is exposed to a chemical environment that accelerates crack initiation and propagation. In PVC, residual stresses from pipe extrusion or installation, when combined with aggressive solvents, can trigger ESC. The pooling of solvent cement at the socket bottom increases both solvent concentration and contact time, making the localised area more susceptible to cracking under internal pressure or external loads.

Effect of Ambient Temperature and Pipe Size

Cure time varies with temperature and pipe diameter. The risk of over-softening is greater in small diameter pipes and at low ambient temperatures if excess solvent cement is pooled in the back of the socket. Small pipes are more prone to solvent saturation due to low internal air volume compared to large pipes which allow faster vapour dispersion. Vapour dispersion is also significantly slowed at ambient temperatures below 5C.

Best Practices

To minimise the risks of over-softening and environmental stress cracking, the following practices should be followed:

- Apply a uniform, thin coat of cement to both spigot and socket.
- Prevent excess cement from accumulating at the socket bottom.
- Allow sufficient curing time with consideration for the ambient temperature and pipe size before pressurisation (typically 24 hours or more).
- Use the correct solvent cement type: Type P for pressure systems, Type G for gap-filling, and Type N for non-pressure applications.

Proper attention to ambient temperature, pipe size, and jointing technique is essential to ensure joint integrity, avoid localised softening, and prevent environmental stress cracking.

6.0 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.

7.0 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.

8.0 CCTV INSPECTION OF SOLVENT WELDED PIPES

Closed-circuit television (CCTV) inspection is now a standard method for assessing the condition of installed infrastructure. The use of high-definition cameras, advanced lighting, and enhanced magnification has greatly improved the ability to examine internal pipe surfaces. However, these technological advancements can also increase the likelihood of misinterpretation, where harmless visual effects—such as solvent cement smearing—may appear more significant than they actually are.

Excess cement forming a thin, partially translucent smear in non-pressure pipes should not be considered pooling. On CCTV inspections, these smears may appear extensive, but they do not reduce joint strength or compromise the integrity of the installation. Images 1-3 below are examples of solvent cement smearing in DN150 PVC-U DWV pipe as observed during CCTV inspection of the pipeline. In all cases, smears are located at the invert (bottom) of the pipe.

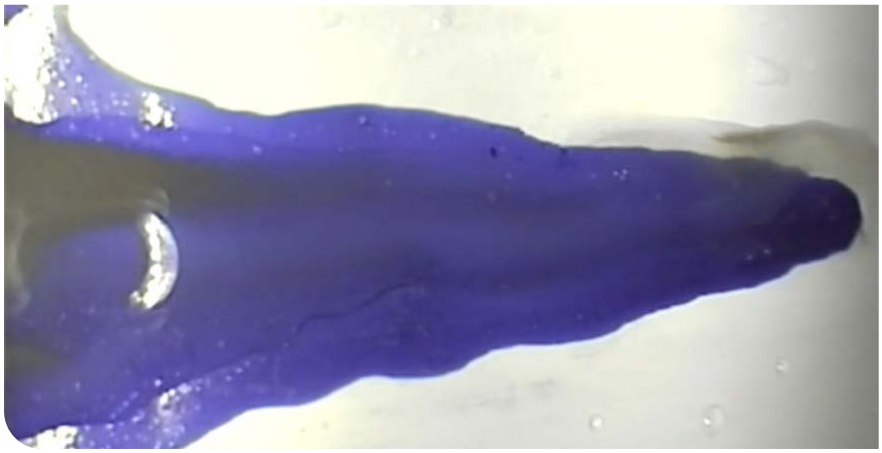

Image 1

Image 2

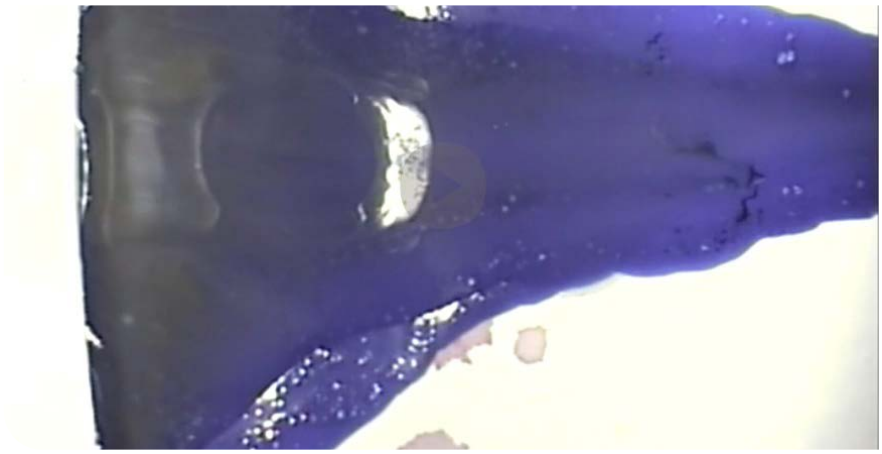

Image 3

Other factors to consider during CCTV inspection are the pipe diameter and application, where the potential adverse effects of excessive pooling are reduced in the case of non-pressure pipelines, DN150 and above.

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 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*

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