Durapipe PVC-U Jointing Guide

The cold solvent welding using 'Solvent Cement' is the standard procedure for jointing PVC-U pipes and fittings. The solvent cement operation is carried out by using solvent made from PVC-U polymer together with a mix of solvents. This mix of solvents softens the walls of the pipes and fittings and carries out the welding, resulting in a mating of two surfaces.

Durapipe PVC-U pipes and fittings are designed for an interference fit. Although Durapipe PVC-U solvent cement has good gap filling properties no attempt should be made to increase the clearance between the pipes and fittings.

Solvent cement welding offers a simple and quick means of constructing high integrity, leak-free joints.

The solvent cement operates by chemically softening the joint surfaces. Joint integrity will be greatly reduced if these surfaces are not clean and properly prepared.

Durapipe PVC-U solvent cement **must** be used.
The jointing procedure detailed below must be followed.

This relates to the new "one-step" solvent cement. With this cement it is not necessary to abrade pipe or fitting.

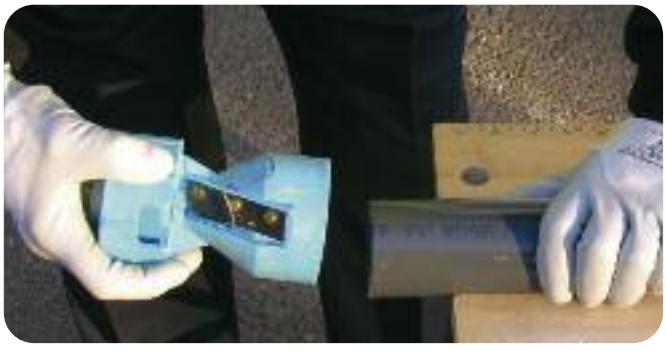
Procedure

1. The pipe must be cut clean and square. A suitable wheel cutter will eliminate swarf. As an alternative (and on larger sizes) a carpenters saw should be used, however this may create dust and swarf which can enter the system.



2. Chamfer the end of the pipe using a coarse file or suitable chamfering tool. The chamfer should be approximately 45° by 3mm to 5mm depending on the pipe size.

This operation is very important as non-chamfering can cause the solvent cement to be scraped away from the internal surface of the fitting, causing a poor joint.



Remove any dirt, grease or moisture. A thorough wipe with a clean, dry rag is usually sufficient. Check dry fit. Pipe should insert easily into socket, approximately 1/4 to 3/4 of the total socket depth.

3. Mark the pipe a known distance from the end and clear of the area to be cleaned. This mark should be used to confirm full insertion of pipe into socket of fitting.



4. Ensure joint surfaces are clean and free from moisture. Clean surfaces thoroughly with Durapipe Eco-cleaner using lint free cloth/paper towel.



5. Using a clean brush, apply cement to the pipe and fitting. The joint surfaces should be completely covered by cement.

Cement should be applied using an appropriate size brush and tin of cement. It is important to apply cement quickly to enable assembly without excessive force being required.
When applying cement with brush, the size of the brush should be approximately half the size of the pipe to be jointed - brush size up to 2 1/2" (63mm) for 0.5 litre and up to 3" (75mm) for 1 litre tins.

Note: Before commencing the solvent weld procedure, please check the expiry date of the solvent cement being used.



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6. Immediately after applications of cement, push pipe fully home into the fitting, as far as the internal stop, without rotation. After this operation, the fitting may be rotated if necessary for alignment (max. 1/4 turn). Hold the pipe and the fitting for times varying from a few seconds on sizes 1/2" or 20mm up to 1 minute on sizes 8" or 225mm and above. The slight taper moulded into the fitting may otherwise cause it to slide off the pipe with consequent loss of joint strength. Application of the correct amount of cement will result in a neat bead of cement at the edge of the fitting and at the edge of the pipe. Excessive deposits inside the fittings must be avoided as these can weaken the wall, particularly on smaller sizes.
When working under cold conditions make sure the joints are free from frost and moisture.



7. Wipe off excess cement from the outside of the joint.



8. Using the mark previously made, check that the pipe has been fully inserted.



9. Do not disturb the joint for at least 15 minutes after assembly. Allow sufficient drying time prior to pressurisation of the system (see page 18).

10. Replace lids on containers.

CAUTION

- **DO NOT use near naked flames**
- **DO NOT smoke in the working area**
- **DO NOT use in confined spaces**
- **DO NOT joint in the rain or wet conditions**
- **DO NOT use dirty brushes**
- **DO NOT use dirty or oily cleaning cloths**
- **DO NOT use the same brushes for different cements**
- **DO NOT dilute or decant Durapipe PVC-U solvent cement**
- **Follow safety instructions on Durapipe solvent cement and Eco-cleaner containers**
- **Always wear appropriate personal protective equipment**

Notes:

1. The integrity of Durapipe PVC-U systems may be affected if Durapipe PVC-U solvent cement or HCR-36 chemically resistant cement is not used. Durapipe UK disclaims responsibility for any Durapipe PVC-U system constructed with any other cements or not fabricated in accordance with the instructions contained herein.
2. On sizes 6" or 160mm and above use 3" wide brushes and 1 litre tins of cement.
3. To achieve the correct speed of application on sizes 4" or 110mm and above, cement should be applied simultaneously to pipe and fitting, by two people.
4. Application of the correct amount of cement will result in a neat ring of cement at both ends of the joint.
5. Where PVC-U pipework is to be used to convey concentrated chemicals please refer to page 18 for details on HCR-36 chemically resistant cement.
6. Durapipe have produced a series of videos demonstrating the correct jointing procedures for the various pipework systems. Please visit **www.durapipe.co.uk/Technical/Video/Index.asp**

Branch connections - Reduced bore

Reduced branch connections can be made as follows:
Imperial range:
Bushed equal tees or Y-Pieces.
Metric range:
Bushed equal tees, Y-Pieces or bolt-on saddles.

Drying times

The drying times will vary with fit, amount of solvent cement applied, ambient temperature and working pressure. It is recommended that, wherever possible, joints of sizes up to 8"/225mm are allowed to dry for at least 24 hours, and sizes 10" and 12"/250mm and 315mm for at least 48 hours.
These guidelines are based on an ambient temperature of between 10°C to 40°C. Longer drying times will be required at lower ambient temperatures.

It is recognised that there will be occasions when the system will need to be put into service within a few hours of being made.
A rough but safe working guide where the ambient temperature is between 10°C to 40°C and the contents temperature does not exceed 20°C is as follows:

Size Range	Drying time
Up to 4"/Up to 125mm	1.0 hour/bar
5" & 6"/140mm & 160mm	1.5 hours/bar
8"/200mm & 225mm	2.0 hours/bar
10 & 12"/250mm & 315mm	30 hours minimum

Note: Minimum drying period should never be less than 1 hour.

The consumption of solvent cement for carrying out the jointing depends on different elements (ambient conditions, pipe dimensions, viscosity of the cement, workers' experience etc).

An indication of the number of joints likely to be made per litre of Durapipe PVC-U solvent cement is as follows:

Size mm	Size imperial	Joints per litre PVC-U
12 - 32	3/8 - 1	300
40 - 63	1 1/4 - 2	120
75 - 90	3	50
110 - 125	4	30
140 - 160	6	15
200 - 225	8	8
280 - 315	10 - 12	3

The solvent cement is made with PVC-U resin.

HCR-36 Chemically resistant PVC-U cement

For PVC-U applications with the following chemicals we recommend the use of HCR-36 (Product code **03 468 396**, can be found on pages 52 and 76), a chemically resistant version of our PVC-U One-step solvent cement. Always use the appropriate cleaner (Product code **03 467 395**) when using this chemical resistant cement.

Sulphuric acid	concentration higher than 70%
Hydrochloric acid	concentration higher than 25%
Nitric acid	concentration higher than 20%
Hydrofluoric acid	each concentration
Sodium hypochlorite	active chlorine higher than 7.5%
Lyes, bases (caustic soda)	concentration higher than 35%

Maximum gap 0.3mm	Maximum pressure
20°C	12 bar
50°C	6 bar
60°C	4.5 bar
80°C	1.5 bar

Maximum pressure depends also on the pipe system used and PN class.

Instructions for use

1. Cut the pipe at right angles to its axis and chamfer it.
2. Clean surfaces to be welded together with HCR chemically resistant cleaner. Check dry fit. Pipe should insert easily into socket, approximately 1/4 to 3/4 of the total socket depth.
3. Apply solvent cement quickly in a thin and even coat into the fitting, and a thicker coat on the pipe-end, stroking the cement along and not round the surface.
4. If the solvent cement must fill a gap, a second (after 30 sec.) or even a third layer of the solvent cement can be necessary.
5. Immediately push the joint together and hold for a moment in this position. Remove any surplus cement. Do not charge the joint mechanically for the first 10 minutes. Do not use the solvent cement below temperatures of 5°C.

The use of bushes and reducers

Reducing bushes

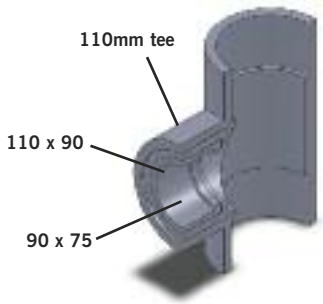
Reducing bushes offer a neat and simple method of reducing socket size in the minimum of space.
Care must be taken to prepare properly all jointing surfaces as recommended earlier, with the end of the bush being chamfered (unless a moulded chamfer is included).

Ensure that adequate solvent cement is applied to surfaces to be jointed. The shape of the bush can make it difficult to hold when applying cement to the outer surface. A short length of pipe pushed into the bush can be used as a handle, to make this operation easier.

The correct amount of solvent cement will result in a complete ring of cement being formed at both ends of the joint.

The use of reducers

All fittings have female ends, dimensionally controlled for cold fusion jointing. In addition the metric series reducers are provided with controlled outside diameter at the large end. They can therefore be used as male or female components as shown.



Example in the use of reducing bushes.

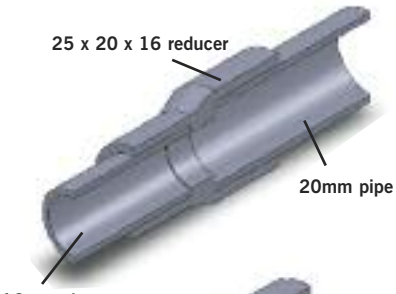


Illustration shows use of the inner socket of the reducer.

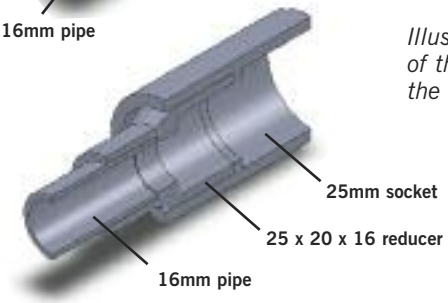


Illustration shows use of the outer spigot of the reducer.

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Threaded connections

Connections - plastics to metal

There are several recommended methods to connect metal and plastic systems:
Composite unions
Flanges
Male threaded fittings
Female threaded fittings

Plastics expand or contract more than metals for any given change in temperature. The practice of connecting plastic threaded fittings to metal threads is not recommended where the joint is likely to experience a temperature change of more than +/-5ºC, otherwise leaks may occur.

Composite unions are available with brass male or female BSP threaded adaptors.
If it is required to cut a thread on to Durapipe PVC-U pipe, use a sharp die especially reserved for plastic pipes and cut full thread depth without lubricant, in one operation.

This should only be attempted on pipe sizes up to 2" n.b. Class T pipe must be used. Pipes from Durapipe PVC-U metric range are not suitable for threading.

Assembly should be carried out by hand and final tightening by a strap wrench, if necessary.

Extra care must be taken not to overtighten or damage the thread. **Pipe wrenches must not be used.**

It is recommended that PTFE tape be used when making threaded joints/connections.

Any other sealing compound must be confirmed by Durapipe UK as being suitable.

'Boss White' and anaerobic adhesive sealants, such as Loctite 542 and 572, can chemically attack PVC-U and must **not** be used.

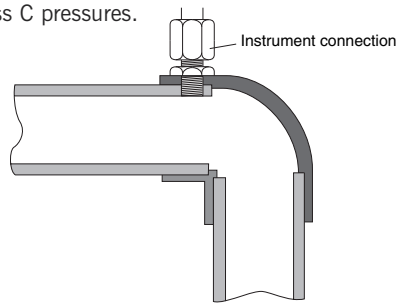


Connections for instrumentation

Instrumentation connections can be made by drilling through pipe and socket where the material is at its thickest and tapping the hole to receive a threaded fitting, as shown below:

Pipe size	Size of connection
16mm-63mm/3/8"-2"	Use tees, reducing bushes and threaded fittings
75mm-110mm/2 1/2"-4"	Max. tapping 1/2" BSP
125mm-140mm/5"	Max. tapping 3/4" BSP
160mm & above/6" & above	Max. tapping 1 BSP

Such connections, if correctly drilled and tapped with a full thread form, will be limited to Class C pressures.



Flanged joints

Full face flanges are available from 1/2" to 6" and 25mm to 110mm. Stub flanges are available from 2" to 12" and in metric sizes from 20mm to 315mm.

The correct galvanised mild steel backing ring and rubber gasket must be used with both types.

Flange bolting procedure

The following procedure is recommended for installing Durapipe PVC-U flanges:

1. Inspect flange faces and ensure that they are clean and undamaged.
2. Check that the correct backing ring and rubber gaskets have been supplied. Durapipe UK supplies a matched system of flanges and backing rings - do not interchange Metric and Imperial components.
3. Loosely assemble flanges. Ensure that flanges and bolt holes align and that the flange faces are parallel. Ensure that the gasket is correctly positioned between the flanges.
4. Ensure that the appropriate sized washer are placed under both bolt heads and nuts.
5. Tighten the nuts and bolts in a diagonally opposite sequence (see below) to ensure even loading around the flange to avoid distortion. It is recommended that the nuts and bolts be tightened as uniformly as possible progressively from a finger tight start.
6. Repeat as necessary until recommended torque value at all bolts is achieved.

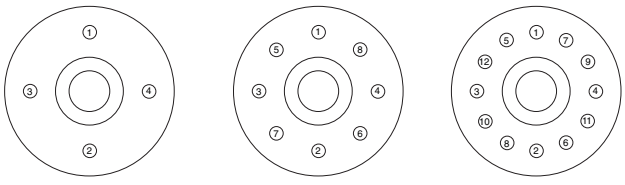
Tightening torques for flange bolts in PVC-U piping systems

Recommended Torque Values (Nm)

Size	Torque
16	15
20	15
25	15
32	15
40	20
50	30
63	35
75	40
90	40
110	40
125	50
140	50
160	60
200	70
225	70
250	80
315	100

The tolerance on torque is +/- 10%

Tightening sequence



Comparison of PVC-U Imperial and Metric Sized Pipe

Tabulated below is a comparison of imperial sized PVC-U pipe to BS3505 and metric sized pipe to EN 1452-2. They are produced to different standards, but can be joined together using flanges or adaptors.

The systems are also designated differently; the imperial system refers to the nominal bore size; the metric system relates to the outside diameter.

Both systems are produced with the outside diameter as the controlled dimension. This enables the same fitting of a particular size to be joined to all classes of pipe in that size.

Please refer to the pipe section in this brochure for pipe sizes available from Durapipe UK.

Threaded systems
Imperial systems Class 7 pipe can be machined to BSP parallel or BSP taper thread forms. Metric pipe is not produced with an outside diameter suitable for threading.

Imperial System (BS 3505)							Metric System (EN 1452-2)				
Size (nominal bore) (inch)	Minimum mean outside diameter (mm)	Minimum wall thickness (mm)					Size outside diameter (mm)	Min. mean outside diameter (mm)	Min. wall thickness (mm)		Design Coefficient
		Class B	Class C	Class D	Class E	Class 7			PN10	PN16	
3/8	17.0				1.5	3.2	16	16.0			2.5 up to 90mm
1/2	21.2				1.7	3.7	20	20.0		1.5	
3/4	26.6				1.9	3.9	25	25.0		1.9	
1	33.4				2.2	4.5	32	32.0	1.6	2.4	
1 1/4	42.1				2.7	4.8	40	40.0	1.9	3.0	
1 1/2	48.1			2.5	3.1	5.1	50	50.0	2.4	3.7	
2	60.2		2.5	3.1	3.9	5.5	63	63.0	3.0	4.7	
2 1/2	75.2		3.0	3.9	4.8		75	75.0	3.6	5.6	
3	88.7	2.9	3.5	4.6	5.7		90	90.0	4.3	6.7	
4	114.1	3.4	4.5	6.0	7.3		110	110.0	4.2	6.6	2.0 from 110mm
							125	125.0	4.8	7.4	
5	140.0	3.8	5.5	7.3	9.0		140	140.0	5.4	8.3	
6	168.0	4.5	6.6	8.8	10.8		160	160.0	6.2	9.5	
							180	180.0	6.9	10.7	
							200	200.0	7.7	11.9	
8	218.8	5.3	7.8	10.3	12.6		225	225.0	8.6	13.4	
10	272.6	6.6	9.7	12.8	15.7		250	250.0	9.6	14.8	
12	323.4	7.8	11.5	15.2	18.7		315	315.0	12.1	18.7	

Properties guide

Chemical resistance and performance data	Typical applications	Unsuitable for the following uses	Sizes and jointing information
Strong mineral acids Caustic and ammoniacal solutions Some organics Most detergents Temperature range +5ºC to 60ºC	Chemicals, potable water, general purpose water, waste water etc.	Aromatic solvents temperatures below 0°C temperatures over 60°C	Pipe and fittings for solvent welding manufactured in metric sizes 12mm to 315mm to DIN and ISO standards and 3/8" to 12" British Standards. Threaded fittings also available.

Note: Temperatures given are for guidance only, please check before specifying.

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General Information

Handling and storage

The high impact strength of Durapipe PVC-U systems provides some protection against damage but care should be taken at all stages of handling, transportation and storage.

Pipe must be transported by a suitable vehicle and properly loaded and unloaded, eg., wherever possible moved by hand or mechanical lifting equipment. It must not be dragged across the ground.

The storage should be flat, level and free from sharp stones.

Lengths

Pipe lengths stored individually should be stacked in a pyramid not more than one metre high, with the bottom layer fully restrained by wedges. Where possible, the bottom layer of pipes should be laid on timber battens at one-metre centres. On site, pipes may be laid out individually in strings. (Where appropriate, protective barriers should be placed with adequate warning signs and lamps.)

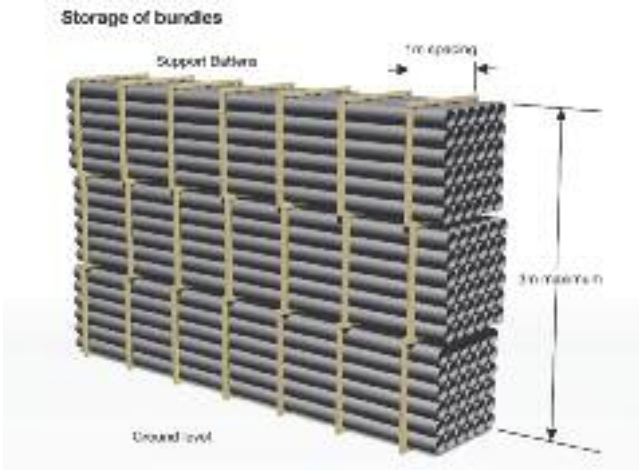


Bundles

Bundled packs of pipe should be stored on clear, level ground with the battens supported from the outside by timbers or concrete blocks. For safety, bundled packs should not be stacked more than three metres high.

Smaller pipes may be nested inside larger pipes. Side bracing should be provided to prevent stack collapse.

Similar precautions should be taken with fittings and these should be kept in protective wrappings until required for use.



Health and Safety at Work Act and COSHH Regulations

Attention is drawn to the requirements in the UK of this Act and to the Control of Substances Hazardous to Health (COSHH) Regulations. Durapipe UK cannot accept responsibility for accidents arising from the misuse of its products because of bad installation or incorrect application.

Material safety data

Material Safety Data sheets are available on our website.

Filling and flushing

When purchasing chemicals for either flushing or long-term system use, suppliers should be advised that this is for PVC-U material. Guidance on the suitability of various system flushing or filling fluids with PVC-U can be found in the Durapipe Chemical Resistance brochure, 04900004 for further details.

Testing

It is suggested that the following test procedure be followed, after joints have been allowed to dry for the appropriate minimum time (at least 24 hours up to 8"/225mm, sizes 10"/250mm and 12"/315mm require a minimum of 48 hours at 20°C).

The system should be divided conveniently into test sections.

Fill section with cold water making sure that no air pockets remain. Do not pressurise at this stage.

Check system for leaks. If none are apparent, check for and remove any remaining air. Increase pressure up to 3 bar. Do not pressurise further at this stage.

Leave section pressurised for 10 minutes. If pressure decays, inspect for leaks and rectify as necessary. If pressure remains constant, slowly increase the hydrostatic pressure to $1^1/_2$ times nominal operating pressure.

Leave section pressurised for a period not exceeding 1 hour. During this time pressure should not change.

Caution

Personnel must stand well clear when pressure testing systems. Similarly, under no circumstances should pressure tests be carried out using pressurised gases. Such a test could be extremely dangerous and serves no useful purpose.

Note: If extended times are required to achieve hydrostatic pressure, either leakage has occurred or air remains in the line. Inspect for leakage and if none is apparent, reduce pressure and check for trapped air. This must be removed before further pressurisation commences.

Colour

Durapipe PVC-U products are a grey colour, generally in accordance with BS5252, colour ref. RAL 7011.

Auto CAD drawings

Both 2D & 3D drawings of both metric and imperial products contained in this brochure are available either on our website www.durapipe.co.uk or via our technical support department.