WELD-ON®

THE WORLD'S MOST TRUSTED BOND

SOLVENT WELDING GUIDE

This guide describes the basic principles for solvent welding plastic pipe and fittings and gives recommended techniques for making high-strength joints in a wide variety of conditions.

THE WORLD'S MOST TRUSTED BOND

For 70+ years, Weld-On® has produced the most dependable, fail-proof solvent cements for use with PVC, CPVC, ABS pipe and fittings.

Each Weld-On® formulation has been developed for a specific application and is subject to the strictest quality control program in the industry. This program guarantees the most consistent and highest quality solvent cements commercially available.

Weld-On® solvent cements, primers and accessories are shipped worldwide to customers in such diverse fields as construction, agriculture, swimming pools and spas, water and wastewater, and manufacturing.

The solvent-welded connection in thermoplastic pipe and fittings are the last vital link in a plastic pipe installation. It can mean the success or failure of the system as a whole. Accordingly, it requires the same professional care and attention given to other components of the system.

This guide was developed to aid the installer in the proper techniques needed to join plastic pipes and fittings. The suggestions and data in this guide are based on information we believe to be reliable. Installers should verify that they can make satisfactory joints under varying conditions. Also, it is recommended that installers receive our free training from trained instructors or competent, experienced installers. **See Warning, Caution and Danger statements on pages 13-16 of this document. Contact us or your supplier for additional information or instructions.**

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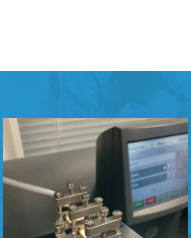


PROCEDURE FOR PIPE JOINING

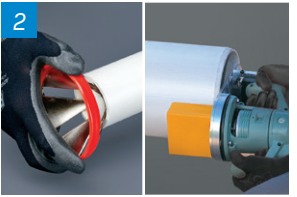
1. Prepare the Pipe:
Check that the pipe has been cut square and remove any burrs from the inside and outside edges.

Use a Weld-On® deburring tool to smooth the sharp edges both inside and outside the pipe.

Ensure the pipe and socket are free from dirt, swarf, and moisture.

Plastic pipe tubing cutters may also be used for cutting plastic pipe; however, these produce a raised bead at the end of the pipe. This bead must be removed with a Weld-On chamfering tool.

2. Chamfer the Pipe:
Use a proper deburring/ chamfering tool @ 10 - 22° to remove burrs on inside/ outside of the pipe. This process will chamfer and prepare pipe for welding.



3. Clean the Pipe:
With a clean, dry rag, remove any dirt, oil, shavings or moisture from the inside and outside of the pipe and fitting. A thorough wipe is usually sufficient.

Moisture will retard cure and dirt, oil, or any foreign material can prevent proper welding.

4. Mark the Pipe:
Create two witness marks: Using a marker create a first mark on the pipe, equal to the depth of the fitting socket. Next, place a second mark (2") further up the pipe. This second mark is used as a reference to ensure the pipe did not back out of the socket.

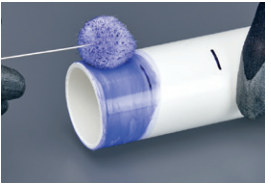
This first mark will help determine when the pipe is fully inserted into the socket bottom. The second mark will designate if the pipe moved back out of the socket during the cure time.

5. Dry Fit the Joint:
Insert the pipe into the socket (without primer or cement) to check for proper fit. Fit should not be too loose or too sloppy.

6. Use the Right Weld-On Applicator:
Select an applicator that is approximately half of the pipe diameter.

Before applying primer, vigorously shake or stir the cement. Primer is not required to be shaken or stirred.

7. Prime the Surfaces:
Using a proper size Weld-On® applicator, apply Weld-On primer to fitting socket (not less than 15 turns) then pipe then fitting socket. Do not allow primer to run down the inside or outside of the fitting or pipe.



Cold weather will require more reps. When PVC cement in the can falls below 41°F it becomes too thick to apply. At temperatures higher than 77°F, the application process must be carried out faster due to the faster evaporation of the solvents. (Refer to pages 11-12 for Cold & Hot Weather Tips")

8. Apply Solvent Cement:
Start by applying a uniform thick layer of solvent cement (4-6 turns) to the external surface of the pipe just slightly past the first witness mark.

Then apply a medium coating (uniform 4-6 turns), of solvent cement over the full socket depth.

Take care to avoid excess cement building up at the back of the socket.

If needed, add a second layer of cement to the pipe. Most joint failures are caused by insufficient application of cement.

9. Assemble:
Immediately and without delay assemble pipe and fitting in one smooth continuous motion until the pipe is fully inserted into the socket bottom.

10. Hold the Joint:
Hold the joint firmly for a minimum of 30 seconds to ensure a strong bond. In extremely cold conditions, hold the joint longer than 30 seconds. Avoid any movement or disturbance during this phase, as it can weaken the joint. If this happens, cut the joint and start the process over.

11. Visual Joint check (bead check):
After assembly, a joint should have a full and continuous bead of cement at the socket entrance. If voids (gaps) in this bead are visible, sufficient cement was not applied and the joint may be defective.

12. Wipe Off Excess Cement:
Use a clean dry rag to wipe off excess solvent cement immediately from the outside of the joint. This step ensures a neat and professional-looking joint.

The addition of primers, cleaners or other thinners to thin the viscosity of solvent cement is not allowed.

13. Allow Proper Curing Time:
Handle freshly assembled joints carefully until initial set has taken place. Follow Weld-On set and cures times before handling or hydrotesting piping system. *(Refer to set and cure time table on page 18)*

Curing Time: The joint's curing process depends on ambient temperature, humidity, and amount of time when last joint is made. Joints cure faster in low humidity and higher temperatures.

JOINING LARGE DIAMETER PIPE AND FITTINGS

(6 inch Diameter and Larger)

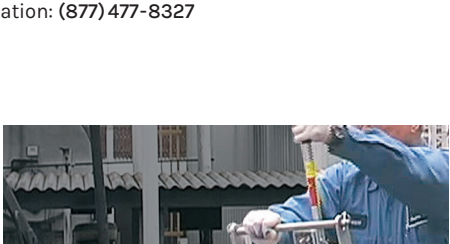
As pipe diameter increases, make sure to have a larger crew size to support applying primer and solvents correctly using a pipe puller. The professional installer should be able to successfully assemble large diameter pipe and fittings by following the Procedure for Pipe Joining instructions listed in the beginning of this guide along with the following additional recommendations.

1. The use of proper size applicators is even more necessary to ensure enough cement is applied to fill the larger gap that exists between the pipe and fittings.
2. Of equal importance is the use of the applicable cement for the size of the pipe and fittings being installed. We recommend the following:
   - Up to 12" PVC Sch 40 or Sch 80 - Weld-On® 711™ & 717™
   - Up to 30" PVC Sch 40 or Sch 80 - Weld-On® 719™
   - Up to 12" CPVC - Weld-On® 714™& 724™
   - Up to 24" CPVC - Weld-On® 729™
3. The end of pipe must be cut square and chamfered.
4. Suggested size of joining crew:
   - 6" - 8" : 2-3 people per joint
   - 10" - 30" : 3-4 people per joint

   It is important that large-diameter joining is done with an increased size crew.

5. Because of the short sockets in many large diameter fittings, **IT IS VERY IMPORTANT TO HAVE PIPE BOTTOMED INTO THE FITTING.** Large diameter pipe is heavy and can develop significant resistance during insertion before reaching socket bottom. For larger size piping above 110mm or 4" use the pipe-puller (such as the one pictured below).
6. Large diameter pipe and fittings require longer set and cure times. In cold weather, a heat blanket or heat lamps may be used to speed up the set and cure times. Applied heat shall not exceed 100.4° F.
7. Prefabricate as many joints as possible in warm environment.
8. If the pipe is to be buried, make as many joints as possible above ground, then after joints have fully cured, carefully lower into trench.
9. Never bury empty cans, brushes, or anything else containing solvent cement, primer, or cleaner into the pipe trench.

Contact Weld-On's Technical Service Department for further information: **(877) 477-8327**



CHEMICAL APPLICATIONS

The Installation of plastic pipes and fittings for chemical applications require a higher degree of skill and could be life-threatening if they fail. It is for this reason we recommend the following tips for these applications.

Tips for Installation:

1. Installers should attend a Weld-On® Installation Seminar.
2. Allow a minimum 48 hour cure time (depending on the chemical used). More cure time is always better in chemical applications.
3. Flush the system, per project engineer's instructions before putting it into service.
4. Installers should use extra care during assembly to ensure proper installation of system.
5. Make sure the proper cement for the specific application is used.
6. If there is any doubt about the compatibility of materials (pipe, fittings or cement) with chemicals in the system, manufacturers of materials should be contacted.

REPAIRS

For over seventy years, we have been manufacturing solvent cements and have had the opportunity to evaluate numerous joint failures, visit many job sites and witness numerous attempts at repairing leaking joints (most do not work).

Taking into consideration the cost of materials, time involved and labor costs, in most cases, the installer is better off cutting out the defective joint, replace it with new materials, and taking greater care in the joining process.

HELPFUL HINTS

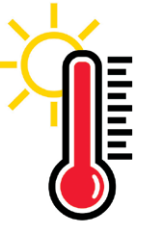
We are all aware that a properly cemented joint is the most critical part of the installation of plastic pipe and fittings. And no matter how many times we join pipe and fittings, it's very easy to overlook something. So, we just want to remind you of a few things you may already know.

1. Are you using the proper cement for the job – for the type and size of pipe and correct fittings being joined?
2. Do you need to take special precautions because of unusual weather conditions?
3. Do you have sufficient manpower? Do you need more help to maintain proper alignment and to bottom pipe in fitting?
4. Do you have the proper tools, applicators and sufficient quantities of Weld-On® cements and primer? Is cement in good condition?

   Do not add primer, cement, cleaners, or solvents of any kind to try to rejuvenate or thin the viscosity of solvent cements.
5. Primer is **NOT** to be used on ABS pipe or fittings.
6. Use a large enough applicator to quickly spread cement generously on pipe and medium coat in the socket. Then assemble immediately.
7. Avoid puddling cement inside the fitting socket, especially on thin wall, bell-end PVC pipe and ABS in any schedule.
8. **DO NOT** allow primer or cement to run through a valve-socket into the valve body. The solvents can cause damage to interior valve components and cause valve malfunction.
9. Be aware at all times of good safety practices. Solvent cements for pipe and fittings are flammable, so there should be no smoking, vaping or other sources of heat, spark or flame in working or storage areas. Be sure to work only in a well ventilated space and avoid unnecessary skin contact with all solvents.
10. Take advantage of our free literature on joining techniques. We offer videos on joining PVC/CPVC pipe and fittings, and individual bulletins. We also offer joining seminars and job site training.

    Call Weld-On Technical Service Department for more details at **(877) 477-8327**

JOINING PLASTIC PIPE IN HOT WEATHER



There are many occasions when solvent welding plastic pipe at 95°F (38°C) temperatures and above cannot be avoided. If special precautions are taken, problems can be avoided.

Solvent cements for plastic pipes contain high-strength solvents that evaporate faster at elevated temperatures, especially during hot winds. If the pipe is stored in direct sunlight, the pipe surface temperatures may be from 20°F to 30°F (10°C to 15°C) higher than the ambient temperature. Solvents attack these hot surfaces faster and deeper, especially inside a joint. Therefore, it is very important to avoid puddling the cement inside the fitting socket and to wipe off any excess cement outside the joint.

By following our standard instructions and using a little extra care, as outlined below, successful solvent-cemented joints can be made in even the most extreme hot weather conditions.

Tips to Follow when Solvent Welding in High Temperatures:

1. Store solvent cements and primers in a cool or shaded area before use.
2. If possible, store fittings, pipe, or at least the ends to be solvent welded in a shady area before cementing.
3. Cool the surfaces to be joined by wiping them with a damp rag. Make sure that the surface is dry prior to applying solvent cement.
4. Try to do the solvent welding during the cooler morning hours.
5. Make sure that both surfaces to be joined are still wet with cement when putting them together. With large-diameter pipe, more people on the crew may be necessary.
6. Using a primer and a heavier, high-viscosity cement will provide a little more working time. Vigorously shake or stir the cement before using it.

During hot weather, there can be a greater expansion-contraction factor. We suggest you follow the advice of the pipe manufacturer regarding this condition. Anchored and final connections should be made during the cooler hours of the day.

By using Weld-On® products as recommended and by following these hot weather tips, making strong, leakproof joints even during very hot weather conditions can be achieved.

JOINING PLASTIC PIPE IN COLD WEATHER

Working in freezing temperatures is always challenging. But sometimes the job is necessary. If that unavoidable job includes solvent welding plastic pipe, you can do it successfully with Weld-On® Solvent Cements.

By following our standard instructions and using a little extra care as outlined below, successful solvent-welded joints can be made at temperatures even as low as -15°F (-26°C). Solvents penetrate and soften the plastic pipe and fitting surfaces in cold weather more slowly than in warm weather. The plastic is more resistant to solvent attack. Therefore it becomes even more important to soften surfaces with an aggressive primer. Because of 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 when Solvent Welding in Cold Temperatures:

1. Prefabricate as much of the system as is possible in a heated work area.
2. Store cements and primers in a warmer area when not in use and make sure they remain fluid. If possible, store the fittings & valves the same way.
3. Take special care to remove moisture, including ice and snow, from the surfaces to be joined, especially from around the ends of the pipe.
4. Use the most aggressive Weld-On Primer to soften the joining surfaces before applying cement. More than one application may be necessary.
5. Vigorously shake or stir cement before using. Allow a longer cure period before the system is tested and used. (A heat blanket may be used to speed up the set and cure times.)
6. Read and follow all of our directions carefully before installation.

All Weld-On cements are formulated to have well-balanced drying characteristics and to have good stability in subfreezing temperatures.

For all practical purposes, good solvent-welded joints can be made in very cold conditions with proper care and a little common sense.

⚠ CAUTION WARNINGS ⚠

For over 70 years, millions of solvent welded joints have been made with only rare cases of mishap. However, since flammable and toxic solvents are part of these products, appropriate safety precautions should be used.

Keep out of reach of children.

All solvent cements and primers for plastic pipe are flammable and should not be used or stored near heat, spark, open flame and other sources of ignition. Vapors may ignite explosively.

Solvent cement vapors are heavier than air and may travel to source(s) of ignition at or near ground or lower level(s) and flash back. Keep container closed when not in use and covered as much as possible when in use.

Where plastic pipe is being installed or has recently been solvent welded, extreme caution should be taken when using welding torches or other spark generating equipment. Flammable vapors from cemented joints sometimes linger within or around a piping system, especially in well casing, elevator shafts and other confined areas.

Remove solvent vapors by air circulation, purging, or other means prior to the use of welding torches, or other spark or flame generating equipment or procedures.

Avoid breathing of vapors. Use only in well-ventilated area. If confined or partially enclosed, use forced ventilation. When necessary, use local exhaust ventilation to remove harmful airborne contaminants from employee breathing zone and to keep contaminates below 25 ppm TWA.

Atmospheric levels must be maintained below established exposure limits contained in Section II of the Material Safety Data Sheet (MSDS). If airborne concentrations exceed those limits, use of a NIOSH approved organic vapor cartridge respirator with full face-piece is recommended. The effectiveness of an air-purifying respirator is limited. Use it only for a single short-term exposure. For emergency and other conditions where short-term exposure guidelines may be exceeded, use an approved positive pressure self-contained breathing apparatus.

⚠ CAUTION WARNINGS ⚠

Do not smoke, eat or drink while working with this product. Avoid contact with skin, eyes and clothing. Wash clothing if contaminated and before reuse.

May cause eye injury. Protective equipment such as gloves, goggles and impervious apron should be used.

Do not take internally. Carefully read Material Safety Data Sheet and follow all precautions.

Do not use this product for other than intended use.

Weld-On solvent cements must never be used in a PVC or CPVC system using or being tested by compressed air or gases. Pressurized (compressed) air or other compressed gases contain large amounts of stored energy which present serious safety hazards should a system fail for any reason.

Do not use any type of dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introduction of granules or pellets of calcium hypochlorite with PVC and CPVC solvent cements and primers (including their vapors) may result in a violent chemical reaction if a water solution is not used. It is advisable to purify lines by pumping chlorinated water into the piping system – this solution will be nonvolatile. Furthermore, dry granular calcium should not be stored or used near solvent cements and primers.

All systems should be flushed before start-up to remove excess fumes from piping system.

New or repaired potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652.

SAFETY CAUTIONS AND SPECIAL CONSIDERATIONS

1. Proper workmanship and adherence to correct procedures are essential for durable solvent joints. Note that specific guidelines and standards mentioned, such as ISO/EN or ASTM should be referenced for accurate installation.
2. Always ensure that dry-fit joint have a net fit and not too loose or a sloppy fit between the pipe and socket.
3. Store solvent cement and priming fluids in a cool place away from heat, flames, and sparks.
4. Wear proper protective hand gloves when applying solvent cement to prevent skin contact. Please refer to the Weld-On GHS guide.
5. Do not smoke, vape or use any open flame product. Lastly, do not eat or drink around the solvent welding process.
6. Follow safety precautions and first aid instructions in case of accidental contact.

Scan QR Code for Weld-On products Safety Data Sheet library.

FIRST AID

Inhalation: If ill effects occur from inhalation, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Eye Contact: Flush abundantly with flowing water for 15 minutes and call a physician.

Skin Contact: Wash skin with plenty of soap and water for at least 15 minutes. If irritation develops, get medical attention.

Ingestion: If swallowed, give 1 to 2 glasses of water or milk,

DO NOT INDUCE VOMITING. Contact a physician immediately.

SPECIAL PRECAUTIONS

AS A GENERAL RULE, WELD-ON® SOLVENT CEMENTS SHOULD NOT BE USED IN A PVC OR CPVC SYSTEM USING OR BEING TESTED BY COMPRESSED AIR OR GASES!

NOTE: Pressurized (compressed) air or other compressed gases contain large amounts of stored energy which present serious safety hazards should a system fail for any reason.

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USE CAUTION AROUND TORCHES, GRINDERS OR ANY OTHER TYPE OF FLAME OR SPARK GENERATING DEVICE ON JOBSITES

Extreme caution should be taken around plastic pipe being installed or where it has been recently installed on a jobsite. Flammable vapors will linger for some time in low areas (e.g., elevator shafts, well casings, small confined rooms, basements, large diameter vertical piping, etc.).

Special care must be taken when using a welding torch in these installations:

A. Well casing, elevator shafts and other confined areas.

B. Installing pumps in irrigation water lines.

C. Plastic pipe systems in industrial plant areas with little or no air circulation.

In all cases, solvent vapors must be removed by air circulation, purging, or other means prior to the use of welding torches, or other spark or flame generating equipment or procedures.

PRODUCT SELECTION GUIDE

PRODUCT TYPE:	*REGULAR BODIED CEMENT* For Pipe Size Up to 4 inches	*MEDIUM BODIED CEMENT* For Pipe Size Up to 6 inches	*HEAVY BODIED CEMENT* For Pipe Size Up to 12 inches	*EXTRA HEAVY BODIED CEMENT*  For Pipe Size Up to 30 inches
PVC SOLVENT CEMENTS	700™ ECO 700™ 702™ 710™	704™ 705™ ECO 705™ 721™ ECO 721™	711™ ECO 711™ 717™ ECO 717™	719™
PVC SPECIALTY SOLVENT CEMENTS		725™ Wet 'R Dry™ 727™ Hot 'R Cold™ 737™ Turf 'N Ag™ 795™ Flex PVC™		
PVC POOL SOLVENT CEMENTS	740™ ECO 740™	744™ ECO 744™ 747™ Pool 'R Spa™ 748™ Pool Fast™ ECO 748™ Pool Fast™	746™ ECO 746™	
CPVC SOLVENT CEMENTS	713™	FlowGuard Gold™	714™ 714™ ECO 724™	729™
ABS SOLVENT CEMENTS		771™ 773™		
SPECIALTY SOLVENT CEMENTS		790™ Multipurpose™ 794™ ABS-PVC Transition™		
PRIMERS & CLEANERS	P-68 ECO™ Primer P-68™ P-70™ P-75™		C-65™ Cleaner PC-64™ Primer-Conditioner	

Refer to the Weld-On Product Guide for all product details and pipe size recommendations.

Weld-On® continues to lead the industry in offering the widest selection of regulatory-compliant, environmentally-friendly ultra-low VOC solvent cements and primers.

Weld-On® solvent cements, primers and cleaning products have received **UL GREENGUARD GOLD** Certification. They have been tested and certified to meet some of the world's most rigorous third-party chemical emissions to create improved indoor environments.

spot.ul.com

* Certification icons for reference:

AVERAGE INITIAL SET SCHEDULE
For WELD-ON® 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"+
60°- 100°F	2 minutes	5 minutes	30 minutes	2 hours	4 hours
40°- 60°F	5 minutes	10 minutes	2 hours	8 hours	16 hours
0°- 40°F	10 minutes	15 minutes	12 hours	24 hours	48 hours

Note - Initial set schedule is the necessary time to allow before the joint can be carefully handled. In damp or humid weather, allow 50% more set time.

AVERAGE JOINT CURE SCHEDULE
For WELD-ON PVC / CPVC Solvent Cements**

Relative Humidity 60% or Less	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"+
Temperature range during assembly and cure periods	up to 160 psi	above 160 psi to 370 psi	up to 160 psi	above 160 psi to 315 psi	up to 160 psi	above 160 psi to 315 psi	up to 100 psi	up to 100 psi
60°- 100°F	15 min	6 hrs	30 min	12 hrs	1½ hrs	24 hrs	48 hrs	72 hrs
40°- 60°F	20 min	12 hrs	45 min	24 hrs	4 hrs	48 hrs	96 hrs	6 days
0°- 40°F	30 min	48 hrs	1 hour	96 hrs	72 hrs	8 days	8 days	14 days

Note - Joint cure schedule is the necessary time to allow before pressurizing system. In damp or humid weather allow 50% more cure time.

**These figures are estimates based on testing done under laboratory conditions. Field working conditions can vary significantly. This chart should be used as a general reference only.

Average Number of Joints/Liter of WELD-ON 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

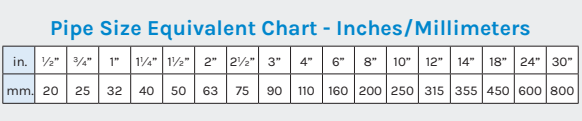
*For Primer: Double the number of joints shown for cement. These figures are estimates based on our laboratory tests. Due to the many variables in the field, these figures should be used as a general guide only.

Note: 1 Joint = 1 Socket

Pipe Size Equivalent Chart - Inches/Millimeters

in.	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	6"	8"	10"	12"	14"	18"	24"	30"
mm.	20	25	32	40	50	63	75	90	110	160	200	250	315	355	450	600	800

Fahrenheit to Celsius Conversion Chart



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CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001

ASTM INTERNATIONAL MEMBER

REV 01-24-USA IC 01/24