

# Solvent Welding Instructions

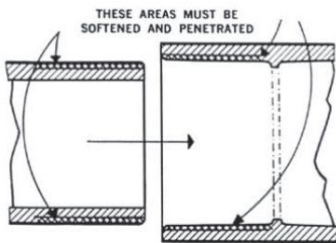
solvents. Application of the solvents or cements with rags and bare hands is not recommended; natural fiber brushes and other suitable applicators can produce satisfactory results.

**DANGER:** EXTREMELY FLAMMABLE. VAPOR HARMFUL. MAY BE HARMFUL IF SWALLOWED. MAY CAUSE SKIN OR EYE IRRITATION.

## Solvent Welding Instructions

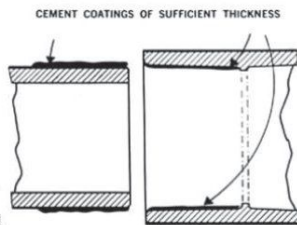
To make consistently good joints, the following points should be clearly understood.

1. The joining surfaces must be softened and made semifluid.
2. Sufficient cement must be applied to fill gap between pipe and fitting.
3. Assembly of pipe and fittings must be made while the surfaces are still wet and cement is still fluid.
4. Joint strength develops as the cement dries. In the tight part of the joint, the surfaces will tend to fuse together; in the loose part, the cement will bond to both surfaces.



FABCO recommends the use of a primer for all applications. A suitable primer will usually penetrate and soften the surfaces more quickly than cement alone. Additionally, the use of a primer can provide a safety factor for the installer, for he can know under various temperature conditions when sufficient softening has been achieved. For example, in cold weather more time and additional applications may be required.

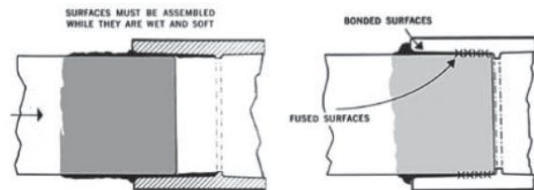
Sufficient cement to fill the loose part of the joint must be applied. Besides filling the gap, adequate cement layers will penetrate the surfaces and also remain wet until the joint is assembled. Prove this for yourself. Apply on the top surface of a piece of pipe two separate layers of cement.



First apply a heavy layer of cement; then along side it, apply a thin brushed out layer. Test the layers every 15 seconds or so by a gentle tap with your finger. You will note that the thin layer becomes tacky and then dries quickly (probably within 15 seconds); the heavy layer will remain wet much longer. A few minutes after applying these layers check for penetration. Scrape the surface of both with a knife. The thin layer will have achieved little or no penetration; the heavy one will have achieved

much more penetration.

If the cement coatings on the pipe and fittings are wet and fluid when assembly takes place, they will tend to flow together and become one cement layer. Also, if the cement is wet, the surfaces beneath them will still be soft and these softened surfaces in the tight part of the joint will tend to fuse together. As the solvent dissipates, the cement layer and the softened surfaces will harden with a corresponding increase in joint strength. A good joint will take the required working pressure long before the joint is fully dry and final joint strength is obtained. In the tight (fused) part of the joint, strength will develop more quickly than in the looser (bonded) part of the joint. Information about the development of bond strength of solvent welded joints is available in this manual.



## SOLVENT WELDING WITH PRIMER

1. Assemble proper materials for the job (proper primer, cement, if necessary - cleaner, and applicator for the size of pipe and fittings to be assembled).
2. Pipe must be cut as square as possible. Use a miter box saw or power saw. Check the end of the pipe with a square to make sure it has been cut squarely. A diagonal cut reduces bonding area in the most effective and critical part of the joint.



3. Plastic tubing cutters may also be used for cutting plastic pipe; however, some produce a raised bead at the end of the pipe. This bead must be removed with a file or deburring tool, as it will scrape the cement away when pipe is inserted into the fitting.



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4. Remove inside diameter burrs or raised beads with an internal deburring tool or knife. Remove the burrs or raised beads on the outside diameter of the pipe by using a file or external deburring tool that will produce a  $3/32"$ ,  $10-15^\circ$  chamfer (bevel). Burrs can scrape channels into pre-softened surfaces or create hang-ups across the inside fitting diameter.



5. With a clean-dry rag, remove any dirt, grease, 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, grease, or any foreign material can prevent proper fusion).



6. Check pipe and fittings for dry fit before cementing. For proper interference fit, fitting should go over end of pipe easily but become tight about  $1/3$  to  $2/3$  of the way on. Too tight a fit is not desirable; you must be able to fully bottom the pipe in the socket during assembly. If the pipe and fittings are not out of round, a satisfactory joint can be made if there is a "net" fit, that is, the pipe bottoms in the fitting socket with no interference, but without slop. A quick, dry fit "slop" test: Hold a short length of pipe vertically with a fitting "bottomed" on the pipe. If the fitting falls off the end of the pipe, do not start assembly. Contact your pipe or fitting supplier. Measure the fitting socket length and mark this distance on the pipe OD to insure the fitting has been fully inserted, add a couple inches to this distance and make a second check mark on the pipe, as the primer and cement will remove the first mark. All pipe and fittings must conform to ASTM or other recognized product standards.

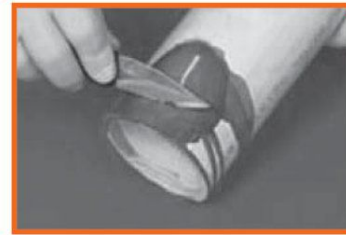


7. Use the right applicator for the size of pipe or

fittings being joined. The applicator size should be approximately  $1/2$  the pipe diameter. It is important that a satisfactory size applicator be used to help ensure that sufficient layers of cement are applied.



8. Priming; the purpose of a primer is to penetrate and soften the surfaces so they can fuse together. The proper use of a primer and checking its softening capability provides assurance that the surfaces are prepared for fusion in a wide variety of conditions. Check the penetration or softening on a piece of scrap pipe before you start the installation or if the weather changes during the day.



Using a knife or other sharp object, drag the edge over the coated surface. Proper penetration has been made if you can scratch or scrape a few thousandths of the primed surface away. Because weather conditions do affect priming and cementing action, repeated applications to both surfaces may be necessary. In cold weather more time is required for proper penetration.

NOTE: WITHOUT HESITATION, COMPLETE STEPS 9 THROUGH 16.

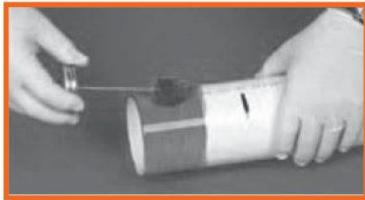
FOR PIPE DIAMETERS OF  $6"$  AND LARGER, THE SIZE OF THE JOINING CREW SHOULD BE INCREASED (SEE JOINING LARGE DIAMETER PIPE AND FITTINGS).

9. Using the correct applicator (as outlined in step #7), aggressively apply the primer into fitting socket, keeping the surface and applicator wet until the surface has been softened. More applications may be needed for hard surfaces and cold weather conditions. Re-dip the applicator in primer as required. When the surface is primed, remove any puddles of primer from the socket.



10. Next, aggressively apply the primer to the end of the pipe to a point  $1/2"$  beyond the depth of the fitting socket.

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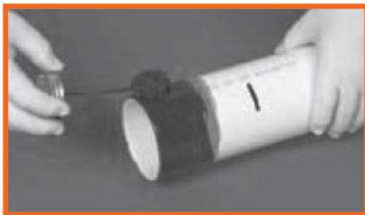
11. Apply a second application of primer to the fitting socket. Do not allow primer to run down the inside of the fitting or pipe.



12. With the proper size and type of applicator, while surfaces are still wet, immediately apply the appropriate Weld-On® cement.

PLEASE NOTE: THE ADDING OF PRIMERS, CLEANERS OR OTHER THINNERS TO THIN THE VISCOSITY OF SOLVENT CEMENT IS NOT RECOMMENDED.

13. Cementing: (Stir or shake the cement before using.) Aggressively apply a full, even layer of cement to the pipe-end equal to the depth of the fitting socket – do not brush it out to a thin paint type layer, as this will dry too quickly.



14. Aggressively apply a medium layer of cement into the fitting socket; avoid puddling cement in the socket. On bell-end pipe do not coat beyond the socket depth or allow cement to run down into the pipe beyond the bell.



15. Apply a second, full even layer of cement on the pipe. Most joint failures are caused by insufficient application of cement.



16. Immediately, while cement is still wet, assemble the pipe and fittings. If not completely wet, recoat parts before assembly. If cement coatings have hardened, cut pipe, dispose of fitting and start over. Do not assemble partially cured surfaces. While inserting, twist 1/8 to 1/4 turn until reaching socket bottom. Do not continue to rotate after the pipe has reached the socket bottom.



17. Hold the pipe and fitting together for a minimum of 30 seconds to eliminate movement or pushout.



18. After assembly, a joint should have a ring or bead of cement completely around the juncture of the pipe and fitting. If voids (gaps) in this ring are present, sufficient cement was not applied and the joint may be defective.



19. Using a rag, remove the excess cement from the pipe and fitting, including the ring or bead around the socket entrance, as it will needlessly soften the pipe and fitting, and does not add to joint strength. Excess cement around the socket entrance will also extend the cure time. Avoid disturbing or moving the joint.



20. Handle newly assembled joints carefully until initial set has taken place. Follow Weld-On® set and cure times before handling or hydro-testing piping system.

## Joining Large Diameter Pipe and Fittings

### 6" Diameter and Larger

As pipe diameter increases, so does the difficulty in installing it. The professional installer should be able to successfully assemble large diameter pipe and fittings by following the Weld-On Solvent Welding with Primer instructions listed in the beginning of this guide along with the following additional recommendations.

1. 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 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 Duct - Weld-On 729™

3. End of pipe must be cut square and chamfered (beveled). (See photo beside)

4. Increase size of joining crew:
  - 6"- 8": 2-3 people per joint
  - 10"- 30": 3-4 people per joint

It is important in large diameter joining that the primer and cement be applied simultaneously to the pipe and fittings.

5. Make sure to apply a second, full layer of cement to



the pipe.

6. 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. It is for this reason that we recommend above 4" diameter the use of a pipe-puller such as the one pictured. (Available at FABCO PLASTICS).



7. Large diameter pipe and fittings require longer set and cure times. \*(In cold weather, a heat blanket may be used to speed up the set and cure times.)
8. Prefabricate as many joints as possible.
9. If pipe is to be buried, make as many joints as possible above ground, then after joints have cured, carefully lower into trench.
10. Never bury empty cans, brushes, or anything else containing wet cement, primer, or cleaner next to the pipe.

\*Contact FABCO PLASTICS for further information.

## Solvent Welding Chemical Applications

Installations of plastic pipe and fittings for chemical applications requires a higher degree of skill than other installations; joint failures in these systems could be life threatening. 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 at least two to three times the normal set and

cure times on page 22.

3. Flush system before putting into operation.
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 compatibility of materials (pipe, fittings or cement) with chemicals in system, manufacturers of materials should be contacted.

## Solvent Welding Repairs

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, replacing it with new materials and taking greater care in the joining process.

If the joint cannot be cut out, the following repair is somewhat successful. This repair is for leaks only, not cases where pipe has separated from fitting. Leak area should be dry and clean of debris, oil or grease.

1. Apply Weld-On® 810™/811™ to area to be repaired. Let the adhesive set.
2. Cut a fiberglass mat or tape, providing sufficient coverage/wrap to the leak area. Saturate mat/tape with adhesive.
3. Cover or wrap repair area with saturated mat/tape. Work air bubbles out of the fiberglass mat/tape.
4. Let repaired area cure before pressurizing. Although not a guaranteed fix, this process has proven very successful in most applications.

# Solvent Welding Instructions

## 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 pipe contain high strength solvents which evaporate faster at elevated temperatures. This is especially true when there is a hot wind blowing. 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 prior to use.
2. If possible, store fittings and 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 with a damp rag. Make sure that 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.

As you know, 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 never easy. 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). In cold weather, solvents penetrate and soften the plastic pipe and fitting surfaces more slowly than in warm weather. Also the plastic is more resistant to solvent attack. Therefore it becomes even more important to pre-soften surfaces with an aggressive primer. And, 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 in Solvent Welding during Cold Weather:

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 available 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.

### AVERAGE INITIAL SET SCHEDULE FOR WELD-ON PVC/CPVC SOLVENT CEMENTS\*

| TEMPERATURE RANGE    | 1/2" TO 1 1/4" (20-40MM) | 1 1/2" TO 2" (50-63MM) | 2 1/2" TO 8" (75-200MM) | 10" TO 15" (250-380MM) | 15"+ (380MM+) |
|----------------------|--------------------------|------------------------|-------------------------|------------------------|---------------|
| 60-100°F / 16 - 38°C | 2 min.                   | 5 min.                 | 30 min.                 | 2 hrs.                 | 4 hrs.        |
| 40-60°F / 5 - 16°C   | 5 min.                   | 10 min.                | 2 hrs.                  | 8 hrs.                 | 16 hrs.       |
| 0-40°F / -18 - 5°C   | 10 min.                  | 15 min.                | 12 hrs.                 | 24 hrs.                | 48 hrs.       |

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.

\*These figures are estimates based on our laboratory tests. These figures should be used as a general guide only.

# Solvent Welding Instructions

## AVERAGE JOINT CURE SCHEDULE FOR WELD-ON PVC/CPVC SOLVENT CEMENTS\*

| RELATIVE HUMIDITY<br>60% OR LESS                      | PIPE SIZES                  |                               |                           |                               |                            |                               |                           |                          |
|---|-----------------------------|-------------------------------|---------------------------|-------------------------------|----------------------------|-------------------------------|---------------------------|--------------------------|
|   | 1/2" TO 1-1/4"<br>(20-40MM) |                               | 1-1/2" TO 2"<br>(50-63MM) |                               | 2-1/2" TO 8"<br>(75-200MM) |                               | 10" TO 15"<br>(250-380MM) | 15"+<br>(380MM+)         |
| TEMPERATURE RANGE DURING<br>ASSEMBLY AND CURE PERIODS | UP TO 160<br>PSI (11 BAR)   | 160 TO 370 PSI<br>(11-26 BAR) | UP TO 160 PSI<br>(11 BAR) | 160 TO 315 PSI<br>(11-22 BAR) | UP TO 160 PSI<br>(11 BAR)  | 160 TO 315 PSI<br>(11-22 BAR) | UP TO 100 PSI<br>(7 BAR)  | UP TO 100 PSI<br>(7 BAR) |
| 60°-100°F   | 15 min.                     | 6 hrs.                        | 30 min.                   | 12 hrs.                       | 1 1/2 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 hr.                     | 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.

## AVERAGE NUMBER OF JOINTS/QUART (1KG) OF WELD-ON® CEMENT\*

| PIPE DIAMETER    | 1/2" | 3/4" | 1"  | 1 1/2" | 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 | 3/4 | 1/2 |

For Primer: Double the number of joints shown for cement. Note: 1 Joint = 1 Socket

\*These figures are estimates based on our laboratory tests. These figures should be used as a general guide only.

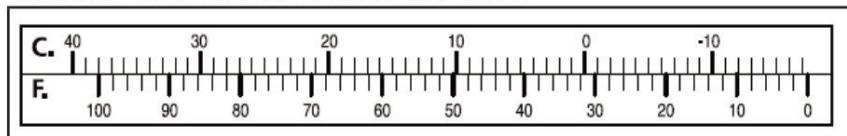
## PIPE SIZE EQUIVALENT CHART - INCHES/MILLIMETERS

|             |     |     |    |       |       |    |       |    |     |     |     |     |     |     |     |     |     |
|-------------|-----|-----|----|-------|-------|----|-------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| INCHES      | 1/2 | 3/4 | 1  | 1-1/4 | 1-1/2 | 2  | 2-1/2 | 3  | 4   | 6   | 8   | 10  | 12  | 14  | 18  | 24  | 30  |
| MILLIMETERS | 20  | 25  | 32 | 40    | 50    | 63 | 75    | 90 | 110 | 160 | 200 | 250 | 315 | 355 | 450 | 600 | 800 |

## PRODUCT SHELF LIFE

| WELD-ON PRODUCT     | SHELF-LIFE |
|---------------------|------------|
| Primers/Cleaners    | 3 years    |
| PVC Solvent Cement  | 3 years    |
| CPVC Solvent Cement | 2 years    |
| ABS Solvent Cement  | 3 years    |

## FAHRENHEIT TO CELSIUS CONVERSION CHART



## Solvent Welding Helpful Hints

We are all aware that a properly cemented joint is a 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. Have you reviewed all of the instructions on the cement container label or in ASTM D-2855?
2. Are you using the proper cement for the job – for the type and size of pipe and correct fittings being joined?
3. Do you need to take special precautions because of unusual weather conditions?
4. Do you have sufficient manpower? Do you need more help to maintain proper alignment and to bottom pipe in fitting?
5. Do you have the proper tools, applicators and sufficient quantities of Weld-On® cements and primer and is cement in good condition?

Please Note: The adding of primers, cleaners or other thinners to thin the viscosity of solvent cement is not recommended.

6. Remember, primer is NOT to be used on ABS pipe

or fittings.

7. Be sure to use a large enough applicator to quickly spread cement generously on pipe and fittings. Then assemble immediately.
8. Avoid puddling excess primer and cement inside the fitting socket, especially on thin wall, bell-end PVC pipe.
9. 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.
10. Be aware at all times of good safety practices. Solvent cements for pipe and fittings are flammable, so there should be no smoking 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. More detailed safety information is available from us.
11. Take advantage of our free literature on joining techniques. We offer DVDs/CDs on joining PVC/CPVC pipe and fittings, and individual bulletins.

# Solvent Welding Instructions

## Solvent Welding Special Precautions

### **WELD-ON® SOLVENT CEMENTS MUST NEVER BE USED IN A PVC OR CPVC SYSTEM USING OR BEING TESTED BY COMPRESSED AIR OR GASES!**

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.

### **CAUTION:**




- USE CEMENTS AND PRIMERS ONLY IN WELL VENTED AREAS
- SEE MSDS SECTION II (AVAILABLE ON REQUEST) FOR EXPOSURE LIMITS AND FIRST AID INSTRUCTIONS
- CEMENTS AND PRIMERS ARE VOLATILE, KEEP AWAY FROM ANY SOURCE OF IGNITION

## Solvent Welding Storage and Handling

Store in the shade between 40°F and 110°F (5°C and 44°C) or as specified on label. Keep away from heat, spark, open flame and other sources of ignition. Keep container closed when not in use. If the unopened container is subjected to freezing, it may become extremely thick or jelled. This cement can be placed in a warm area, where after a period of time, it will return to its original, usable condition. But such is not the case when jelling has taken place because of actual solvent loss – for example, when the container was left open too long during use or not properly sealed after use. Cement in this condition should not be used and should be properly discarded.

Weld-On® solvent cements are formulated to be used “as received” in original containers. Adding thinners or primers to change viscosity is not recommended. If the cement is found to be jelly-like and not free flowing, it should not be used. Containers of cement should be shaken or stirred before using. Do not shake primers.

## Solvent Welding Listings and Standards

Weld-On products are  ,  , and/or  listed and meet one or more of the following ASTM Standards: D-2235, D-2564, D-2846, D-3122, D-3138, F-493, F-656.

