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## THE COMPLETE GUIDE TO SOLVENT CEMENT & CPVC FIRE PROTECTION SYSTEMS

BlazeMaster®
FIRE PROTECTION SYSTEMS

# BLAZEMASTER® FIRE PROTECTION SYSTEMS ARE JOINED BY SOLVENT CEMENT WELDING BECAUSE IT'S QUICK, SIMPLE, AND HIGHLY RELIABLE.


Solvent cement welding is a fast, easy installation process that uses solvents and CPVC resin to chemically fuse the pipe and fitting together at the molecular level. In the end, using solvent cement doesn't just adhere two pieces together—it creates one continuous piece of plastic. The joint becomes the strongest part of a piping system.

This guide to solvent cement explains:

- What it is.
- How it works.
- The process for utilizing it in fire sprinkler applications.
- Special considerations for successful installation.

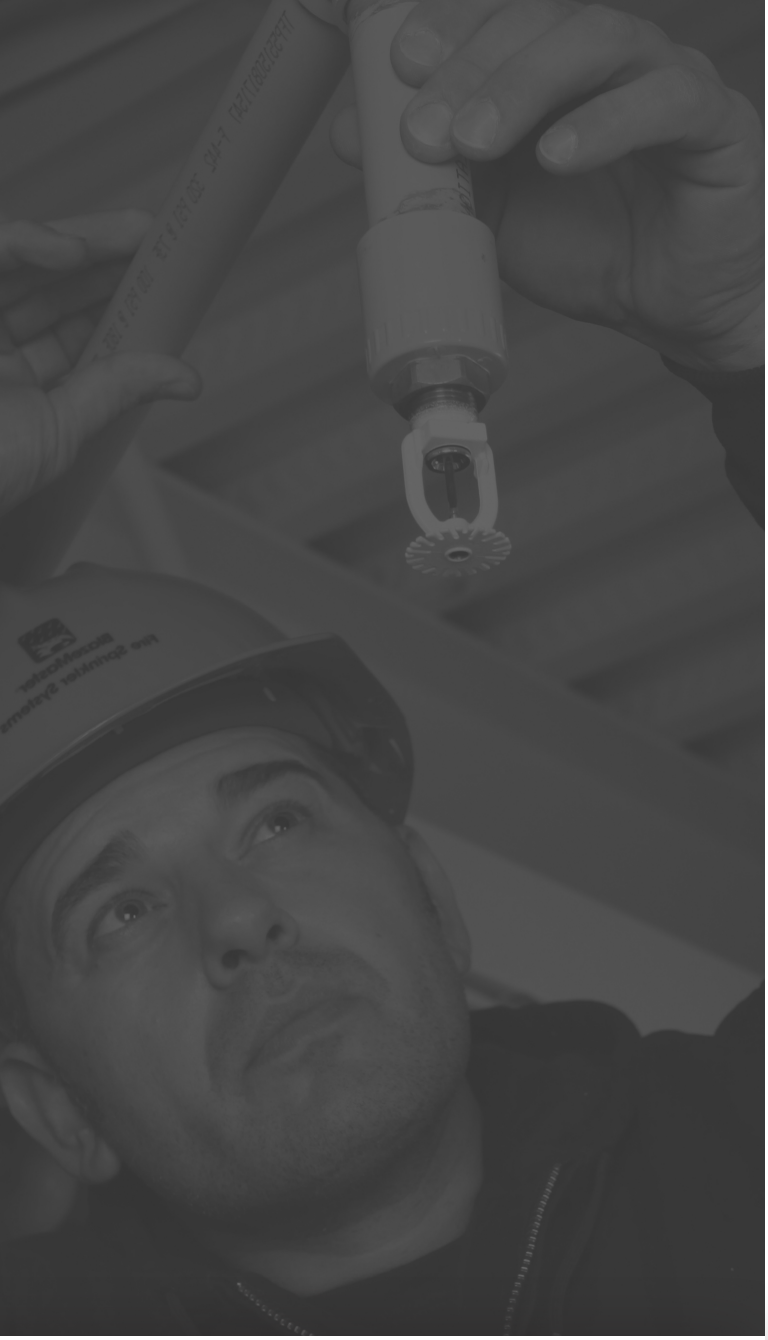

## WHAT IS SOLVENT CEMENT

Solvent cement is made up of CPVC resin, stabilizers and fillers blended in a cocktail of solvents. These solvents serve two purposes:

1. PREPARE THE SURFACE OF THE PIPE AND FITTING.
2. DISSOLVE THE CPVC RESIN.

When applied to the pipe and fitting, the solvents soften and dissolve the top layer of the pipe and fitting material, unbinding the surface molecules. The interference fit forces the pipe and fittings into a snug position when they are pushed together, and the freed surface molecules entangle, fusing the two pieces together. As the solvent evaporates, the molecules harden again, creating a permanent bond between the pipe and fittings.

When applied correctly and fully cured, the solvents don't weaken the material's structural integrity and the fused joint takes on the same characteristics and capabilities of the piping material itself. This helps to maintain the life expectancy, high distortion temperature, pressure rating, and safety qualities throughout the system.



## Solvent Cement is *Not* Glue

The terms “glue” and “solvent cement” are often used interchangeably with reference to thermoplastic piping installation. On a basic level, both accomplish the immediate goal of joining pipes and fittings.
However, the substances are actually very different.

## How Glue Works

Glue functions with adhesion and cohesion.
If pipe and fittings are glued together, adhesive forces are those that connect the glue to each piping piece.
A cohesive force holds the glue to itself.

## Why Glue isn’t Meant for Joining CPVC Piping

Glue bonds only “stick” materials together, regardless of the type of adhesive. This means that when a strong enough force acts on the adhered area, the bond can break and the joint can come apart.

In addition, the glue is often a different type of material than the piping itself, meaning its capabilities when faced with extreme heat may vary.

At the end of the day, a fire sprinkler system is only as reliable as its weakest point. This is why BlazeMaster Fire Protection Systems recommends solvent cement.

## Different Types of Solvent Cement

Solvent cement is a mixture of solvent, stabilizers and dissolved plastics, and there are a variety of options available. That said, the specific solvent cement you use will be determined by the piping material with which you’re working.

Reason being, the dissolved plastic within the solvent cement must be the same plastic material as the piping itself. If it’s not, the joint will not be as strong as it should be. For example, while CPVC is made by chlorinating a PVC base, the finished products are much different in terms of capabilities and characteristics. CPVC pipes and fittings should not be joined with PVC solvent cement.

Furthermore, all CPVC materials are not equal, nor do they always work well together. For this reason, only use solvent cements that have been specifically formulated and approved for use with CPVC fire sprinkler systems and approved by the pipe and fitting manufacturers.

# HOW TO ASSEMBLE CPVC PIPE & FITTINGS WITH SOLVENT CEMENT

## Cut the Piping

BlazeMaster pipe is easily cut with a ratchet cutter, wheel-type plastic tubing cutter, power saw, or fine-toothed saw—don't use a dull or broken cutting blade. To ensure the pipe is cut squarely, use a miter box when cutting with a hand saw. Cutting the pipe as squarely as possible provides the maximum bonding surface area.

## Remove Burrs and Filings

Burrs and filings can prevent proper contact between the pipe and fitting and may put undue stress on the pipe and fitting assembly. For this reason, they must be removed from the outside and inside of the pipe. A chamfering tool or file is suitable for this purpose.

You should also create a slight bevel at the end of the pipe. This bevel helps to ease the pipe into the fitting socket without pushing the solvent cement down into the joint. For pipe sizes 2 in. (50 mm) and larger, a 10 to 15° chamfer of 3/32 in. (2.38 mm) is recommended.


## Prepare the Piping for Fitting

Wipe loose debris and moisture from the fitting socket and pipe end with a clean, dry rag. Moisture can slow the curing, and at this stage of assembly excessive water can reduce the joint strength.

Before applying solvent cement, insert the pipe into the fitting. The pipe should easily enter the fitting socket to 1/3 to 2/3 of the depth. If the pipe hits the bottom lip of the fitting with little or no interference, use a different fitting.

## Apply Solvent Cement

Use only BlazeMaster solvent cement which is approved for use in fire protection systems. In general, don't use solvent cement that has exceeded its shelf life or has become discolored or gelled, and don't apply solvent cement near an open flame, source of heat, or while smoking.

The solvent cement can be applied directly to the clean pipe and fitting surfaces.

Apply solvent cement with a natural bristle brush or dauber half the size of the pipe diameter. Use a dauber to apply cement on pipe sizes below 2 in. (50 mm).

Don't allow the solvent cement to puddle within the fittings and pipe.

Apply a heavy, even coat of cement to the outside of the pipe end, then a medium coat to the inside of the fitting socket. Pipe sizes greater than 2 inches (50 mm) should receive a second coat of cement on the pipe end.


## Assemble the Pipe and Fitting

Immediately after cement application, insert the pipe into the fitting socket and rotate ¼ turn until the fitting-stop is reached. The fitting should be properly aligned for installation at this time, and the pipe must meet the bottom of the fitting socket.

Then, hold the assembly in place for 10 to 30 seconds to allow the pieces to set in place and to avoid push-out.

A bead of cement should be evident around the pipe and fitting juncture. If this bead is not visible around the joint, it may indicate that insufficient cement was applied. In this case, the fitting must be cut out, discarded and redone with new pieces. Cement in excess of the bead should be wiped off with a rag.


## Solvent Cement Cure Times

Once assembly is complete, the newly fused CPVC molecules harden as the solvent flashes off, or evaporates. When all the solvent is gone, the joint is considered fully cured, and you're left with one uniform piece of CPVC.

Solvent cement cure times depend on pipe size, temperature, relative humidity, and tightness of fit. Drying time is faster for drier environments, smaller pipe sizes, high temperatures, and tighter fits.

## Recommended Cure Times

After a joint is assembled using solvent cement, the cement must be allowed to properly "cure" before the piping system is pressurized. Recommended cure times are shown on page 7. These recommendations should only serve as a guide, as we recommend checking with your manufacturer for specific instructions.

## How to Properly Utilize Solvent Cement in Hot Weather

In hot environments, solvent cement evaporates more quickly, creating potential challenges for installers. However, reliable CPVC joints can be solvent cement welded at temperatures exceeding 95°F (35°C).

When applying solvent cement to pipes and fittings in high-temperature environments, BlazeMaster Fire Protection Systems recommends the following:

- Direct sunlight can increase the surface temperature of the material by 20° - 30°F (10° - 16°C), so **keep the piping, fitting and solvent cement in the shade** as much as possible.
- If possible, **create bonds during the cooler parts of the day** (morning or evening) or indoors.
- Cool down joints with a wet rag before applying solvent cement. However, make sure the joint surfaces are dry at the time the solvent is applied.
- Shake and mix the solvent cement well before applying to ensure a consistent mixture.
- Solvents attack hot surfaces faster and deeper than they do average or cold surfaces, so **be extra careful to avoid puddling inside the joints.**
- Because solvent evaporates more quickly in high temperatures, **make sure the joint surfaces are still wet with solvent when connected.**

## Allow Longer Set and Cure Time in Humid Environments

The more humid an environment, the less available space is in the air for the solvent to evaporate. In general, pipes in environments that are humid or damp should cure for an extra 50% of the recommended time. So, if the manufacturer's listed cure time is 15 minutes, the pipe should cure for a minimum of 22.5 minutes.

## How to Properly Use Solvent Cement in Cold Temperatures

In cold weather, pipe and fittings are more resistant to solvent penetration. This means solvents penetrate and soften the pipe and fitting surfaces more slowly than in warm weather. BlazeMaster solvent cement is tested and listed for use down to 0°F (-17°C).

Key tips for cold weather solvent cement welding include the following:

- Prefabricate as much of the system as possible in a heated space.
- Store cements in a warmer area to ensure they remain fluid. If the solvent freezes, it should be discarded.
- Take special care to remove moisture from the ends of the pipe.
- Vigorously shake or stir the cement before use.

## Cold Weather Solvent Cement Cure Times

In contrast to warm temperatures, cold temperatures require extra time for the joint to cure. Weak joints can result if the system is pressure tested or put into operation before the joint has fully cured, causing issues within the system, specifically leaks.

Consult the manufacturer's design manual recommended times.

## Next Steps

Solvent cement welding is a reliable method for joining CPVC pipes and fittings in fire sprinkler system applications. To discuss the specifics of solvent cement in relation to your next project with the BlazeMaster Fire Protection Systems team, contact us today.

## TABLE I

| | 225 psi (1552 kPa) Test Pressure (maximum) Ambient Temperature During Cure Period | | |
|---|---|---|---|
| **Pipe Size** | **60°F to 120°F (16°C to 49°C)** | **40°F to 59°F (4°C to 15°C)** | **0°F to 39°F (-18°C to 4°C)** |
| **3/4" (20 mm)** | 1 hr. | 4 hrs. | 48 hrs. |
| **1" (25 mm)** | 11/2 hrs. | 4 hrs. | 48 hrs. |
| **11/4" & 11/2" (32 & 40 mm)** | 3 hrs. | 32 hrs. | 10 days |
| **2" (50 mm)** | 8 hrs. | 48 hrs. | Note 1 |
| **2 1/2" & 3" (65 & 80 mm)** | 24 hrs. | 96 hrs. | Note 1 |

## TABLE II

| | 200 psi (1379 kPa) Test Pressure (maximum) Ambient Temperature During Cure Period | | |
|---|---|---|---|
| **Pipe Size** | **60°F to 120°F (16°C to 49°C)** | **40°F to 59°F (4°C to 15°C)** | **0°F to 39°F (-18°C to 4°C)** |
| **3/4" (20 mm)** | 45 mins. | 11/2 hrs. | 24 hrs. |
| **1" (25 mm)** | 45 mins. | 11/2 hrs. | 24 hrs. |
| **11/4" & 11/2" (32 & 40 mm)** | 11/2 hrs. | 16 hrs. | 120 hrs. |
| **2" (50 mm)** | 6 hrs. | 36 hrs. | Note 1 |
| **21/2" & 3" (65 & 80 mm)** | 8 hrs. | 72 hrs. | Note 1 |

## TABLE III

| | 100 psi (690 kPa) Test Pressure (maximum) Ambient Temperature During Cure Period | | |
|---|---|---|---|
| **Pipe Size** | **60°F to 120°F (16°C to 49°C)** | **40°F to 59°F (4°C to 15°C)** | **0°F to 39°F (-18°C to 4°C)** |
| **3/4" (20 mm)** | 15 mins. | 15 mins. | 30 mins. |
| **1" (25 mm)** | 15 mins. | 30 mins. | 30 mins. |
| **11/4" (32 mm)** | 15 mins. | 30 mins. | 2 hrs. |

***Note 1:*** *For these sizes, the solvent cement can be applied at temperatures below 40°F (4.5°C), however, the sprinkler system temperature must be raised to a temperature of 40°F (4.5°C) or above and allowed to cure per the above recommendations prior to pressure testing.*

# RELIABILITY TESTED FOR LIFE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