

## INSTALLATION INSTRUCTIONS

### INTRODUCTION

#### Scope

One of the more important features of industrial thermoplastics is the ease with which they lend themselves to a variety of fabricating techniques. This versatility, plus the wide selection of piping components now available, make possible fast and economical installation, maintenance and modification of industrial piping systems. It is the objective of this section to provide detailed instructions on all known techniques of joining, maintaining and handling thermoplastics in order to permit maximum integrity of your piping system.

#### Solvent Welding

Polypropylene (PP), is a thermoplastic polyolefin and PVDF (Kynar), cannot be dissolved by even the strongest of organic solvents. Since solvent attack (or "bite") by dissolution is necessary to effect a solvent cement bond with thermoplastics, it is not possible to join polypropylene or PVDF by solvent cementing. Therefore, polypropylene and PVDF pressure systems can only be joined using heat fusion techniques. A thermal sealing procedure is used when joining ½" through 4" sizes. When joining 6" polypropylene systems, which are recommended for drainage applications only, a fillet welding procedure is utilized.

#### Threading

Threaded joints are sometimes used when a piping system must be dismantled for occasional cleaning or modifications. Since threading results in a reduction in the effective wall thickness of the pipe, the pressure rating of threaded pipe is reduced to one-half that of unthreaded pipe, i.e., pipe joined by solvent cementing or thermal sealing. This reduction in wall thickness resulting from threading can seriously affect the pressure carrying capability and mechanical strength of Schedule 40 or lighter pipe and therefore, only Schedule 80 or heavier pipe should be threaded when the pipe is to be used for pressure applications. Also, threading is not recommended for plastic pipe above 4 inches in diameter nor is it recommended for pressure polypropylene piping systems.

#### Flanging

One of the earliest methods for joining thermoplastic piping, flanging continues to be used extensively for process lines. Thermoplastic flanges and flanged fittings are available in a full size range and may be attached to pipe by solvent welding, by threading, or by thermal sealing, as required by the particular thermoplastic material.

### STORAGE AND HANDLING OF THERMOPLASTIC PIPING COMPONENTS

#### Scope

Industrial thermoplastic piping components are designed and manufactured for use in severe duty systems involving the transport of aggressive liquids. In order to ensure their integrity, once installed, they must be handled with reasonable care prior to installation.

#### Storage

##### 1. Pipe

When pipe is received in standard lifts it should remain in the lift until ready for use. Lifts should not be stacked more than three high and should always be stacked wood on wood. Loose pipe should be stored on racks with a minimum support spacing of three feet. Pipe should be shaded but not covered directly when stored outside in high ambient temperature. This will provide for free circulation of air and reduce the heat build-up due to direct sunlight exposure.

##### 2. Fittings

Fittings should be stored in their original cartons to keep them free of dirt and reduce the possibility of damage. If possible, fittings should be stored indoors.

##### Solvent Cements and Primers

Solvent cements have a definite shelf life and each can and carton is clearly marked with a date of manufacture. Stock should be rotated to ensure that the oldest material is used first. Primer does not have a shelf life but it is good practice to rotate this stock also. Solvent cements and primers should be stored in a relatively cool shelter away from direct sun exposure.

Caution: Solvent cements and primers are composed of various solvents and as such require special conditions for storage. Because of their flammability they must not be stored in an area where they might be exposed to ignition, heat, sparks or open flames.

#### Handling

##### 1. Pipe and Fittings

Care should be exercised to avoid rough handling of thermoplastic pipe and fittings. They should not be dragged over sharp projections, dropped or have objects dropped upon them. Pipe ends should be inspected for cracks resulting from such abuse. Transportations by truck or pipe trailer will require that the pipe be continuously supported and all sharp edges on the trailer bed that could come in contact with the pipe must be padded.

##### 2. Solvent Cements and Primers

Keep containers for solvent cements tightly closed except when in use. Avoid prolonged breathing of solvent vapours, and when pipe and fittings are being joined in partially enclosed areas use a ventilating device to attenuate vapor levels. Keep solvent cements, primers and cleaners away from all sources of ignition, heat, sparks and open flames. Avoid repeated contact with the skin by wearing proper gloves impervious to the 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 FOR PVC & CPVC PRESSURE PIPE SYSTEMS

#### Scope

The solvent welding procedure detailed herein applies to all Chemkor polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) pressure piping systems including molded fittings and valves. Belled end pipe can also be joined in this manner. Chemkor Technical Service is available for additional solvent welding guidance and recommendations.

#### Joining Equipment and Materials

- Cutting Tool
- Rags (nonsynthetic, i.e., cotton)
- Deburring Tool
- Cement and Primer Applicators
- Applicator Can or Bucket
- Hytek /Chemkor Purple Primer
- Hytek /Chemkor Solvent Cement
- Tool Tray
- Notched Boards

## Types of Cement and Primer

- 1) Hytek / Chemkor Light Duty Clear Industrial Grade PVC Solvent Cement is for use with Schedule 40, DWV and Class (SDR rated) piping through 6". The clear formulation is designed for plumbing and conduit systems. (Light blue container, label.)
- 2) Hytek / Chemkor Heavy Duty Grey Industrial Grade PVC Solvent Cement is for use with Schedule 80 piping through 6". The gap-filling high viscous formulation may also be used for Schedule 40, drainage, conduit and all Class (SDR rated) piping through 6". (Light green container label.)
- 3) Hytek / Chemkor Extra Heavy Duty Grey Industrial Grade PVC Solvent Cement is for use with all PVC piping, especially 6" and larger. When applied, the very heavy bodied formulation maintains a generous coating with minimum change in thickness over the entire pipe circumference. (Black container label.)
- 4) Hytek / Chemkor Heavy Duty Light Grey Industrial Grade CPVC Solvent Cement is for use with all sizes of Schedule 40 and 80 CPVC piping. It may be used in any industrial or commercial applications suitable to CPVC. (Orange container label.)
- 5) Hytek / Chemkor Purple Primer is for use with all PVC and CPVC piping applications. (Purple container label.)

All of the products above are listed by IAPMO for pressure and drainage applications, and they are NSF approved for potable water

## PREPARATION FOR JOINING

### 1. Cutting

The smaller sizes of plastic pipe can easily be cut with a pipe or tubing cutter which has a cutting wheel that is specifically designed for plastic. Such a cutter is available from the Reed Manufacturing Co. or the T.D. Williamson Co. The pipe can also be cut with a power or hand saw. A circumferential speed of about 6,000 ft./min. is suitable for circular saws. Band saw speed should be approximately 3,000 ft./min. To ensure square and cuts, a miter box, hold-down or jig should be used. For best results, use a fine-toothed blade (16-18 teeth per inch) with little or not set (maximum 0.023 inch). And if a large quantity of pipe is to be cut, use carbide-tipped blades.

### 2. Deburring and Beveling

All burrs, chips, filings, etc., should be removed from both the pipe I.D. and O.D. before joining. Use a deburring tool, knife or a half-round coarse file to remove all burrs. All pipe ends should be beveled to approximately 1/16" to 3/32" on a 10-15 degree angle for ease of socketing and to minimize the chance of wiping the solvent cement from the I.D. for the fitting as the pipe is socketed. The beveling can be done with a coarse file or beveling tools use such as that manufactured by Reed Manufacturing Company, Erie Pennsylvania.

### 3. Fitting Preparation

Prior to solvent welding, all fittings and couplings should be removed from their cartons and exposed for at least one hour to the same temperature conditions as the pipe in order to assure that they are thermally balanced before joining.

### 4. Cleaning

Using a clean, dry cotton rag, wipe away all loose dirt and moisture from the I.D. and O.D. of the pipe end and the I.D. of the fitting. Do Not Attempt To Solvent Weld Wet Surfaces.

**For checking penetration, you should be able to scratch or scrape a few thousandths of the primed surfaces away. Repeated applications to either or both surfaces may be necessary. Weather conditions do affect priming action. In cold weather, more time is required for proper penetration.**

## Priming

The function of purple primer is to penetrate and soften the bonding surfaces of PVC and CPVC pipe and fittings. It is the product that penetrates rapidly. It is very effective on the hard-finished, high-gloss products now being produced. Priming is a 3-step process as follows:

1. Using a natural bristle brush about one-half the width of the pipe diameter to be jointed or a doubler supplied with the primer container, apply Purple Primer freely to the inner fitting socket. A rag is not recommended as repeated contact with skin may cause irritation or blistering. Keep the surface wet by maintaining a brushing motion of the applicator over the entire surface for five to fifteen seconds. Re-dip applicator as necessary but avoid puddling inside the fitting.
2. Apply primer to the pipe surface in the same manner making sure that the length of pipe evenly brushed is at least equal to the fitting socket depth.
3. Re-apply primer to the fitting socket. Alternate applications of Purple Primer, start with the female component.

**Solvent cements and primer are extremely flammable and vapour harmful. Keep away from heat, sparks and open flame. Use only with adequate ventilation. Harmful if swallowed. Avoid prolonged breathing of vapour. Avoid contact with eyes, skin and clothing. Causes eye irritation. Repeated or prolonged skin contact causes skin irritation. Close container after each use. In case of skin contact, flush with water; for eyes, flush with water for at least 15 minutes and seek medical attention. Wash contaminated clothing before reuse. If swallowed, Do Not Induce Vomiting, call Physician immediately.**

## SOLVENT CEMENT APPLICATION

Before the primer dries, use a second applicator (see chart on preceding page for specific recommendation) to apply solvent cement in a 3-step process as follows:

1. Cover the pipe liberally with solvent cement for a length at least equal to that of the fitting socket depth. It is important not to be stingy with cement.
2. Continuing with alternate surface application, coat the fitting socket thoroughly with a medium layer of solvent cement. Avoid puddling in the socket. On belled end pipe, do not coat beyond the socket depth or allow cement to run beyond the bell.
3. Put a second coat of cement on the pipe. This completes the six steps of alternate surface applications for a joint - three of primer and three of solvent cement - starting with the female component. Cement layers must be without voids and sufficient to fill any gaps in the joints.

## Joining

- 1) Immediately upon finishing cement application and before it starts to set, insert the pipe to the full socket depth while rotating the pipe or fitting a ¼ turn to ensure complete and even distribution of the cement. Hold joint together for a minimum of 10 to 15 seconds to make sure that pipe does not move or back out of the socket.
- 2) For pipe sizes 6" and larger, a joining crew consisting of two men is recommended and the following additional steps necessary:
  - a) Rotation of the pipe in the fitting may be omitted.
  - b) Hold joint together for 1 to 3 minutes depending on pipe size.
  - c) As an aid for joining in these larger sizes, it is recommended that a come-along or pipe joining tool similar to that manufactured by Reed Manufacturing Company be used.

**Excess Cement**

Immediately after joining and before joint is set, gently place it back onto a level surface, wipe off all excess cement from the circumference of the pipe and fitting

**Joint Integrity**

PVC and CPVC piping joint integrity depends greatly upon following exactly and by Chemkor's specific handling, inspection, storage, shipping, fabrication, installation, testing and operating instructions. Joint integrity also depends greatly upon an infinitely wide, unpredictable and uncontrollable set of product and environmental conditions that go into determining the length of joint drying times before it may be moved; handled; low, high or working pressure tested. These conditions include size of pipe, surface temperature of the joint, dry joint interference fit and relative humidity. Drying times will be faster with smaller pipe, higher surface temperature, tighter interference fits and lower relative humidity. Drying times will be slower when these conditions are reversed.

Because of these almost infinite and completely unpredictable variety of drying conditions that can exist from job to job and from time to time, Chemkor only specifically recommends for its PVC and CPVC products the below solvent welding joining temperature and joint drying times:

- 1) The actual joining should not be done in atmospheric temperatures below 40° F or above 90° F when exposed to direct sunlight.
- 2) Chemkor recommends that 72 hours of joint drying time should elapse for all sizes of pipe and drying temperatures before the joint is subjected to any appreciable internal or external pressure on a full time basis.

Recommendations for Solvent Cement and Primer Application				
Nominal Pipe Size (Inches)	Brush Width* (inches)	Roller Length (inches)	Duabers (Commercial /Residential Piping Only)	
			Pressure Joints	Non-Pressure Joints
¼	¼	N.R.	-	-
½	½	N.R.	¾" Dia.	¾" Dia.
¾	½	N.R.	¾" Dia.	¾" Dia.
1	½	N.R.	¾" Dia.	¾" Dia.
1-¼	1	N.R.	¾" Dia.	1-½" Dia
1-½	1	N.R.	1-½" Dia	1-½" Dia
2	1	N.R.	1-½" Dia	1-½" Dia
2-½	1	N.R.	N.R.	1-½" Dia
3	1-½	N.R.	N.R.	N.R.
4	2	3	N.R.	N.R.
6	3	3	N.R.	N.R.
8	4	7	N.R.	N.R.
10	4 to 6	7	N.R.	N.R.
12	4 to 6	7	N.R.	N.R.

N.R. = Not Recommended

\*Natural bristle brushes should always be specified

It is recognized that the recommended brush width may not always be readily available. However, the selection should come as close as possible to the recommended width in order to ensure complete coverage with a minimum number of brush strokes.

**Handling**

During the initial setting of the cement, which begins about two minutes after application (on small sizes), be careful not to move or disturb the joint.

Chemkor offers, as a non-liability supplier, the following drying times as a guide in aiding the installer, engineer, owner or other decision making party in deciding at his own risk when the joints are sufficiently dry for movement; handling; low pressure, initial joint testing, application of high pressure tests and introduction of working pressure. These drying times are based upon a combination of past field experience and laboratory tests.

PVC and CPVC Joint Movement Times			
Nominal Pipe Size	Hot Weather 90° - 150° F Surface Temperature	Mild Weather 50° - 90° F Surface Temperature	Cold Weather 10° - 50° F Surface Temperature
¼" - 1-¼"	12 Min.	20 Min.	30 Min.
1-½" - 2-½"	30 Min.	45 Min.	1 Hr
3" - 4"	45 Min.	1 Hr	1 Hr & 30 Min
6" - 8"	1 Hr	1 Hr & 30 Min	2 Hr & 30 Min
10" - 12"	2 Hrs	3 Hrs	5 Hrs

\*The temperatures above are drying temperatures and should not be confused with atmospheric, joining temperature recommendations and limitations. See section on "Joint integrity."

**Pressure Testing**

***Air or Compressed Gas Is Not Recommended as a Media for Pressure Testing of Plastic Piping Systems.***

**1. Initial Joint Testing:**

Initial joint testing of PVC and CPVC pipe could possibly be accomplished to 10% of its hydrostatic pressure rating after the below drying times:

PVC and CPVC Joint Movement Times at 10% Pressure Testing			
Nominal Pipe Size	Hot Weather 90° - 150° F Surface Temperature	Mild Weather 50° - 90° F Surface Temperature	Cold Weather 10° - 50° F Surface Temperature
½" - 1-¼"	1 Hr	1 Hr & 15 Min	1 Hr & 45 Min
1-½" - 2-½"	1 Hr & 30 Min	1 Hr & 45 Min	3 Hrs
3" - 4"	2 Hrs & 45 Min	3 Hrs & 30 Min	6 Hrs
6" - 8"	3 Hrs & 30 Min	4 Hrs	12 Hrs
10" - 12"	6 Hrs	8 Hrs	72 Hrs

\*The temperatures above are drying temperatures and should not be confused with atmospheric, joining temperature recommendations and limitations. See section on "Joint Integrity."

## 2. High Pressure Testing:

The PVC and CPVC pipe can be pressure tested up to 100% of its hydrostatic pressure rating after drying times listed in the tables which follows:

PVC and CPVC Joint Movement Times at 100% Pressure Testing			
Nominal Pipe Size	Hot Weather 90° 150° F Surface Temperature	Mild Weather 50° - 90° F Surface Temperature	Cold Weather 10° - 50° F Surface Temperature
½" - 1-¼"	4 Hrs	5 Hrs	7 Hrs
1-½" - 2-½"	6 Hrs	8 Hrs	10 Hrs
3" - 4"	8 Hrs	18 Hrs	24 Hrs
6" - 8"	12 Hrs	24 Hrs	48 Hrs
10" - 12"	18 Hrs	36 Hrs	72 Hrs

\*The temperatures above are drying temperatures and should not be confused with atmospheric, joining temperature recommendations and limitations. See section on "Joint Integrity."

## 3. Full-Time Working Pressure:

PVC and CPVC joints may be introduced to maximum working pressure on a full-time basis after approximately four times the drying time shown above for 100% pressure testing.

### Do's and Don'ts

#### Do

- Use the proper applicator (See chart for specific recommendations).
- Use proper type of solvent cement for the job.
- Apply the cement while the primer is still wet.
- Follow the instructions completely.

#### Don't Attempt to solvent weld under the following conditions:

- If it is raining
- If atmospheric temperature is below 40°F
- If under direct exposure to sun at atmospheric temperature above 90°F.

Discard empty cans of solvent, primer or rags in trench or near piping. Concentrated fumes of dripping cement or primer can cause piping failure.

### Hot Weather Cementing

Since cement contains a solvent, certain precautions or steps should be taken when the atmospheric temperature is above 90°F to avoid excessive evaporation of the solvent from the cement just prior to joining. Such evaporation will cause the cement to prematurely set before joining, thus, adversely affecting the joint integrity. Use one or a combination of the below to reduce the chances of this condition occurring:

- Shade or shelter the joint surface from direct exposure to the sun's rays for at least one hour prior to joining and during the joining process.
- Make cement joints during early morning hours.
- Apply cement quickly. On 6" and larger pipe, it is recommended that two men apply cement to pipe surface while the third applies it to the fitting socket.
- Join pipe to fittings as quickly as possible after applying cement.

## Cold Weather Cementing

Because the solvents in the cement will not evaporate as readily when the temperature is below 40°F, the following suggestions are offered:

- Store pipe, fittings, cement and primer in a heated area.
- Pre-fab as much of the system as possible in a heated work area.
- Joints that must be made outside should be protected with a portable shelter and heated with indirect heat to surface temperatures above 40°F prior to joining. The shelter and heat should remain in place for at least two hours after joint assembly.
- Pipe and fittings must be dry prior to joining and the joints should be kept dry until the cement has had sufficient time to set.

### Handling of Primer and Cement

**Observe the "use prior to" date. Cement has a limited shelf life. Do not permit solvent cement can to stand open. Do not use cement that has dried to the point where it becomes lumpy and stringy. Throw it away. Do not attempt to thin out sluggish cement with thinner or primer.**



**Do Not Attempt to Speed the Setting or Drying of the Cement by Applying Direct Heat to the Solvent Welded Joint. Forced rapid drying by heating will cause the cement solvents to boil off, forming porosity, bubbles and blisters in the cement film.**

### Estimated Solvent Cement Requirements

The below estimated PVC and CPVC solvent cement requirements should only be considered as a guideline for usage and could vary according to a wide variety of installation conditions. Further, these estimates should in no way be used to restrict the liberal cement application instructions recommended for the pipe.

Number of Joints Per....*			
Pipe Size	Pint	Quart	Gallon
½"	130	260	1,040
¾"	80	160	640
1"	70	140	560
1-¼"	50	100	400
1-½"	35	70	280
2"	20	40	160
2-½"	17	34	136
3"	15	30	120
4"	10	20	80
5"	8	16	64
6"	N/R	8	24
8"	N/R	3	12
10"	N/R	N/R	10
12"	N/R	N/R	6

\*Each joint represents one socket in a fitting.

N/R - Not recommended.