TECHNICAL BULLETIN

HOW TO MAKE SOLVENT CEMENT JOINTS

This literature describes the procedure for making joints with PVC plastic pipe using plain ends, bell ends and fittings, by means of solvent cements. These procedures are general ones for PVC piping. In non-pressure applications, simplified procedures may be used. The techniques covered are applicable only to PVC pipe of the same classes as described. Pipe and fittings are manufactured within certain tolerances to provide for the small variations in the extrusion, however, bell-end and molding processes and are not always to the exact size.

To consistently make good joints, the following should be clearly understood and adhered to:

Pipe and Fittings

The pipe and fittings should meet the requirements of current NSF, CSA and/or ASTM piping standards.

Solvent Cements

Westlake solvent cements do meet and exceed both the NSF, CSA and ASTM standards for solvent cements. Check with local, state, and federal codes concerning any product requirements.

Selection of Solvent Cements

Solvent cements are available in different viscosities and wet film thickness, to cover the range of pipe sizes from 1/8 to 12 inch. The cement viscosity plays an important role for interference fit joints, as well as non-interference joints, as found is some schedule 80 (Heavy Bodied) pipe and fittings. One of the general principles of solvent cementing that should be strictly adhered to is: sufficient cement must be applied to fill the gap between the pipe and fitting. The ability of a solvent cement to fill a gap in a pipe joint can be determined by considering its viscosity and wet-film thickness.

Storage of Cements, Cleaners, And Primers

PVC solvent cements should be stored in a cool place except when in use at the job site. These cements have a limited shelf life when not stored in hermetically sealed containers. Screw top containers are not considered to be hermetically sealed. Consult our technical department for specific storage recommendations on storage conditions and shelf life. The cement is unsuitable for use on the job site if it exhibits an appreciable change from the original viscosity, or if a sign of gelation is apparent.

If the cement is "jelly-like", do not use it and do not attempt to bring it back to the original viscosity by adding solvents or thinners.

Cleaners

There are two types of cleaners used in a solvent welding process, chemical cleaners and mechanical.

Chemical cleaners are a blend of solvents formulated to remove surface impurities (oil, dirt, etc.) and surface gloss from pipe and fittings.

Mechanical cleaners are fine abrasive paper or cloth (180 grit or finer) or clean oil free steel wool. Both types are used to remove oil and dirt from the pipe and fittings surfaces.

Primers

CPVC and PVC Primer exceed the ASTM Standard Specification F656.

Most city, state and federal codes require these and other code approvals. Always check with governing authority before using a product.

There exists a common misunderstanding that if a cleaner is used, a primer is not required, and vice versa. It is important to note that cleaners and primers are intended for different functions and should not be considered interchangeable.

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Cutting Pipe

Cut pipe square with the axis, using a fine-tooth handsaw and a miter box, or a fine tooth power saw with suitable guides. Wood working blades may also be used. A rotary cutter may be used if the cutting blades are specifically designed for cutting plastic pipe in such a way not to raise a burr or ridge at the cut end of the pipe. If other tools are not available, a standard rotary metal pipe cutter may be used, provided great care is taken to remove all the ridge raised at the pipe end by the wedging action of the cutting wheels. Failure to remove the ridge will result in the cement in the fitting socket being scraped from the socket surface, producing a dry joint with a high probability of joint failure. Remove all burrs with a knife, file, or abrasive paper.

Joint Preparation

Failing to chamfer or deburr the edge of the pipe may remove the cement and softened material from the fitting socket, which may result in a leaking joint.

Dry Fit Testing

The solvent cement joint is designed so that there will generally be interference of pipe wall with the fitting socket before the pipe is fully inserted. Insert the pipe into the fitting and check that the interference occurs about 1/3 to no more that 2/3 of the socket depth. When pipe and fittings are at their tolerance extremes or when Schedule 80 pipe is used, it may be possible to fully insert the dry pipe into the fitting socket until it bottoms. If this occurs, the fit between the pipe and fitting must be snug. If the fit is loose or wobbly, other pipe or fittings should be selected which gives a proper fit.

Cleaning

Surfaces to be joined must be cleaned and be free of dirt, moisture, oil, and other foreign materials. If this cannot be accomplished by wiping with a clean dry cloth, a chemical or mechanical cleaner must be used.

Applicator Size

Apply the cement with a natural bristle, nylon brush or suitable applicator. The brush size should be half the diameter of the pipe. Example use a 2-inch brush for a 4-inch pipe, except that for pipe sizes 6 inches and larger, a 3 inch brush or applicator is adequate. Other applicators may be used provided their use, results in an equivalent amount of cement being applied to the joining surfaces. Remember, both surfaces must be wet before assembling the pipe and fitting. Failure to apply adequate cement to both the pipe and fitting surfaces may cause joint failures.

Application of Primer and Cements

PVC solvent cement is fast drying, and therefore the cement must be applied as quickly as possible, consistent with good workmanship. It may be necessary for two workers to perform this operation for larger sizes of pipe and fittings. Under conditions of high atmospheric humidity, quick application is very important to minimize condensation of moisture from the air on the cement surface. The surface temperature of the mating surfaces should not exceed 45°C (110°F) at the time of assembly. In direct sunlight or in ambient temperatures above 45°C (110°F), the pipe temperature may be reduced by swabbing the surface to be cemented with clean wet rags provided the pipe is thoroughly dried before primer and cement are applied.

First apply primer to inside socket surface using a scrubbing motion to ensure penetration. Next soften surface of male end of pipe, to be inserted into socket, to depth of fitting socket by uniformly applying a liberal coat of primer. Be sure entire surface is well softened. Without delay, apply cement to pipe while the surfaces are still wet with primer. Apply cement lightly but uniformly to inside of socket, taking care to keep excess cement out of socket. In extreme conditions, it may become necessary to apply a second application of solvent cement to the pipe end only. Contact our technical department for information on solvent welding in temperatures below 5°C.

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Special Instructions for Bell-End Pipe - The above procedures may be followed in the case of bell-end pipe EXCEPT that great care should be taken not to apply an excess of cement in the bell socket. This precaution is particularly important for installation of bell-end pipe with a wall thickness of less than 1/8 inch (3 mm).

Joint Assembly

Immediately after applying the last coat of cement to the pipe, and while both the inside socket surface and the outside surface of the male end of the pipe are SOFT AND WET with solvent cement, forcefully bottom the male end of the pipe in the socket. Turn the pipe and fitting 1/4 of a turn during assembly to distribute the cement evenly. NOTE: The 1/4 turn should be completed before the pipe reaches full socket depth of the fitting. Assembly should be completed in 20 seconds or less after the last application of cement. The pipe should be inserted with a steady even motion. Hammer blows should not be used. If there is any sign of drying of the cement surfaces, due to delay in assembly, the surfaces should be recoated, taking care again not to apply a surplus of cements to the inside of the socket, particularly in bell-end pipe. As large axial forces are necessary for the assembly of interference fit joints in large size pipe, two or more workers are needed for such joints. Mechanical forcing equipment, such as come-along or levers and braces may also be necessary. Until the cement is set in the joint, the pipe may back out of the fitting socket not held in place for approximately 1 minute after assembly. Care should be taken during assembly not to disturb or apply any force to joints previously made. Early rough handling can destroy fresh joints.

After assembly, wipe excess cement from the pipe at the end of the fitting socket. A properly made joint will show a bead around its entire perimeter. Any gaps at this point may indicate a defective assembly job, due to insufficient cement or the use of light-died cements on large diameter where standard or heavy bodied should have been applied.

Installation

After the set period, the pipe can be carefully placed in a prepared ditch and snaked from side to side. Prior to backfilling, the pipe shall be brought to approximate operating temperature either by shading backfilling, or by filling with water, or by allowing to stand overnight. The pipe system should be allowed to stand vented to the atmosphere prior to pressure testing. The set period before the system is pressure tested will depend on the specific cement, the size of the pipe, the ambient temperature, and the dry joint tightness. Necessary cure time can vary from minutes to days depending on conditions and the solvent cement used. A general rule, relatively short cure periods are satisfactory for high ambient temperatures with low humidity, small pipe sizes, quick drying cements, and tight-fitting joints. Longer cure periods are required for low temperatures, large pipe sizes, slow drying cements, loose joints, and relatively high humidity. Shade backfill, leaving all joints exposed so that they can be examined during pressure tests. On long runs pressure tests should be performed on sections no longer than 5000 feet. Test pressure should be 150% of system design pressure and held at this pressure until the system is checked for leaks, or follow the requirements of the applicable codes, whichever is higher.

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