You can make LEAK-FREE PVC

When installing or repairing PVC pipe, follow the cement manufacturer's instructions rigidly and work quickly to ensure reliable solvent welds.

By Larry Workman,
applications engineer,
Lasco Fittings,
Philips Industries Inc.,
Anahiem, Calif.

How many times have you had to repair a broken or leaking PVC irrigation system only to have the *repair* leak? The most frequent problem reported to PVC fitting manufacturers results from solvent cementing that fails.

Most likely, the problem was partially created years ago by the plastic pipe and fitting industry in its enthusiasm about the ease with which solvent-weld joints could be made. PVC turf and irrigation systems are easy to install, but larger sizes (more than 2 inches) require a degree of expertise to produce a leak-free joint. We all have seen papers, pamphlets and instruction sheets that discuss cutting the pipe square, deburring, cleaning and priming the pipe prior to applying solvent cement. However, most of these publications do not emphasize the most important aspects of proper solvent joining of PVC pipe and fittings.

Primer and cement

First and most important, choose the proper solvent cements and primers. According to the American Society for Testing and Materials (ASTM), a primer must be identified by its function and the designation "F-656" on its label. This avoids confusion with plastic piping *cleaner,* which is intended only to clean the surface of the pipe. Most primers are colored blue or purple to aid you in verifying their use in a completed joint.

Most solvent cement labels show the pipe sizes that the manufacturer recommends for that cement. Follow the cement manufacturer's instructions rigidly; otherwise, joint failure is likely.

Solvent cements designed for smaller-sized piping systems have a

Daubers, brushes and a mop illustrate the various sizes and styles of cement applicators.

JOINTS

more "water-like" consistency. They do not have the body (or solids) necessary to fill the normal gap or void between larger-diameter fittings and pipe. In some of the larger sizes (4-in. Schedule 40, for example), the industry-allowable tolerances for pipe and fittings can result in a gap of approximately 1/32 inch at the socket entrance.

Dry joints

Solvent cement consists primarily of volatiles that evaporate during curing. When an applicator or brush is too small to apply the cement quickly, the volatiles *flash off*, leaving insufficient solvent to create a bond between the pipe and fitting. This results in a *dry joint*.

To prevent dry joints, the applicator size should be at least one-half the pipe diameter. For example, a 4-in. pipe requires a 2-in.-wide brush or a 2-in.-diameter dauber. The typical 1-qt. cement can comes with a 1½-in.-diameter applicator.

Some failures occur from the common practice of taping together quart-can containers of both cement and primer. Although this is convenient for the installer and saves time, the daubers and brushes that fit quart cans are not intended for use on larger-size systems.

Such small applicators cannot hold enough cement to prevent the applied cement from partially drying *before* the joint is assembled. Therefore, the "convenience" of the two cans taped together may be counterproductive. Installers must apply sufficient cement on the joining surfaces *quickly* for a reliable solvent welding of two PVC parts.

Select an applicator that is at least one-half the pipe diameter, and apply the cement quickly to prevent it from partially drying before the joint is assembled. Shown is Schedule 40 (or SDR) pipe, which is typical in an irrigation installation.

1,2,3, etc.

Do not ignore the proper *sequence* of applying the primer and cement. It is extremely important when you assemble large-size fittings—and *absolutely necessary* when you use Schedule 80 fittings.

Follow these steps *in order*:

1. Prime both the pipe and fitting socket to be joined.
2. Immediately apply a coat of cement to the pipe end.

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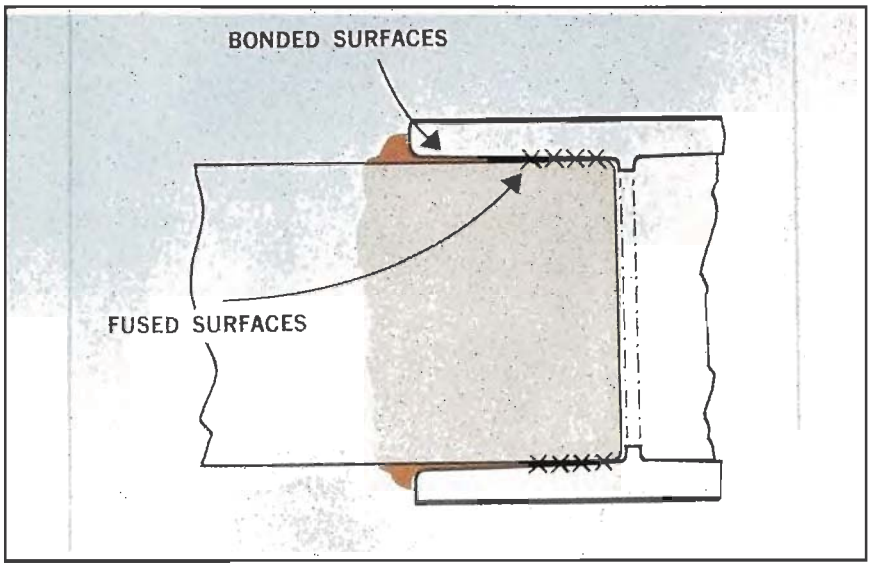
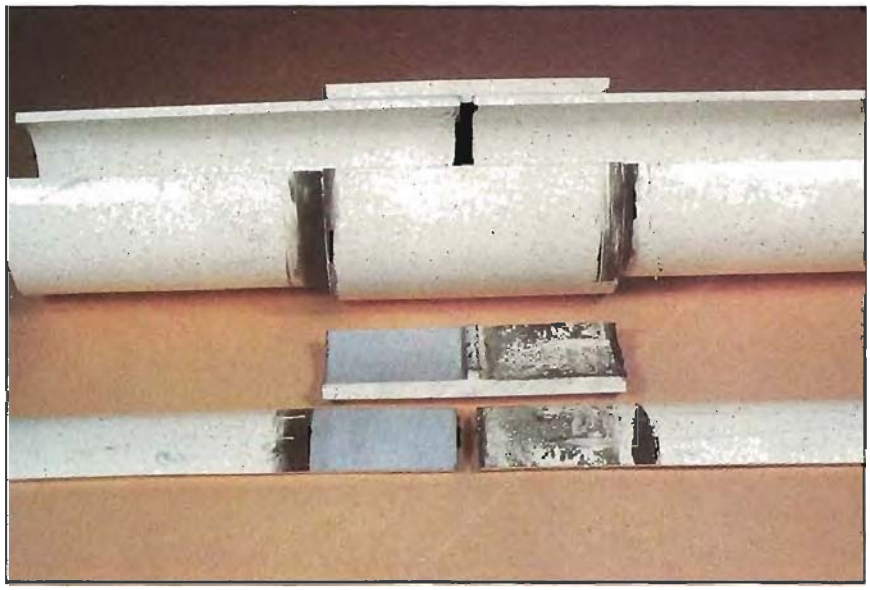


PVC Schedule 40 and Schedule 80 fittings have tapered sockets that—when properly prepared—push excess cement back out along the pipe, filling the gap at the socket opening.

Leak-free joints (Continued from IR-5)



Notice the difference between the dry joint (gray) and the properly prepared joint (blue). The dry joint does not have enough solvent to soften the surfaces of the pipe and socket that must weld together.

3. Apply a light coat of cement to the fitting socket.

4. Add a second coat of cement to the pipe.

5. Push the parts together, rotating one-eighth to one-quarter turn, and hold for 15 to 30 seconds. (In cold weather installations, increase the hold time to prevent push-off.)

The second coat of cement on the pipe is the key to success because it puts the most adhesive where it will be most beneficial. All PVC, Schedule 40 and Schedule 80 fittings have tapered sockets. As you insert the pipe into the fitting, any excess cement on the pipe will be pushed back out along the pipe, filling the gap between the pipe and fitting at the socket opening. Abnormal amounts of cement will not be trapped within the joint, and you can wipe them off at this point.

This assembly method prevents a cement puddle from forming inside the fitting, as it would if the excess cement were in the socket. Puddles of cement may cause excessive softening and blistering of the plastic components.

Remember to put cement on the pipe, then on the socket, and a second coat on the pipe before assembling. It is vital to follow this procedure.

Our failure analysis laboratory often receives joints that are reported to be leaking because of defective fittings, but we find that the cement was an improper type (viscosity) or that the application and assembly was faulty. When we cut these joints along the length of the pipe, the two pieces either fall apart or can be pulled apart easily, proving the lack of a good solvent weld.

Next time you make a repair or a new installation, stop and review your supplies.

- Do you have the correct primer and solvent cement for the diameters of pipe to be assembled?
- Do you have an applicator that is at least half the diameter of the pipe?
- Review the procedure by the numbers: (1) prime both parts, (2) apply one coat of cement on the pipe and one coat in the fitting, (3) apply a second coat on the pipe, (4) assemble, and (5) hold.

It can be as easy—and foolproof—as 1,2,3,4,5. □

A field failure shows how too little cement left a gap (arrow) between the pipe and the fitting, resulting in a leaking joint.

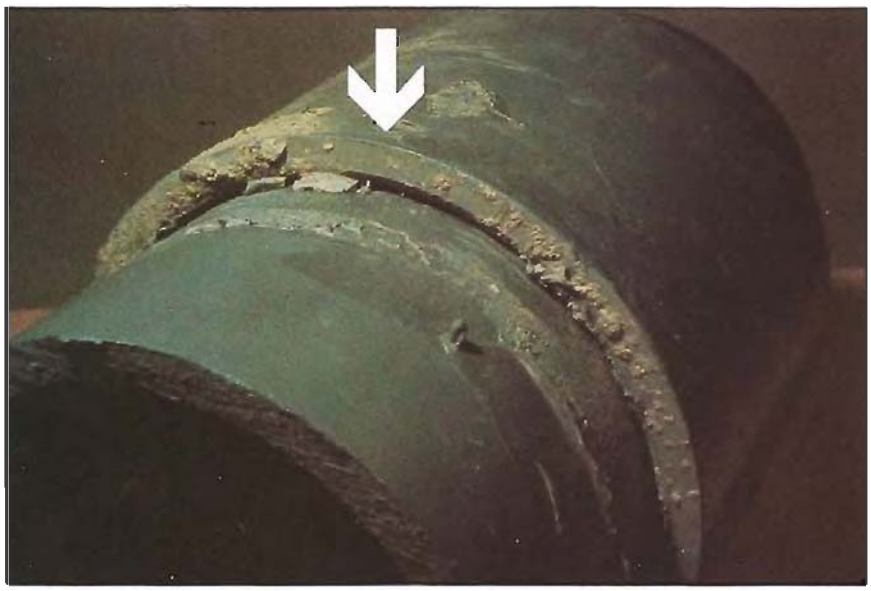


Photo credit: Author.