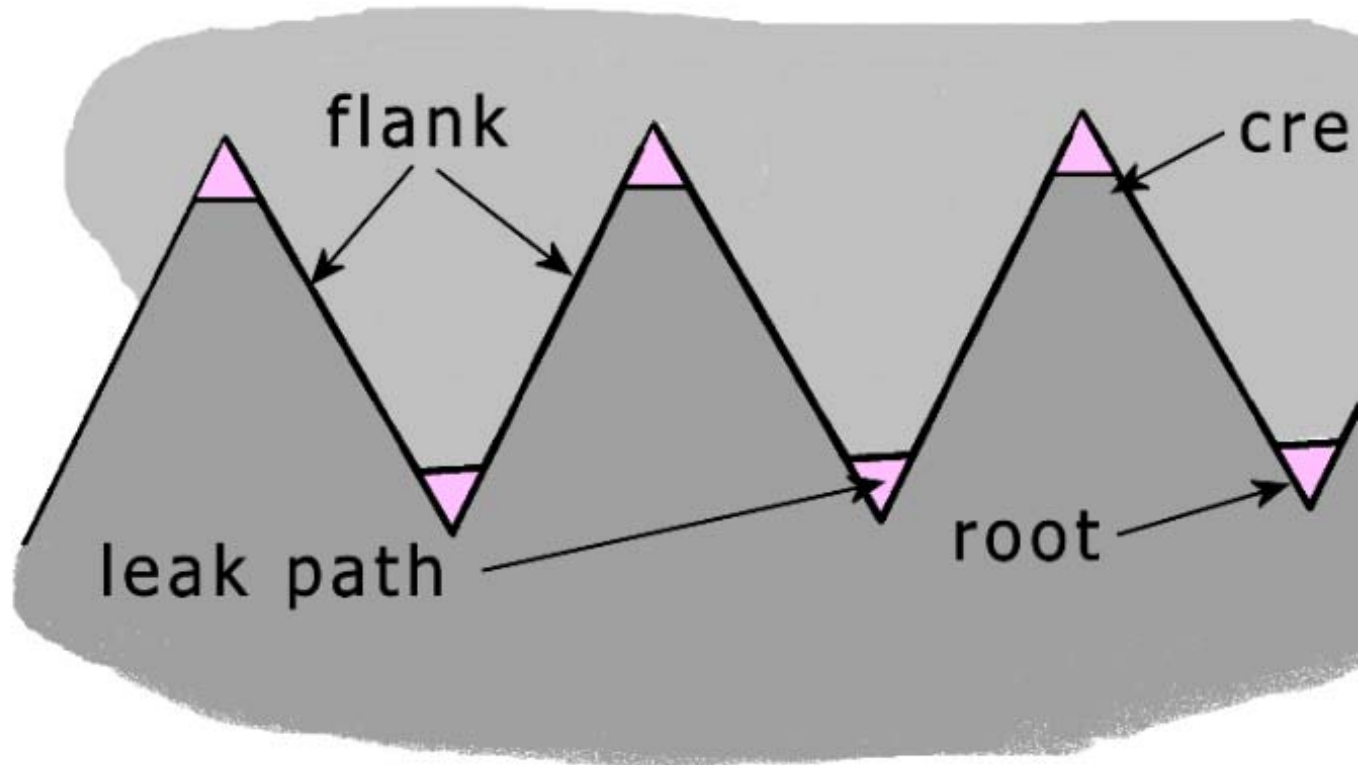


What thread sealant to use with PVC fittings!



This is a common question that is asked by installers when assembling PVC tapered pipe threads in a piping system. There is a common misconception that Teflon sealant or tape is the best for **ALL** threaded joints. With metal fittings these products are acceptable, but when working with PVC fittings the potential for failures is exaggerated. Threaded pipe joints are a necessary evil. Designers and installers strive to reduce the number of threaded joints in a system; yet, they are essential for change of materials and convenience of repair.

This illustration shows how the threaded two parts mate when tightened. Note the voids left where the crest and root do not meet. All tapered pipe threads have a small spiral leak path between the root and crest of the mating threads. This leak path needs to be sealed during the joint assembly to obtain a drip free connection. The purpose of a thread sealant is to "plug" the leak passage.

One "solution" has been to wrap the male threads in Teflon tape as a means of packing the joint to avoid leakage. This creates two additional problems, rather than solving anything. First, although it is not a sealant, it has been adopted for thread sealing because of its anti-friction lubricity which allows more turns to be taken on a tapered fitting. Second, the additional thickness of the tape adds to the wedging force of the male threads. Then, when the threaded joint is backed off, such as for alignment, the tape which has been permanently compressed, has lost its packing ability. Result: a drip or leak!

Teflon tape can be classified as a "trapped elastomer." Like imprecise tapered pipe threads it creates an

additional variance in the process of joint sealing; however, tape is often banned in irrigation systems because of shredding and contamination. Teflon tape joints serve well in most metallic connections, yet increases the potential for failures in PVC joints.

During the process of tightening a joint the tape is sheared along the flanks, while lubricating, and gets packed into the voids between the root and crest of each thread. In metallic joints the process of packing increases the stress in the male and female parts yet is tolerated by the strength of the materials.

Most materials can tolerate compression loads much greater than tensile. Within a threaded connection the male component is compressed; while the female threaded part is stretched during tightening. PVC does not have the strength to withstand the combined loads of tightening along with the bulk of the Teflon being "packed" into the root/crest voids. It is easier to split smaller diameter threaded joints than larger ones since the stress and strain loads are greater. Teflon, within a "sealant" or tape, make the threads more lubricated, inviting over-tightening. The joint goes together so easily that it does not "feel" tight to the installer. Because the threads are tapered, once the male and female threads are engaged (finger tight- not even hand tight) additional turns cause the female part to stretch or undergo "strain."

Recommended good practice is to use a thread sealant (not a thread lubricant) and to assemble the joint to finger tight plus one turn, two turns at the most.

When tapered threaded parts are assembled and the PVC female threaded part splits, the most likely cause is from over-tightening. The failure of the female part with a crack that is parallel to the axis of the fitting pinpoints the cause as over tightening. Many times the crack has progressed through the pipe and other parts, but its origin was from within the female threads. A crack or split is always oriented perpendicular to the causing load. In these failures the male threads induced stress (stretch) to the female threads.



In a threaded joint the greatest stress is generated within the meshed threads; so any cracks or failures will originate from the interior and progress to the exterior. The wall thickness of the female threaded portion, part or assembly has an insignificant effect on preventing failure from cracking.

When assembling threaded PVC fittings, a sealing compound that is non-hardening is the best. Recommended good practice is to use a thread sealant (not a thread lubricant) to assemble the joint to finger **tight plus** one and one-half ($1\frac{1}{2}$) turns, two turns at the most. Teflon tapes and hardening pastes can permit a leak path to develop when a joint is backed off, mechanically flexed or expanded

with changing temperatures. Conversely, a non-hardening compound is forced by the internal fluid pressure into potential points of leakage; performing a true sealing role. The sealing compound must be compatible to all materials and media to which the joint will be exposed. Many brands of pipe sealants contain oils, solvents or carriers that can damage PVC. A proper sealant must be approved by the manufacturer to be harmless to the joint materials and not contaminate the fluid in the piping system. Finally, a sealing compound must not lubricate the joint to the point that over-tightening is encouraged.