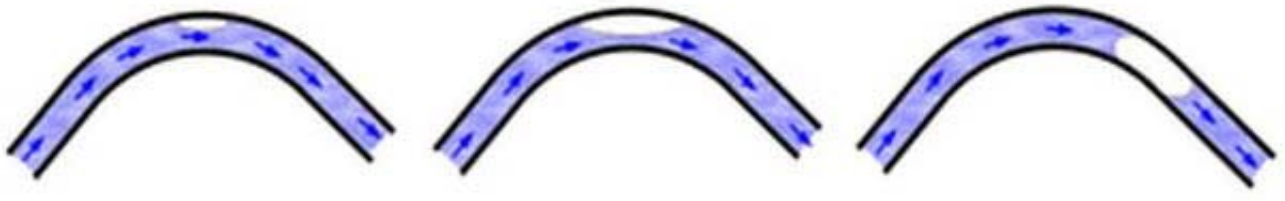
Springtime Startup fitting Failures

As Spring approaches and the winterized" irrigation systems are being recharged care must be taken to prevent component failures. There are always an increase in broken or leaking fittings at this time of the year!

A pocket of air within a piping system can create the same shock pressure as water hammer. Air pockets occur from improper design, system filling or undulating terrain.



As air separates from the liquid, a bubble or air slug slowly builds creating a restriction. This restriction in turn creates an increase in velocity directly underneath the air pocket. Once the air pocket reaches a critical size it is swept downstream leading to high fluid velocities where none existed before. To prevent this scenario the system design needs to accommodate the ability to remove air from high points in a system. Water has a density about 800 times of air. Because of this, and its smaller molecular size (compared to a molecule of water), air can be expelled through an opening, nozzle or spray head several times faster than water. The actual difference in velocity depends on several factors but a rough

estimate is 10 times faster.

This means that the velocity of water behind a slug of air moving thru a system can be about 10 times faster than just water moving thru a system with no air slugs. When the last of an air pocket or slug of air is expelled thru an orifice the moving water is decreased in velocity by 10 times almost instantaneously as it seeks unsuccessfully to move thru the same orifice. This rapid change in fluid velocity creates a large pressure surge or water hammer condition.

The failure of a pipe or fitting from exceedingly high pressure over a short period, usually defined as less than a minute, would be classified as a burst or short term failure. The more common evidence for these failures is sharp edged cracks and fragments, similar to glass. If these fragments are not contained or entrapped during the failure they can be dangerous. A short term or brittle failure shows no visible, to the naked eye, material deformation, stretching, elongation or necking down close to the break.

The “Springtime Startup” procedure is correspondingly critical. The refilling of a system that has been drained needs the full attention of the operator to prevent air slug and surge failures in the operation. **Start by filling the system with the valve one-quarter opened**, until all the air within the system has been displaced. Only after all the air has been removed should the valve be opened completely.

All air must be expelled from a piping system to prevent air slugs which cause pressure spikes. This is best done during the filling or refilling of a system. To lower the chance of getting air in a system it is important to fill slowly from the lowest possible elevation. The flow velocity during **the filling process should not exceed 2 feet per second**. Be sure to allow sufficient air venting at the highest possible elevation. The combination of slow filling and ample venting will keep the amount of entrapped air to a minimum.