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Water Pipe Failure Analysis, Part II

By

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Accidents caused by failed piping are often catastrophic in that the water damages expensive computer equipment, elevator electronics, interior decorating, etc. This article presents additional case studies that may help decipher the cause of a particular failure.

Figure 1

Figure 1 is a view of a polyvinyl chloride (PVC) pipe Tee joining three hoses. Figure 2 is a view of typical cracks found in the pipe about a year after it was buried in the ground as part of a swimming pool installation. The cracks continued to grow, causing water leakage that resulted in a significant repair job to the pool installation. The cause of the fracture in the PVC pipe apparently was the usage of a solvent based pipe sealing compound that chemically attacked the PVC and weakened its structure. As polymer (plastic) piping parts become more common, chemical attack failure modes of this nature will be more prevalent.

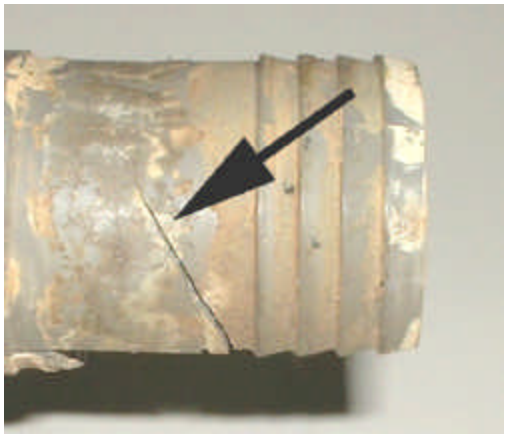

Figure 2

Figure 3

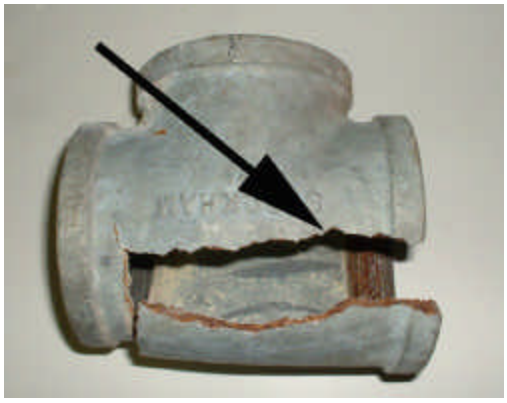

Figure 4

Figures 3 and 4 on the previous page show additional examples of freeze related failures. The large deformations of the copper elbow in Figure 3 and the large deformation of the cast iron T of Figure 4 are characteristic of freeze related damage. During freezing, the cracking of the fittings does not necessarily relieve internal pipe pressure and the freeze slug continues to deform the metal until it thaws or until all freezing related expansion has ceased.

Figure 5

Figure 5 is a view of a galvanic corrosion related failure in the vicinity of acidic soil. Such failures occur several years after installation. Figure 6 is a

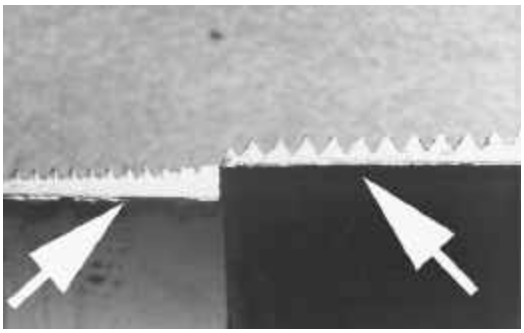

Figure 6

comparison of the cross section of two pipe nipples. The pipe nipple to the right has an improperly manufactured thread where the thread depth is nearly 70% of the wall thickness. The pipe nipple shown by the left arrow is one of acceptable manufacture where the thread depth may be less than 30% of the total wall thickness. Due to the excessive thread depth the pipe nipple on the right failed at a very low load, causing water to cascade down several stories in a high rise building, resulting in a costly loss.

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