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CPVC Fire Sprinkler Systems and Spray Foam Insulation

For many years, non-compatible chemicals coming into contact with the CPVC piping have caused one of the most prevalent problems faced by our industry. The increased use of spray foam insulation, typically used in attics to insulate the house or rooms from heat loss, has exposed a new addition to this dilemma. In recent times, we have witnessed two very different cases, involving two separate foam products, wherein the use of these products has resulted in the failure of the Fire sprinkler piping system. The first case involved Environmental Stress Cracking (ESC) and the second was the deformation of the piping due to excessive heat.

Environmental Stress Cracking (ESC) this is the crazing, cracking, or fracturing of the plastic material in the presence of an incompatible chemical agent and some form of stress (The environment). In these conditions, a failure can occur even under low stress loads (See Figure1). In this case, the base formula of the foam insulation was suspect of containing chemicals that are not compatible with the CPVC material. The stress portion of the equation could have been from the internal water pressure.

Heat generated during the curing process of the insulation product in the second case, is believed to have caused the deformation of the piping shown in figure 2. This build up of heat is referred to as an exothermic reaction and is caused by the reaction of the foam with air. The level of heat generated is dependent on the thickness of each pass. For example, based on information from the manufacturer of the foam product, a 2" pass will reach a temperature of 197°F at 4.25 minutes and a 4" pass will reach a temperature of 259°F at 11 minutes, which exceeds the temperature rating of the CPVC piping. As shown, the pipe and fitting, while under normal operating pressure, expanded in a balloon like fashion to the point where the pipe burst. In this case there was no evidence of ESC. The problem was exposing the piping to excessive heat. It is believed, in this case, that the manufacturers insulation instructions were not followed correctly.

What we have discovered, is that there is a real threat of ESC through the use of some Spray Foam products and just as big a threat to the CPVC systems if the installation instructions are not followed correctly and to the letter.

It is the installing contractors responsibility to insure that the Foam Insulation product they are using is in fact suitable for use with CPVC piping systems and to follow the product manufacturers installation instructions.