PASCHAL ENGINEERING & FORENSIC CONSULTING, Inc.

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November 18, 2009

Re: Spray Polyurethane Foam (SPF) products compatibility with CPVC piping

The use of spray polyurethane foam (SPF) sealants and insulation in walls and ceiling spaces, and chlorinated poly(vinyl chloride) (CPVC) piping for domestic water and fire suppression systems, is becoming much more prevalent within the building construction industry. This has led to some concern that the SPF products may have an adverse effect on the CPVC piping and cause premature failure of the piping system. One such effect is known as environmental stress cracking or ESC. ESC may occur when the CPVC piping is exposed to an incompatible substance while under stress. ESC can result in cracking and failure of the piping at pressures much lower than the rated pressure.

Spray Polyurethane Foam Alliance (SPFA) members, working with a major supplier of CPVC materials, commissioned a study last year to investigate the potential for ESC.

The results of the study show that all of the SPF products tested, including open-cell SPF, closed-cell SPF, one-component foams, and foams made from natural-oil based materials do not cause ESC and are compatible in direct contact with CPVC piping systems.

Some SPF products contain phosphate ester flame-retardants. There are some phosphate esters which are considered to be ESC agents for CPVC, and as such, would be of concern when exposing the CPVC to these chemicals. This study was designed and conducted to first develop a test method to assess SPF products, and then used that method to determine the effect these products would have on CPVC. The existing test methods for chemical compatibility cannot be directly applied to SPF because the liquid precursors are not necessarily representative of the finished foam product. The test method developed for this study included applying the foam to CPVC piping at specified thicknesses and subjecting the piping/foam assemblies to elevated temperature and stress to accelerate any ESC that may occur. A test duration of 6,000 hours was chosen based on other standard methods that utilize durations of 720 to 3,000 hours. That is, the testing was carried out for two to eight times longer than what would normally be used for this type of evaluation.

The SPF products used in the study were considered to be "worst-case" generic formulations which contained the potential ESC agents (phosphate ester flame retardants) at maximum concentrations used within the industry, and also at typical concentrations. The types of foams included medium-density closed cell foam, low-density open cell foam, and closed-cell one-component foams. The three primary flame retardants and maximum use concentrations were identified and tested in each of the foams.

Details of this study can be obtained by contacting SPFA at (800) 523-6154.

Sincerely,

James R. Paschal, P.E.

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