2.12.2 HAC Crush Test Evaluation

As discussed in Section 2.7.2, *Crush*, a crush test is required for the S300 package. Since a conservative evaluation of the free drop test concludes that the pipe component may become separated from the overpack components (as discussed in Section 2.7.1, *Free Drop*), the crush test will be considered to occur on the pipe component, resting on an unyielding surface. This is a conservative approach to the requirement, since a considerable amount of energy-absorbing structure is neglected, and thus damage to the pipe component or possibly the SFC will be potentially greater.

In this section, the crush test is evaluated using analysis. The SFC has been qualified as special form under the requirements of 10 CFR §71.75, thus it provides a containment function under the severe conditions of a bare, 30-ft free drop (§71.75(b)(1)). This analysis will demonstrate that the impact of a 1,100 lb mass falling from a height of 30 ft, and striking the pipe component so as to suffer the maximum damage, will not impart significant forces to the SFC. Thus, the crush test will not present any conditions that could compromise the containment function of the SFC.

2.12.2.1 Methodology

This analysis uses a half-symmetric FEA model using LS-Dyna (Version LS971S R2) to show that the cavity in the shielding insert for the SFC does not collapse as a result of the crush test, and does not apply any pressure or squeezing forces to the SFC. The dimensional output results of the payload cavity will be used to demonstrate that the cavity remains sufficiently large enough to accommodate the SFC during the crush test.

2.12.2.2 Assumptions

The deformation of the pipe component will be greatest at the maximum temperature. A conservative temperature of 180 °F is used for material properties, which bounds by a significant margin the maximum NCT temperature calculated in Section 3.3, *Thermal Evaluation for Normal Conditions of Transport*. At lower temperatures, the materials will be stronger and more resistant to deformation.

Friction is set to zero, which consequently directs most of the kinetic energy of the falling plate into deformation. A portion of the falling plate energy manifests as kinetic energy as the S300 package accelerates in the horizontal plane. Applying friction to the model will reduce this kinetic energy and the acceleration, but it will also decrease the deformation of the pipe component. Therefore, the frictionless setting results in a more conservative deformation model.

Of the two types of SFC, the larger Model II is used for this analysis, since less overall deformation of the pipe component and shielding insert would be needed to reach and apply load to the Model II SFC.