APPENDIX A - Structural Response Information

Part 1 - Deformed shapes and plastic strain levels

Figure A-1 Steel-lead-steel truck cask following a 30 mph corner impact

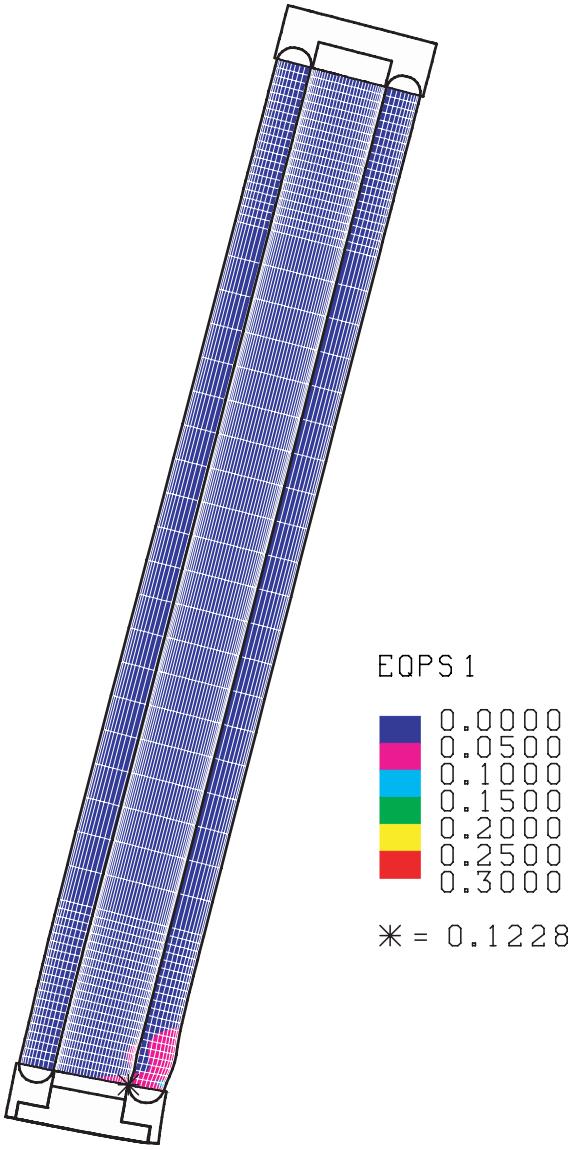


Figure A-2 Steel-lead-steel truck cask following a 60 mph corner impact

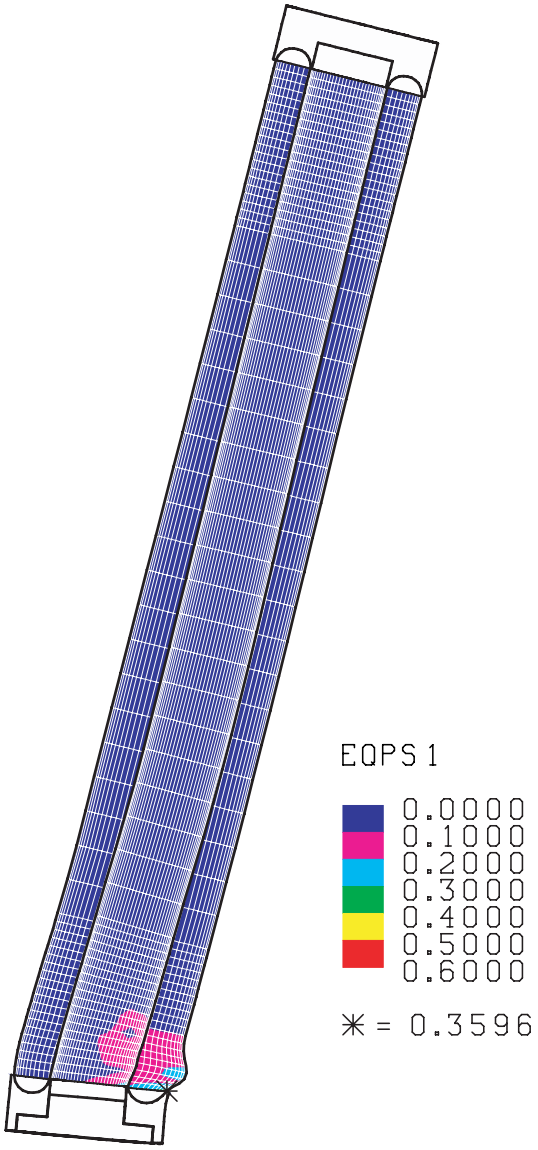


Figure A-3 Steel-lead-steel truck cask following a 90 mph corner impact

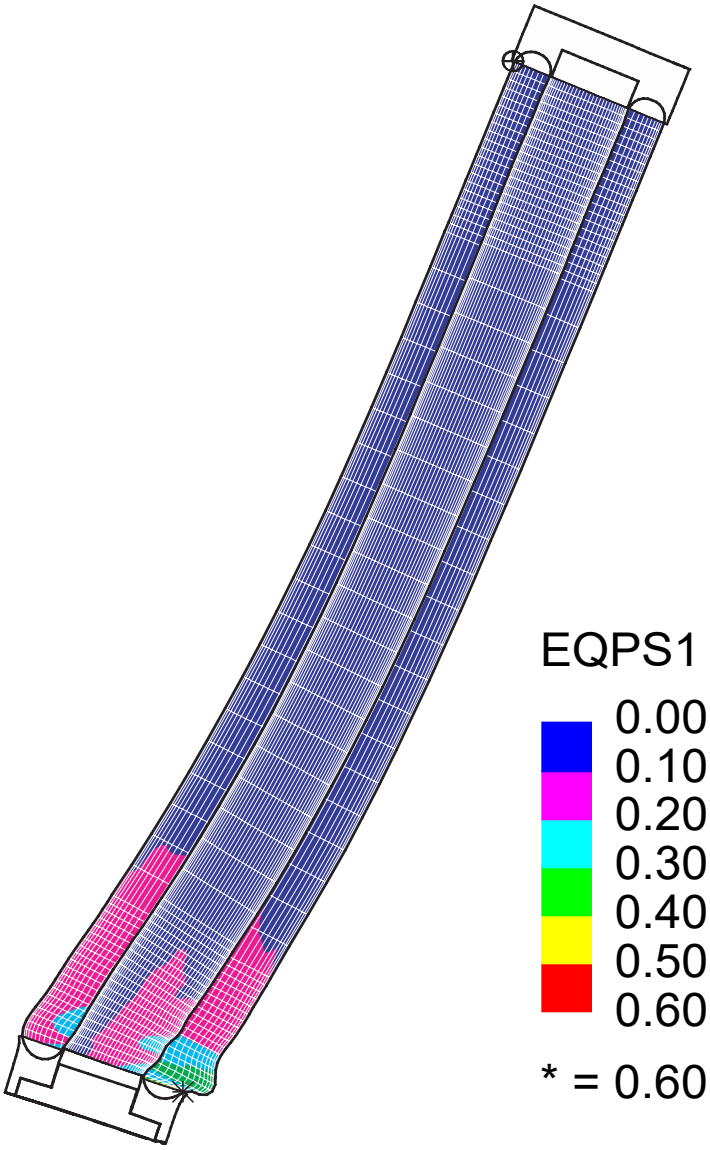


Figure A-4 Steel-lead-steel truck cask following a 120 mph corner impact

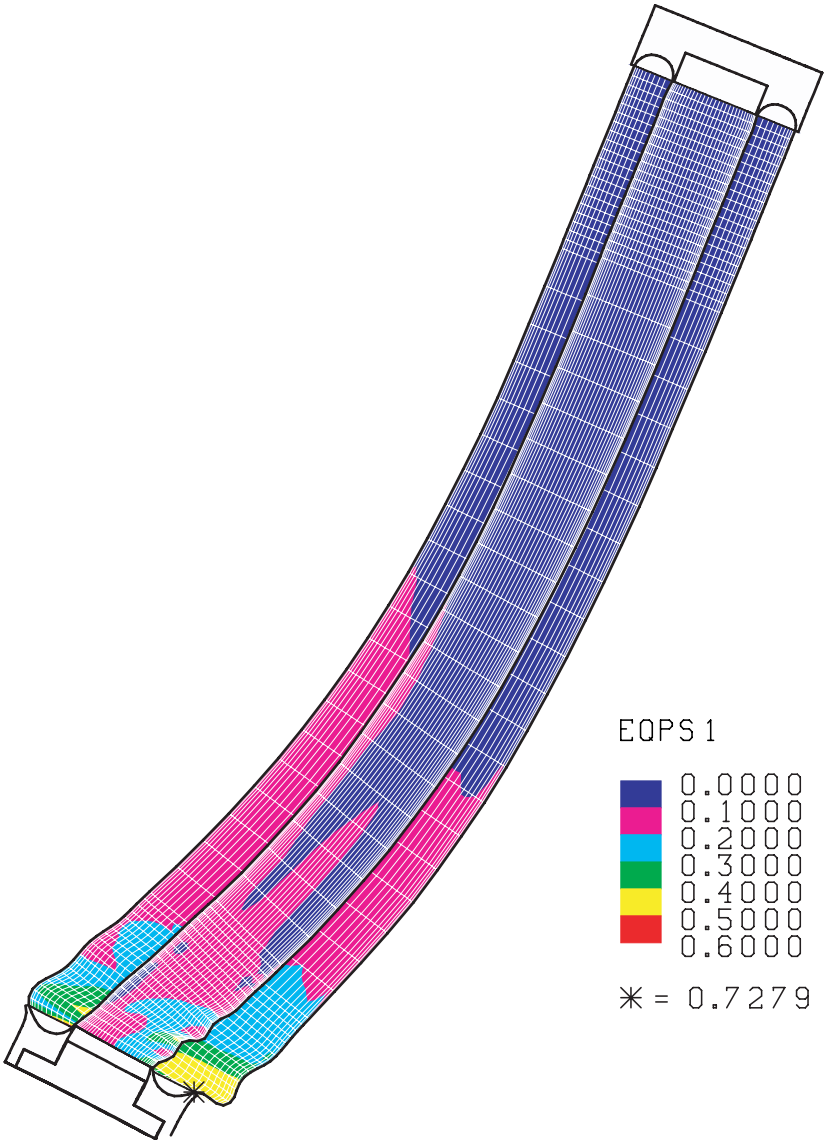


Figure A-5 Steel-lead-steel truck cask following a 30 mph end impact

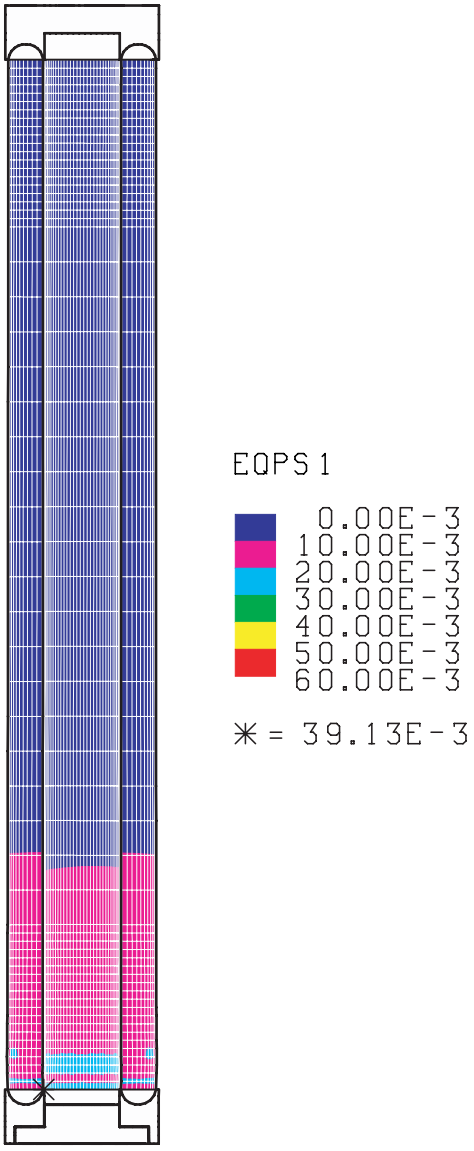


Figure A-6 Steel-lead-steel truck cask following a 60 mph end impact

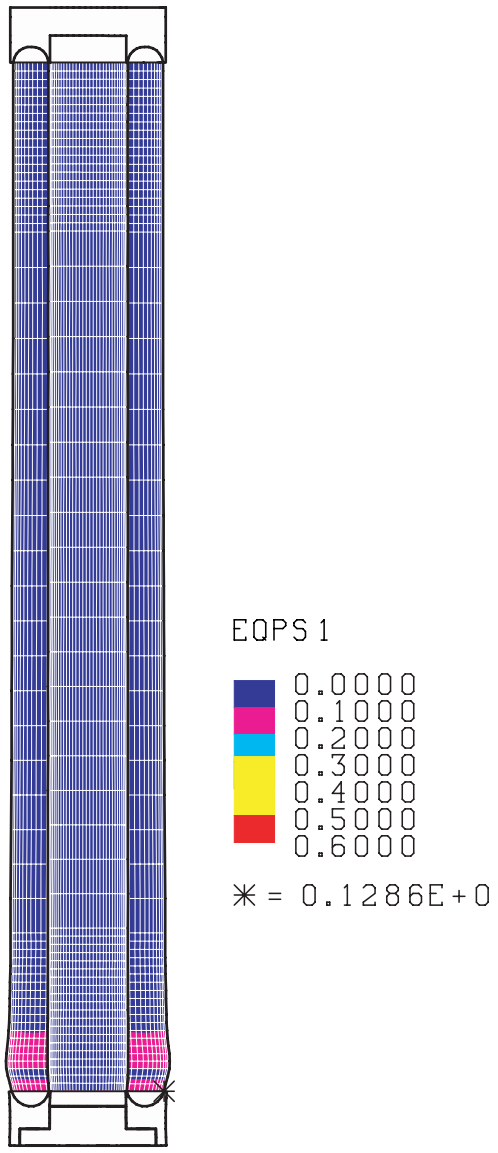


Figure A-7 Steel-lead-steel truck cask following a 90 mph end impact

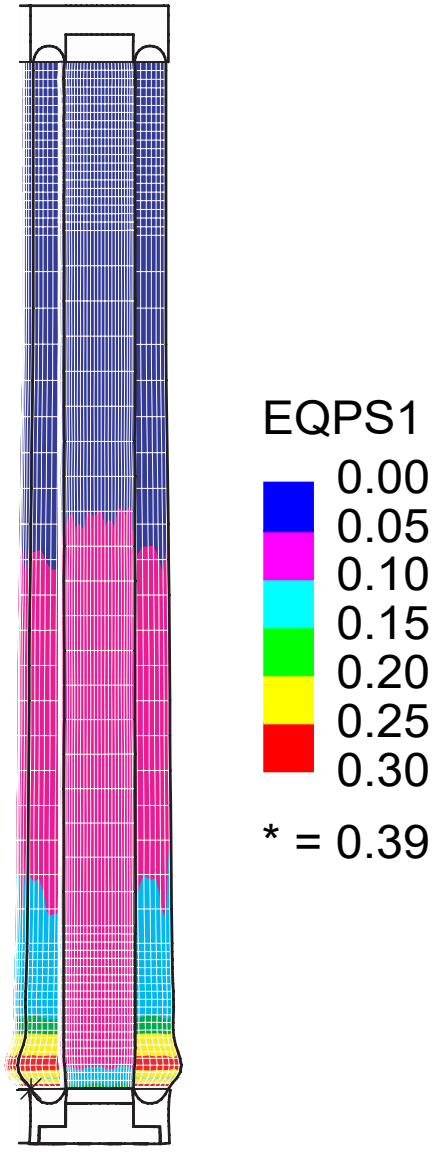


Figure A-8 Steel-lead-steel truck cask following a 120 mph end impact

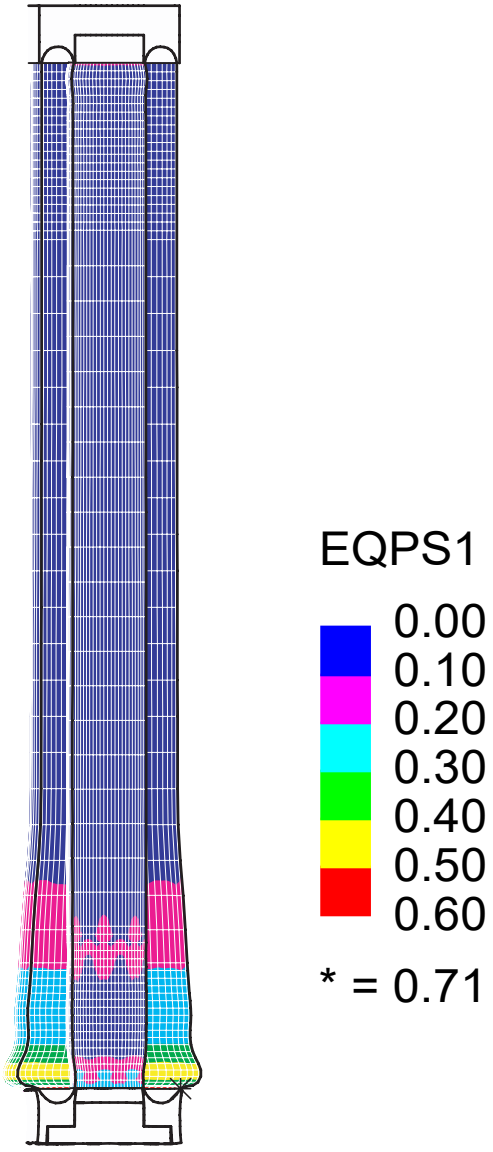


Figure A-9 Steel-lead-steel truck cask following a 60 mph side impact

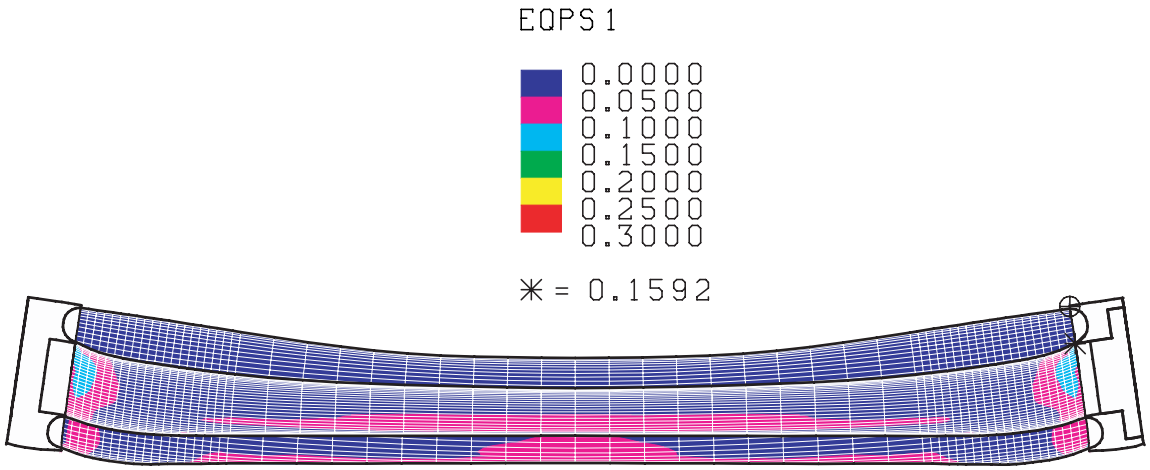


Figure A-10 Steel-lead-steel truck cask following a 90 mph side impact

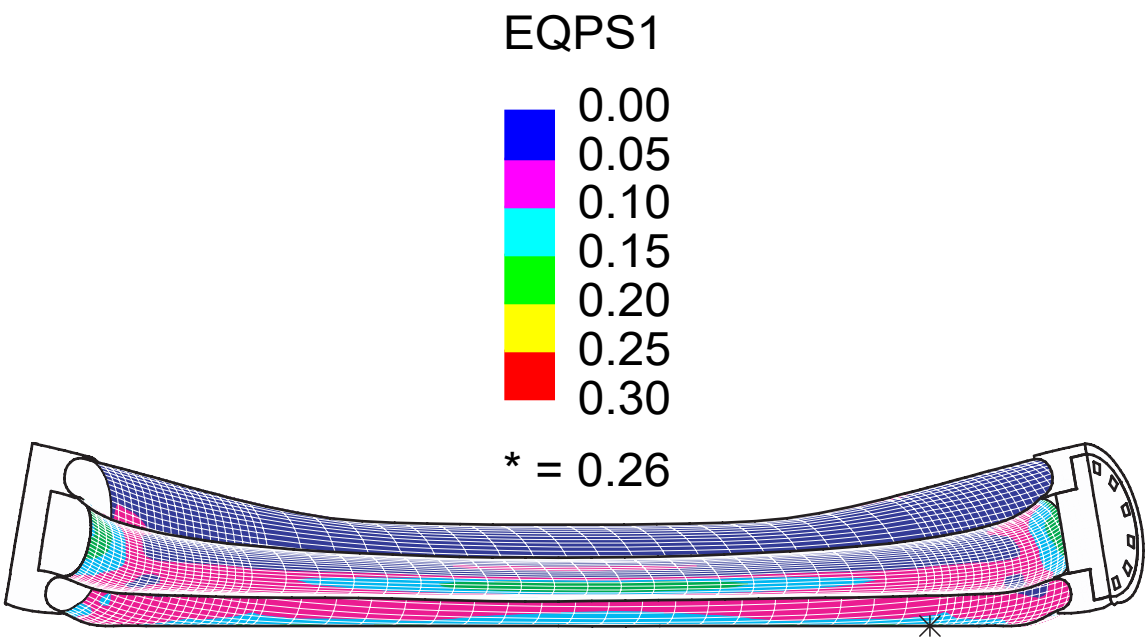


Figure A-11 Steel-lead-steel truck cask following a 120 mph side impact

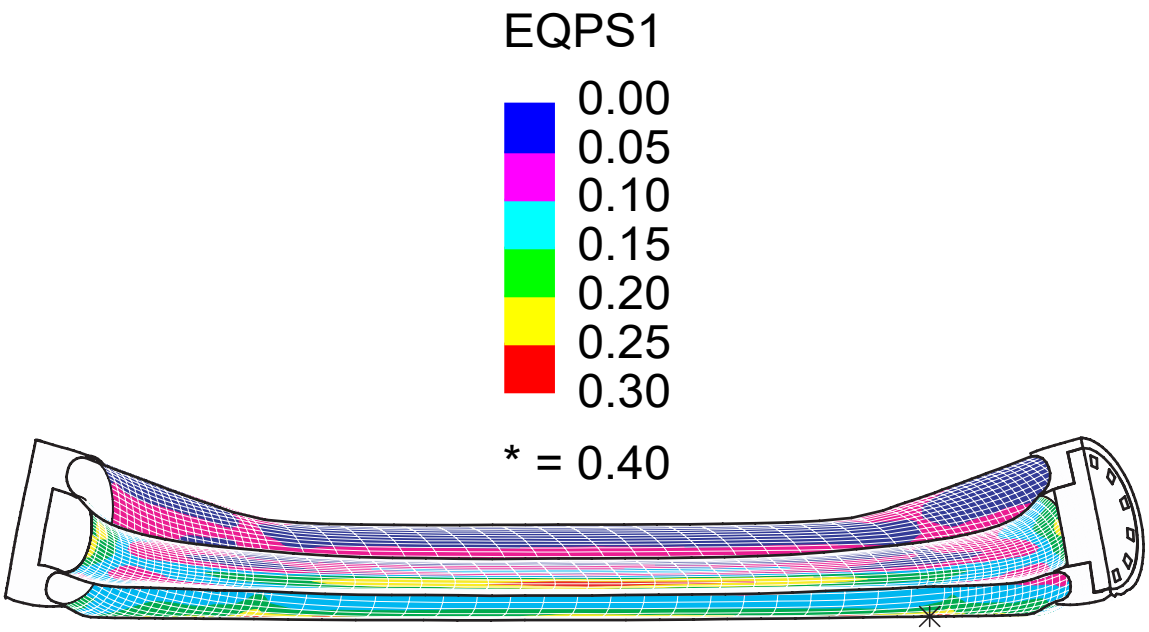


Figure A-12 Steel-DU-steel truck cask following a 30 mph corner impact

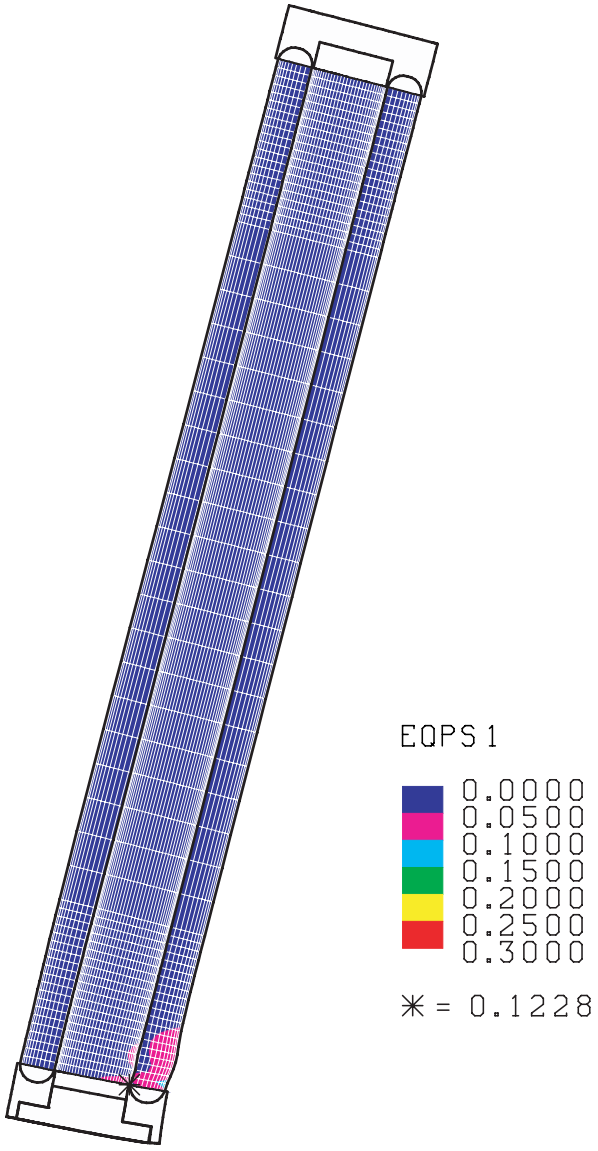


Figure A-13 Steel-DU-steel truck cask following a 60 mph corner impact

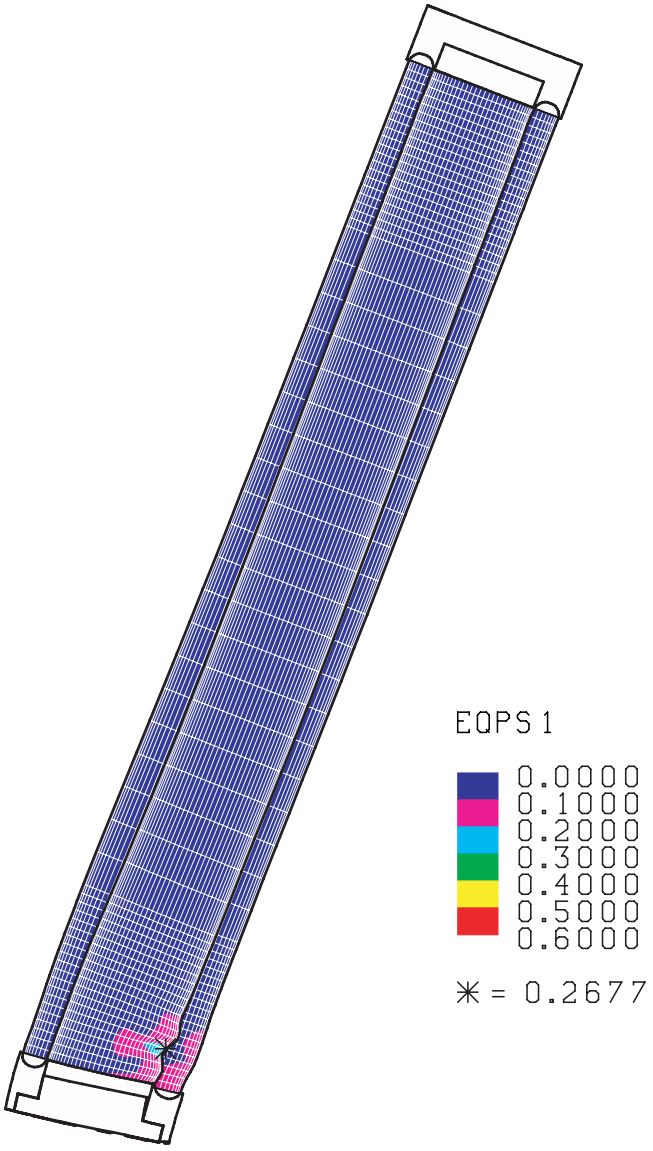


Figure A-14 Steel-DU-steel truck cask following a 90 mph corner impact

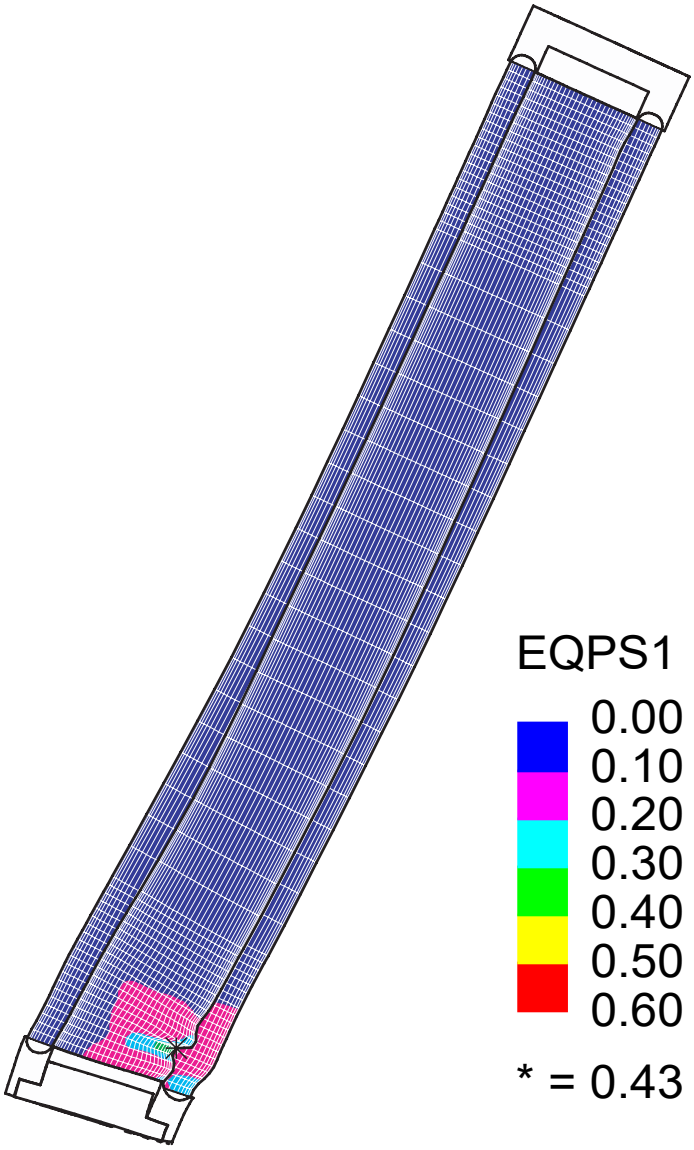


Figure A-15 Steel-DU-steel truck cask following a 120 mph corner impact

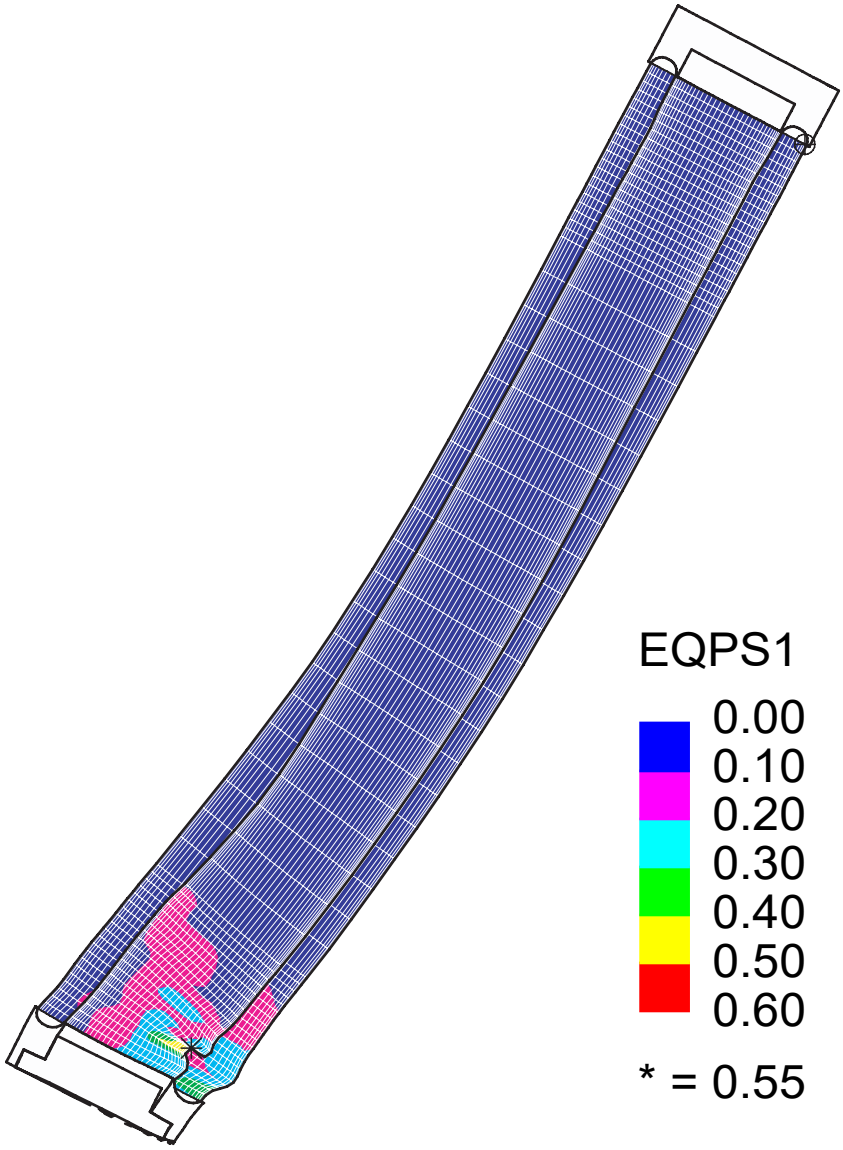


Figure A-16 Steel-DU-steel truck cask following a 30 mph end impact

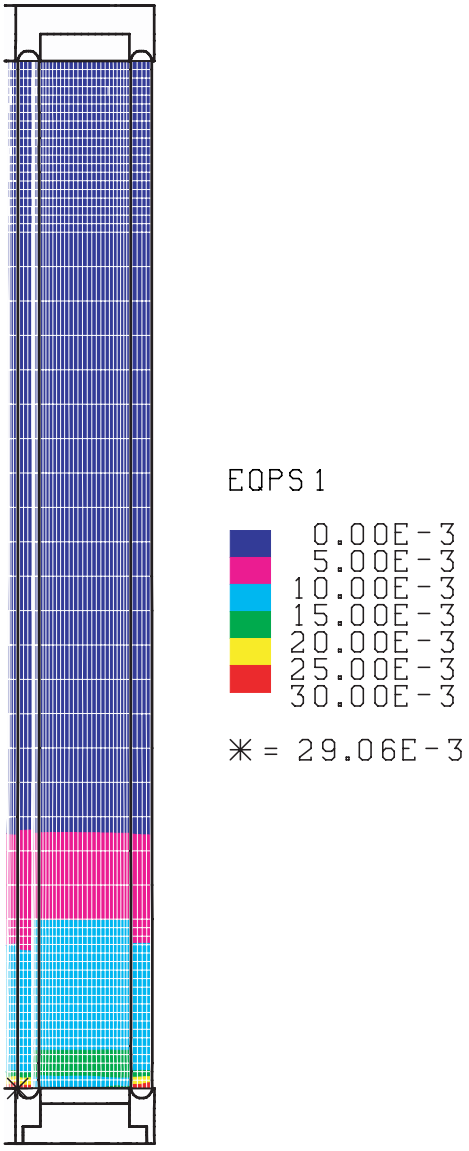


Figure A-17 Steel-DU-steel truck cask following a 60 mph end impact

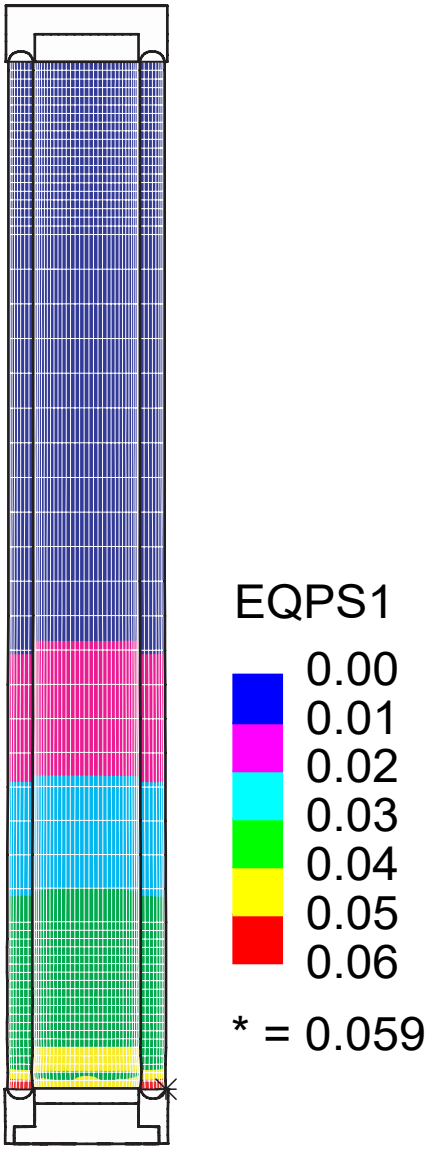


Figure A-18 Steel-DU-steel truck cask following a 90 mph end impact

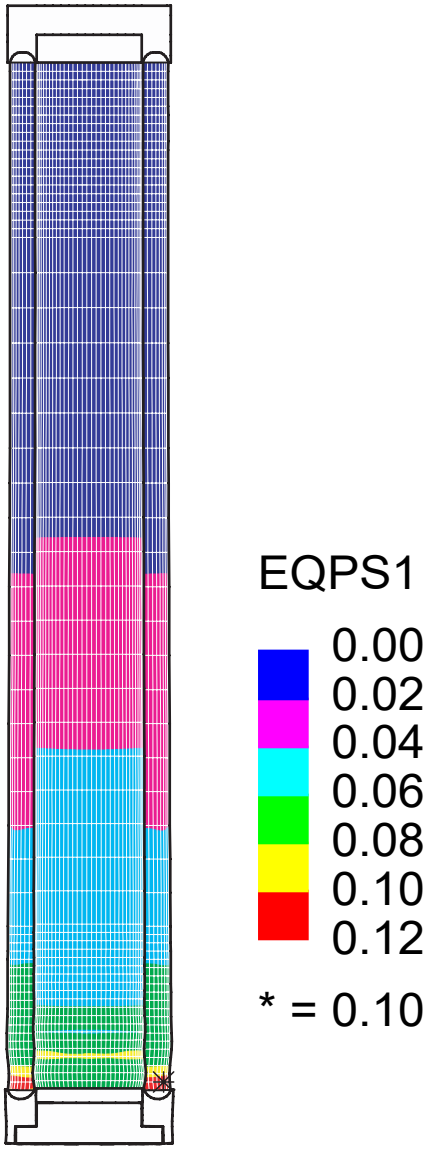


Figure A-19 Steel-DU-steel truck cask following a 120 mph end impact

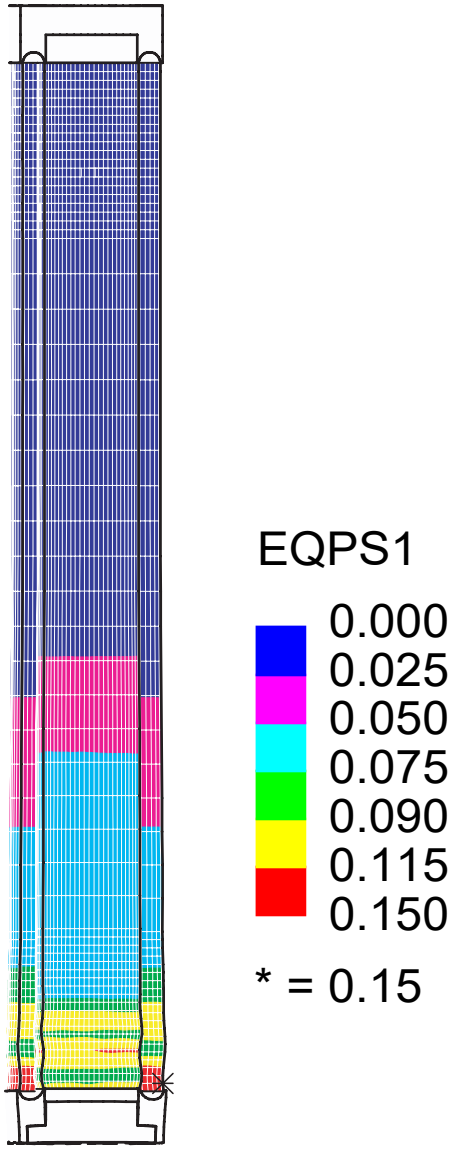


Figure A-20 Steel-DU-steel truck cask following a 60 mph side impact

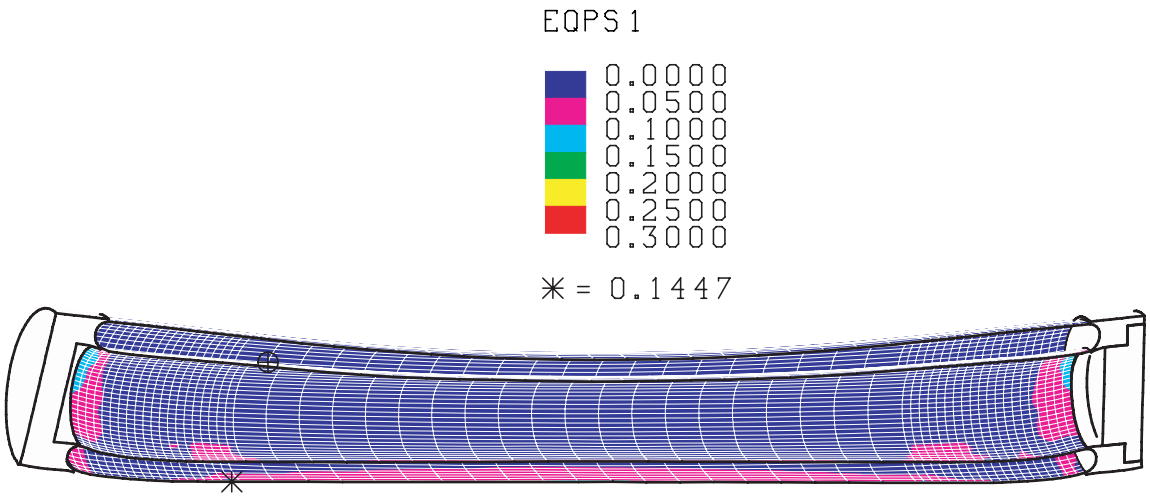


Figure A-21 Steel-DU-steel truck cask following a 90 mph side impact

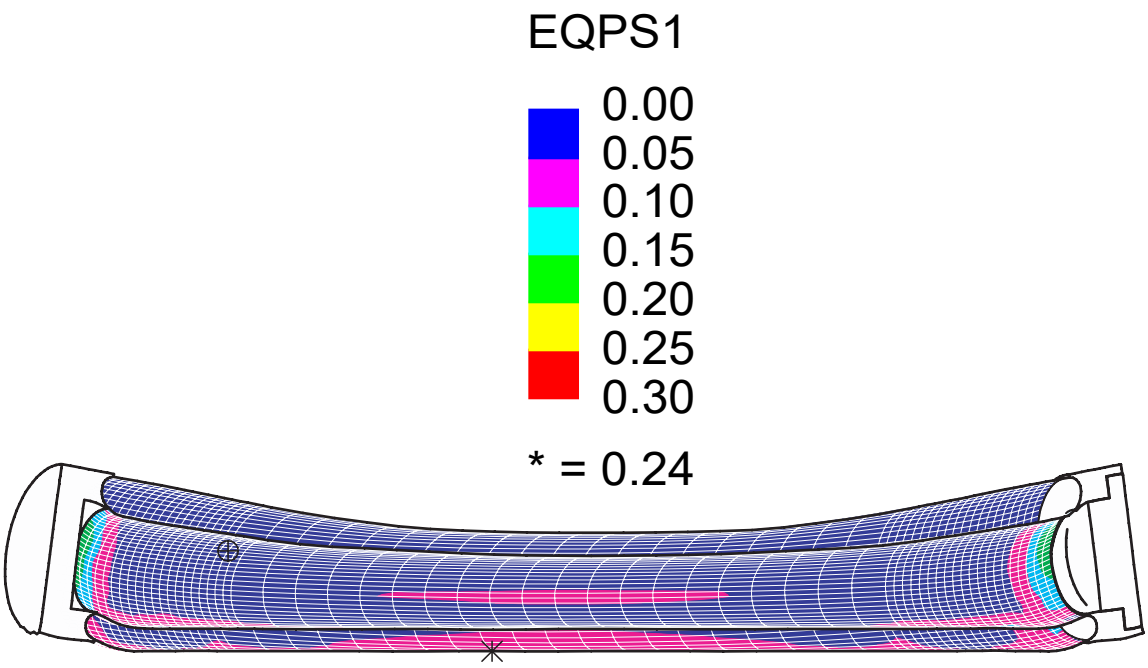


Figure A-22 Steel-DU-steel truck cask following a 120 mph side impact

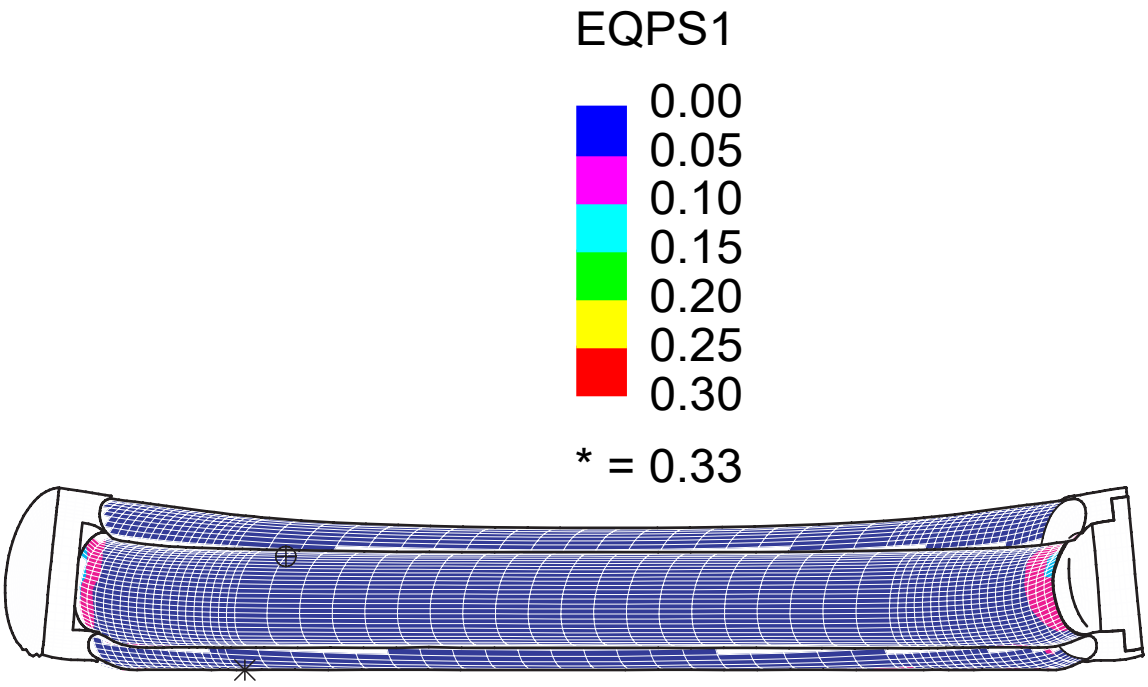


Figure A-23 Steel-lead-steel rail cask following a 60 mph corner impact

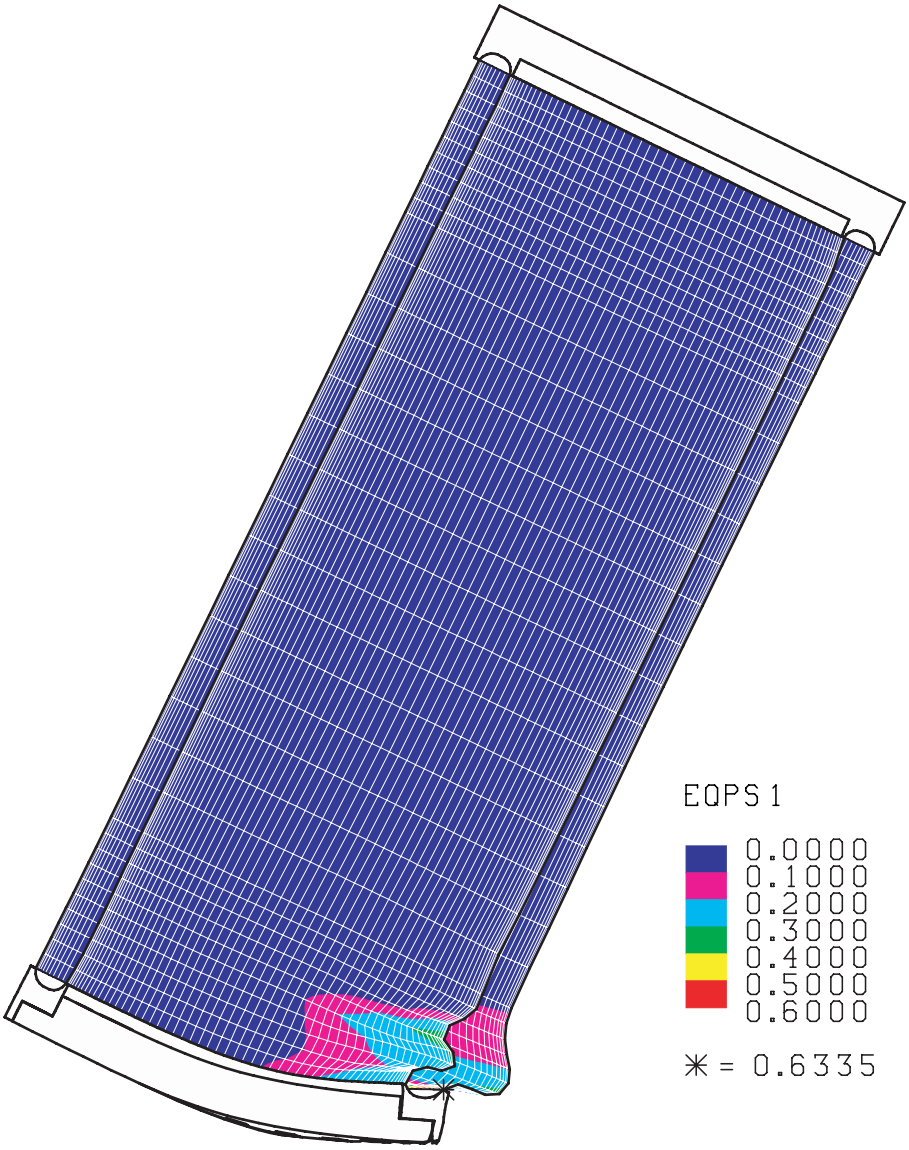


Figure A-24 Steel-lead-steel rail cask following a 90 mph corner impact

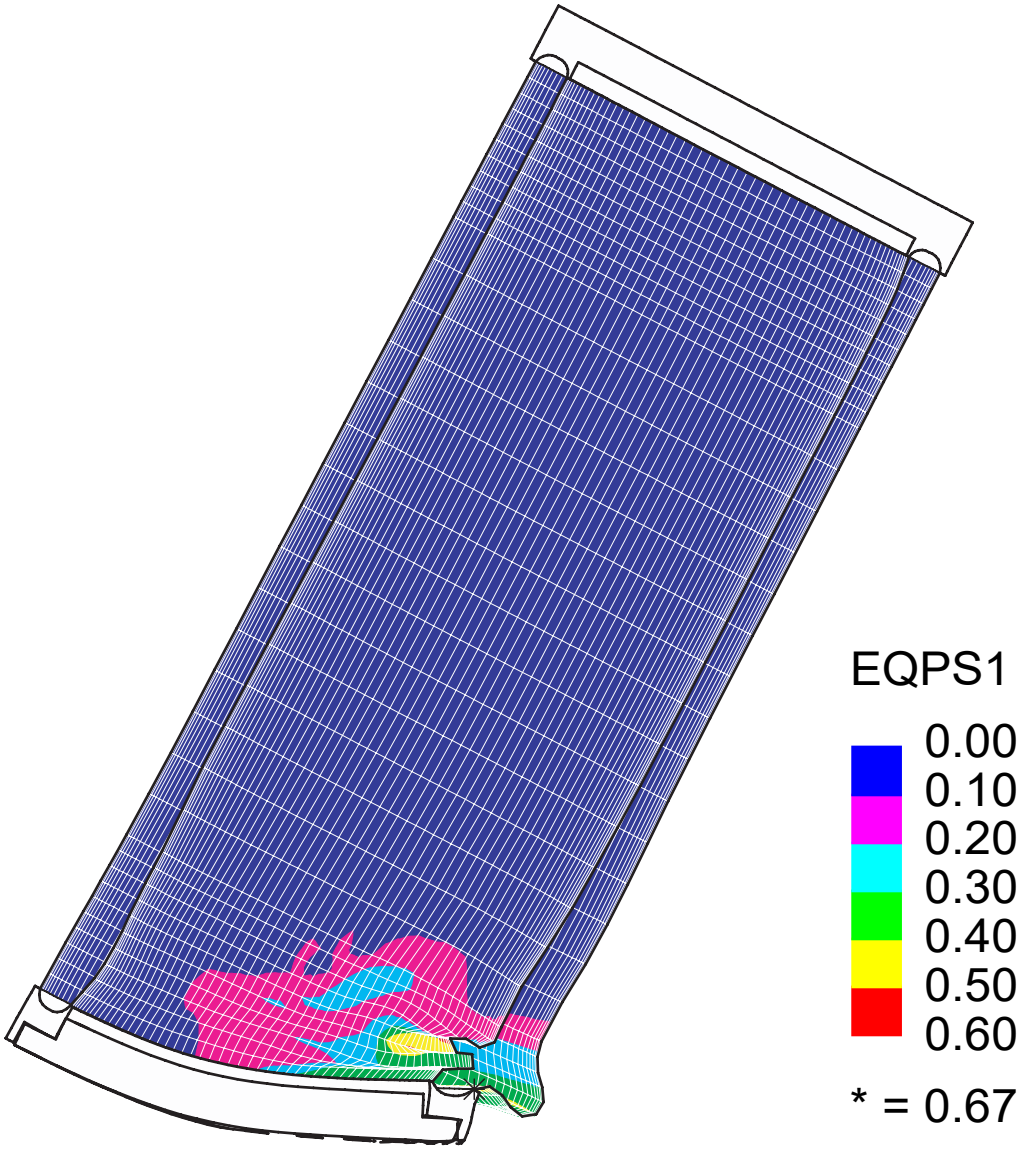


Figure A-25 Steel-lead-steel rail cask following a 120 mph corner impact

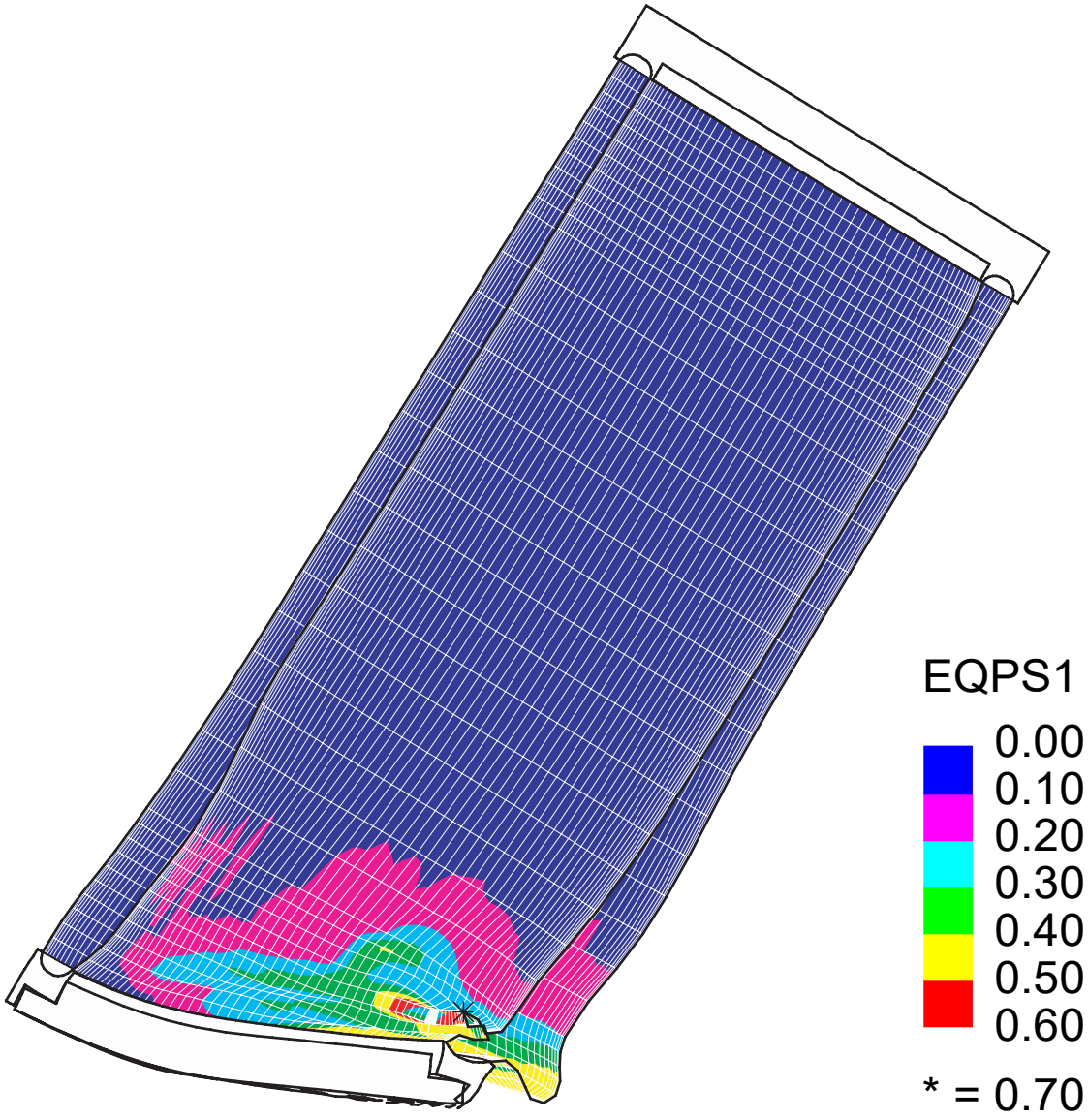


Figure A-26 Steel-lead-steel rail cask following a 30 mph end impact

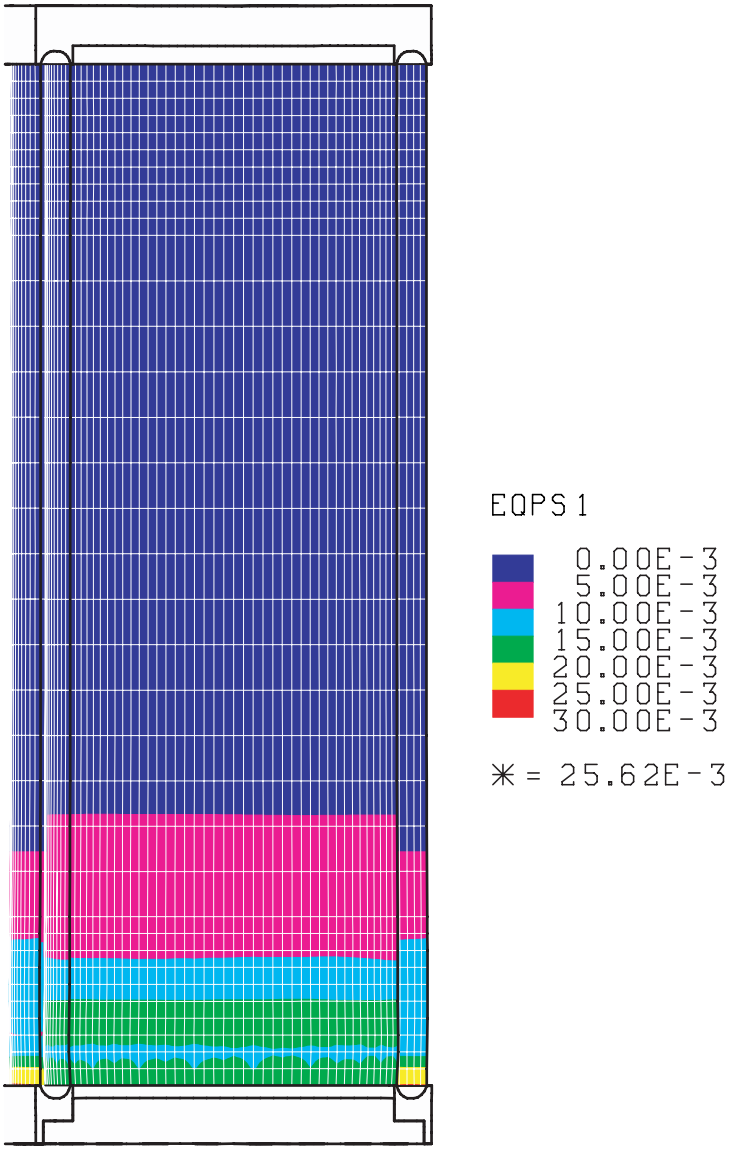


Figure A-27 Steel-lead-steel rail cask following a 60 mph end impact

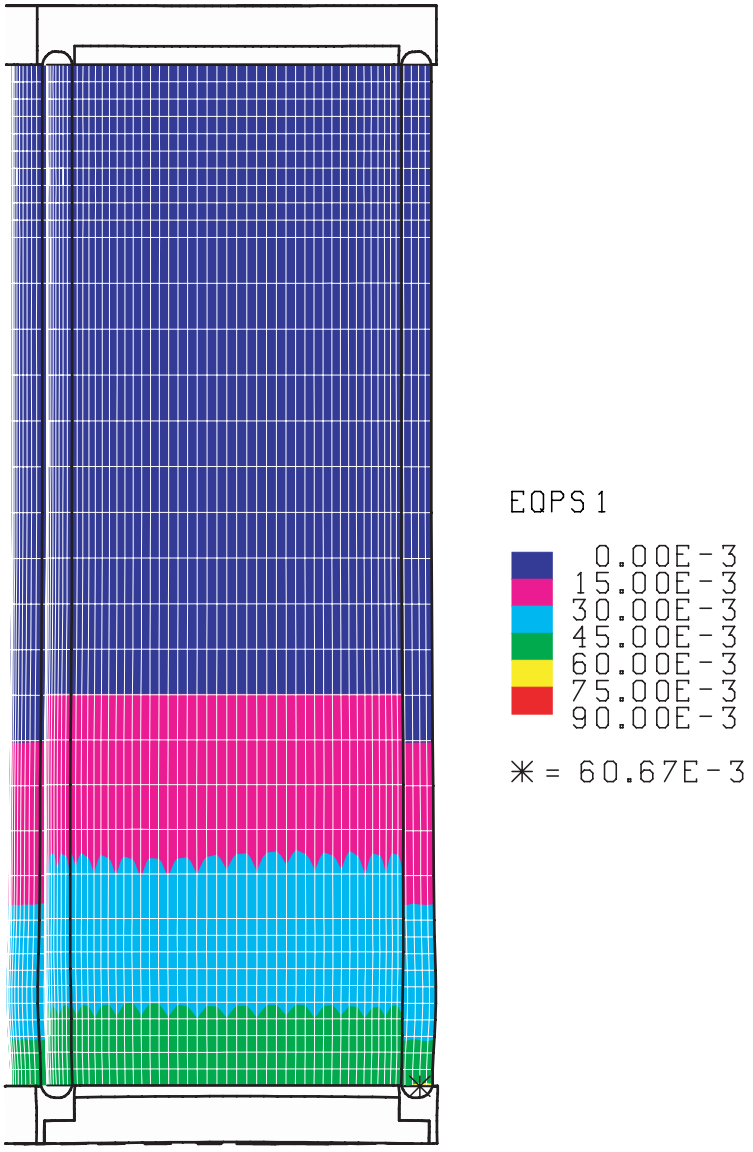


Figure A-28 Steel-lead-steel rail cask following a 90 mph end impact

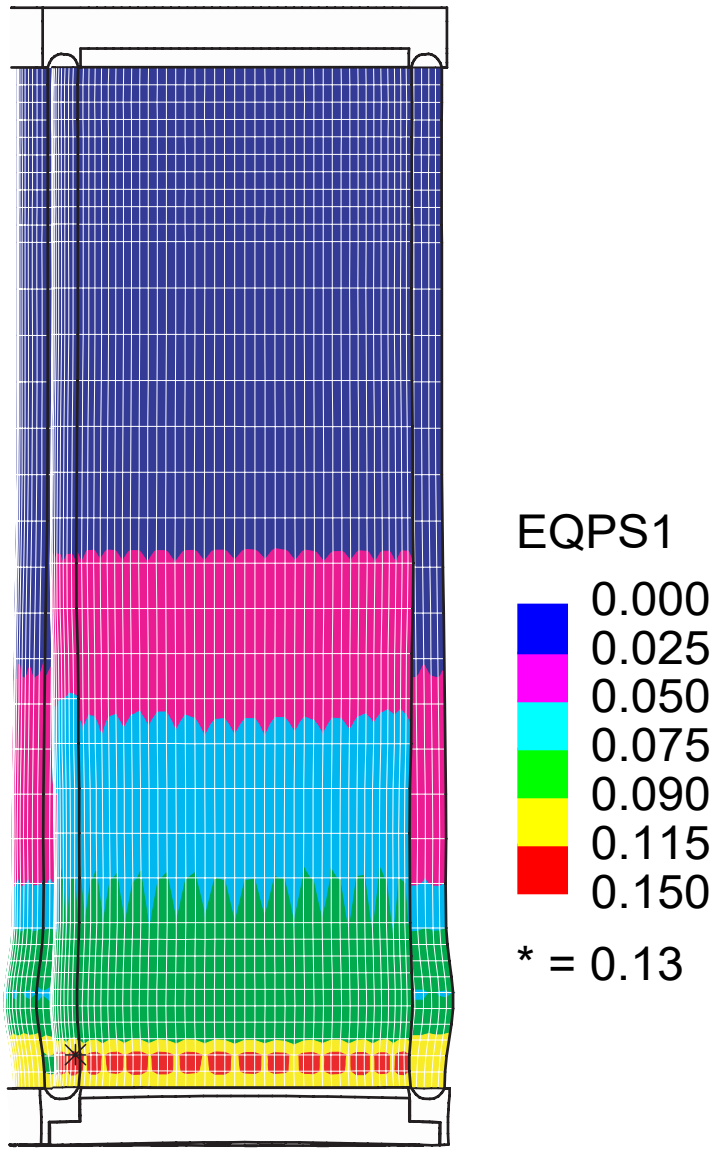


Figure A-29 Steel-lead-steel rail cask following a 120 mph end impact

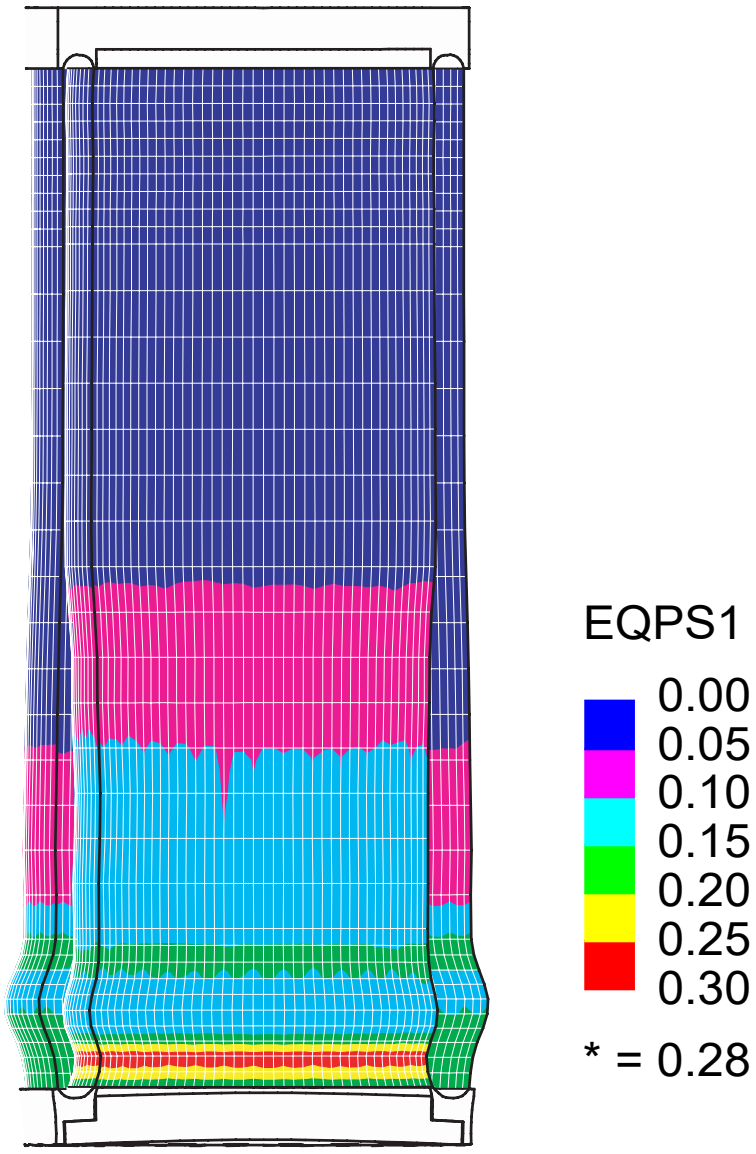


Figure A-30 Steel-lead-steel rail cask following a 30 mph side impact

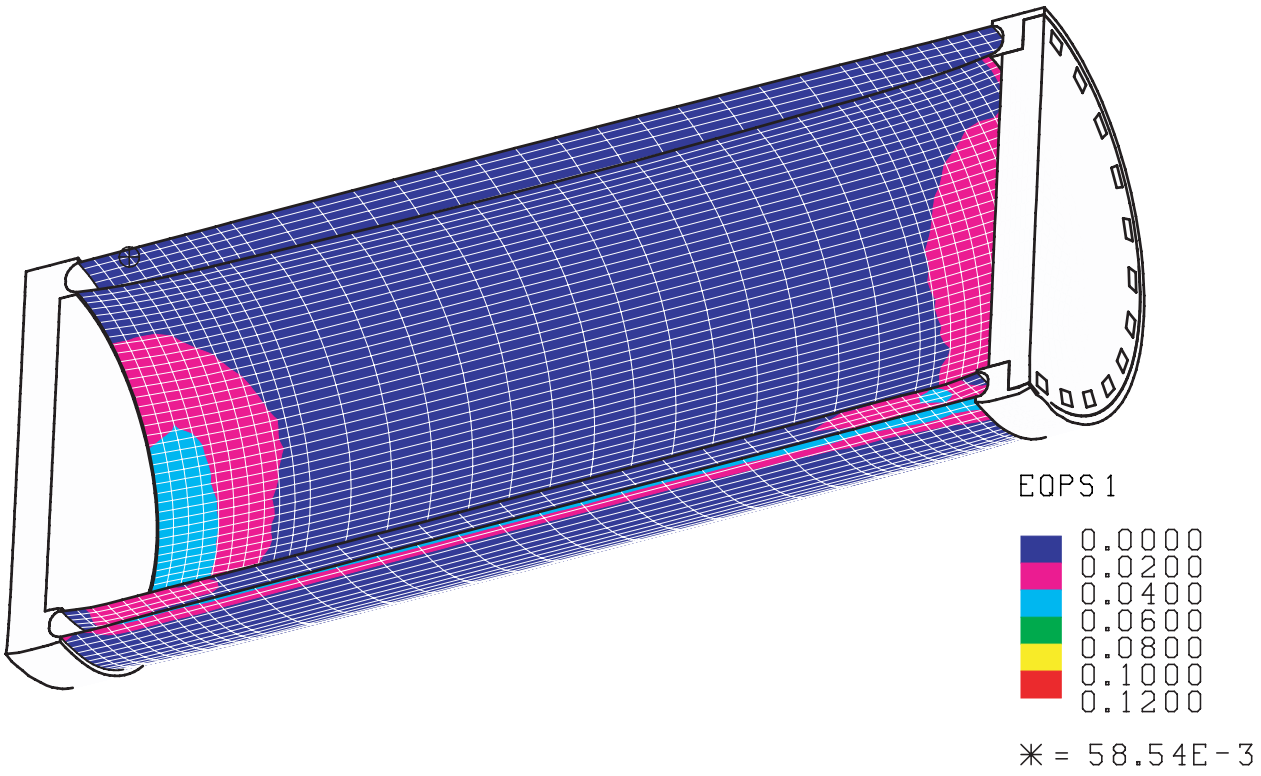


Figure A-31 Steel-lead-steel rail cask following a 60 mph side impact

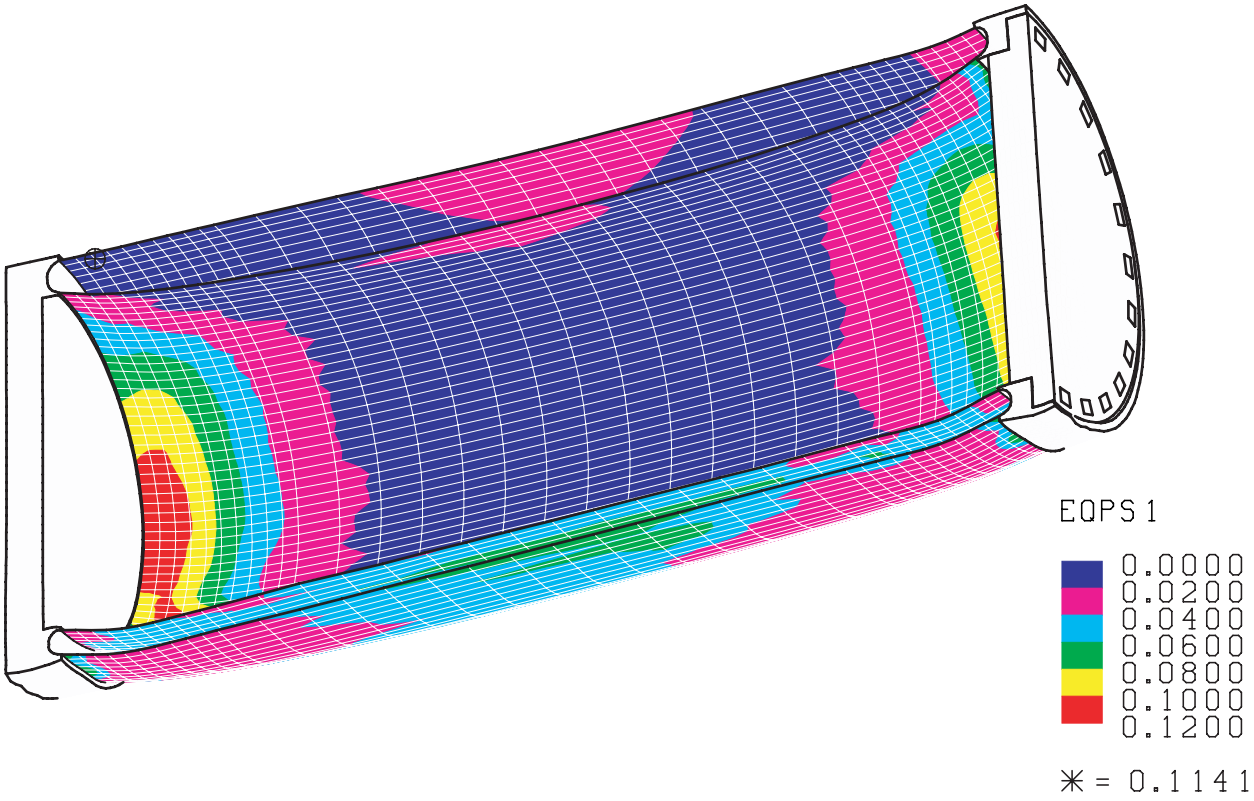


Figure A-32 Steel-lead-steel rail cask following a 90 mph side impact

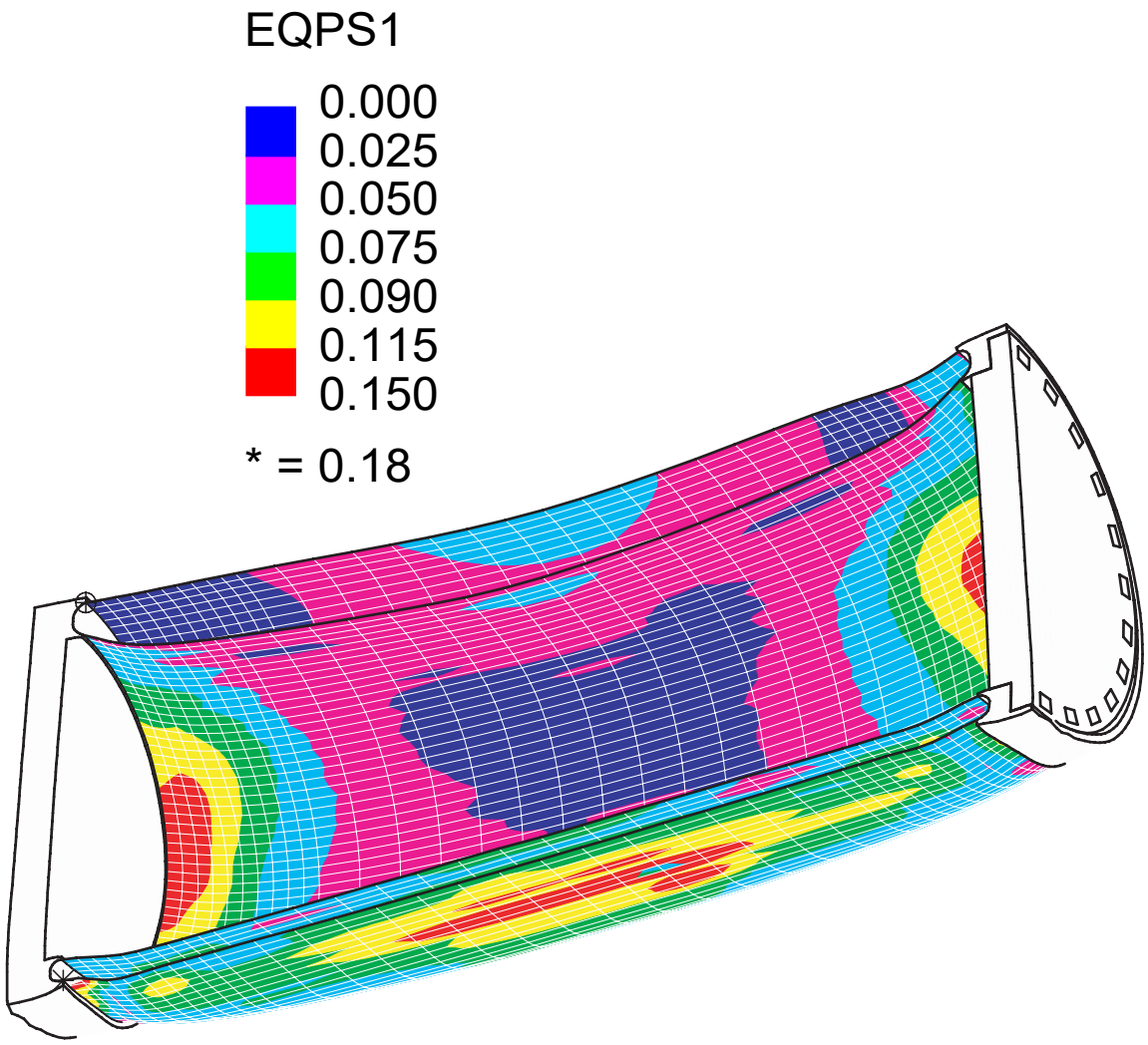


Figure A-33 Monolithic-steel rail cask following a 30 mph corner impact

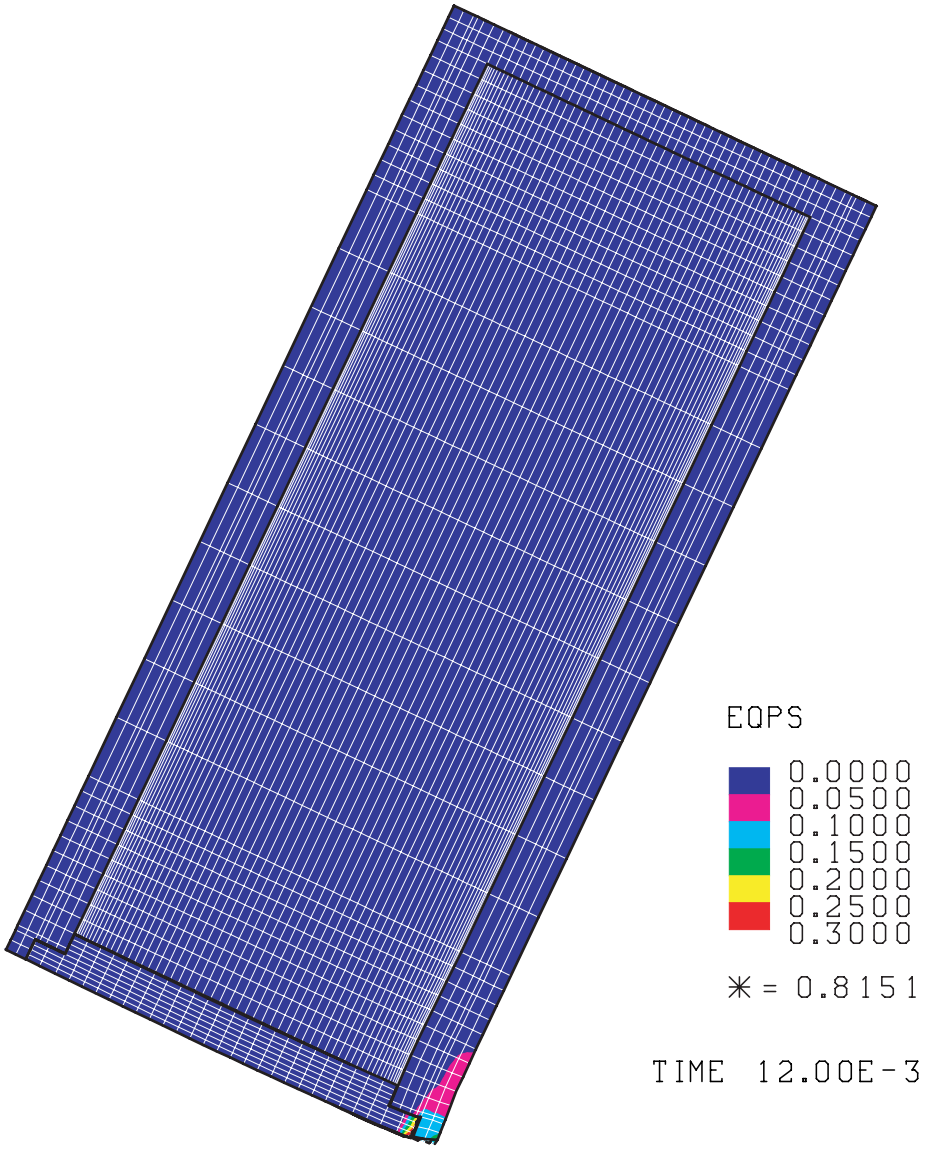


Figure A-34 Monolithic-steel rail cask following a 60 mph corner impact

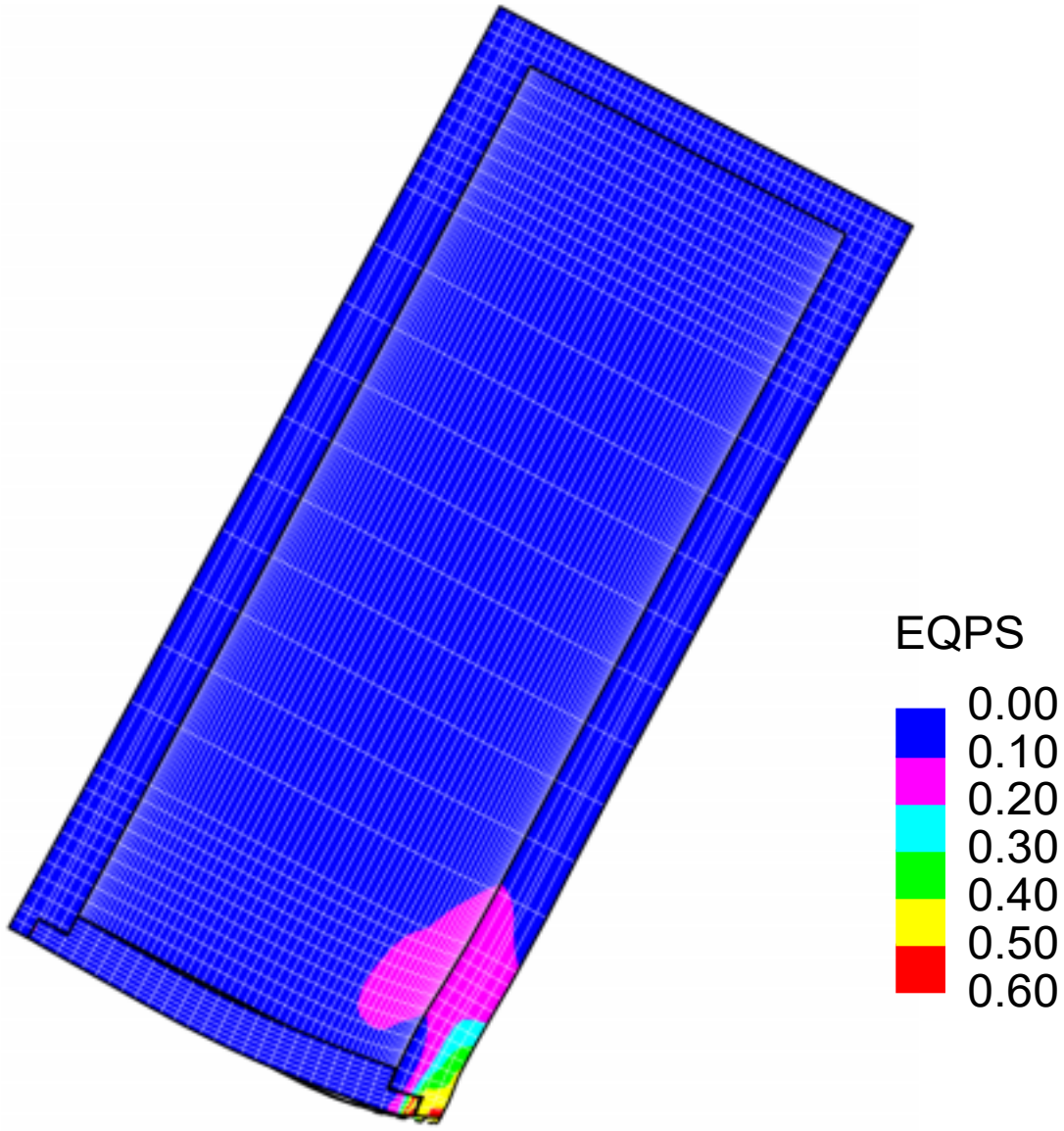


Figure A-35 Monolithic-steel rail cask following a 90 mph corner impact

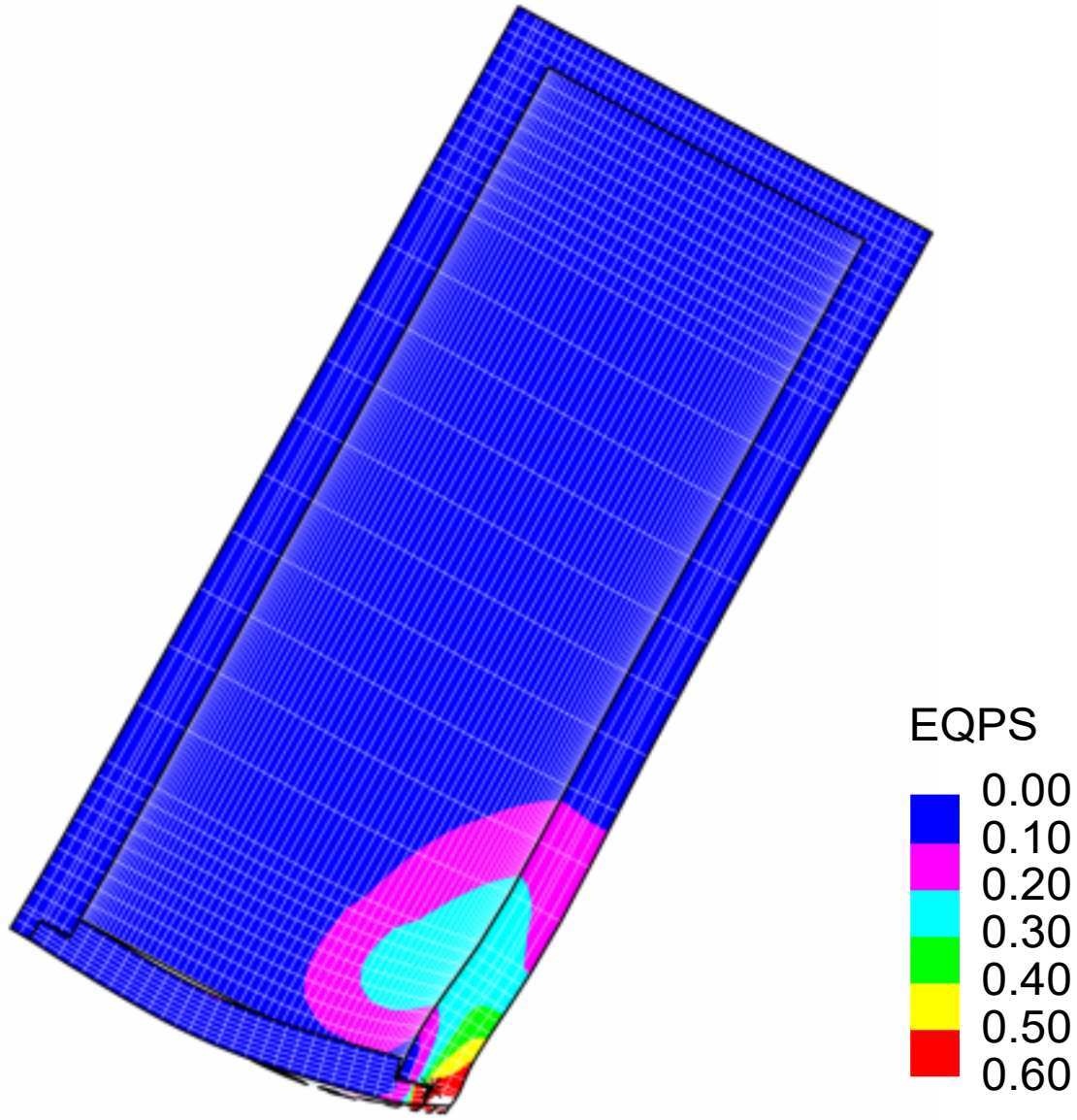


Figure A-36 Monolithic-steel rail cask following a 120 mph corner impact

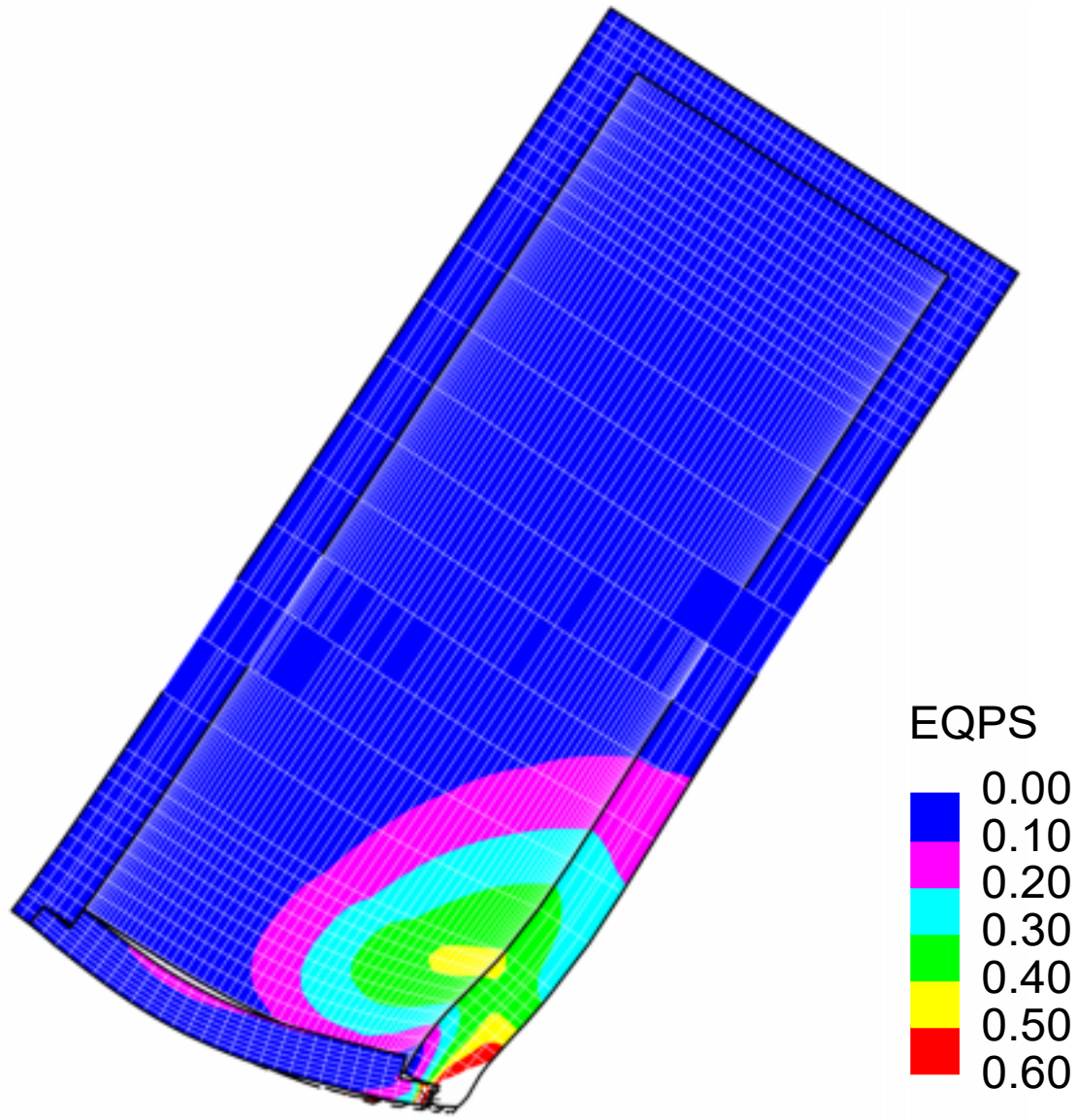


Figure A-37 Monolithic-steel rail cask following a 30 mph end impact

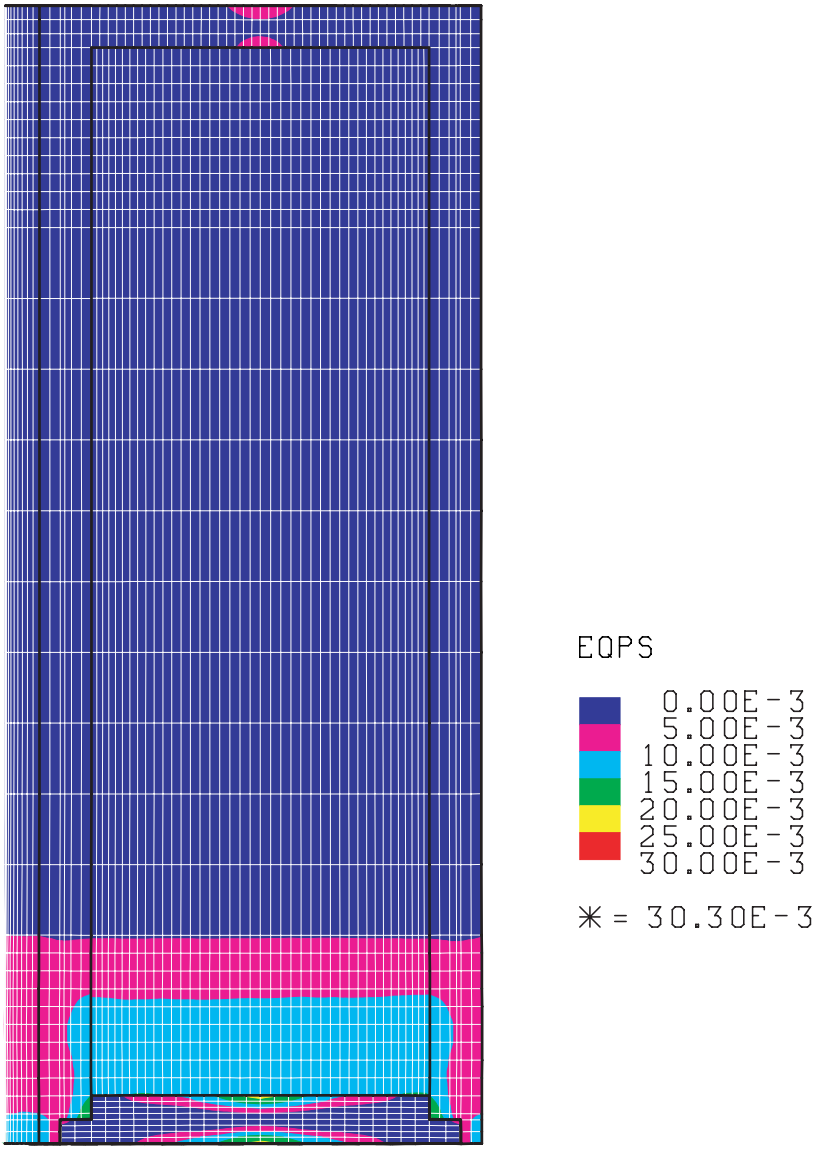


Figure A-38 Monolithic-steel rail cask following a 60 mph end impact

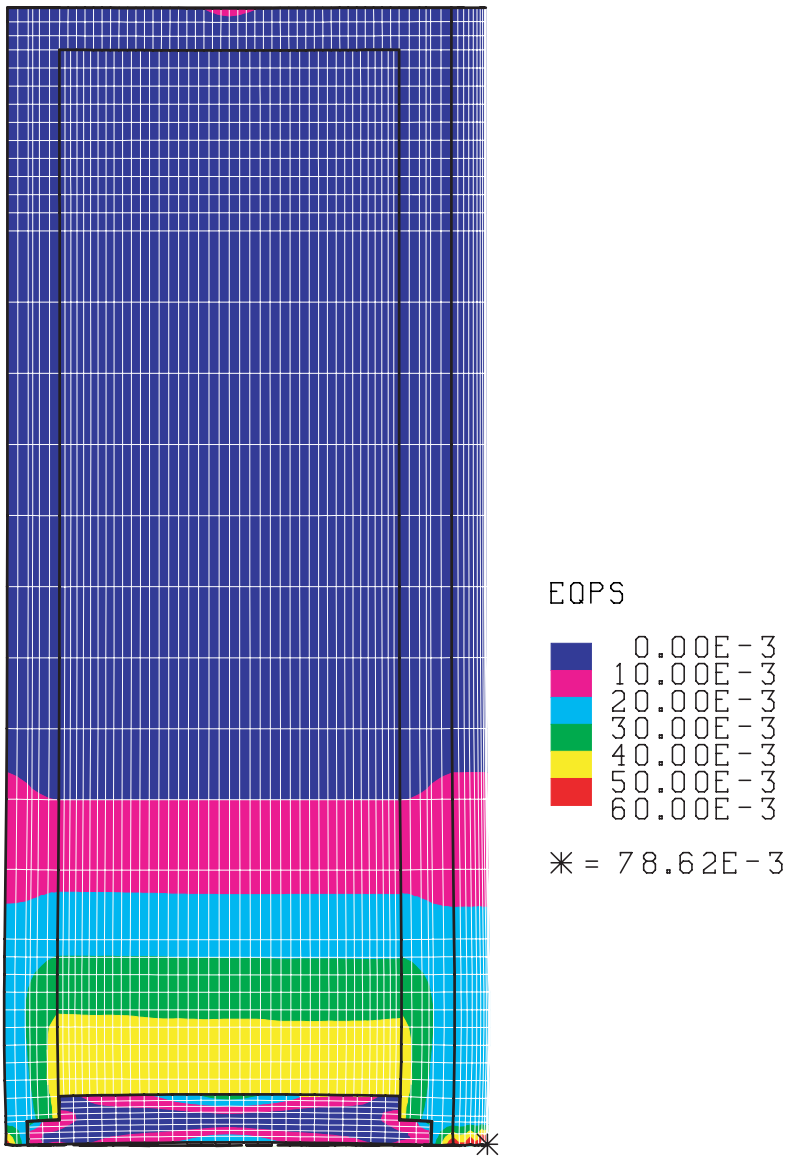


Figure A-39 Monolithic-steel rail cask following a 90 mph end impact

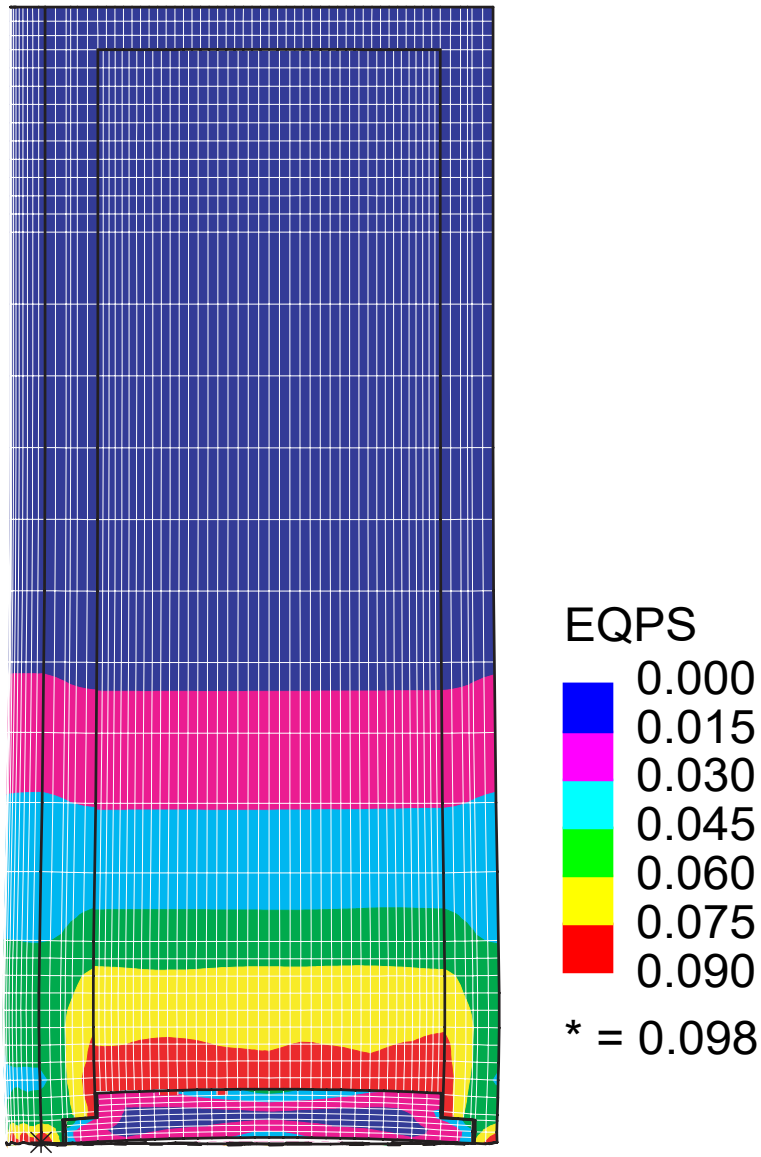


Figure A-40 Monolithic-steel rail cask following a 120 mph end impact

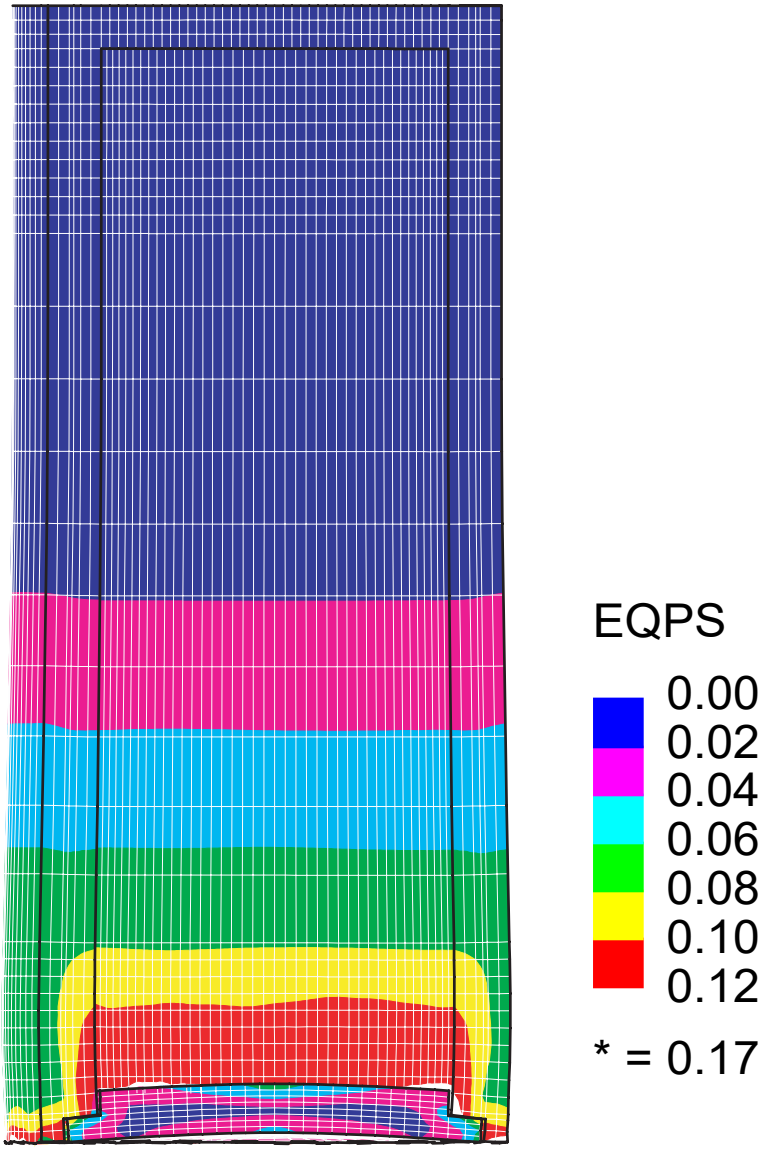


Figure A-41 Monolithic-steel rail cask following a 30 mph side impact

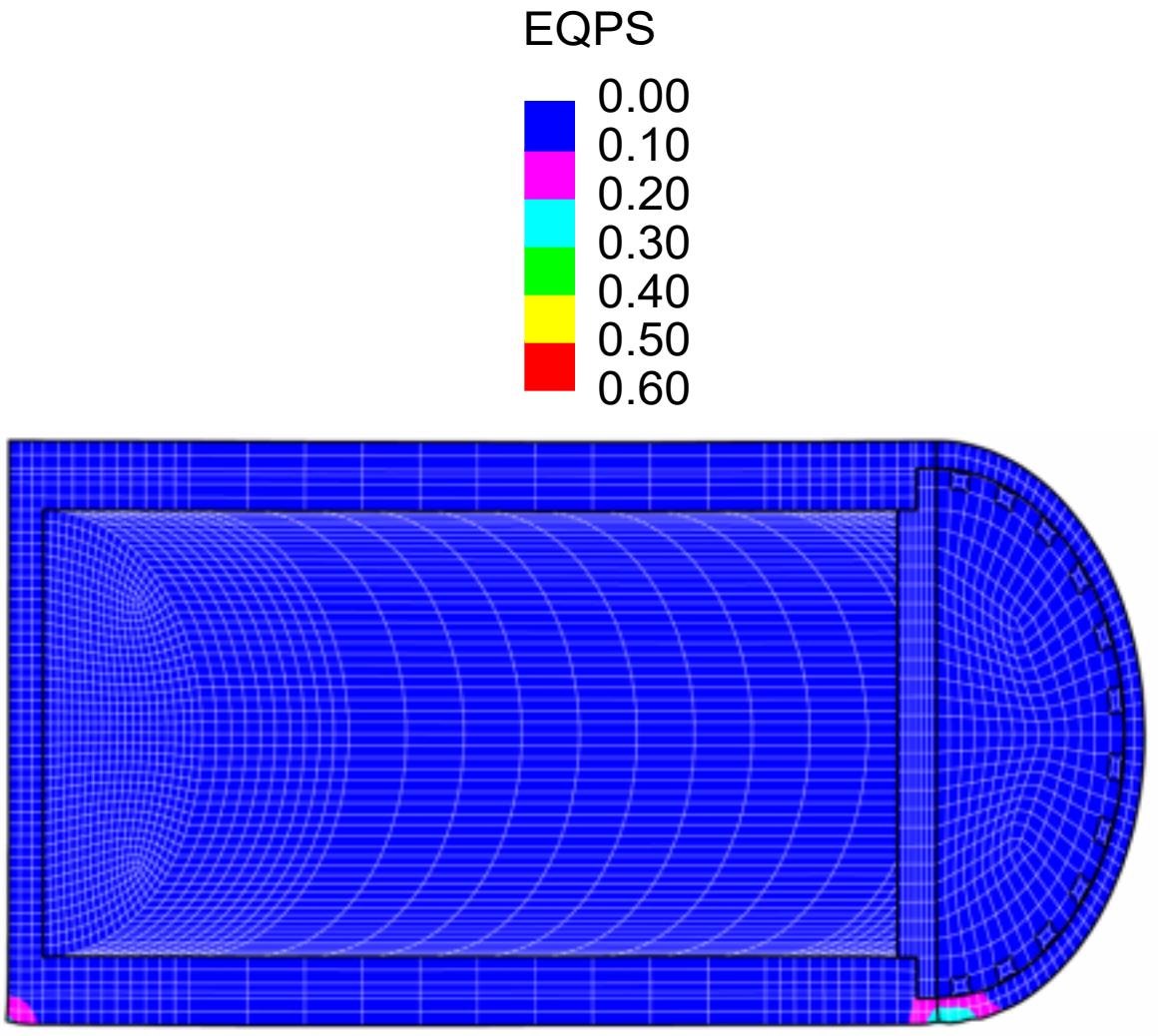


Figure A-42 Monolithic-steel rail cask following a 60 mph side impact

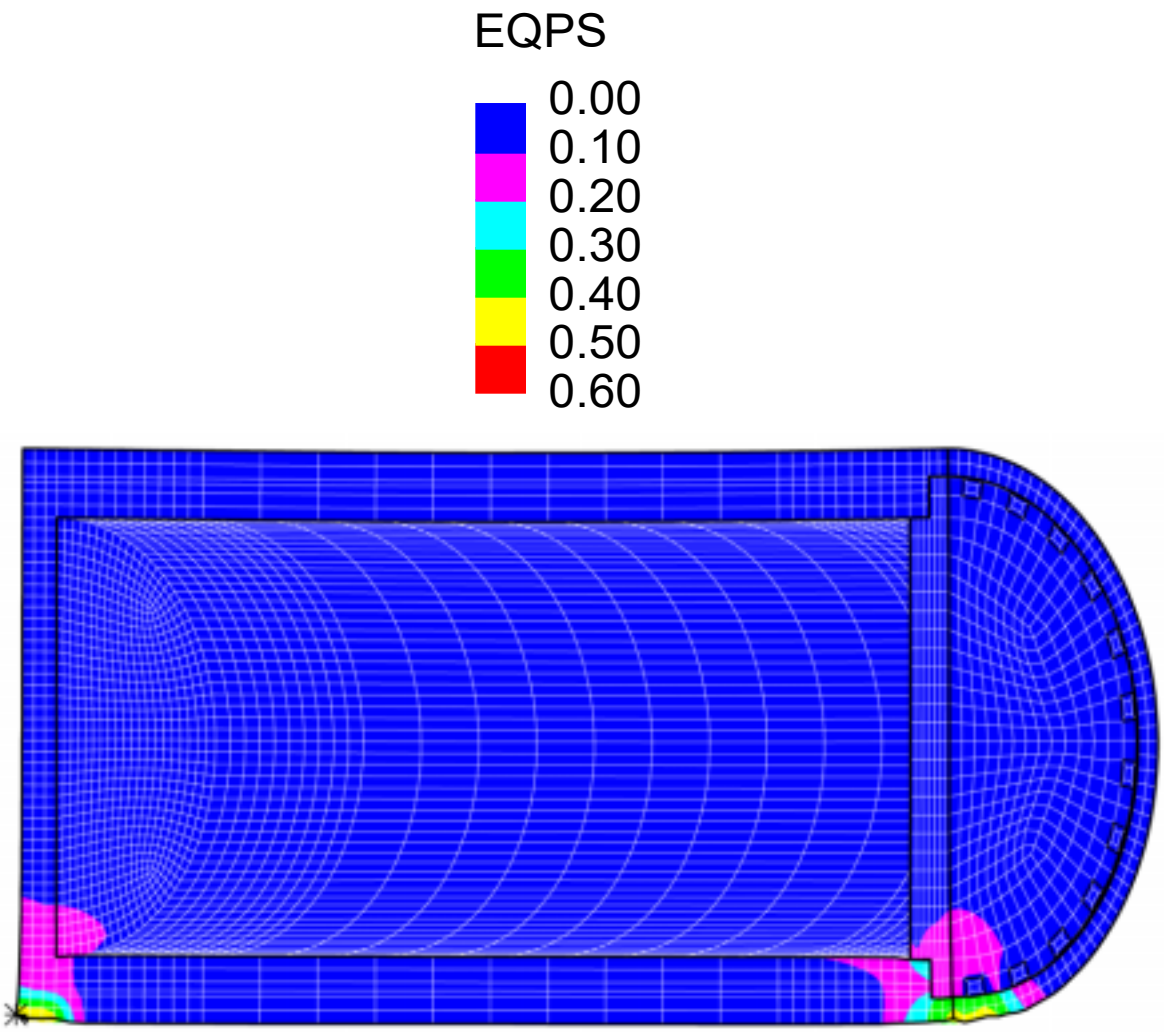


Figure A-43 Monolithic-steel rail cask following a 90 mph side impact

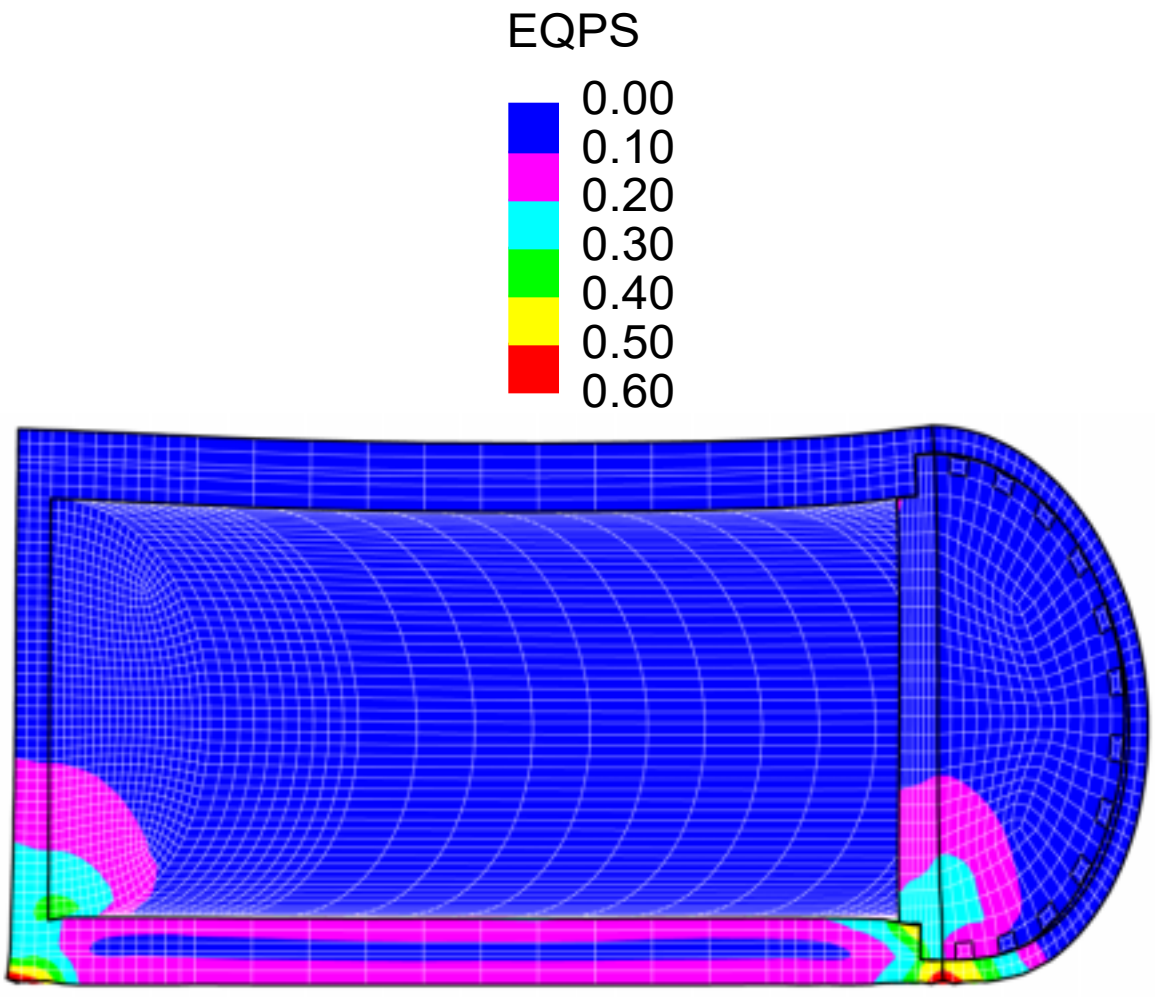
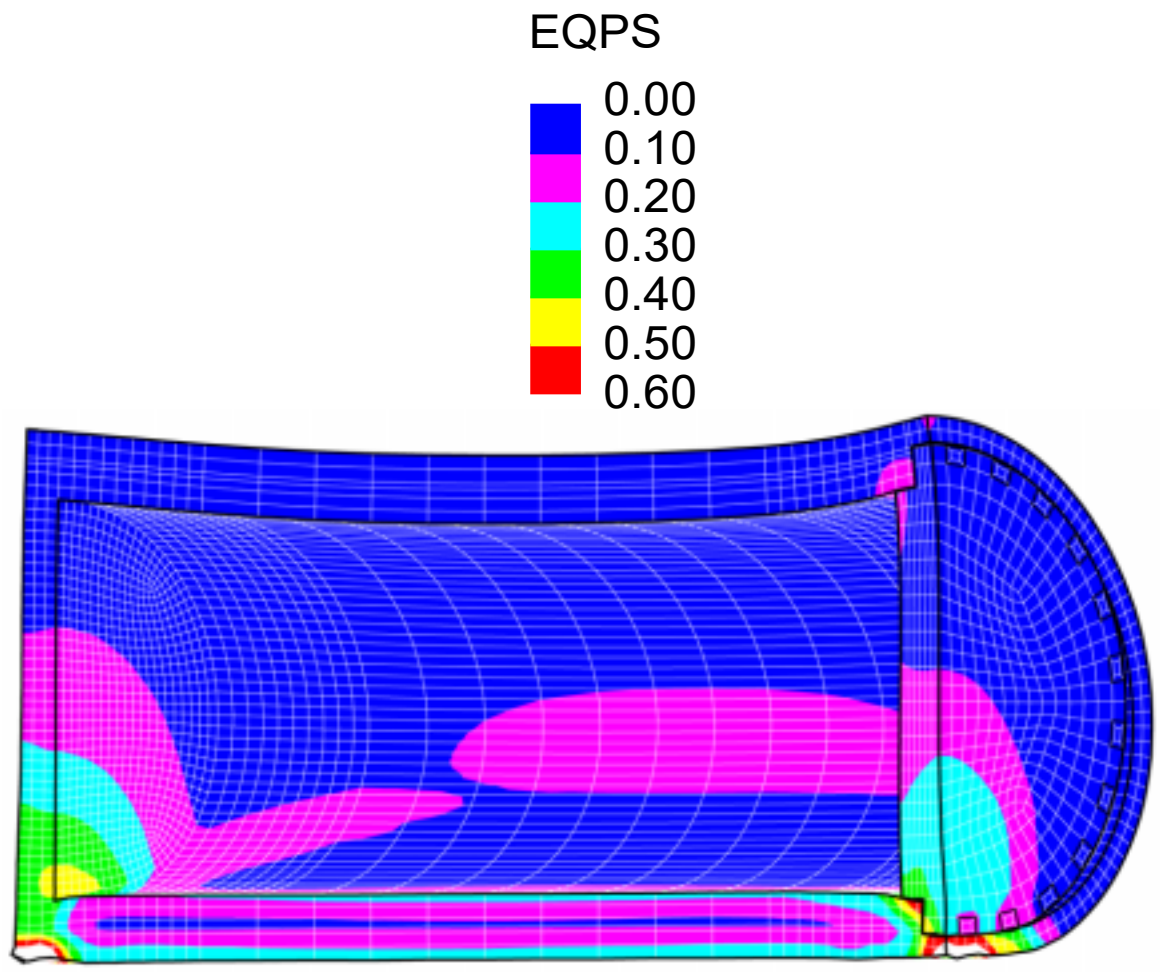


Figure A-44 Monolithic-steel rail cask following a 120 mph side impact



Part 2: Lid opening displacements

Figure A-45 Steel-lead-steel truck cask following a 30 mph corner impact

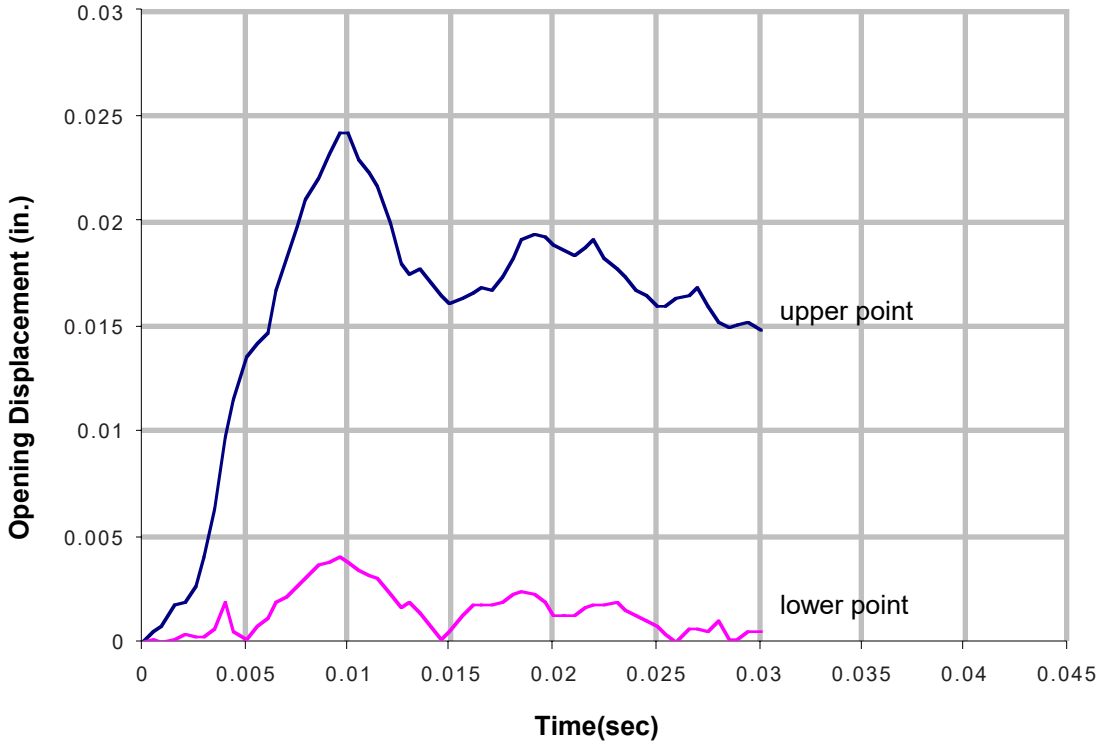


Figure A-46 Steel-lead-steel truck cask following a 60 mph corner impact

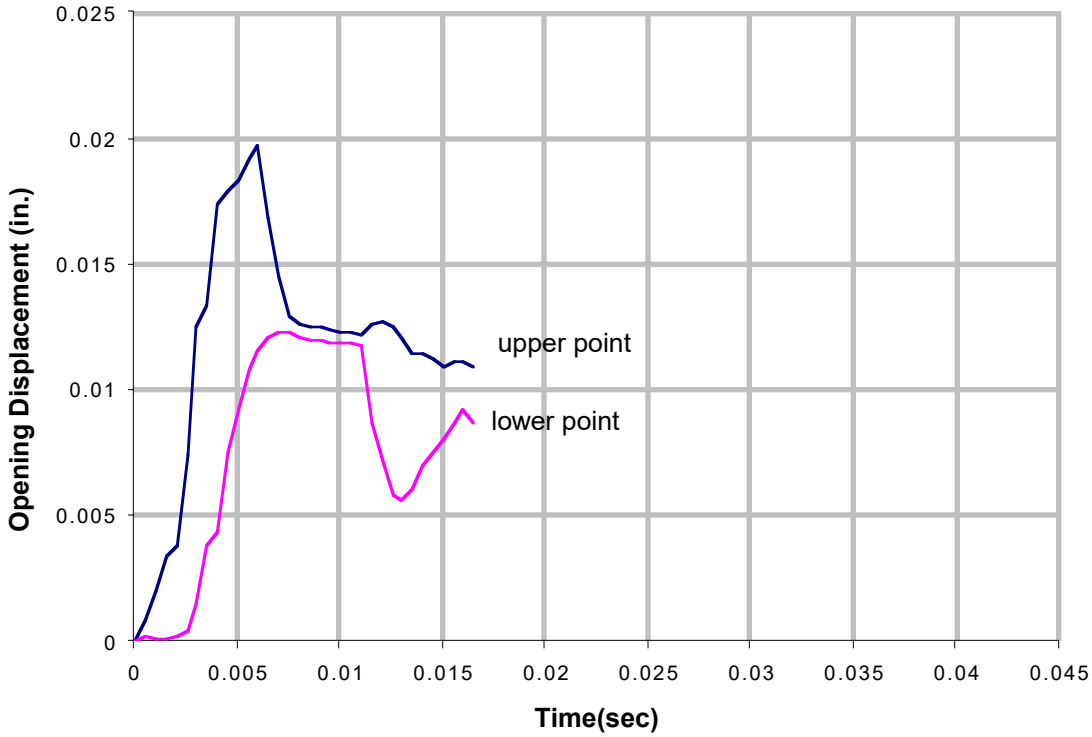


Figure A-47 Steel-lead-steel truck cask following a 90 mph corner impact

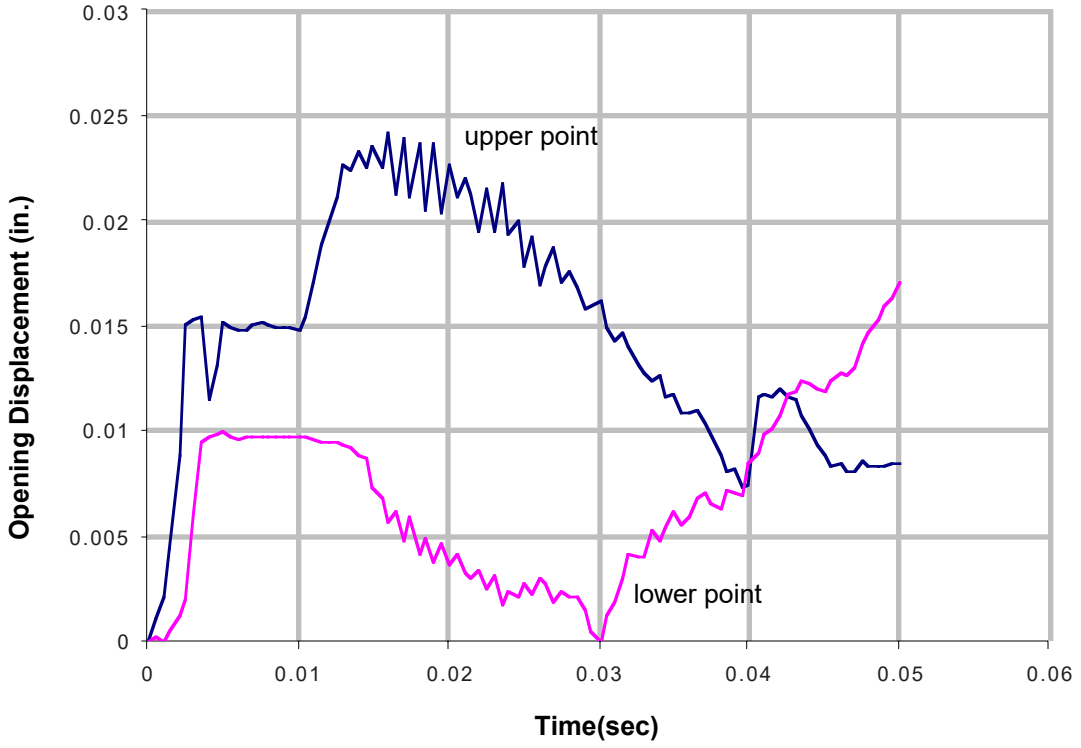


Figure A-48 Steel-lead-steel truck cask following a 120 mph corner impact

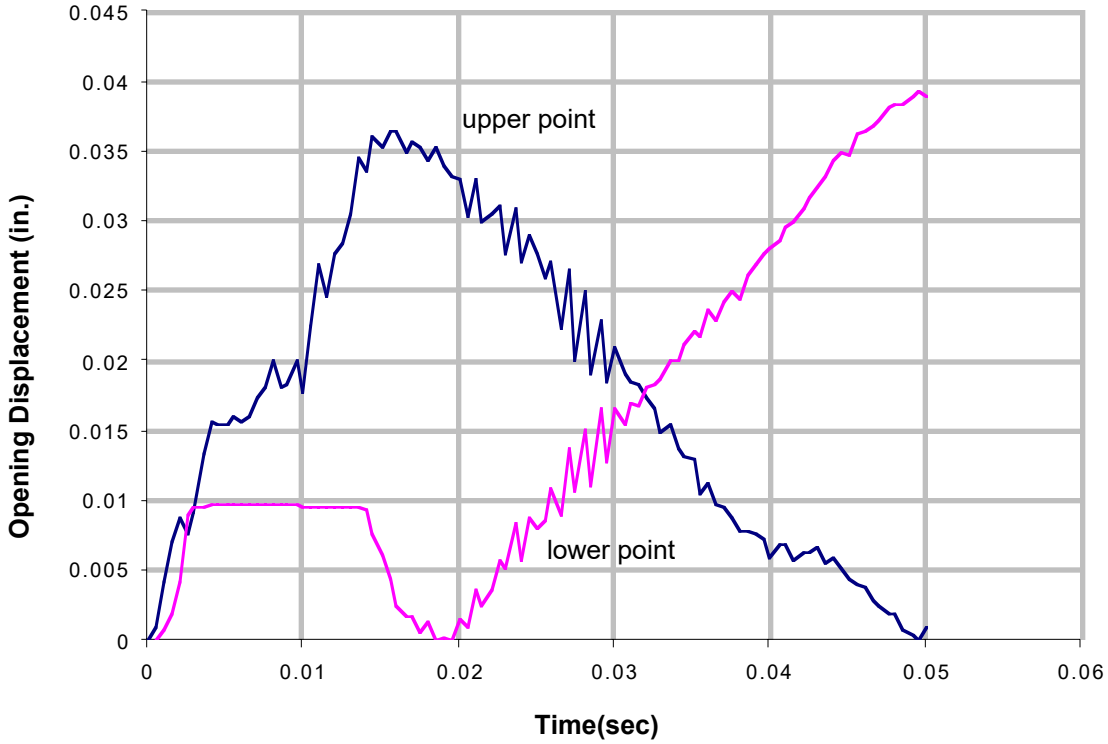


Figure A-49 Steel-lead-steel truck cask following a 30 mph end impact

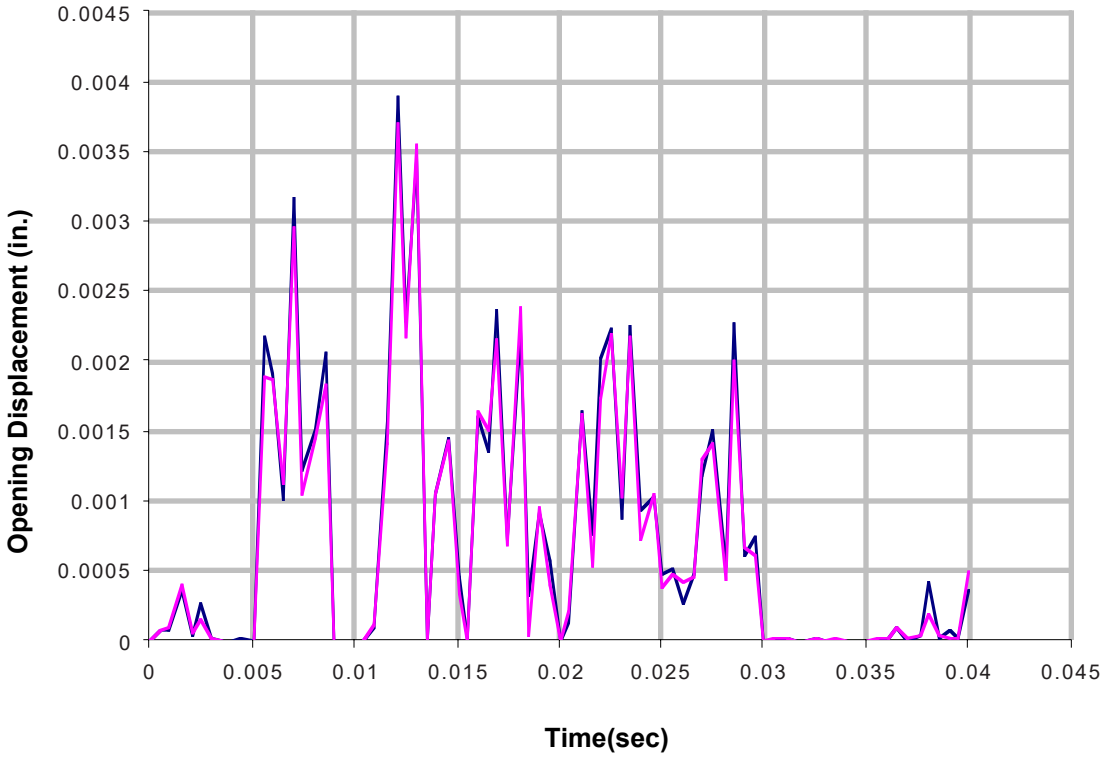


Figure A-50 Steel-lead-steel truck cask following a 60 mph end impact

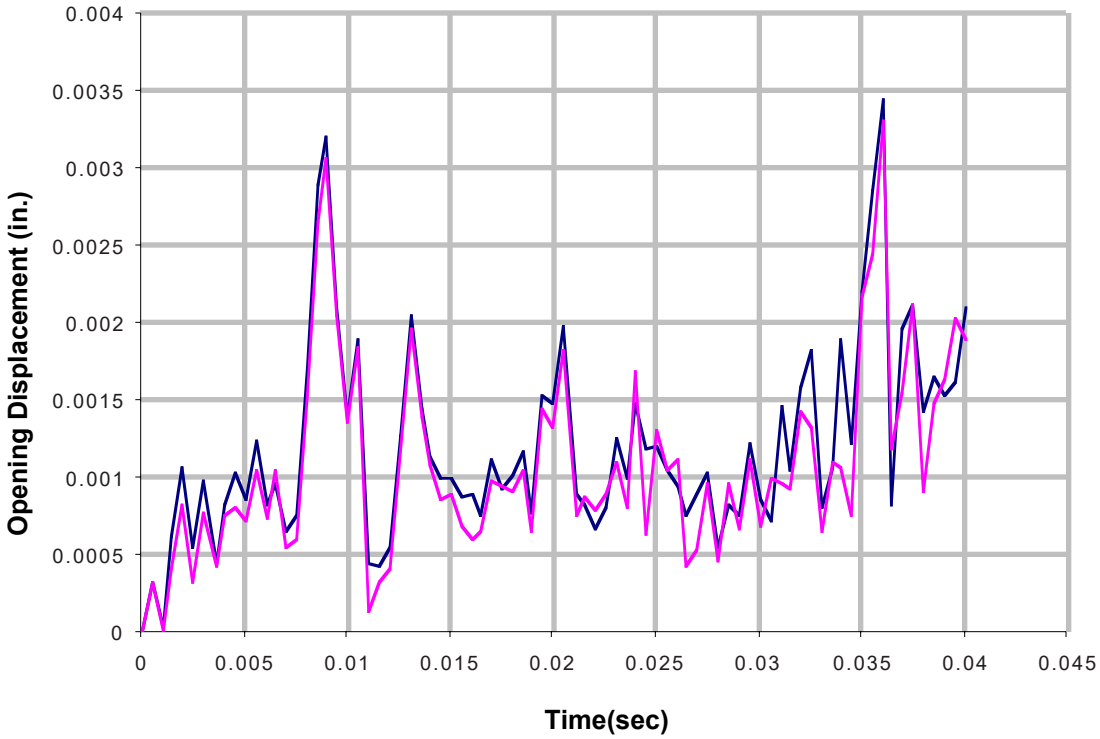


Figure A-51 Steel-lead-steel truck cask following a 90 mph end impact

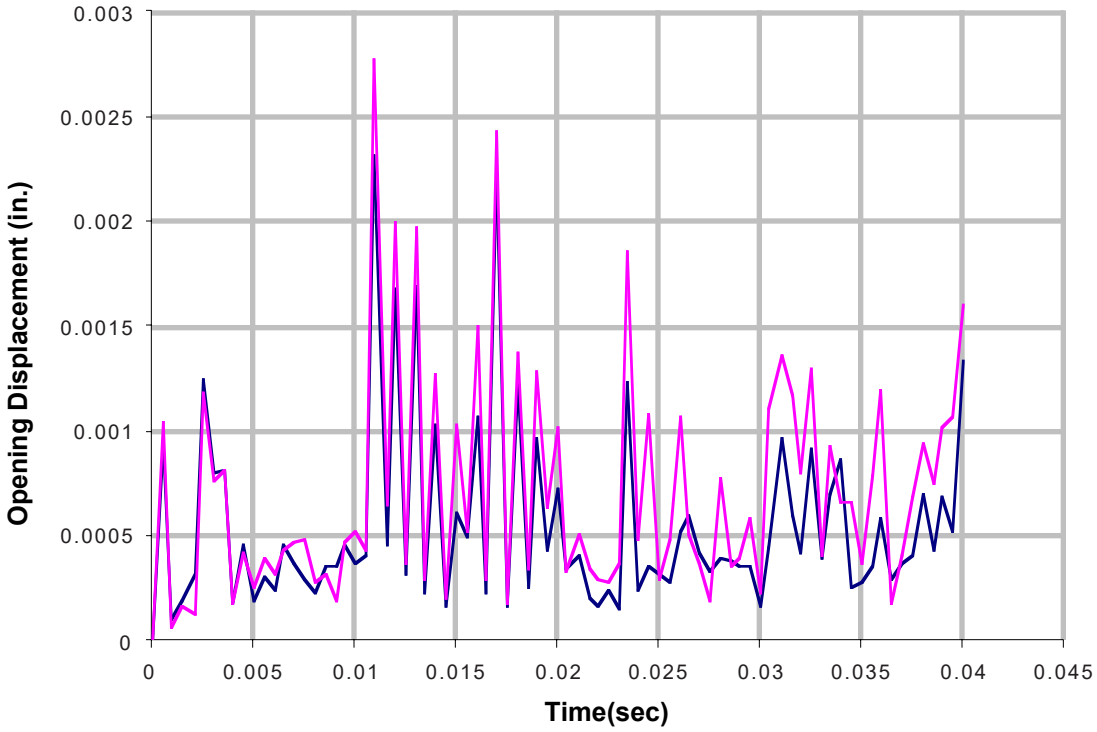


Figure A-52 Steel-lead-steel truck cask following a 120 mph end impact

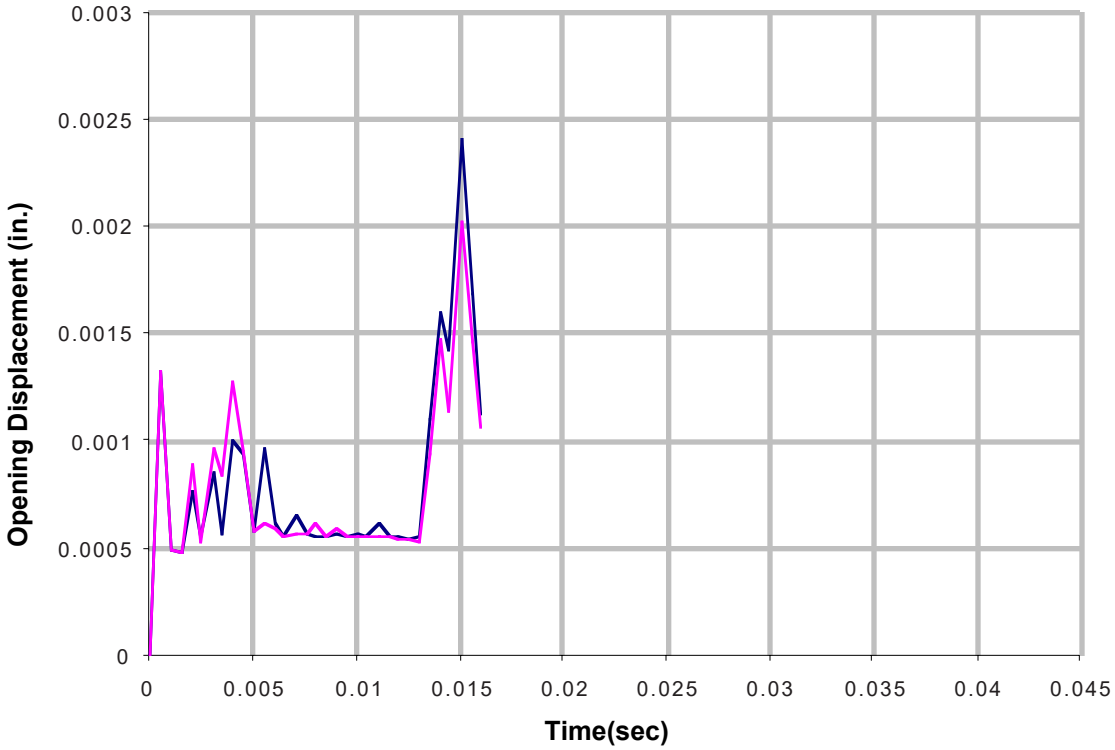


Figure A-53 Steel-lead-steel truck cask following a 60 mph side impact

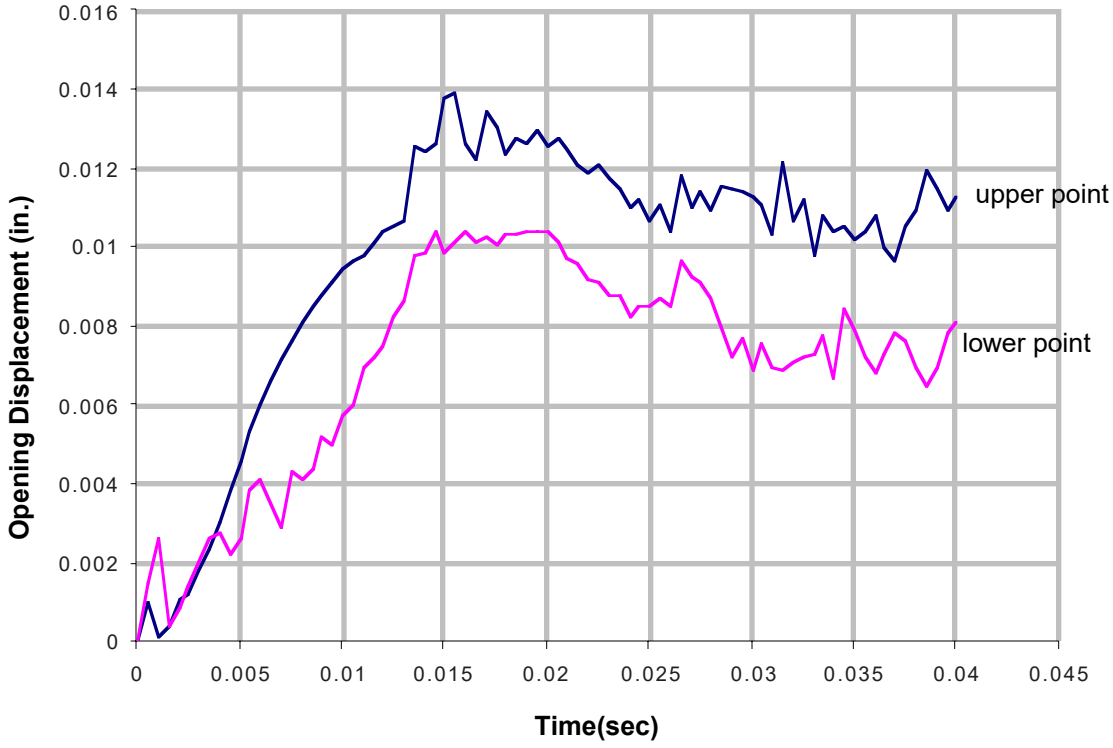


Figure A-54 Steel-lead-steel truck cask following a 90 mph side impact

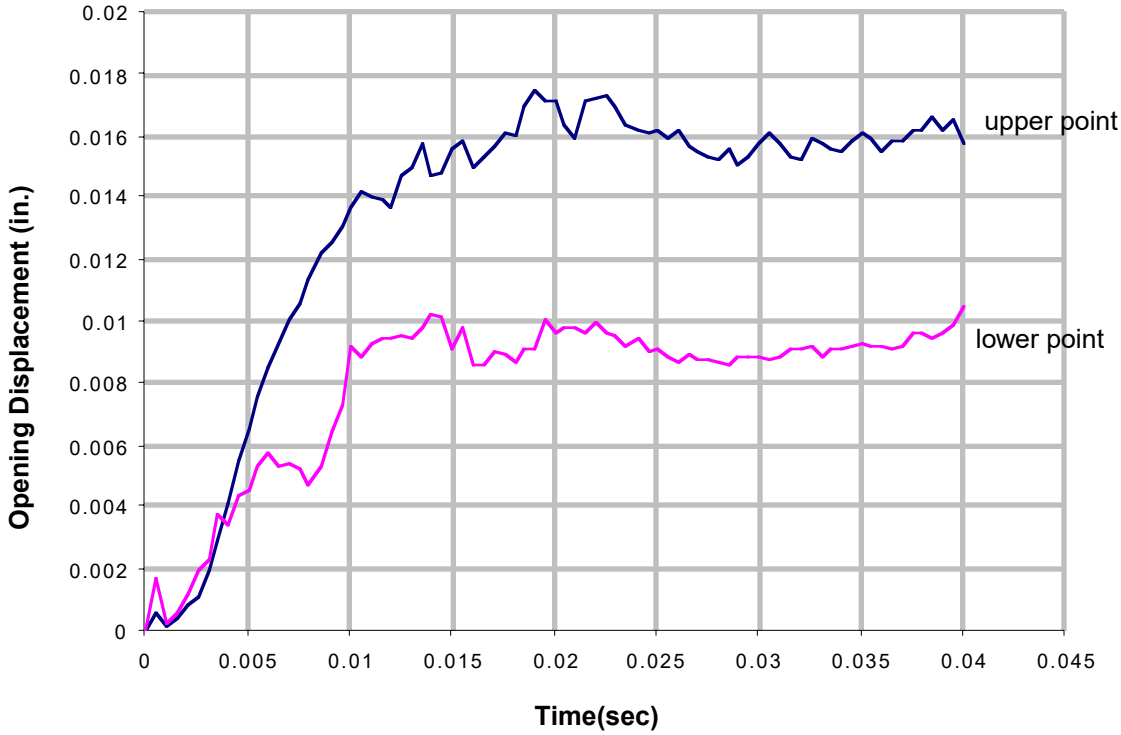


Figure A-55 Steel-lead-steel truck cask following a 120 mph side impact

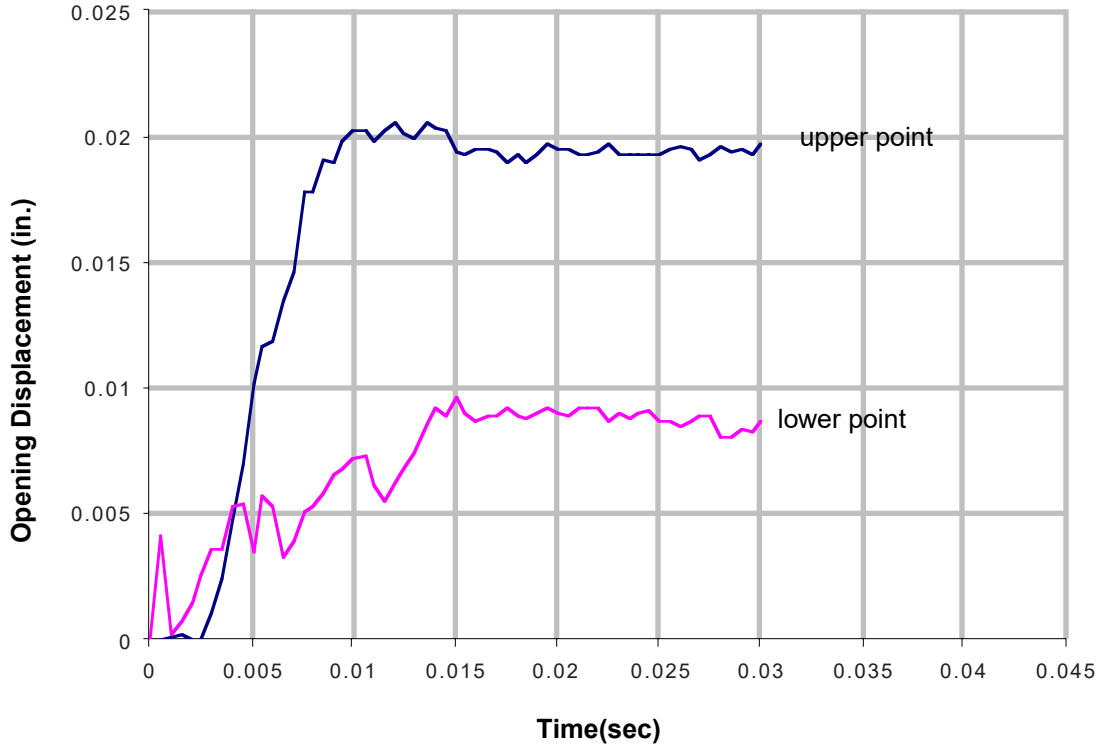


Figure A-56 Steel-DU-steel truck cask following a 30 mph corner impact

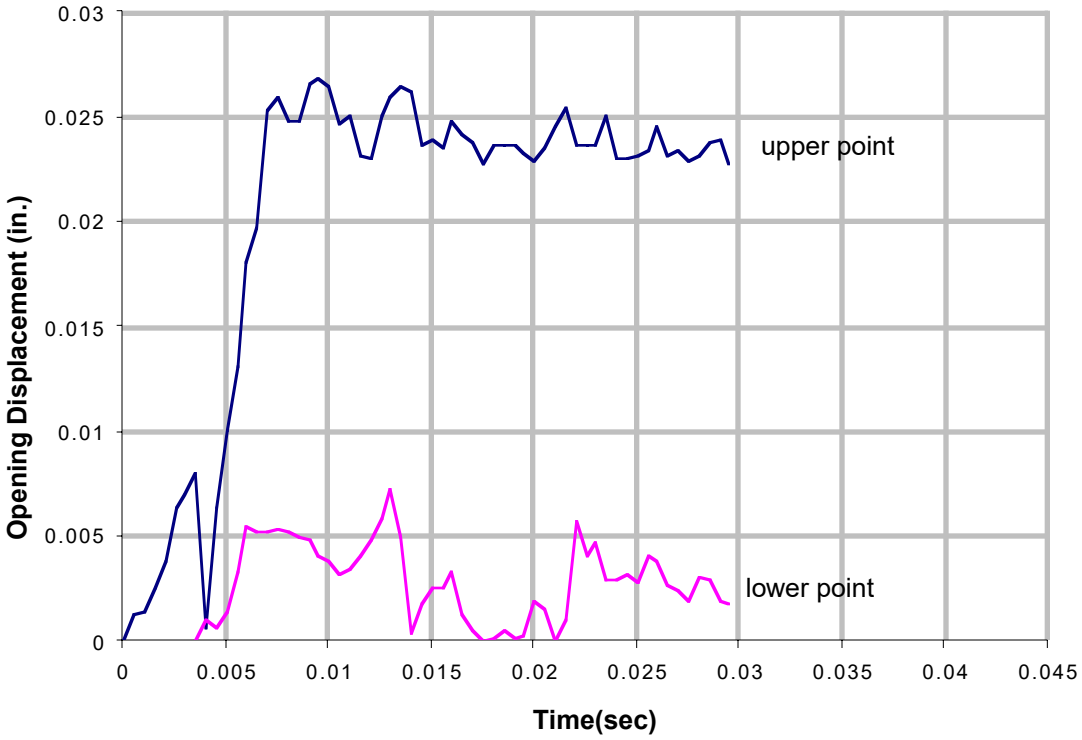


Figure A-57 Steel-DU-steel truck cask following a 60 mph corner impact

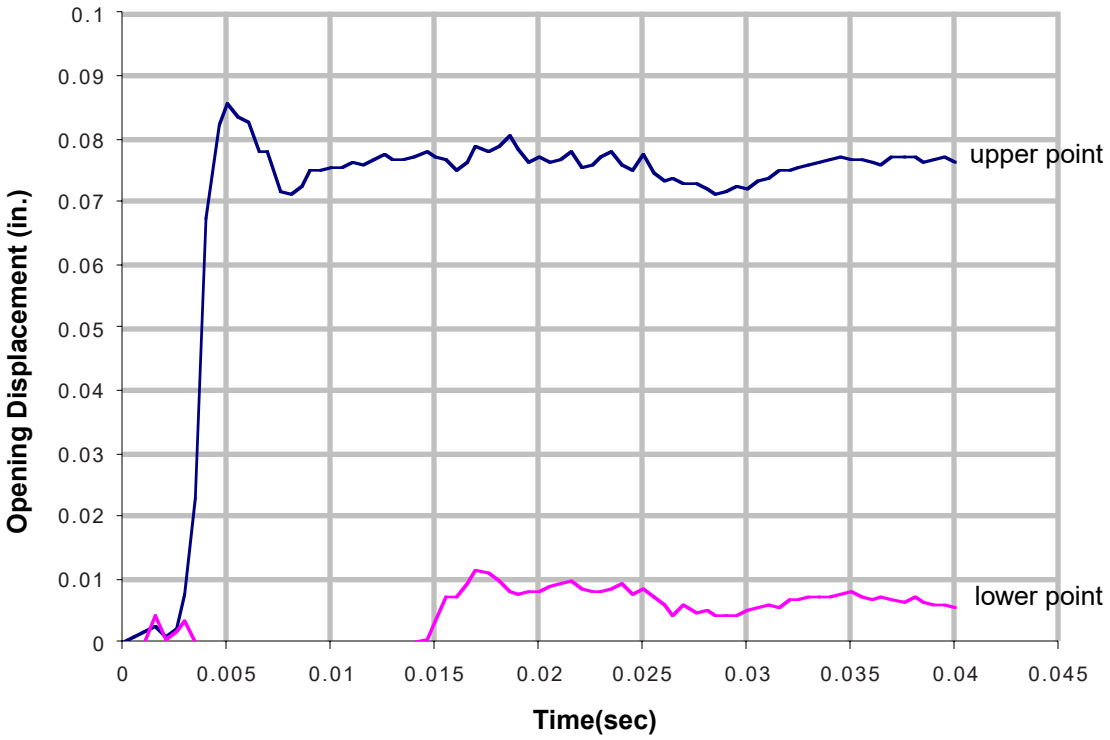


Figure A-58 Steel-DU-steel truck cask following a 90 mph corner impact

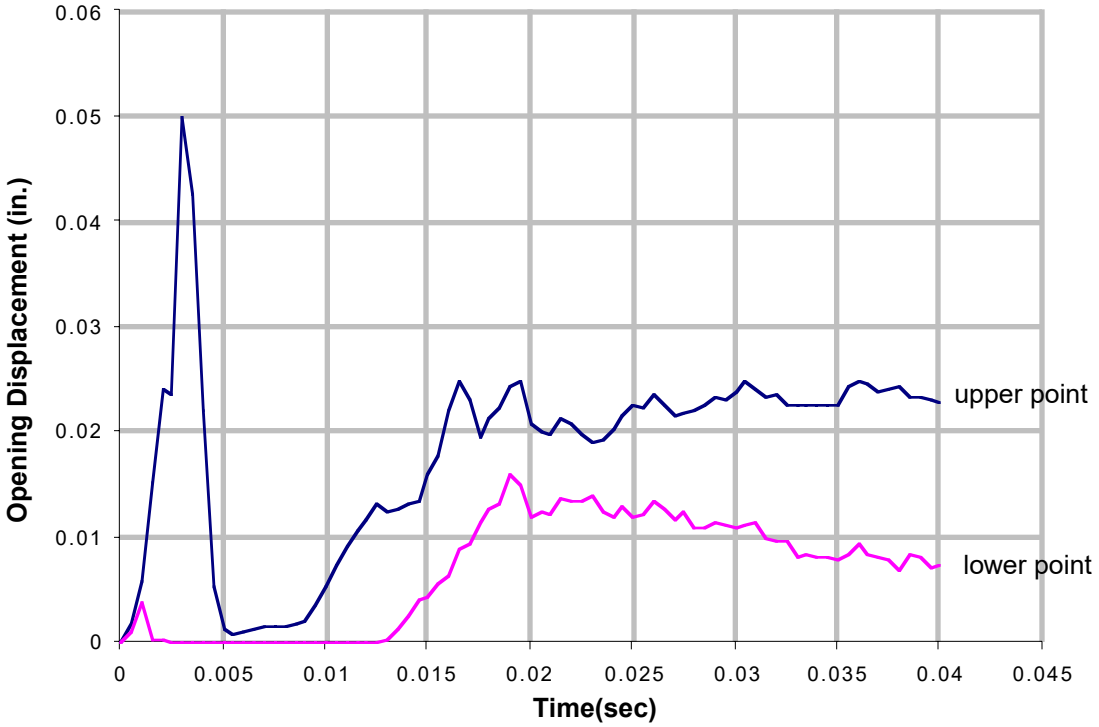


Figure A-59 Steel-DU-steel truck cask following a 120 mph corner impact

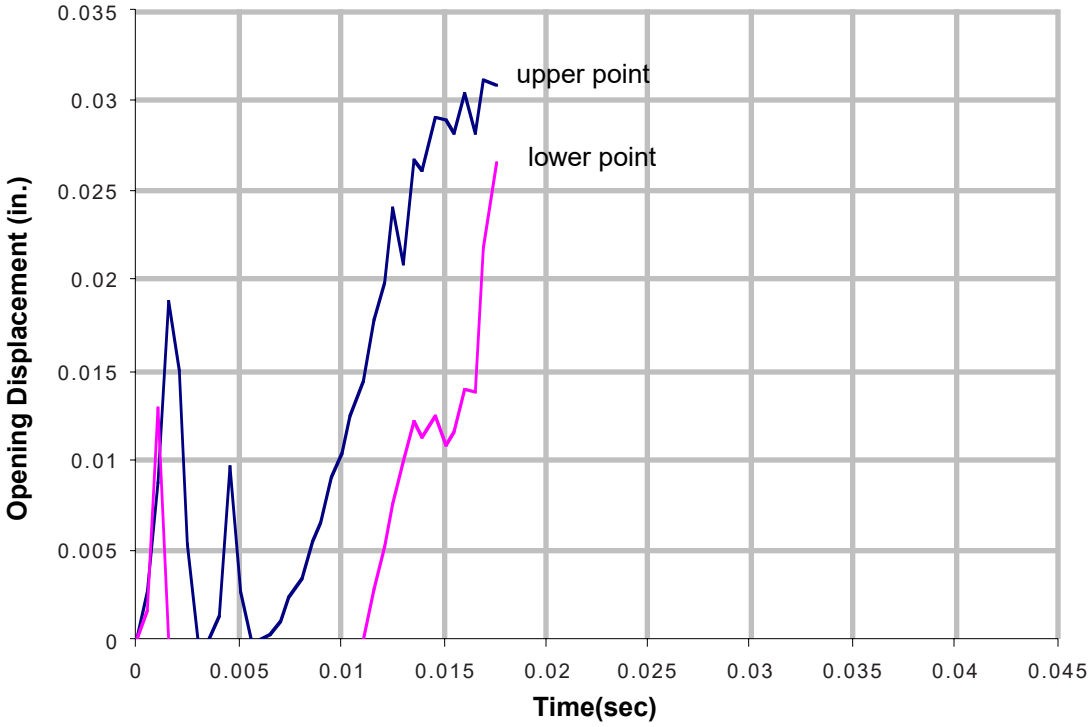


Figure A-60 Steel-DU-steel truck cask following a 30 mph end impact

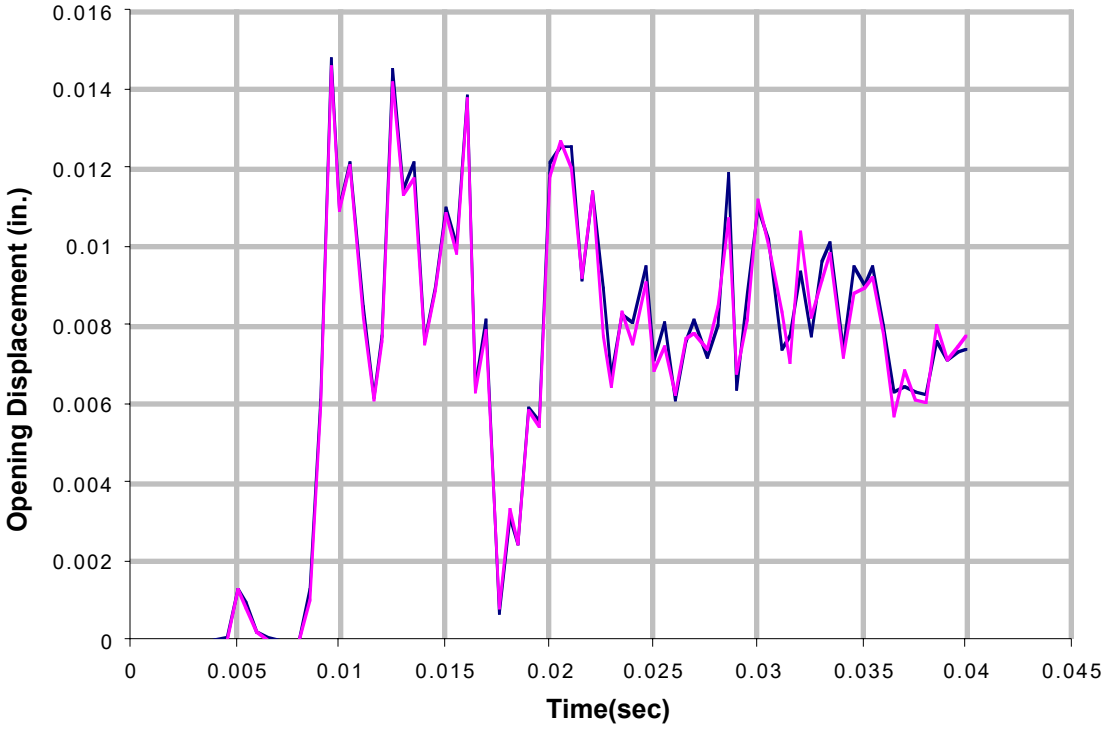


Figure A-61 Steel-DU-steel truck cask following a 60 mph end impact

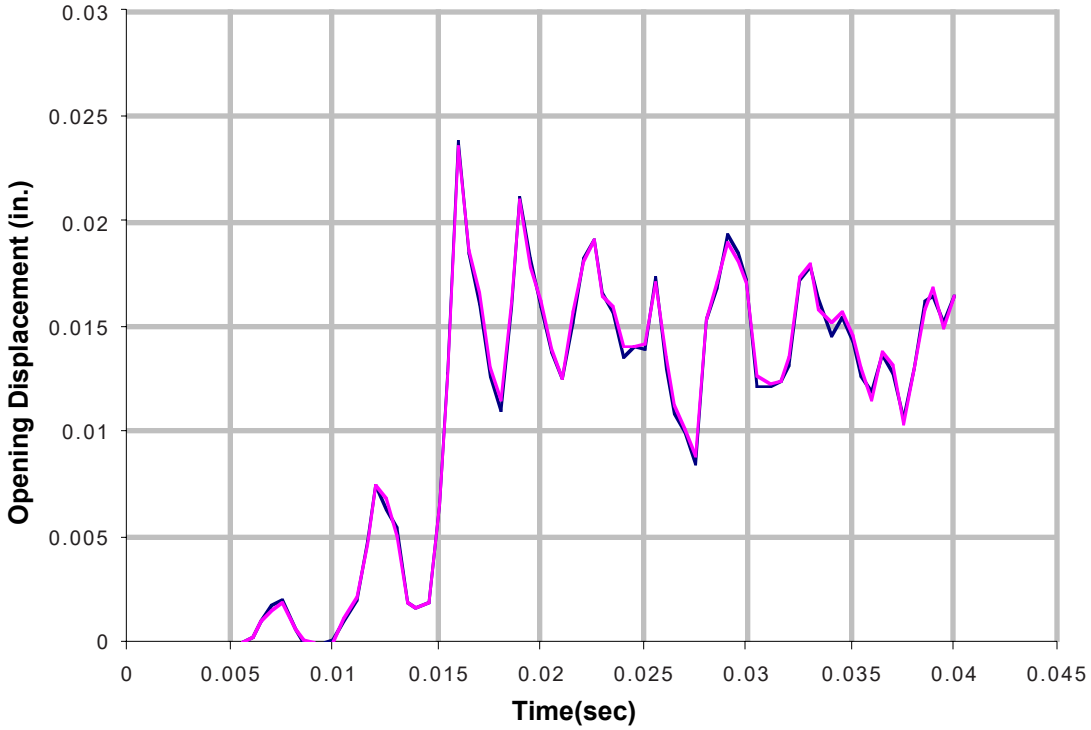


Figure A-62 Steel-DU-steel truck cask following a 120 mph end impact

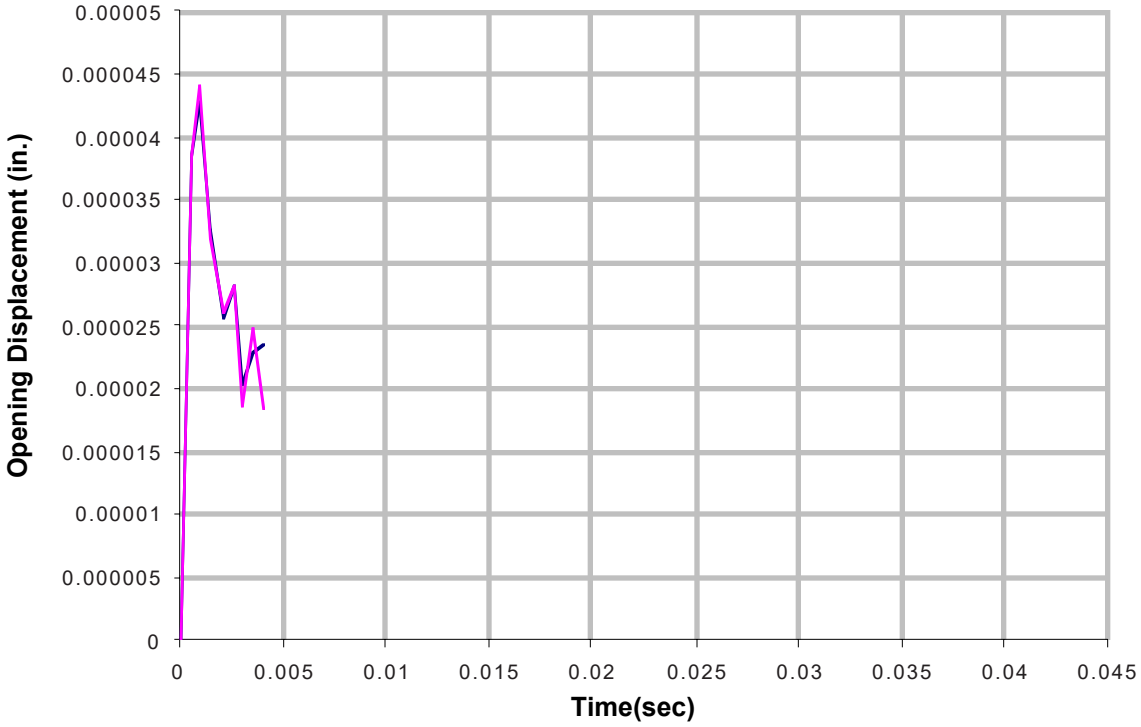


Figure A-63 Steel-DU-steel truck cask following a 30 mph side impact

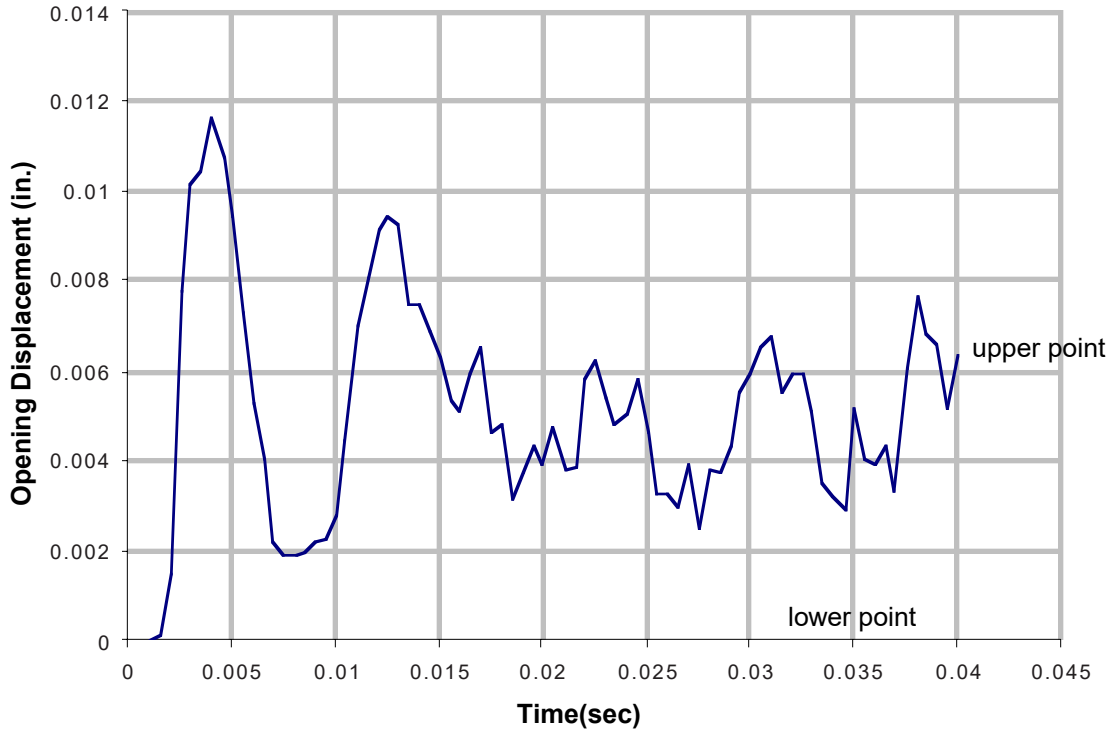


Figure A-64 Steel-DU-steel truck cask following a 60 mph side impact

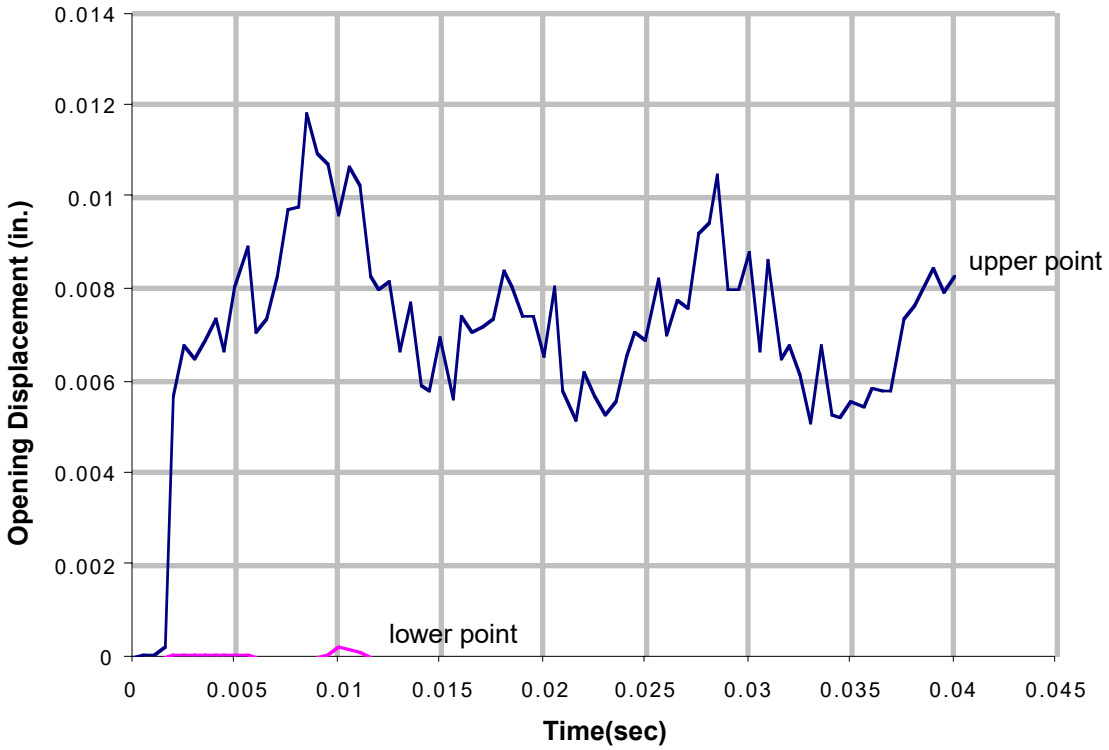


Figure A-65 Steel-DU-steel truck cask following a 90 mph side impact

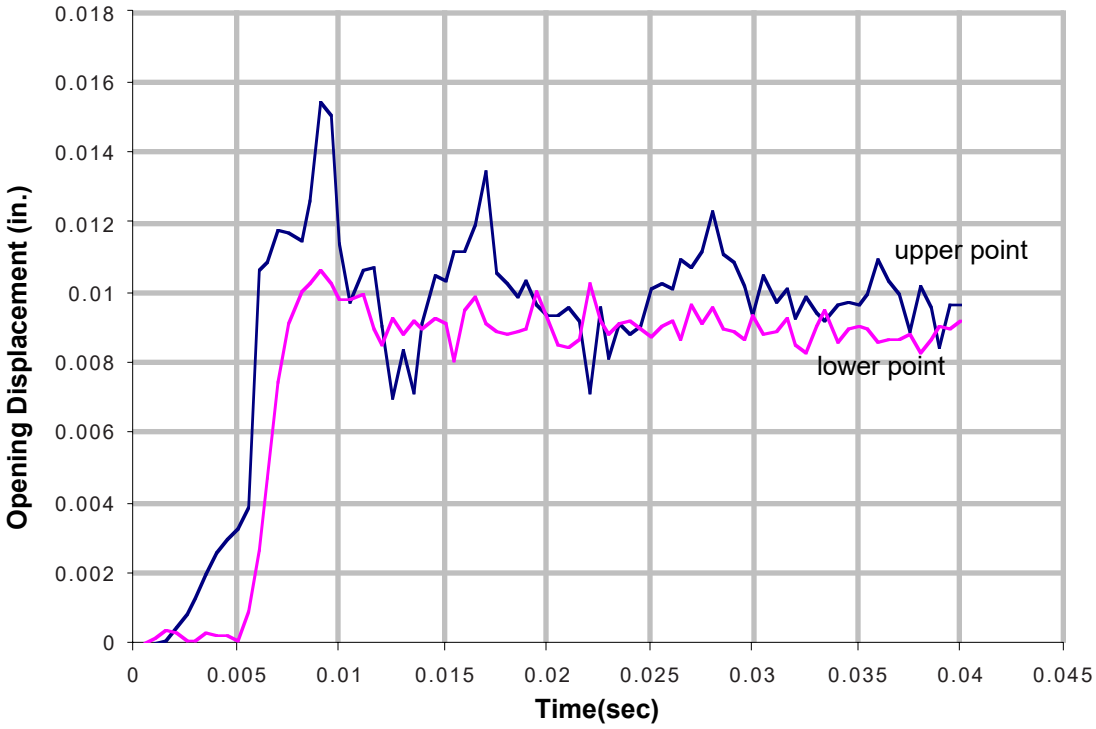


Figure A-66 Steel-DU-steel truck cask following a 120 mph side impact

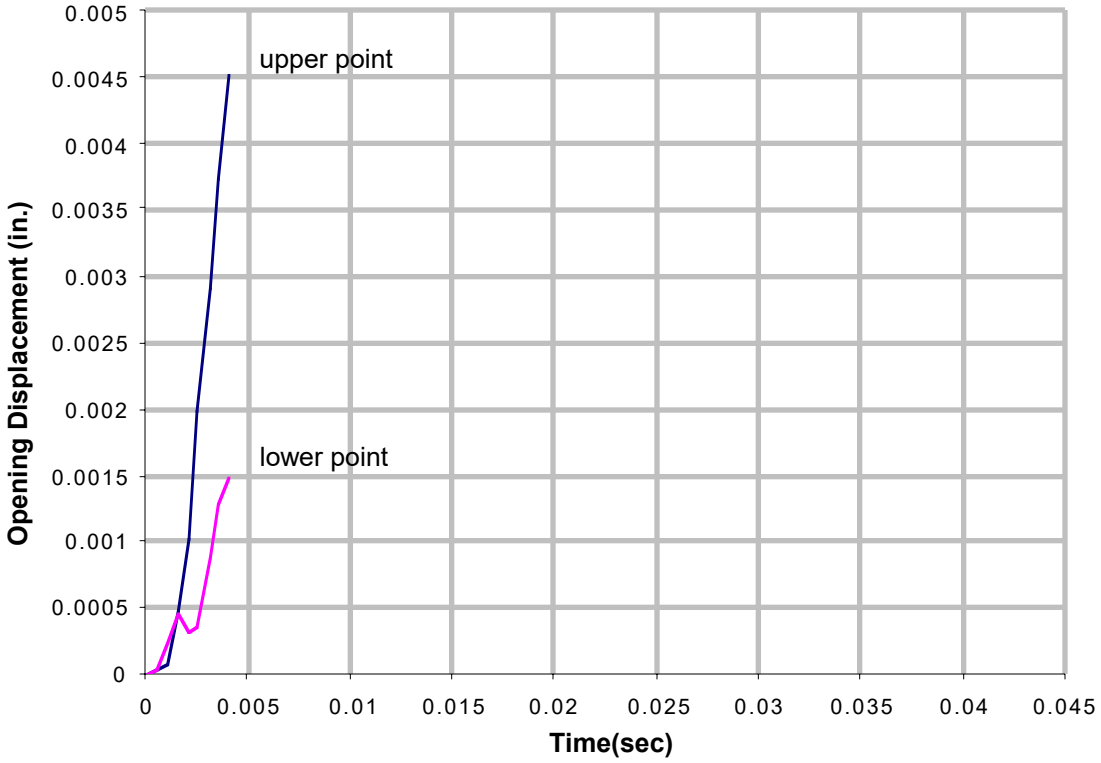


Figure A-67 Steel-lead-steel rail cask following a 30 mph corner impact

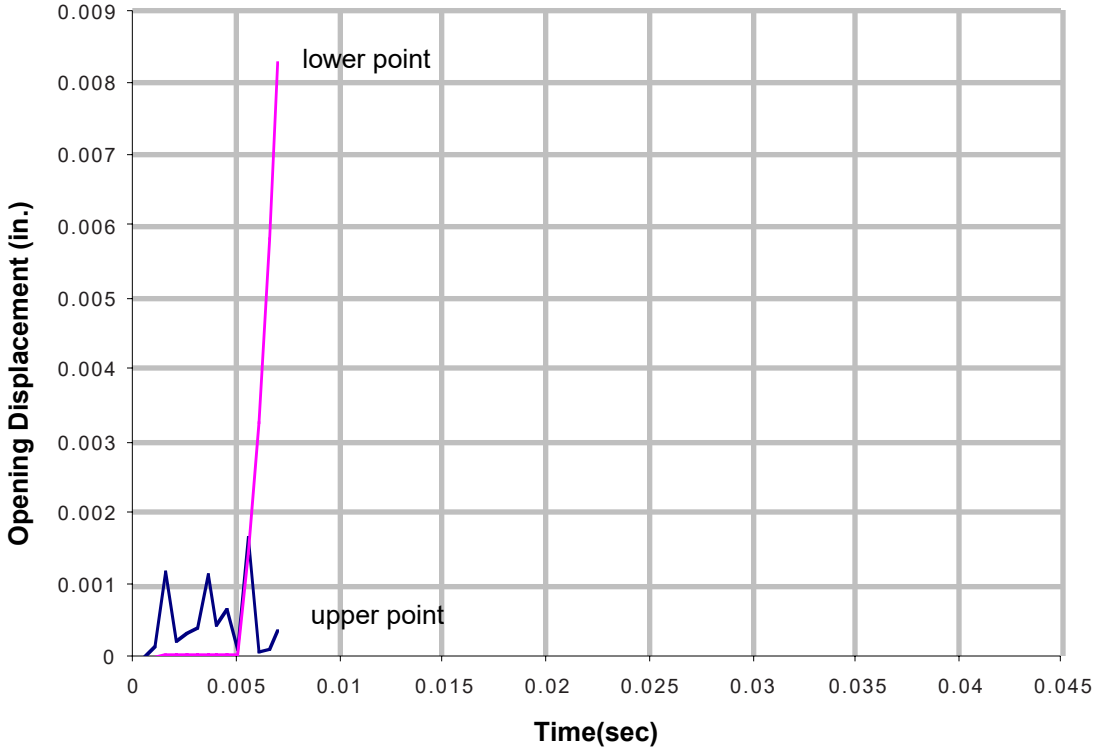


Figure A-68 Steel-lead-steel rail cask following a 60 mph corner impact

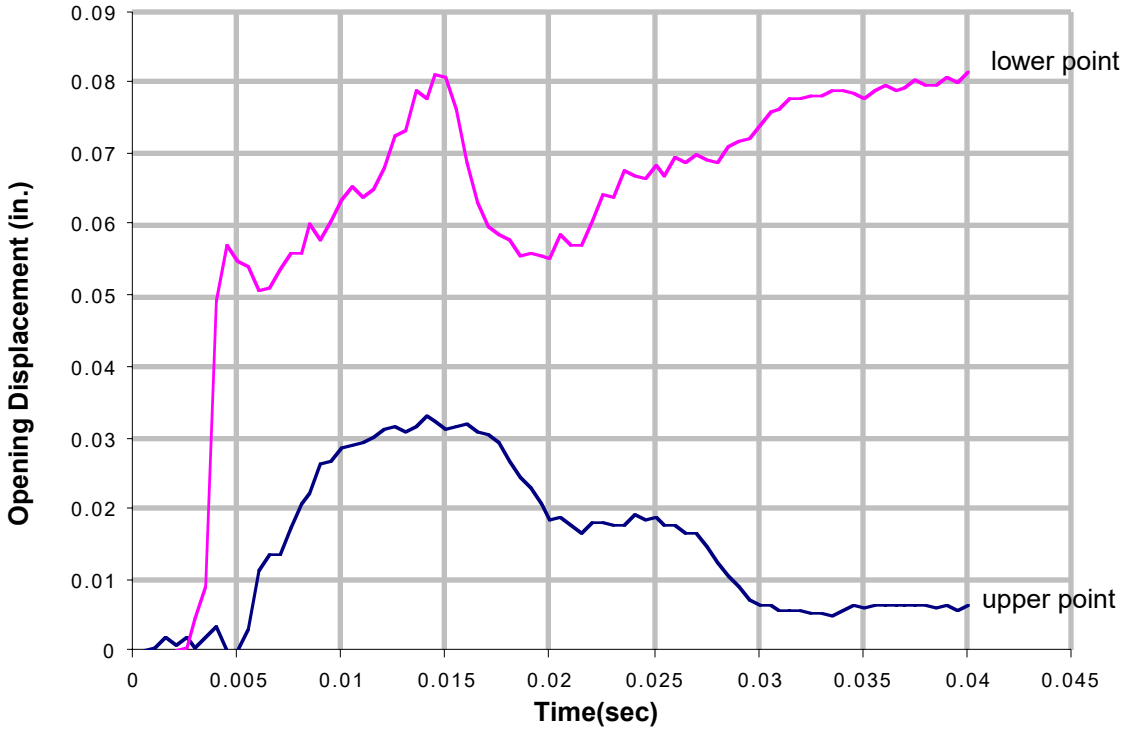


Figure A-69 Steel-lead-steel rail cask following a 90 mph corner impact

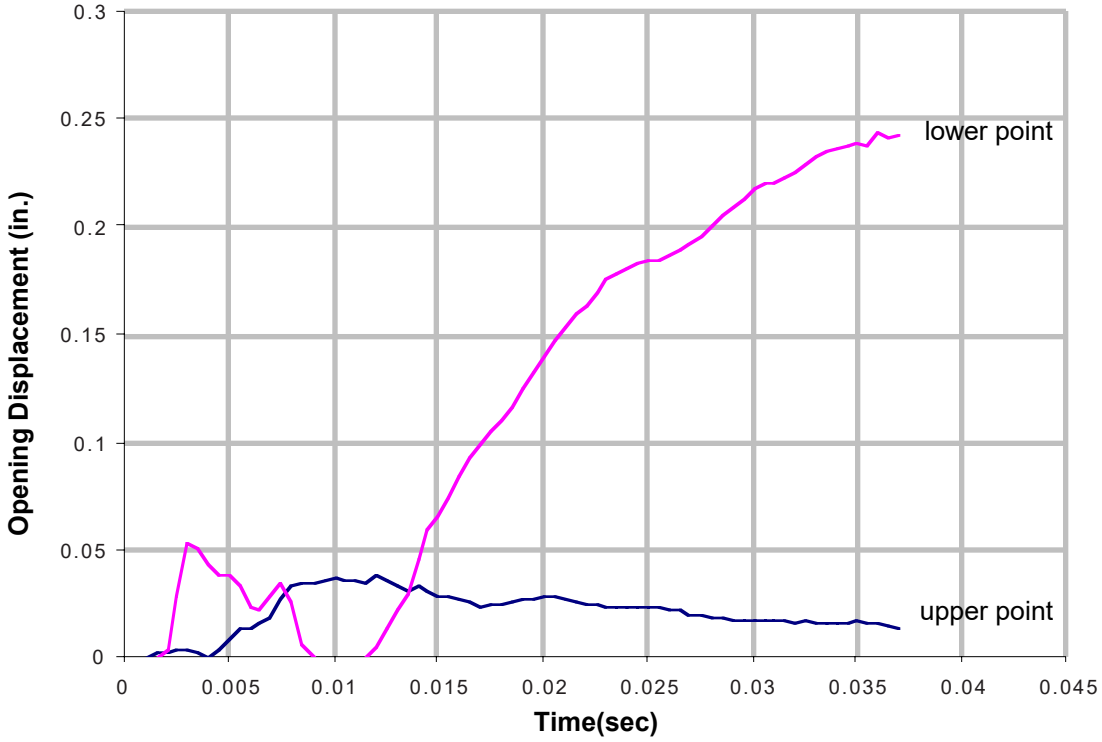


Figure A-70 Steel-lead-steel rail cask following a 120 mph corner impact

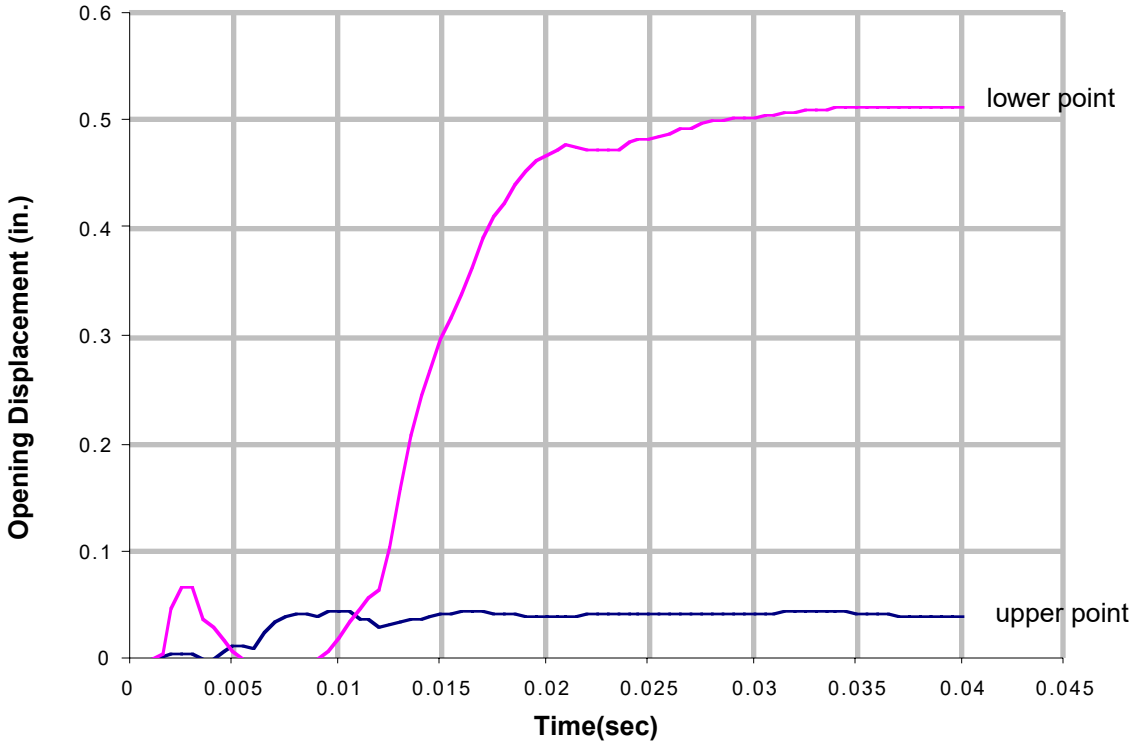


Figure A-71 Steel-lead-steel rail cask following a 30 mph end impact

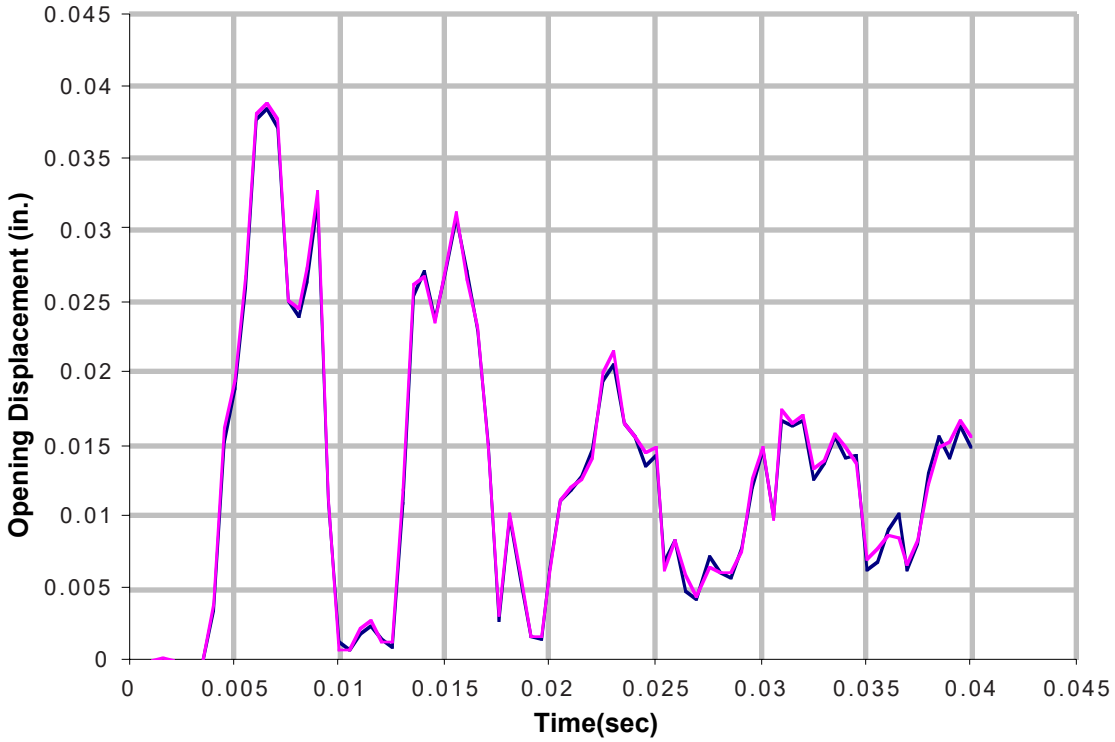


Figure A-72 Steel-lead-steel rail cask following a 60 mph end impact

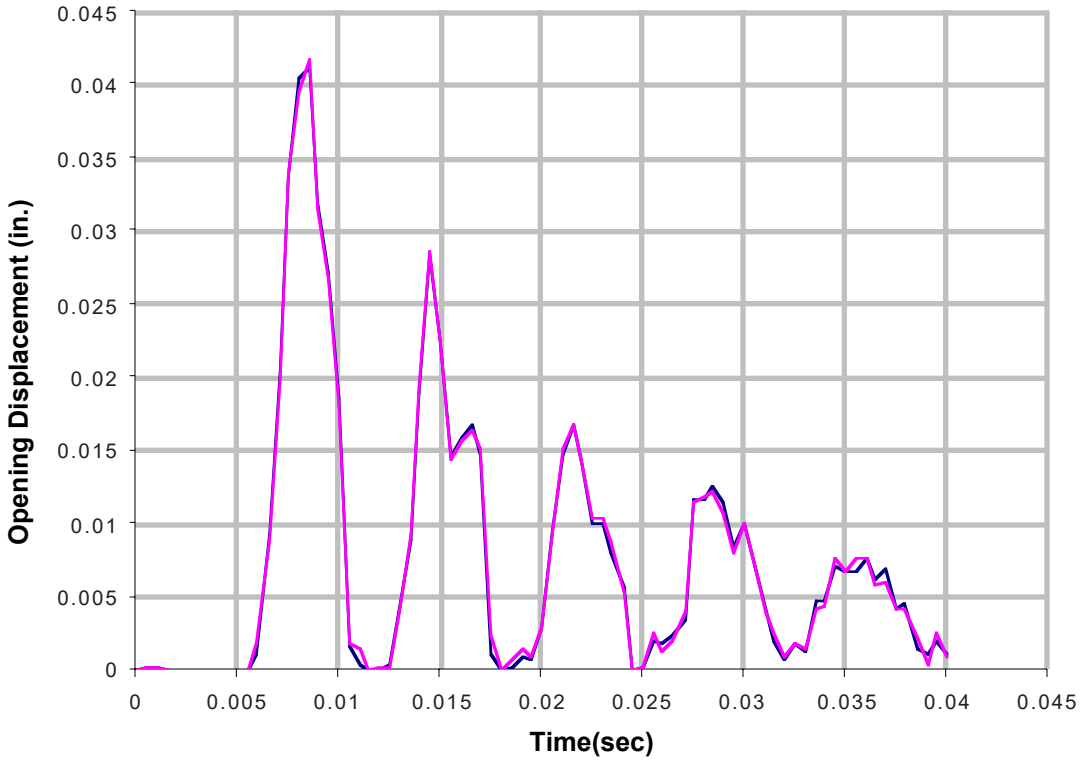


Figure A-73 Steel-lead-steel rail cask following a 90 mph end impact

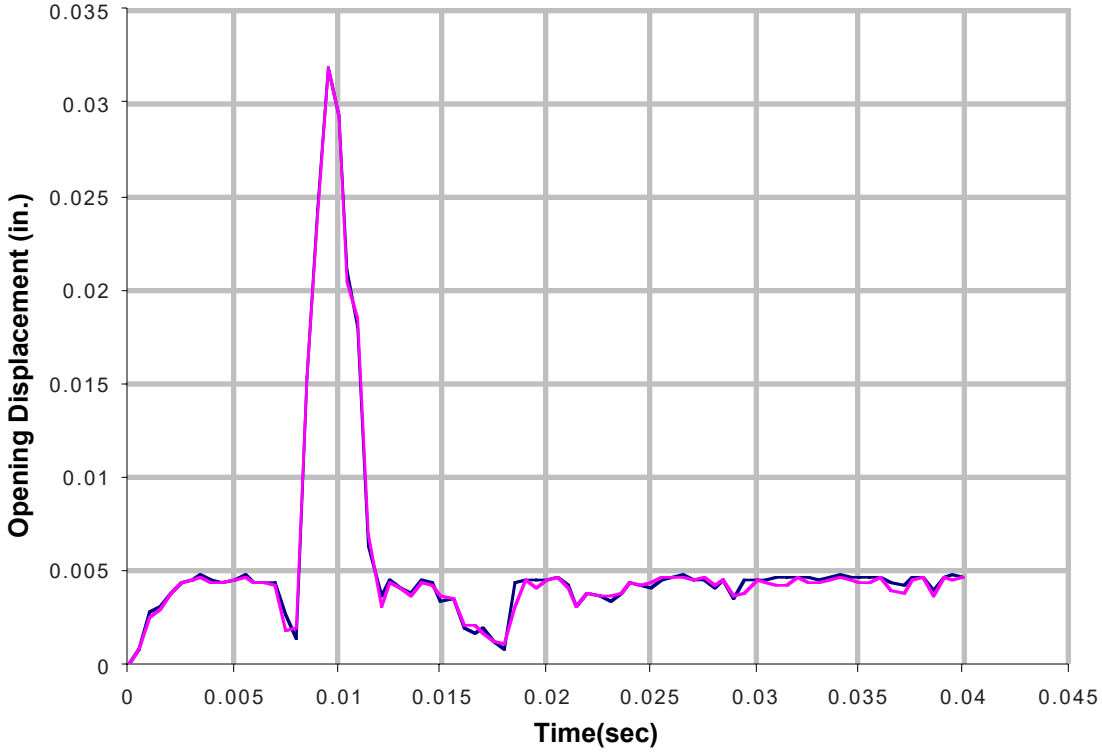


Figure A-74 Steel-lead-steel rail cask following a 120 mph end impact

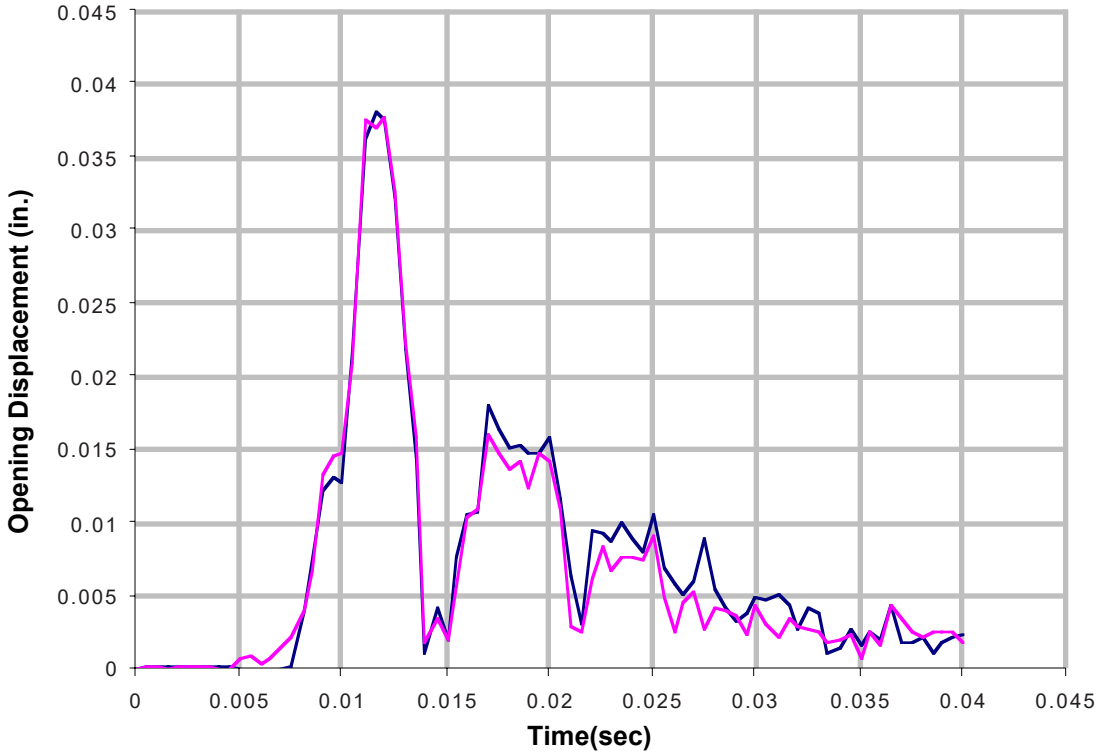


Figure A-75 Steel-lead-steel rail cask following a 30 mph side impact

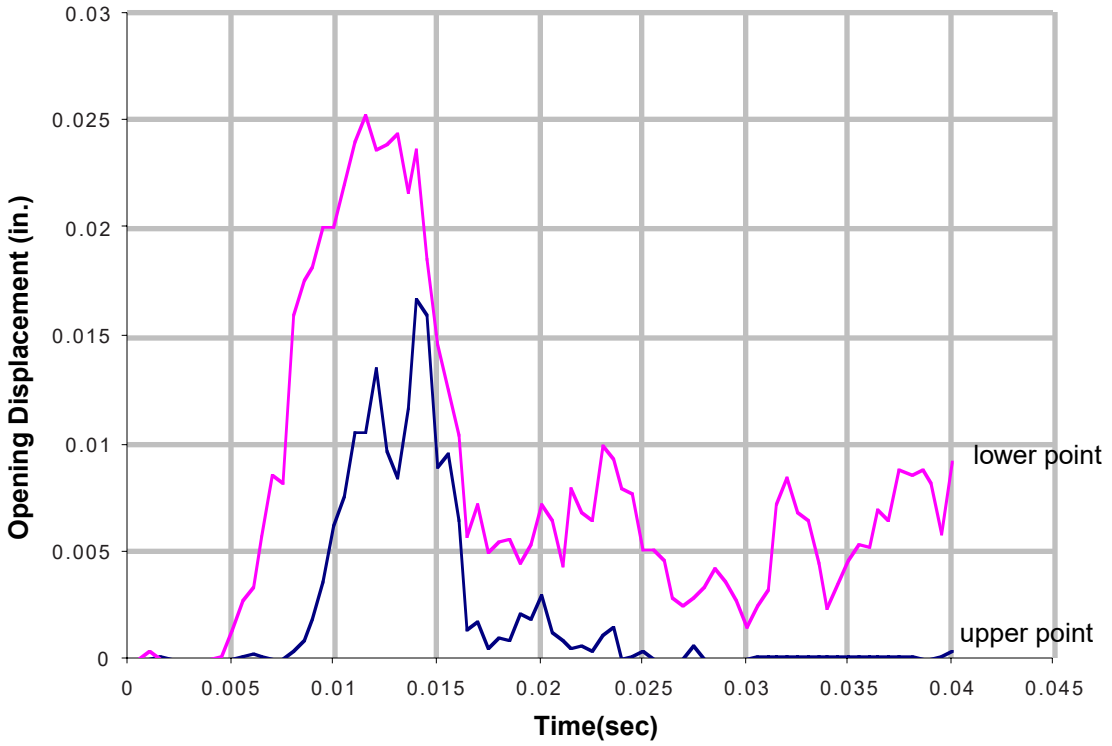


Figure A-76 Steel-lead-steel rail cask following a 60 mph side impact

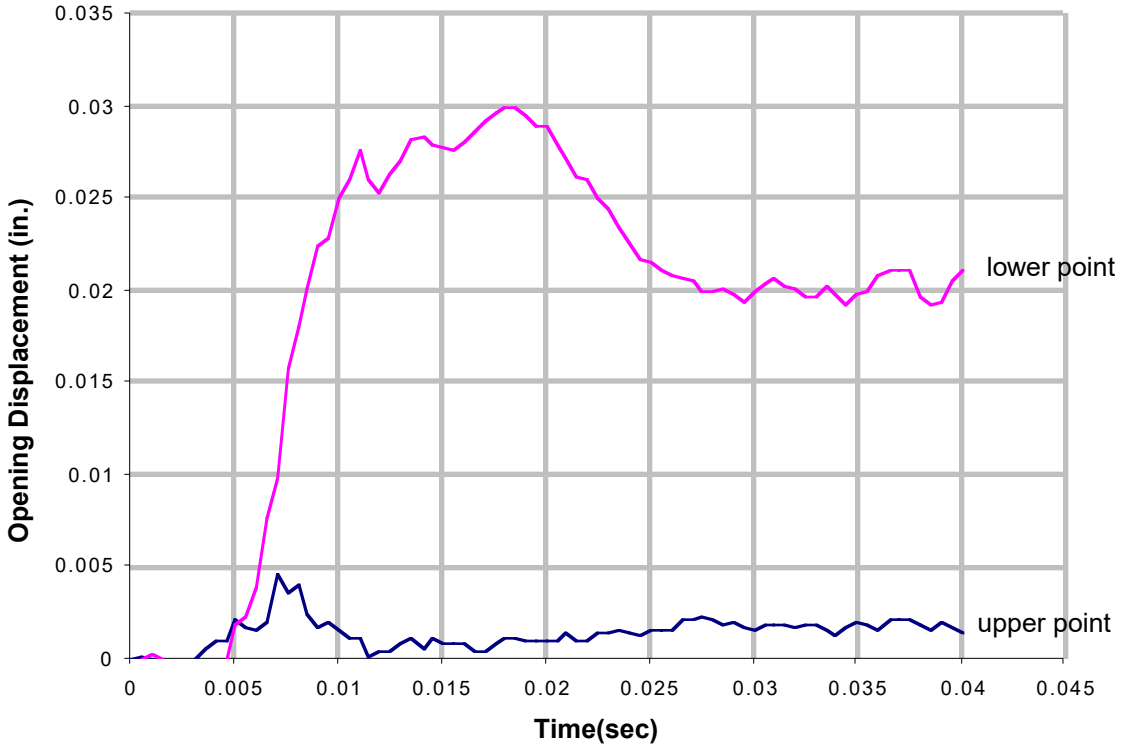


Figure A-77 Steel-lead-steel rail cask following a 90 mph side impact

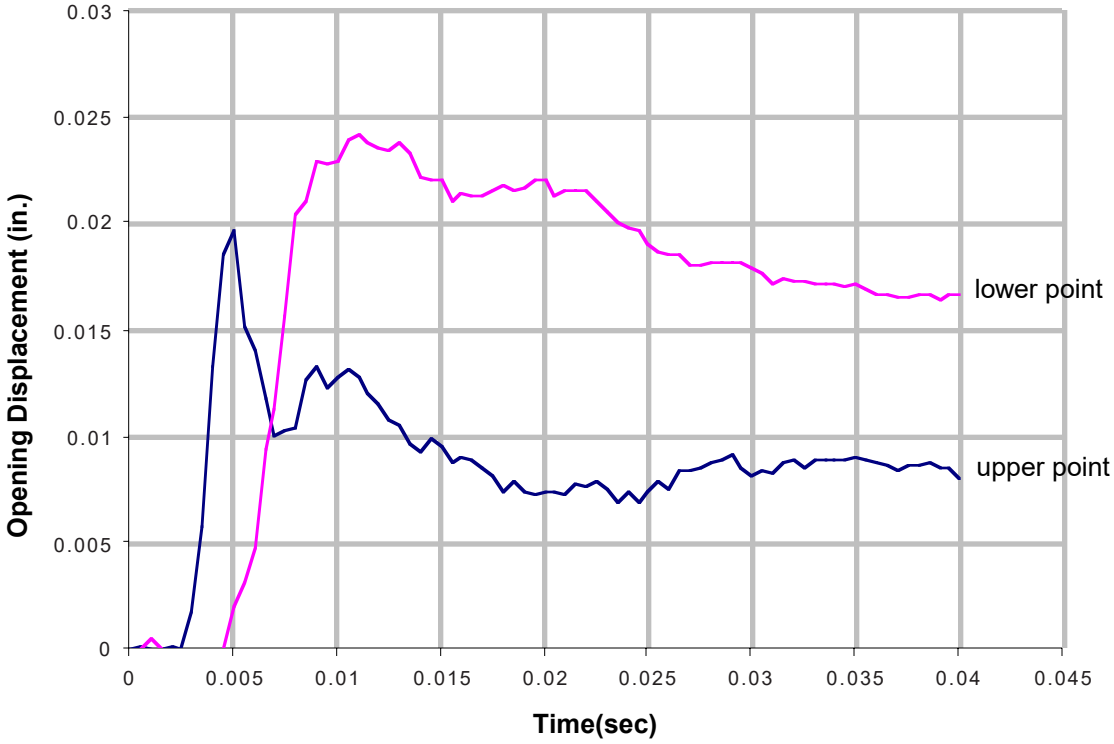


Figure A-78 Monolithic-steel rail cask following a 30 mph corner impact

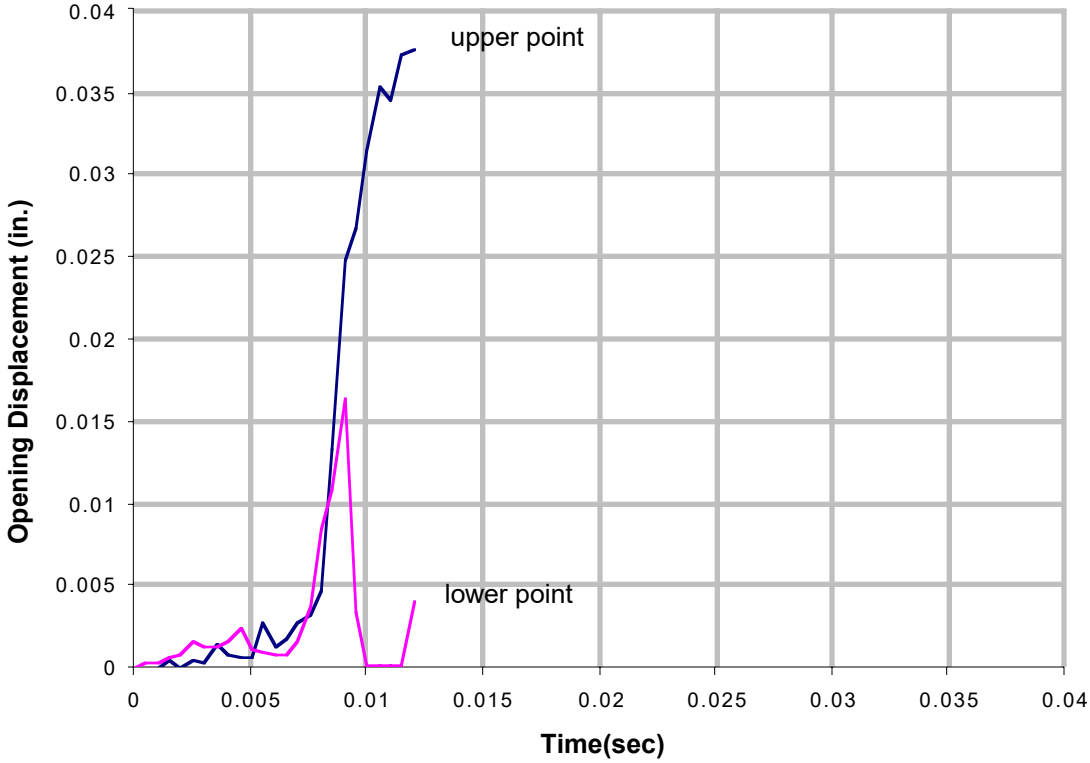


Figure A-79 Monolithic-steel rail cask following a 60 mph corner impact

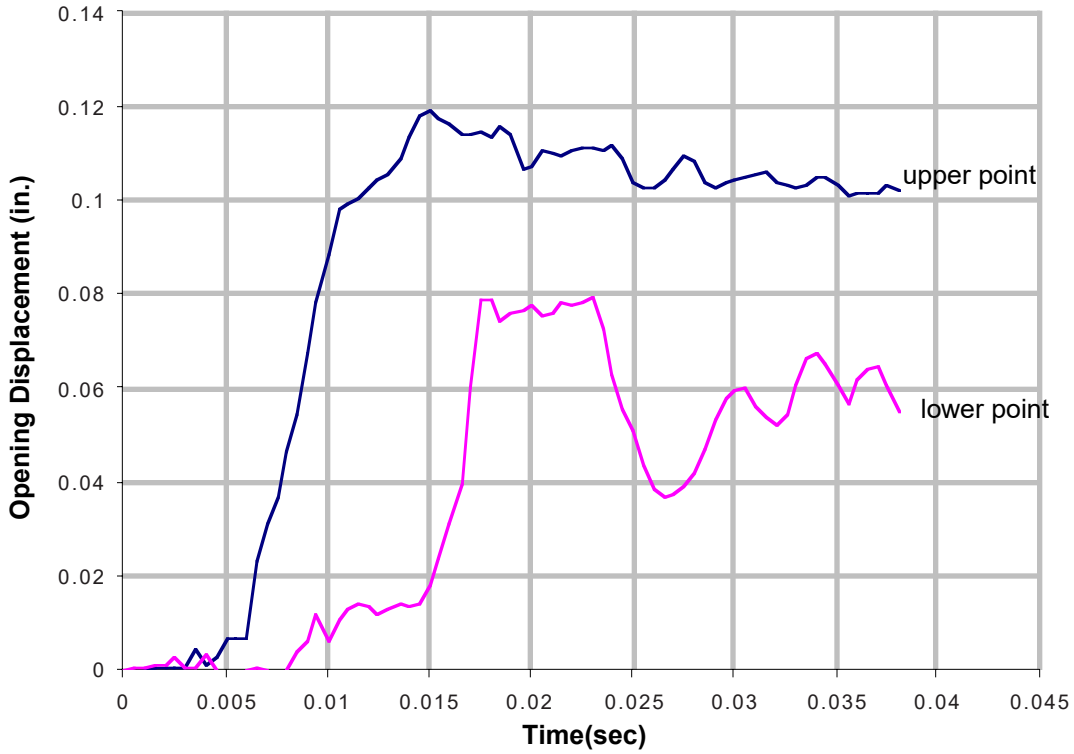


Figure A-80 Monolithic-steel rail cask following a 90 mph corner impact

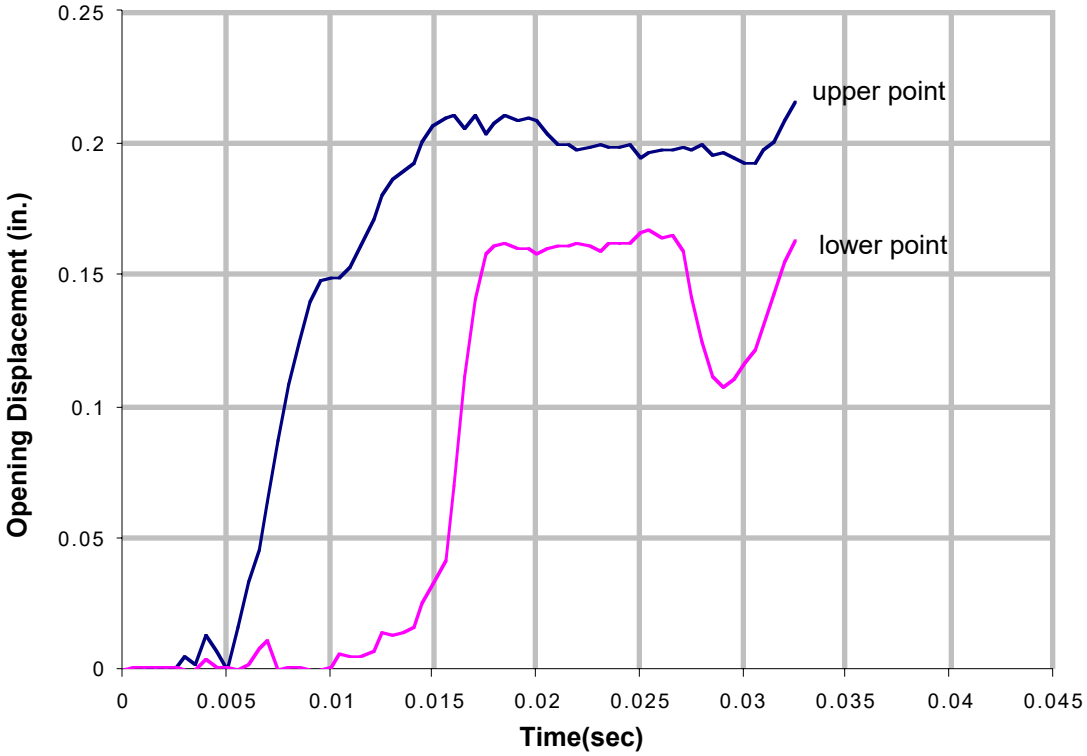


Figure A-81 Monolithic-steel rail cask following a 120 mph corner impact

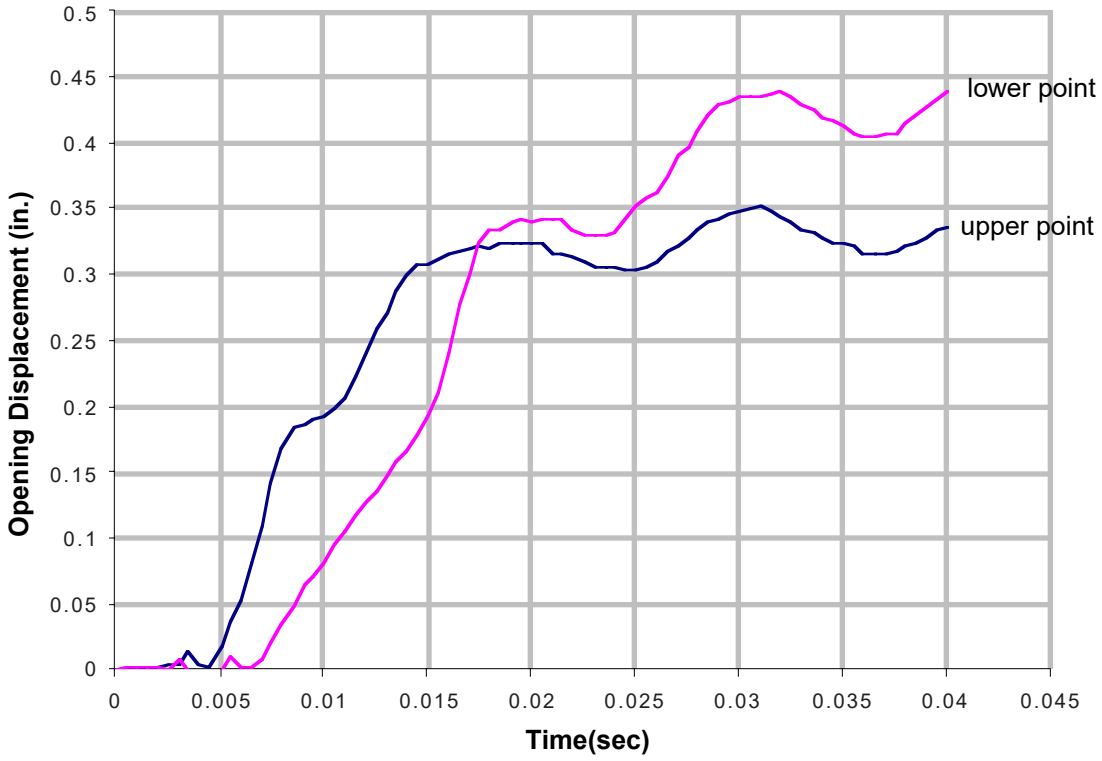


Figure A-82 Monolithic-steel rail cask following a 30 mph end impact

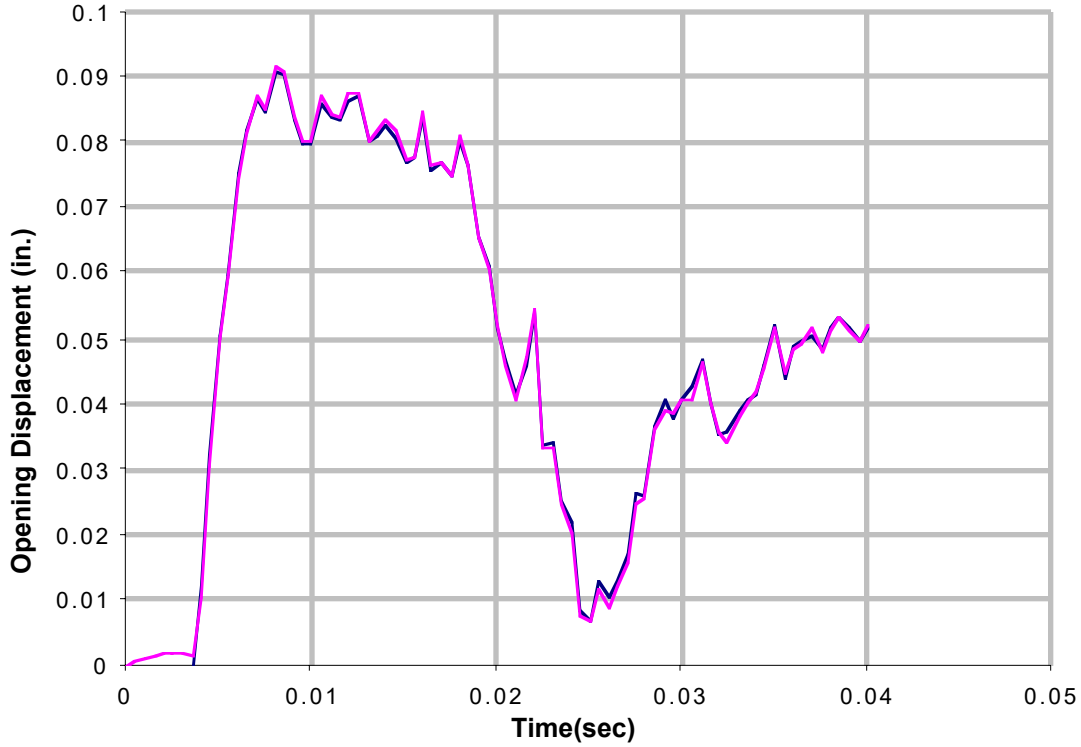


Figure A-83 Monolithic-steel rail cask following a 60 mph end impact

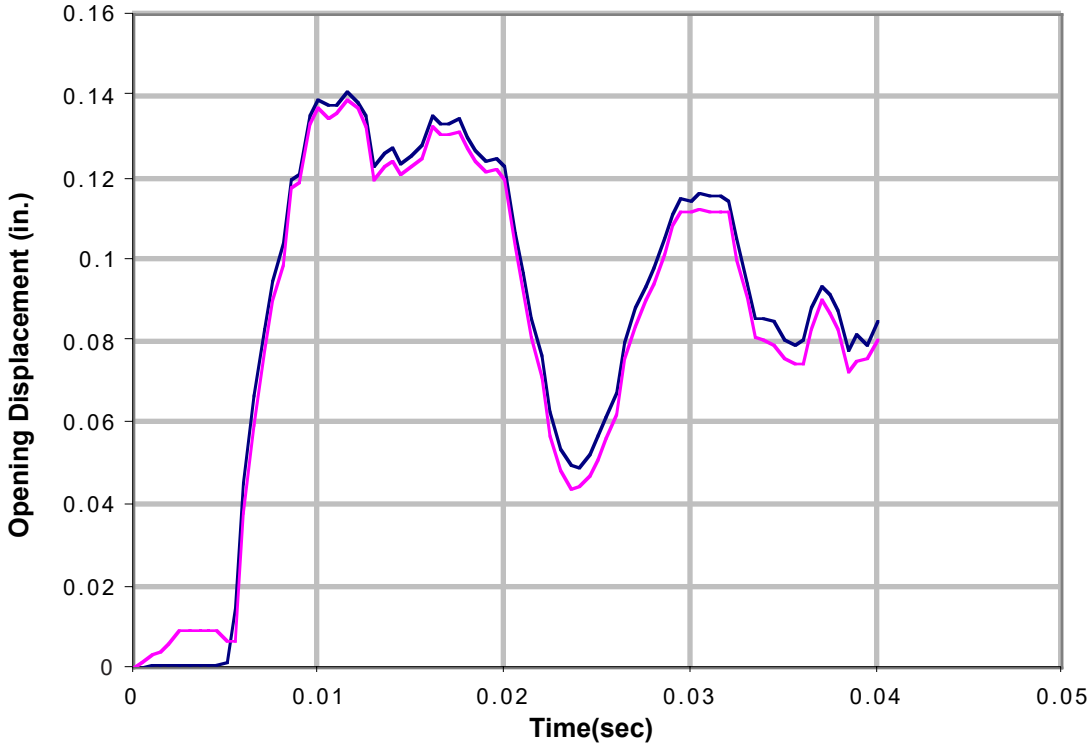


Figure A-84 Monolithic-steel rail cask following a 90 mph end impact

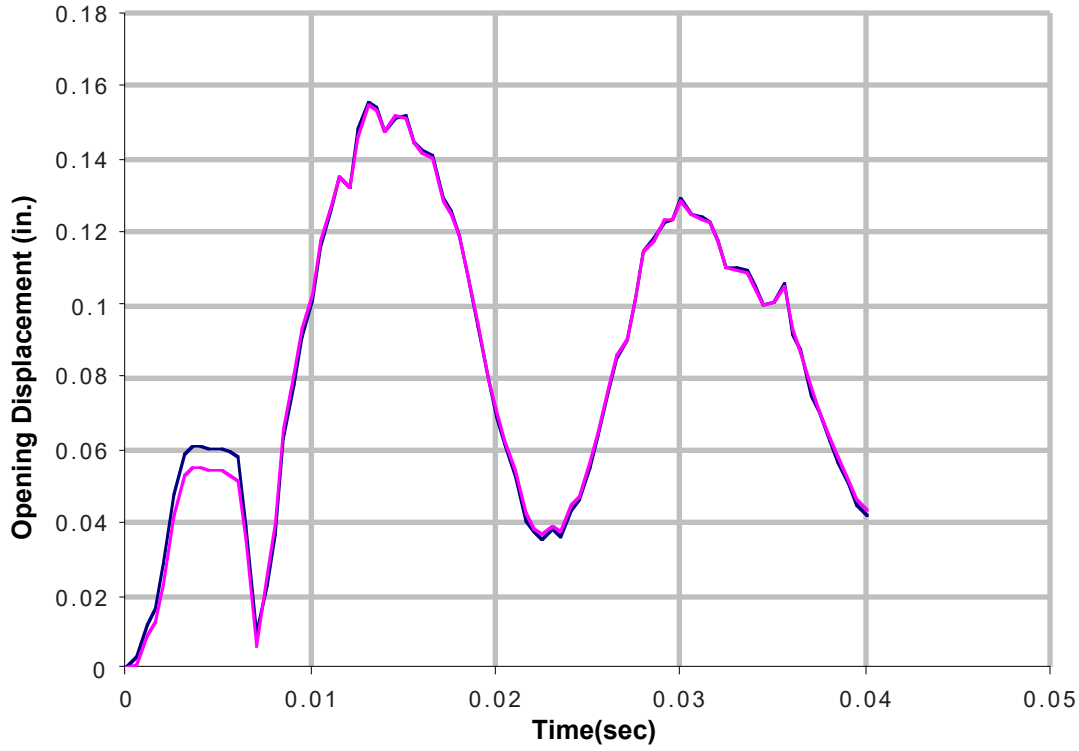


Figure A-85 Monolithic-steel rail cask following a 120 mph end impact

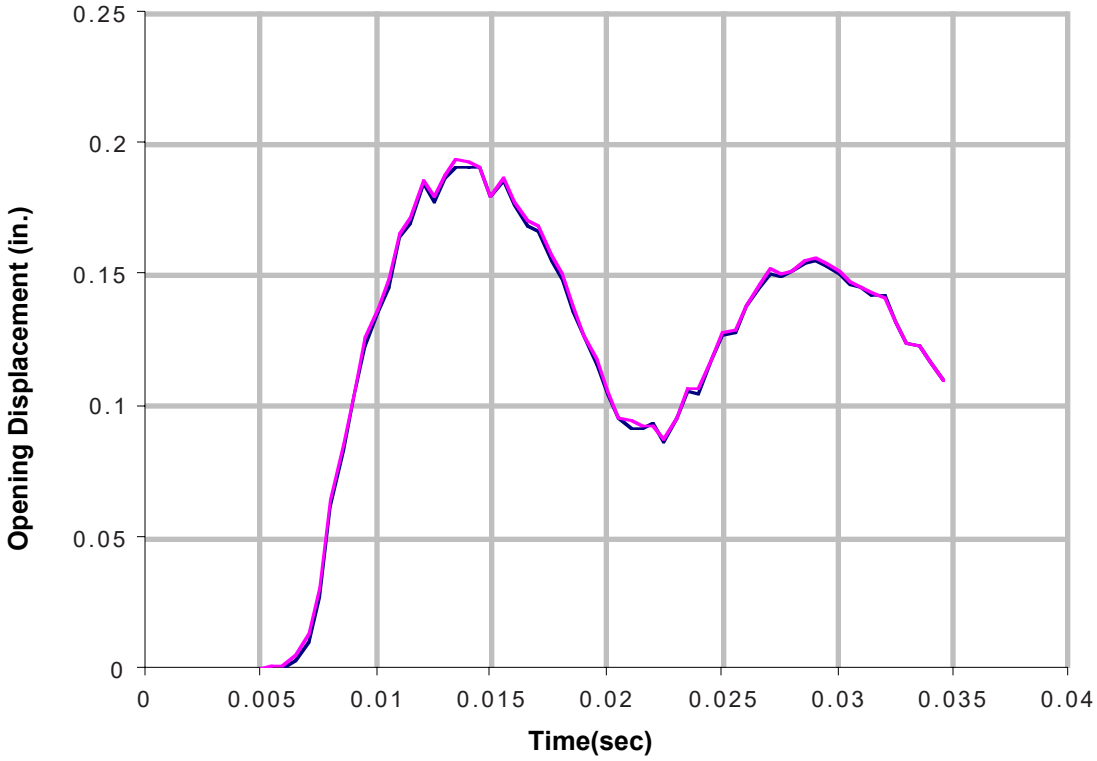


Figure A-86 Monolithic-steel rail cask following a 30 mph side impact

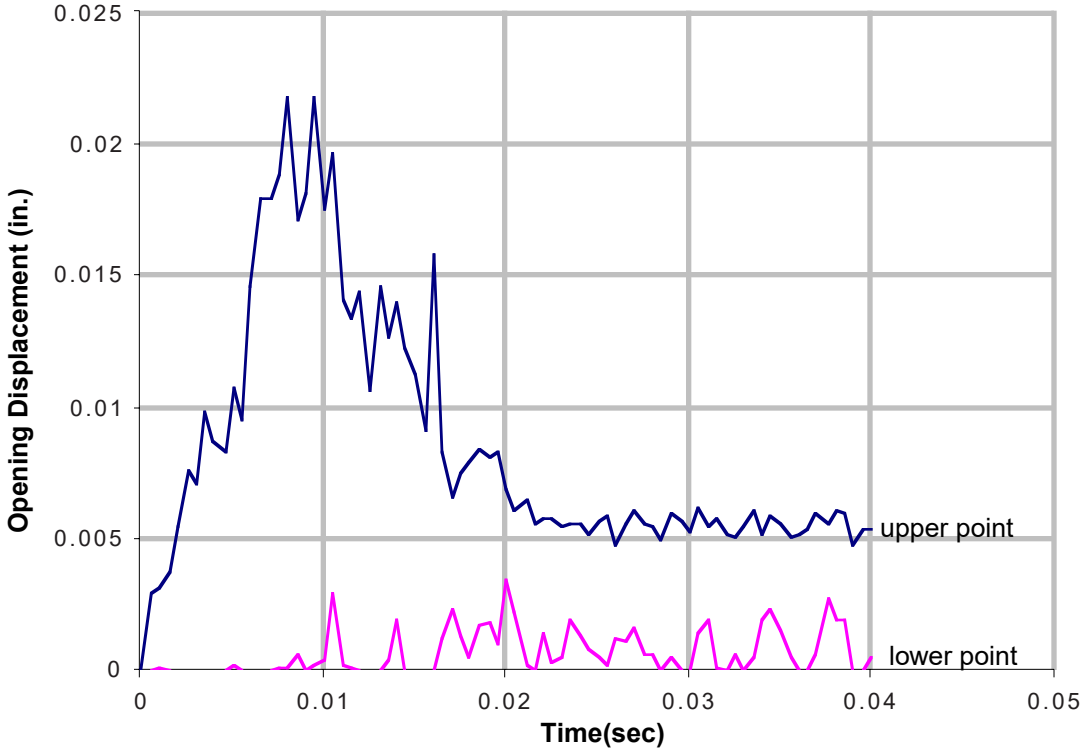


Figure A-87 Monolithic-steel rail cask following a 60 mph side impact

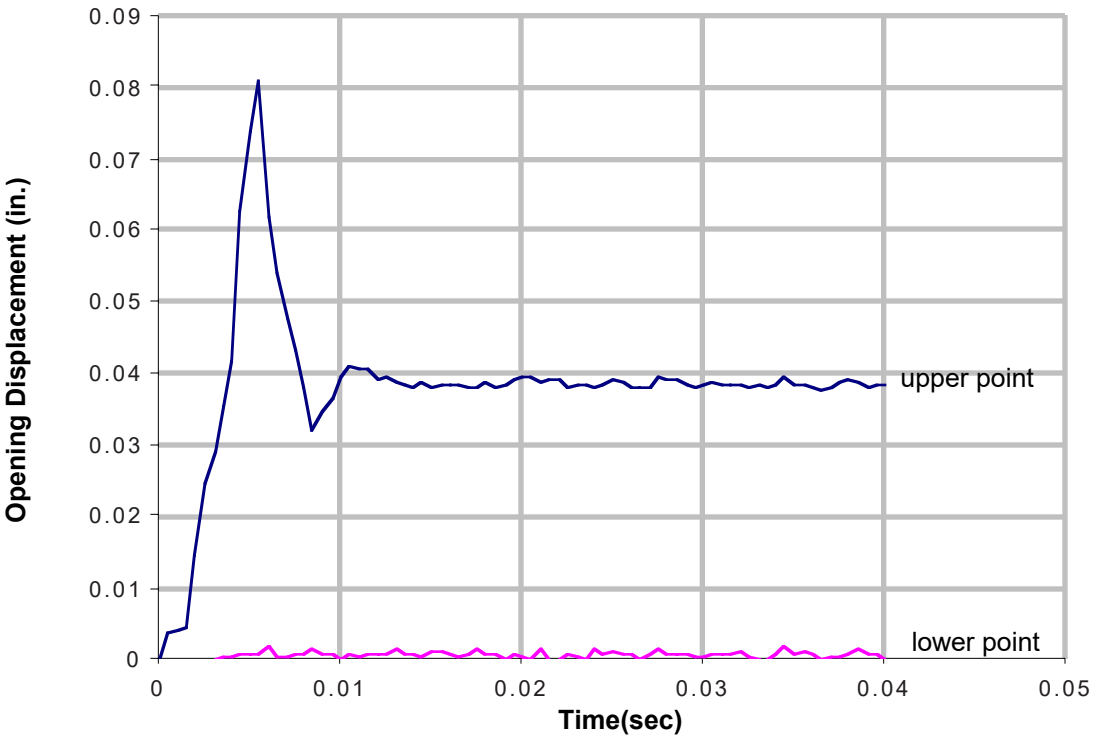
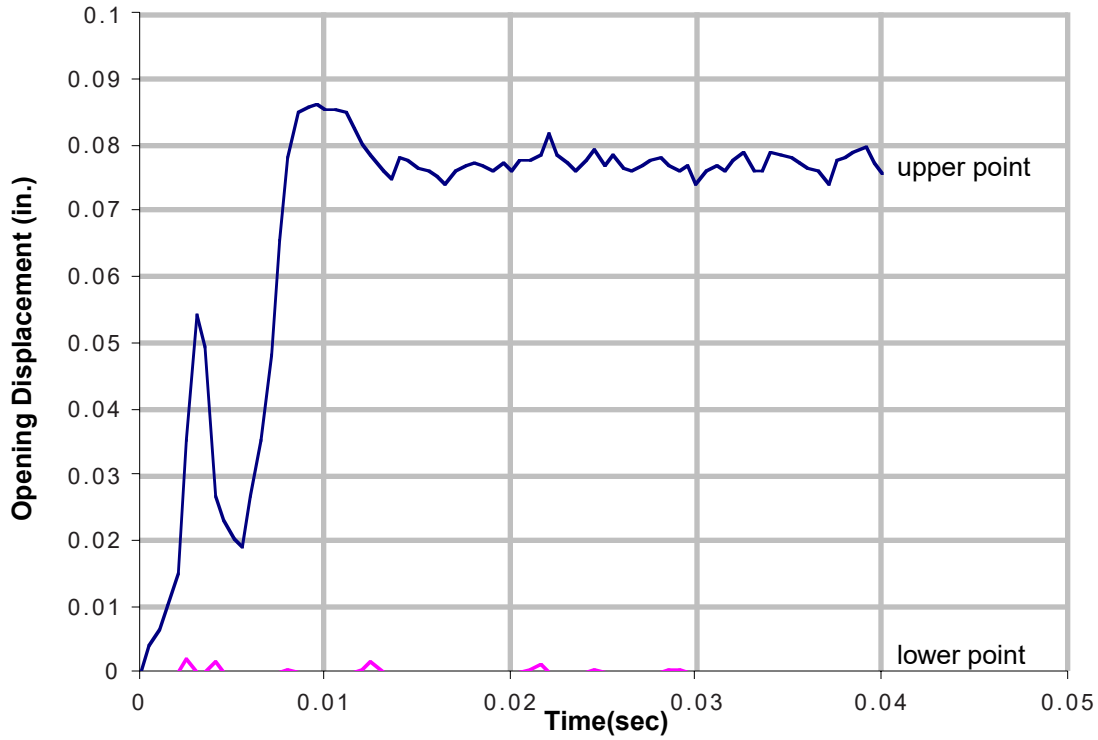


Figure A-88 Monolithic-steel rail cask following a 90 mph side impact



APPENDIX B

Analytical Determination of Package Response to Severe Impacts[1]

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INTRODUCTION

An important aspect of radioactive material transportation risk assessments is the amount of release from packages subjected to accidents more severe than the design basis accident (U.S. NRC 10CFR71 1995) defined as a free fall from 9 m or 30 ft onto an essentially unyielding target. Current risk assessments generally use very conservative estimates of release rates for extra-regulatory accidents. To remove some of this excessive conservatism and more realistically predict transportation risks, the response of a large number of packages to extra-regulatory impacts must be determined.

Cost considerations preclude testing as the means for this determination. Many tests at many different velocities or orientations would be required to obtain a sufficient amount of experience at predicting leakage. Therefore, an analytical tool, such as the finite element method must be used. For a finite element code to be relied upon it must first be qualified for performing analyses resulting in large plastic deformations of the containment boundary of radioactive material transportation packages.

An effort to qualify the finite element method as an accurate and reliable method to predict cask performance has been ongoing at Sandia National Laboratories by comparing analytical results to test measurements of the Structural Evaluation Test Unit (SETU) cask. Comparisons of deformed shapes, strains and accelerations have been made for impact velocities of 13.4, 20.1 and 26.8 m/s (30, 45 and 60 mph). The SETU cask was designed following the method and guidance of U.S. NRC Regulatory Guide 7.6 (U.S. NRC 1978). The unit met the requirements of this guide with as little margin as practical, in order to make the package have a high probability of plastic deformation. The 13.4 m/s (30 mph) impact corresponds to the regulatory 9 m (30 ft) free fall, and the others correspond to impacts with 2.25 and 4 times the kinetic energy of the regulatory impact. One other analysis at an impact velocity of 38.0 m/s (85 mph) or eight times the kinetic energy of the regulatory impact will be included to extend the predictions to even higher energies.

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1. This work was supported by the U. S. Department of Energy under Contract No. DE-AC04-94AL85000.

DESIGN OF TEST UNIT

NRC regulatory Guide 7.6 lists design criteria for the structural analysis of shipping cask containment vessels. These criteria were followed in the design of the test unit wherever possible. The basic configuration of the test unit has a lead shielding layer sandwiched between two stainless steel structural shells. Since a common location for a failure is at the closure, and it was not determined if the impact end or the opposite end closure was most vulnerable, the test unit has a lid on both ends. One of the possible failure mechanisms for this type of package is caused by the impact of the contents against the lid. For this reason the contents were made very stiff, thereby maximizing the amount of damage that it can cause when impacting the lids. A schematic of the Structural Evaluation Test Unit (Ammerman 1993) and photograph are shown in Figure 1.

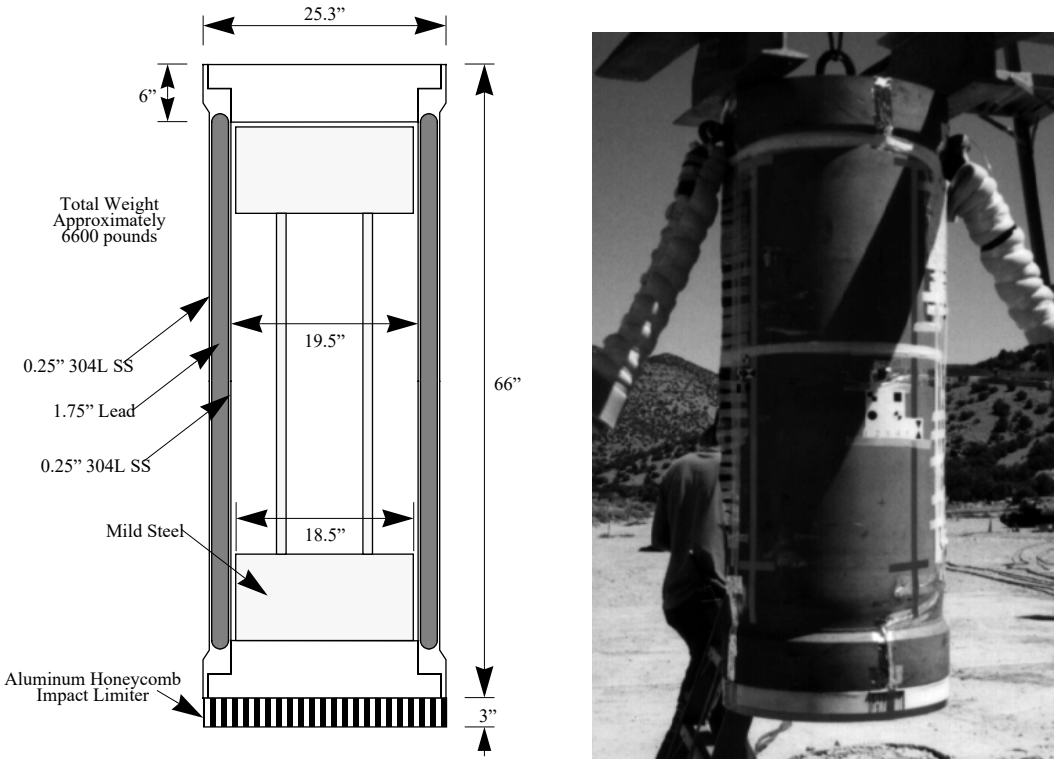


Figure 1. Schematic and photograph of the structural evaluation test unit.

The test package is loosely based (approximately one-third scale) on current casks used in rail transport. The impact limiters used with these casks typically yield accelerations in the 60 G's range for the 9 m (30 ft) free fall onto an unyielding target. Therefore an impact limiter that would yield a peak acceleration of about 180 G's (three times full-scale) for the one-third scale test unit was chosen. Metallic honeycomb was used for construction of the impact limiters to be used in this program. Honeycomb materials provide good repeatability in crush behavior. The major disadvantage of anisotropy in the honeycomb is eliminated because of the end-on drop orientation.

The honeycomb impact limiter crush strength and thickness were initially selected assuming rigid-perfectly-plastic behavior of the honeycomb and a crush at lock-up of 70%. Using the maximum crush strength of 22.1 MPa (3200 psi) versus a nominal crush

strengthen 16.6 MPa (2400 psi), a required thickness of 6.6 cm (2.6 in) is obtained. It was decided to use a honeycomb thickness of 7.6 cm (3.0 in) in the design of the impact limiter.

The major task in design of the test unit was the establishment of the inner and outer wall thickness. The wall thickness had to be sufficient to withstand the loading imposed by the 9 m (30 ft) drop onto an unyielding surface with the impact limiter in place. For manufacturing considerations, the outer stainless steel wall was given an outside diameter of 0.61 m (24 in) and the inner stainless steel wall was given an outside diameter of 0.51 m (20 in). These dimensions are consistent with available pipe sizes. The test unit wall design problem was thus reduced to determining the required thicknesses. An iterative design procedure was used to select the inner and outer wall thicknesses of 6.4 mm (0.25 in). This thickness of stainless steel tubing is commonly available, and the stresses for this design would be very near the allowable stress values from Regulatory Guide 7.6.

The typical method used to design bolted closures is to assume the package contents impacts the closure lid with the same acceleration as the steady-state acceleration of the cask. For the test unit, where the contents weigh 7.34 KN (1,650 lbs) and the acceleration value is 180 G's, a required total bolt force of 1.32 MN (297,000 lbs) is calculated. Typical grade 8 bolts (material SAE 4140) have a nominal yield strength of 938 MPa (136,000 psi), resulting in an allowable bolt stress of 234 MPa (34,000 psi). This results in a required bolt area of 56.4 cm^2 (8.74 in^2), or assuming 24 bolts a required area of 2.35 cm^2 (0.36 in^2) per bolt. Bolts with 19 mm (3/4 in) diameters and fine threads having a cross section area of 2.39 cm^2 (0.37 in^2) were chosen.

FINITE ELEMENT MODEL

In order to accurately capture the acceleration time history and correctly account for the inertial effects, the nonlinear, transient dynamic computer programs PRONTO2D and PRONTO3D (Taylor, 1987, Taylor 1989, Attaway, 1992) were used. PRONTO2D and PRONTO3D are explicitly integrated codes that steps through time, predicting the next time step conditions from the present conditions.

The stainless steel, carbon steel and the lead in the cask were modeled using a realistic analytical material model based on a power law relationship (Stone, 1990). The honeycomb was modeled as low density foam, a material model that adequately captures its volumetric and deviatoric behavior. The material parameters were chosen based on pretest measurements and estimates of strain rate sensitivities. The stainless steel, carbon steel and the honeycomb materials are well characterized for both static and dynamic conditions. The lead is not a well characterized material under dynamic conditions, so the material parameters were chosen based on available data and experience gained during testing.

The 2D axisymmetric finite element model used a total of 7115 - four-node quadrilateral elements. The boundary conditions for the model consisted of a rigid impact plane and an initial velocity applied to the model. The contents were modeled to be in contact with but not attached to the bottom lid. Contact was modeled between the honeycomb and the bottom lid, both lids and the cask body, both lids and the contents, the contents and the cask body and the lead with the interior cavity surfaces. The bolts were modeled as an

equivalent ring attached to the lids and the cask body with coincident nodes at top and bottom of the ring.

The same test specimen was used for all four drop tests. Only the impact limiter was replaced after the first 13.4 m/s (30 mph) test. The small permanent deformations from the first test were present at the start of the second test. The second test impacting at 26.8 m/s (60 mph) hit at a slight angle to vertical on the corner of the cask. The deformations from the second test were large in the stainless steel walls near the impact corner. For the third test, the cask ends which were not significantly damaged, were reused with new wall sections, new lead, new contents and a new impact limiter. The third test impacted at 20.1 m/s (45 mph) on end. The fourth test used the same cask retaining the permanent deformations from the third test with the exception of a new impact limiter. This test hit with a velocity of 26.8 m/s (60 mph).

COMPARISON OF PREDICTIONS AND TEST MEASUREMENTS

The first, third and fourth tests impacting at 13.4, 20.1 and 26.8 m/s (30, 45 and 60 mph) hit flat on end as designed. A 2D axisymmetric finite element analysis was performed and compared to the test results. The second test which hit at a slight angle required a 3D finite element model to capture the non-axisymmetric loading conditions. The results from all four tests and the corresponding predictions are compared in the following sections.

The deformed shapes from the first, third and fourth tests are compared to the 2D axisymmetric analysis predictions in Figure 2. Also shown in the figure are the vertical midheight accelerations from both the analysis and the test measurement. The deformations for the first and third test are relatively small. The fourth test experienced more plastic deformation with a single buckle on the outside wall and a double buckle on the inside wall. The analysis matched the actual deformations very well for all three tests. As shown in the figure the accelerations filtered with a Butterworth lowpass filter at 500 Hz also matched well in both magnitude and timing for these tests.

The prediction of the deformation in the fourth test needed to include the permanent deformations from the third test. This was accomplished in the finite element analysis by using the deformed shape from the 20.1 m/s (45 mph) analysis as the initial shape in the 26.8 m/s (60 mph) analysis. The honeycomb impact limiter portion of the finite element model was input with no initial deformations to coincide with its replacement in the fourth test. This method of analysis ignored the residual stresses that were present in the cask after the 20.1 m/s (45 mph) impact test. Because of the explicit solution scheme there was no way to extract the residual stresses from the analysis. Residual stresses are usually not known and are generally ignored in most analyses. For example any residual stresses from the manufacturing of the casks was unknown and ignored in the initial analysis of each test.

The second test impacted on a corner about 6.3° from vertical. To model the behavior of this test a 3D finite element model was needed. The model retained all the contact surfaces in the 2D model. One change was that shell elements were used in the cask thin walls instead of solid elements to reduce the computation time while still retaining the ability to accurately capture the bending deformations. The deformed shape predicted in

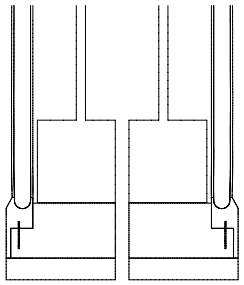
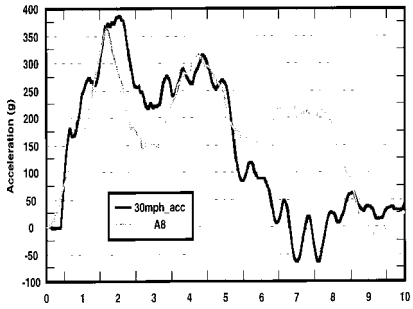
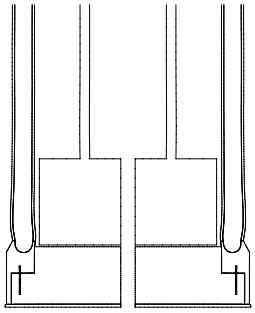
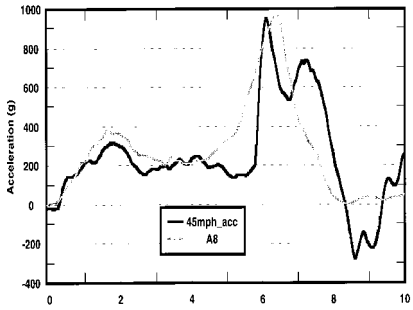
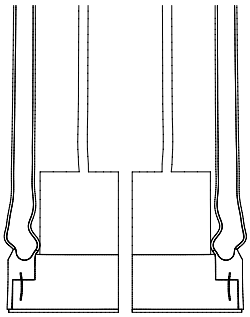
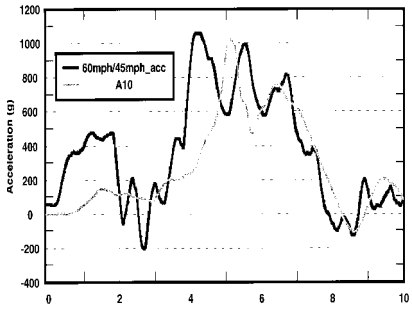
Deformed SETU Cask	Predicted Deformed Shape	Vertical Acceleration Time History
		
		
		

Figure 2. Actual and predicted deformed shapes and measured vs. predicted vertical accelerations for the 13.4, 20.1 and 26.8 m/s (30, 45 and 60 mph) impact tests.

the analysis matches well with the deformed shape from the impacted cask. The strains near the intersection of the wall and the cask bottom were predicted to be near but still below the failure strain of the stainless steel material. The SETU cask did not fail at this location. Figure 3 shows the deformed shape of the cask and the prediction from the

analysis. Note the large deformation in the thin stainless steel walls near the impact corner in both the test photo and in the analysis.

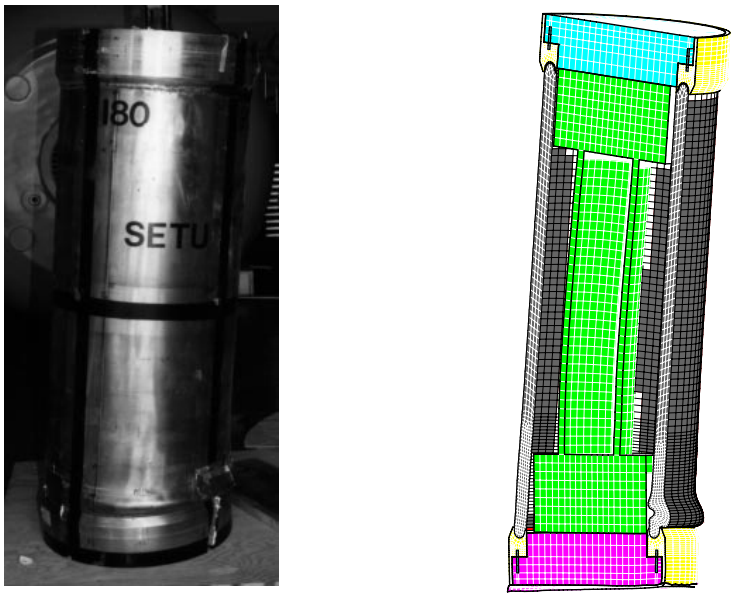


Figure 3. Actual and predicted deformed shapes for test number 2.

To examine the performance of the cask at higher energies the 2D axisymmetric finite element model was run with an impact velocity of 38 m/s (85 mph). This corresponds to an energy level of eight times the regulatory impact velocity. The deformed shape of the cask from the analysis is shown in Figure 4. For this analysis the bolts were re-meshed with a much finer mesh and allowed to fail when their strain exceeded 20%. This analysis predicts substantial strains in the cask and failure in the bolts in the bottom lid. The the thin cask wall received large strains and would likely tear in the outer wall just above the stiff end fixture. The analysis was stable throughout the entire impact event and returned very reasonable predictions for strains, accelerations and deformations. Since this cask has not been tested at this high of an impact velocity, there are no measured results to compare the analysis with.

The analysis of this cask at such a high impact velocity was performed to determine the stability and the limits of the finite element method. Modeling of complex behaviors such as tearing of thin wall sections and shearing of bolts can be predicted with reasonable accuracy at energy levels of eight times or more of the regulatory drop energy. Knowledge of the behavior of casks at impacts that far exceed the regulatory impacts can help lead to a much greater understanding of the performance of casks with regard to possible leakage and structural failure in both regulatory and extra-regulatory impacts.

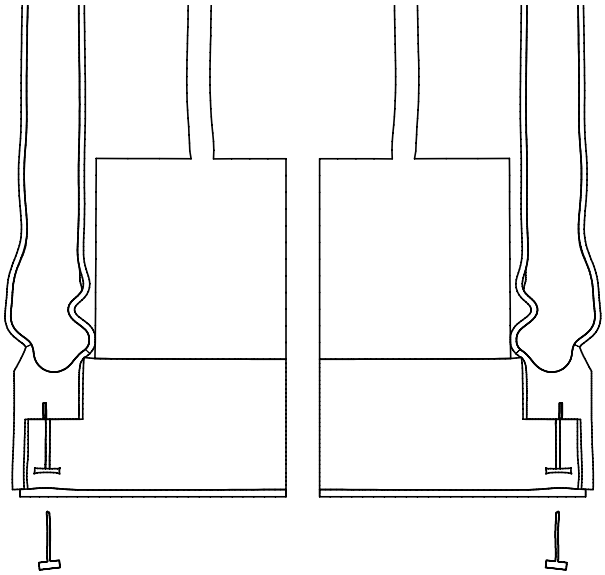


Figure 4. Predicted SETU deformed shape for a 30 m/s (85 mph) impact.

CONCLUSIONS

Modeling of the cask used in this program required an accurate mesh of the cask, analytically correct treatment of the contact problem and accurate material models. The cask used in this series of tests was very complex from a finite element modeling viewpoint. The model included prestressed lead and bolt material, honeycomb material that experienced lock-up conditions, two different types of steel, lids on both ends of the cask and many different contact surfaces. The cask was also purposely designed to just meet the regulatory impact conditions, so the deformations experienced are more than would normally be expected in a typical design. Comparison with test data shows that complex cask designs impacting at high velocities can be accurately modeled. The analysis results compare well with test data at impact energies of up to four times the regulatory impact conditions. The analysis was also stable and produced reasonable results at eight times the regulatory impact conditions. This comparison of analysis and test data shows that finite element methods are very capable at predicting cask behavior at higher than regulatory impact velocities.

By employing finite element analysis techniques to a large number of different cask designs, a great deal of information can be gained about extra-regulatory impact behavior. Predictable behavior in extra regulatory impact conditions can be used to make more accurate assessments of leakage potential. This data can then be used to support risk analyses of transportation systems.

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Stone, C. M., Wellman, G. W., and Krieg, R. D., 1990 "A Vectorized Elastic-Plastic Power Law Hardening Material Model Including Luders Strain," SAND90-0153, Sandia National Laboratories, Albuquerque, NM.

Taylor, L. M., and Flanagan, D. P., 1987 "PRONTO2D: A Two-dimensional Transient Solid Dynamics Program," SAND86-0594, Sandia National Laboratories, Albuquerque, NM.

Taylor, L. M., and Flanagan, D. P., 1989 "PRONTO3D: A Three-dimensional Transient Solid Dynamics Program," SAND87-1912, Sandia National Laboratories, Albuquerque, NM.

U.S. Nuclear Regulatory Commission, 1995, Title 10, Code of Federal Regulations, Part 71, Washington, DC.

U.S. Nuclear Regulatory Commission, 1978, Design Criteria for the Structural Analysis of Shipping Cask Containment Vessels, Regulatory Guide 7.6, Washington, DC.

APPENDIX C - ORIGEN2 CALCULATIONS

ORIGEN2 is the latest version of the **O**ak **R**idge **I**sotope **GEN**eration and Depletion code [B-1] developed by Oak Ridge National Laboratory for calculating the burnup, decay and processing of radioactive materials. ORIGEN uses a matrix exponential method to solve a large system of coupled linear first-order differential equations with constant coefficients.

Presented below are the four ORIGEN2 input files used to generate the burnup and radionuclide inventories for the analysis. The inventories were calculated using the ORIGEN2 code to generate accident source terms, to provide an analytical basis for revalidation of the spent fuel shipment risk estimates originally documented in NUREG-0170. Four burnup configurations were calculated, two each for boiling water reactor (BWR) and pressurized water reactor (PWR) Light Water Reactor systems. The Latin Hypercube Sample (LHS) analysis method will be applied to derive distributions should increased granularity be required. A series of decay intervals of interest consisting of 0.5, 1, 2, 4, 8, and 16 year periods were selected, based upon "standard" reactor fuel uranium-235 isotope enrichments. Related ratios for uranium-238 and uranium-233, which arise as a by-product of the enrichment process, were calculated using derived empirical equations that are a function of reactor type. Due to the 150 maximum IRP+IRF+DEC input card limitation imposed by ORIGEN2, it was necessary to recalculate standardized burnup periods by extending the irradiation time. The remaining nuclide isotopic compositions were directly excerpted from a set of key tables specifically developed to model uranium and plutonium cycle reactors using the ORIGEN computer code [B-2].

Construction of the ORIGEN2 input files generally proceeded in a two-step process. Initially, unit quantities of fuel and assembly materials are subjected to an appropriate reactor irradiation profile for a specific burnup and subsequent decay period for the desired sequence of time periods. Once the unit quantities have completed the burnup and decay cycles, the materials are then mathematically apportioned and integrated to model the reactor assembly of interest. The General Electric BWR/6 8×8 fuel assembly was used to model the BWR systems, and the Westinghouse 17×17 array was selected to represent the PWR designs. The two Light Water Reactor systems constitute the predominant designs currently operating in the United States, for which the assembly key characteristics [B-3] are summarized below.

Characteristics of BWR and PWR Fuel Assemblies

Light Water Reactor (design)	BWR	PWR
Assembly Geometry (array)	8×8	17×17
Overall Assembly Length (m)	4.470	4.059
Cross Section (cm)	13.9×13.9	21.4×21.4
Fuel Rod Length (m)	4.064	3.851
Active Fuel Height (m)	3.759	3.658
Fuel Rod Outside Diameter (cm)	1.252	0.950
Fuel Rods Per Assembly (number)	63	264
Uranium Per Assembly (kg)	183.3	461.4
Uranium Oxide Per Assembly (kg)	208.0	523.4
Assembly Total Weight (kg)	319.9	657.9

References

[B-1] A.G. Croff, A User's Manual for the ORIGEN2 Computer Code, ORNL/TM-7175, Oak Ridge National Laboratory, Oak Ridge TN, July 1980.

[B-2] A.G. Croff, M.A. Bjerke, G.W. Morrison and L.M. Petrie, Revised Uranium-Plutonium Cycle PWR and BWR Models for the ORIGEN Computer Code, ORNL/TM-6051, Oak Ridge National Laboratory, Oak Ridge TN, September 1978.

[B-3] J.W. Roddy, H.C. Claiborne, R.C. Ashline, P.J. Johnson and B.T. Rhyne, Physical and Decay Characteristics of Commercial LWR Spent Fuel, ORNL/TM-9591/V1&R1, Oak Ridge National Laboratory, Oak Ridge TN, January 1986

ORIGEN2 Input Files

bwr267.inp

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 1      -1
 2      -1
 3      -1
 4      RDA * 30,044 MWD/MT BURNUP OF GE BWR/6 2.67% UO2 FUEL & ASSEMBLY
 5      RDA ** CROSS SECTION LIBRARY = BWRUS, 4 CYCLE
 6      RDA *** JD SMITH, SANDIA NATIONAL LABORATORIES
 7      RDA **** (505) 844-0531, FAX 844-2057
 8      RDA     -1 = FRESH BWR FUEL WITH IMPURITIES (1 MT = 1000 KG)
 9      RDA     -2 = FRESH ZIRCALOY-4 COMPOSITION (1 KG)
10      RDA     -3 = FRESH ZIRCALOY-2 COMPOSITION (1 KG)
11      RDA     -4 = FRESH SS 304 COMPOSITION (1 KG)
12      RDA     -5 = FRESH SS 302 COMPOSITION (1 KG)
13      RDA     -6 = FRESH INCONEL X-750 COMPOSITION (1 KG)
14      RDA     WARNING:  VECTORS ARE CHANGED WITH RESPECT TO CONTENT
15      RDA               CHANGES ARE NOTED ON RDA CARDS
16      CUT     5 1.0E-10 7 1.0E-10 9 1.0E-10 -1
17      LIP     0 0 0
18      RDA        DECAY LIB    XSECT LIB                       VAR. XSECT
19      LIB     0    1 2 3     651 652 653    9   50   0   1       40
20      RDA      PHOTON LIB
21      PHO     101 102 103  10
22      TIT  INITIAL COMPOSITION OF FUEL AND STRUCTURAL MATERIAL UNIT QUANTITIES
23      RDA     READ FUEL COMPOSITION INCLUDING IMPURITIES (1000 KG)
24      INP     -1   1  -1  -1  1  1
25      RDA     READ ZIRCALOY-4 COMPOSITION (1.0 KG)
26      INP     -2   1  -1  -1  1  1
27      RDA     READ ZIRCALOY-2 COMPOSITION (1.0 KG)
28      INP     -3   1  -1  -1  1  1
29      RDA     READ SS304 COMPOSITION (1.0 KG)
30      INP     -4   1  -1  -1  1  1
31      RDA     READ SS302 COMPOSITION (1.0 KG)
32      INP     -5   1  -1  -1  1  1
33      RDA     READ INCONEL X-750 COMPOSITION (1.0 KG)
34      INP     -6   1  -1  -1  1  1
35      TIT     IRRADIATION OF ONE METRIC TON OF BWRU FUEL
36      MOV     -1   1   0   1.0
37      PCH      1   1   1
38      HED      1                              CHARGE
39      BUP
40      IRP      96.66   25.90   1   2   4  2   BURNUP= 2,504 MWD/MTIHM
41      IRP     193.33   25.90   2   3   4  0   BURNUP= 5,007 MWD/MTIHM
42      IRP        290   25.90   3   4   4  0   BURNUP= 7,511 MWD/MTIHM
43      DEC        396           4   5   4  0    DECAY FOR 106.0 DAYS
44      IRP     492.66   25.90   5   6   4  0   BURNUP=10,015 MWD/MTIHM
45      IRP     589.33   25.90   6   7   4  0   BURNUP=12,518 MWD/MTIHM
46      IRP        686   25.90   7   8   4  0   BURNUP=15,022 MWD/MTIHM
47      DEC        792           8   9   4  0    DECAY FOR 106.0 DAYS
48      IRP     888.66   25.90   9  10   4  0   BURNUP=17,526 MWD/MTIHM
49      IRP     985.33   25.90  10  11   4  0   BURNUP=20,029 MWD/MTIHM
50      IRP       1082   25.90  11  12   4  0   BURNUP=22,533 MWD/MTIHM
51      DEC       1188          12   1   4  0    DECAY FOR 106.0 DAYS
52      IRP    1284.66   25.90   1   2   4  0   BURNUP=25,037 MWD/MTIHM
53      IRP    1381.33   25.90   2   3   4  0   BURNUP=27,540 MWD/MTIHM
54      IRP       1478   25.90   3   4   4  0   BURNUP=30,044 MWD/MTIHM
55      BUP
56      RDA     -10 = IRRADIATED U FUEL AT DISCHARGE
57      MOV       4   -10     0     1.0
58      PCH     -10   -10   -10
59      RDA     IRRADIATION OF ZIRCALOY-2 CLADDING AT 1.000 FLUX
60      TIT     IRRADIATION OF ZIRCALOY-2 CLADDING AT 1.000 FLUX
61      MOV      -3     1     0   279.50       ZIRCALOY-2 CLAD
62      HED       1                              CHARGE
63      IRF      96.66   -1.0    1   2   4  2   BURNUP= 2,504 MWD/MTIHM
64      IRF     193.33   -1.0    2   3   4  0   BURNUP= 5,007 MWD/MTIHM
65      IRF        290   -1.0    3   4   4  0   BURNUP= 7,511 MWD/MTIHM
66      DEC        396           4   5   4  0    DECAY FOR 106.0 DAYS
67      IRF     492.66   -1.0    5   6   4  0   BURNUP=10,015 MWD/MTIHM
68      IRF     589.33   -1.0    6   7   4  0   BURNUP=12,518 MWD/MTIHM
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 69      IRF        686   -1.0    7   8   4  0   BURNUP=15,022 MWD/MTIHM
 70      DEC        792           8   9   4  0    DECAY FOR 106.0 DAYS
 71      IRF     888.66   -1.0    9  10   4  0   BURNUP=17,526 MWD/MTIHM
 72      IRF     985.33   -1.0   10  11   4  0   BURNUP=20,029 MWD/MTIHM
 73      IRF       1082   -1.0   11  12   4  0   BURNUP=22,533 MWD/MTIHM
 74      DEC       1188          12   1   4  0    DECAY FOR 106.0 DAYS
 75      IRF    1284.66   -1.0    1   2   4  0   BURNUP=25,037 MWD/MTIHM
 76      IRF    1381.33   -1.0    2   3   4  0   BURNUP=27,540 MWD/MTIHM
 77      IRF       1478   -1.0    3   4   4  0   BURNUP=30,044 MWD/MTIHM
 78      RDA      -9 = IRRADIATED ZIRCALOY-2 CLADDING AT DISCHARGE
 79      MOV       4     -9      0      1.0
 80      RDA      IRRADIATION OF ZIRCALOY CLADDING AT 0.500 FLUX
 81      TIT      IRRADIATION OF ZIRCALOY CLADDING AT 0.500 FLUX
 82      MOV      -3      1      0     25.4     ZIRCALOY-2 CLAD
 83      MOV      -3      2      0    304.90    TOTAL ZIRC-2 CLAD
 84      PCH       2      2      2
 85      HED       1                             CHARGE
 86      IRF     96.66   -0.5    1   2   4  2   BURNUP= 2,504 MWD/MTIHM
 87      IRF    193.33   -0.5    2   3   4  0   BURNUP= 5,007 MWD/MTIHM
 88      IRF       290   -0.5    3   4   4  0   BURNUP= 7,511 MWD/MTIHM
 89      DEC       396           4   5   4  0    DECAY FOR 106.0 DAYS
 90      IRF    492.66   -0.5    5   6   4  0   BURNUP=10,015 MWD/MTIHM
 91      IRF    589.33   -0.5    6   7   4  0   BURNUP=12,518 MWD/MTIHM
 92      IRF       686   -0.5    7   8   4  0   BURNUP=15,022 MWD/MTIHM
 93      DEC       792           8   9   4  0    DECAY FOR 106.0 DAYS
 94      IRF    888.66   -0.5    9  10   4  0   BURNUP=17,526 MWD/MTIHM
 95      IRF    985.33   -0.5   10  11   4  0   BURNUP=20,029 MWD/MTIHM
 96      IRF      1082   -0.5   11  12   4  0   BURNUP=22,533 MWD/MTIHM
 97      DEC      1188          12   1   4  0    DECAY FOR 106.0 DAYS
 98      IRF   1284.66   -0.5    1   2   4  0   BURNUP=25,037 MWD/MTIHM
 99      IRF   1381.33   -0.5    2   3   4  0   BURNUP=27,540 MWD/MTIHM
100      IRF      1478   -0.5    3   4   4  0   BURNUP=30,044 MWD/MTIHM
101      RDA     -9 = IRRADIATED ZIRCALOY CLADDING AT DISCHARGE
102      ADD      4     -9      0      1.0    TOTAL IRRAD ZIRC-2 CLAD
103      PCH     -9     -9     -9
104      RDA      IRRADIATION OF ZIRCALOY-4 CHANNEL AT 1.000 FLUX
105      TIT      IRRADIATION OF ZIRCALOY-4 CHANNEL AT 1.000 FLUX
106      MOV     -2      1      0    227.50     ZIRCALOY-4 CHANNEL
107      HED       1                             CHARGE
108      IRF     96.66   -1.0    1   2   4  2   BURNUP= 2,504 MWD/MTIHM
109      IRF    193.33   -1.0    2   3   4  0   BURNUP= 5,007 MWD/MTIHM
110      IRF       290   -1.0    3   4   4  0   BURNUP= 7,511 MWD/MTIHM
111      DEC       396           4   5   4  0    DECAY FOR 106.0 DAYS
112      IRF    492.66   -1.0    5   6   4  0   BURNUP=10,015 MWD/MTIHM
113      IRF    589.33   -1.0    6   7   4  0   BURNUP=12,518 MWD/MTIHM
114      IRF       686   -1.0    7   8   4  0   BURNUP=15,022 MWD/MTIHM
115      DEC       792           8   9   4  0    DECAY FOR 106.0 DAYS
116      IRF    888.66   -1.0    9  10   4  0   BURNUP=17,526 MWD/MTIHM
117      IRF    985.33   -1.0   10  11   4  0   BURNUP=20,029 MWD/MTIHM
118      IRF      1082   -1.0   11  12   4  0   BURNUP=22,533 MWD/MTIHM
119      DEC      1188          12   1   4  0    DECAY FOR 106.0 DAYS
120      IRF   1284.66   -1.0    1   2   4  0   BURNUP=25,037 MWD/MTIHM
121      IRF   1381.33   -1.0    2   3   4  0   BURNUP=27,540 MWD/MTIHM
122      IRF      1478   -1.0    3   4   4  0   BURNUP=30,044 MWD/MTIHM
123      RDA     -8 = IRRADIATED ZIRCALOY CHANNEL AT DISCHARGE
124      MOV      4     -8     0     1.0
125      RDA      IRRADIATION OF ZIRCALOY-4 CHANNEL AT 0.500 FLUX
126      TIT      IRRADIATION OF ZIRCALOY-4 CHANNEL AT 0.500 FLUX
127      MOV     -2      1     0     20.70     ZIRCALOY-4 CHANNEL
128      MOV     -2      2     0    248.20     TOTAL ZIRCALOY-4 CHANNEL
129      PCH      2      2     2
130      HED      1                             CHARGE
131      IRF     96.66   -0.5    1   2   4  2   BURNUP= 2,504 MWD/MTIHM
132      IRF    193.33   -0.5    2   3   4  0   BURNUP= 5,007 MWD/MTIHM
133      IRF       290   -0.5    3   4   4  0   BURNUP= 7,511 MWD/MTIHM
134      DEC       396           4   5   4  0    DECAY FOR 106.0 DAYS
135      IRF    492.66   -0.5    5   6   4  0   BURNUP=10,015 MWD/MTIHM
136      IRF    589.33   -0.5    6   7   4  0   BURNUP=12,518 MWD/MTIHM
137      IRF       686   -0.5    7   8   4  0   BURNUP=15,022 MWD/MTIHM
138      DEC       792           8   9   4  0    DECAY FOR 106.0 DAYS
139      IRF    888.66   -0.5    9  10   4  0   BURNUP=17,526 MWD/MTIHM
140      IRF    985.33   -0.5   10  11   4  0   BURNUP=20,029 MWD/MTIHM
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141      IRF       1082   -0.5   11  12   4  0   BURNUP=22,533 MWD/MTIHM
142      DEC       1188          12   1   4  0    DECAY FOR 106.0 DAYS
143      IRF    1284.66   -0.5    1   2   4  0   BURNUP=25,037 MWD/MTIHM
144      IRF    1381.33   -0.5    2   3   4  0   BURNUP=27,540 MWD/MTIHM
145      IRF       1478   -0.5    3   4   4  0   BURNUP=30,044 MWD/MTIHM
146      RDA      -8 = IRRADIATED ZIRCALOY CHANNEL AT DISCHARGE
147      ADD       4     -8      0      1.0
148      PCH      -8     -8     -8
149      RDA    IRRADIATION OF ZIRCALOY GRID SPACERS AND INCONEL SPRINGS
150      TIT    IRRADIATION OF ZIRCALOY GRID SPACERS AND INCONEL SPRINGS
151      MOV      -2      1      0     10.60     ZIRCALOY GRIDS
152      ADD      -6      1      0      1.80     INCONEL SPRINGS
153      PCH       1      1      1
154      HED       1                              CHARGE
155      IRF      96.66   -1.0    1   2   4  2   BURNUP= 2,504 MWD/MTIHM
156      IRF     193.33   -1.0    2   3   4  0   BURNUP= 5,007 MWD/MTIHM
157      IRF        290   -1.0    3   4   4  0   BURNUP= 7,511 MWD/MTIHM
158      DEC        396           4   5   4  0    DECAY FOR 106.0 DAYS
159      IRF     492.66   -1.0    5   6   4  0   BURNUP=10,015 MWD/MTIHM
160      IRF     589.33   -1.0    6   7   4  0   BURNUP=12,518 MWD/MTIHM
161      IRF        686   -1.0    7   8   4  0   BURNUP=15,022 MWD/MTIHM
162      DEC        792           8   9   4  0    DECAY FOR 106.0 DAYS
163      IRF     888.66   -1.0    9  10   4  0   BURNUP=17,526 MWD/MTIHM
164      IRF     985.33   -1.0   10  11   4  0   BURNUP=20,029 MWD/MTIHM
165      IRF       1082   -1.0   11  12   4  0   BURNUP=22,533 MWD/MTIHM
166      DEC       1188          12   1   4  0    DECAY FOR 106.0 DAYS
167      IRF    1284.66   -1.0    1   2   4  0   BURNUP=25,037 MWD/MTIHM
168      IRF    1381.33   -1.0    2   3   4  0   BURNUP=27,540 MWD/MTIHM
169      IRF       1478   -1.0    3   4   4  0   BURNUP=30,044 MWD/MTIHM
170      RDA      -7 = IRRADIATED ZIRCALOY GRID SPACERS
171      RDA           AND INCONCEL SPRINGS AT DISCHARGE
172      MOV       4     -7     0     1.0
173      PCH      -7     -7    -7
174      RDA  IRRAD. OF SS 304 END PIECES & INCONEL SPRINGS AT 0.130 FLUX
175      TIT  IRRAD. OF SS 304 END PIECES & INCONEL SPRINGS AT 0.130 FLUX
176      MOV      -4      1     0    37.00      SS 304 IN END PIECES
177      ADD      -6      1     0     2.10  INCONEL X-750 EXPANSION SPRINGS
178      PCH       1      1     1
179      HED       1                              CHARGE
180      IRF      96.66   -0.13   1   2   4  2   BURNUP= 2,504 MWD/MTIHM
181      IRF     193.33   -0.13   2   3   4  0   BURNUP= 5,007 MWD/MTIHM
182      IRF        290   -0.13   3   4   4  0   BURNUP= 7,511 MWD/MTIHM
183      DEC        396           4   5   4  0    DECAY FOR 106.0 DAYS
184      IRF     492.66   -0.13   5   6   4  0   BURNUP=10,015 MWD/MTIHM
185      IRF     589.33   -0.13   6   7   4  0   BURNUP=12,518 MWD/MTIHM
186      IRF        686   -0.13   7   8   4  0   BURNUP=15,022 MWD/MTIHM
187      DEC        792           8   9   4  0    DECAY FOR 106.0 DAYS
188      IRF     888.66   -0.13   9  10   4  0   BURNUP=17,526 MWD/MTIHM
189      IRF     985.33   -0.13  10  11   4  0   BURNUP=20,029 MWD/MTIHM
190      IRF       1082   -0.13  11  12   4  0   BURNUP=22,533 MWD/MTIHM
191      DEC       1188          12   1   4  0    DECAY FOR 106.0 DAYS
192      IRF    1284.66   -0.13   1   2   4  0   BURNUP=25,037 MWD/MTIHM
193      IRF    1381.33   -0.13   2   3   4  0   BURNUP=27,540 MWD/MTIHM
194      IRF       1478   -0.13   3   4   4  0   BURNUP=30,044 MWD/MTIHM
195      RDA      -6 = IRRADIATED SS 304 END PIECES & INCONEL SPRINGS @ DISCH.
196      MOV       4    -6    0    1.0
197      PCH      -6    -6    -6
198      RDA      IRRADIATION OF SS 302 IN PLENUM SPRINGS AT 0.500 FLUX
199      TIT      IRRADIATION OF SS 302 IN PLENUM SPRINGS AT 0.500 FLUX
200      MOV      -5     1     0     6.00       SS302
201      PCH       1     1     1
202      HED       1                              CHARGE
203      IRF      96.66   -0.5    1   2   4  2   BURNUP= 2,504 MWD/MTIHM
204      IRF     193.33   -0.5    2   3   4  0   BURNUP= 5,007 MWD/MTIHM
205      IRF        290   -0.5    3   4   4  0   BURNUP= 7,511 MWD/MTIHM
206      DEC        396           4   5   4  0    DECAY FOR 106.0 DAYS
207      IRF     492.66   -0.5    5   6   4  0   BURNUP=10,015 MWD/MTIHM
208      IRF     589.33   -0.5    6   7   4  0   BURNUP=12,518 MWD/MTIHM
209      IRF        686   -0.5    7   8   4  0   BURNUP=15,022 MWD/MTIHM
210      DEC        792           8   9   4  0    DECAY FOR 106.0 DAYS
211      IRF     888.66   -0.5    9  10   4  0   BURNUP=17,526 MWD/MTIHM
212      IRF     985.33   -0.5   10  11   4  0   BURNUP=20,029 MWD/MTIHM
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      IRF       1082   -0.5   11  12   4  0   BURNUP=22,533 MWD/MTIHM
      DEC       1188          12   1   4  0    DECAY FOR 106.0 DAYS
      IRF    1284.66   -0.5    1   2   4  0   BURNUP=25,037 MWD/MTIHM
      IRF    1381.33   -0.5    2   3   4  0   BURNUP=27,540 MWD/MTIHM
      IRF       1478   -0.5    3   4   4  0   BURNUP=30,044 MWD/MTIHM
      RDA      -5 = IRRADIATED SS 302 IN PLENUM SPRINGS AT DISCHARGE
      MOV      4    -5   0   1.0
      PCH     -5    -5   -5
      RDA     ***** OUTPUT MODULE *****
      TIT   ORIGEN2 V2.1 - BWR FUEL ONLY - STANDARD BURNUP (BWRUS)
      BAS      1 MTIHM 2.67% UO2;BURNUP=30,044 MWD/MTIHM, 4 CYCLE
      HED    -10     FUEL DIS
      HED     -1     FUEL CHG
      MOV     -1    1   0   1.0
      MOV    -10    2   0   1.0
      RDA     ***** DECAY MODULE *****
      DEC     0.5   2   3   5   2
      DEC     1.0   3   4   5   0
      DEC     3.0   4   5   5   0
      DEC     5.0   5   6   5   0
      DEC    10.0   6   7   5   0
      DEC    30.0   7   8   5   0
      OPTL      4*8  7  8  7  8  7  8  8*8  5*7  8
      OPTA      4*8  7  8  7  8  7  8  8*8  5*7  8
      OPTF      4*8  7  8  7  8  7  8  8*8  5*7  8
      OUT      8    1     -1    0
      RDA     ***** OUTPUT MODULE *****
      TIT ORIGEN2 V2.1 - BWR FUEL & ASSEMBLY - STANDARD BURNUP (BWRUS)
      BAS  1 MTIHM 2.67% UO2 FUEL ASSY;BURNUP=30,044 MWD/MTIHM, 4 CYCLE
      OPTL      6*8  7  8  7  8  14*8
      OPTA      6*8  7  8  7  8  14*8
      OPTF      6*8  7  8  7  8  14*8
      MOV     -10    1    0   0.1833
      ADD      -9    1    0   0.1833
      ADD      -8    1    0   0.1833
      ADD      -7    1    0   0.1833
      ADD      -6    1    0   0.1833
      ADD      -5    1    0   0.1833
      HED       1  ASSY DIS
      RDA     ***** DECAY MODULE *****
      DEC     0.5   1   2   5   2
      DEC     1.0   2   3   5   0
      DEC     3.0   3   4   5   0
      DEC     5.0   4   5   5   0
      DEC    10.0   5   6   5   0
      DEC    30.0   6   7   5   0
      OUT       7   1  -1   0
      END
    2 922340 240.     922350 26700. 922380 973060. 0       0.0        FUEL 2.67%
    4 030000 1.0      050000 1.0    060000 89.4    070000 25.0    FUEL IMPU
    4 080000 134454.  090000 10.7   110000 15.0    120000 2.0     FUEL IMPU
    4 130000 16.7     140000 12.1   150000 35.0    170000 5.3     FUEL IMPU
    4 200000 2.0      220000 1.0    230000 3.0     240000 4.0     FUEL IMPU
    4 250000 1.7      260000 18.0   270000 1.0     280000 24.0    FUEL IMPU
    4 290000 1.0      300000 40.3   420000 10.0    470000 0.1     FUEL IMPU
    4 480000 25.0     490000 2.0    500000 4.0     640000 1573.   FUEL IMPU
    4 740000 2.0      820000 1.0    830000 0.4     0      0.0     FUEL IMPU
    0
    4 400000 979.11   500000 16.0   260000 2.25    240000 1.25    ZIRC-4
    4 280000 0.02     130000 0.024  050000 0.00033 480000 0.00025 ZIRC-4
    4 060000 0.120    270000 0.010  290000 0.020   720000 0.078   ZIRC-4
    4 010000 0.013    250000 0.020  070000 0.080   080000 0.950   ZIRC-4
    4 160000 0.035    220000 0.020  740000 0.020   230000 0.020   ZIRC-4
    5 920000 0.0002   0      0.0                                 ZIRC-4
    0
    4 400000 979.63   500000 16.0   260000 1.5     240000 1.00    ZIRC-2
    4 280000 0.5      130000 0.024  050000 0.00033 480000 0.00025 ZIRC-2
    4 060000 0.120    270000 0.010  290000 0.020   720000 0.078   ZIRC-2
    4 010000 0.013    250000 0.020  070000 0.080   080000 0.950   ZIRC-2
    4 160000 0.035    220000 0.020  740000 0.020   230000 0.020   ZIRC-2
    5 920000 0.0002   0      0.0                                 ZIRC-2
    0
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285    4 260000 688.44  240000 190.0  280000 89.2    250000 20.0    SS-304
286    4 060000 0.8     150000 0.45   160000 0.3     140000 10.0    SS-304
287    4 070000 1.3     270000 0.8    0      0.0                     SS-304
288    0
289    4 260000 697.74  240000 180.0  280000 89.2    250000 20.0    SS-302
290    4 060000 1.5     150000 0.45   160000 0.3     140000 10.0    SS-302
291    4 070000 1.3     270000 0.8    0      0.0                     SS-302
292    0
293    4 260000 67.846  240000 149.66 280000 721.861 130000 7.982   INC-X-750
294    4 060000 0.399   270000 6.485  290000 0.499   250000 6.984   INC-X-750
295    4 070000 1.3     410000 8.98   160000 0.07    140000 2.993   INC-X-750
296    4 220000 24.943  0      0.0                                   INC-X-750
297    0
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bwr331.inp

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  1      -1
  2      -1
  3      -1
  4      RDA  * GENERAL ELECTRIC BWR/6 8x8 ASSEMBLY
  5      RDA  ** 3.31% UO2 FUEL & ASSEMBLY HARDWARE, 50,008 MWD/MT BURNUP
  6      RDA  *** CROSS SECTION LIBRARY = BWRUE, 4 CYCLE
  7      RDA  **** JD SMITH, SANDIA NATIONAL LABORATORIES
  8      RDA  ***** TELEPHONE: (505) 844-0531, FACSIMILE: 844-2057
  9      RDA     -1 = FRESH BWR FUEL WITH IMPURITIES (1 MT = 1000 KG)
 10      RDA     -2 = FRESH ZIRCALOY-4 COMPOSITION (1 KG)
 11      RDA     -3 = FRESH ZIRCALOY-2 COMPOSITION (1 KG)
 12      RDA     -4 = FRESH SS 304 COMPOSITION (1 KG)
 13      RDA     -5 = FRESH SS 302 COMPOSITION (1 KG)
 14      RDA     -6 = FRESH INCONEL X-750 COMPOSITION (1 KG)
 15      RDA  WARNING: VECTORS CHANGE CONTENT AS NOTED ON RDA CARDS
 16      CUT     5 1.0E-10 7 1.0E-10 9 1.0E-10 -1
 17      LIP     0 0 0
 18      RDA        DECAY LIB    XSECT LIB                      VAR. XSECT
 19      LIB     0    1 2 3     657 658 659    9   50   0   1       42
 20      RDA      PHOTON LIB
 21      PHO     101 102 103  10
 22      TIT  INITIAL UNIT QUANTITY FUEL & STRUCTURAL MATERIAL COMPOSITIONS
 23      RDA   READ FUEL COMPOSITION INCLUDING IMPURITIES (1000 KG)
 24      INP     -1   1  -1  -1  1  1
 25      RDA   READ ZIRCALOY-4 COMPOSITION (1.0 KG)
 26      INP     -2   1  -1  -1  1  1
 27      RDA   READ ZIRCALOY-2 COMPOSITION (1.0 KG)
 28      INP     -3   1  -1  -1  1  1
 29      RDA   READ SS304 COMPOSITION (1.0 KG)
 30      INP     -4   1  -1  -1  1  1
 31      RDA   READ SS302 COMPOSITION (1.0 KG)
 32      INP     -5   1  -1  -1  1  1
 33      RDA   READ INCONEL X-750 COMPOSITION (1.0 KG)
 34      INP     -6   1  -1  -1  1  1
 35      TIT  IRRADIATION (EXTENDED) OF ONE METRIC TON OF BWR UO2 FUEL
 36      MOV     -1   1   0   1.0
 37      PCH      1   1   1
 38      HED      1                                          CHARGE
 39      BUP
 40      IRP     160.9   25.9   1   2   4  2   BURNUP= 4,167 MWD/MTIHM
 41      IRP     321.8   25.9   2   3   4  0   BURNUP= 8,335 MWD/MTIHM
 42      IRP     482.7   25.9   3   4   4  0   BURNUP=12,502 MWD/MTIHM
 43      DEC     588.7          4   5   4  0    DECAY FOR 106.0 DAYS
 44      IRP     749.6   25.9   5   6   4  0   BURNUP=16,669 MWD/MTIHM
 45      IRP     910.5   25.9   6   7   4  0   BURNUP=20,837 MWD/MTIHM
 46      IRP    1071.4   25.9   7   8   4  0   BURNUP=25,004 MWD/MTIHM
 47      DEC    1177.4          8   9   4  0    DECAY FOR 106.0 DAYS
 48      IRP    1338.3   25.9   9  10   4  0   BURNUP=29,171 MWD/MTIHM
 49      IRP    1499.2   25.9  10  11   4  0   BURNUP=33,338 MWD/MTIHM
 50      IRP    1660.1   25.9  11  12   4  0   BURNUP=37,506 MWD/MTIHM
 51      DEC    1766.1         12   1   4  0    DECAY FOR 106.0 DAYS
 52      IRP    1927     25.9   1   2   4  0   BURNUP=41,673 MWD/MTIHM
 53      IRP    2087.9   25.9   2   3   4  0   BURNUP=45,840 MWD/MTIHM
 54      IRP    2248.8   25.9   3   4   4  0   BURNUP=50,008 MWD/MTIHM
 55      BUP
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 56      RDA     -10 = IRRADIATED 1000 KG URANIUM DIOXIDE FUEL AT DISCHARGE
 57      MOV       4  -10     0     1.0
 58      PCH     -10  -10   -10
 59      RDA  IRRADIATION OF ZIRCALOY-2 CLADDING AT 1.000 FLUX
 60      TIT  IRRADIATION OF ZIRCALOY-2 CLADDING AT 1.000 FLUX (FUEL ZONE)
 61      MOV      -3     1     0   279.50       ZIRCALOY-2 CLADDING
 62      HED       1                                          CHARGE
 63      IRF     160.9   -1.0   1   2   4  2   BURNUP= 4,167 MWD/MTIHM
 64      IRF     321.8   -1.0   2   3   4  0   BURNUP= 8,335 MWD/MTIHM
 65      IRF     482.7   -1.0   3   4   4  0   BURNUP=12,502 MWD/MTIHM
 66      DEC     588.7          4   5   4  0    DECAY FOR 106.0 DAYS
 67      IRF     749.6   -1.0   5   6   4  0   BURNUP=16,669 MWD/MTIHM
 68      IRF     910.5   -1.0   6   7   4  0   BURNUP=20,837 MWD/MTIHM
 69      IRF    1071.4   -1.0   7   8   4  0   BURNUP=25,004 MWD/MTIHM
 70      DEC    1177.4          8   9   4  0    DECAY FOR 106.0 DAYS
 71      IRF    1338.3   -1.0   9  10   4  0   BURNUP=29,171 MWD/MTIHM
 72      IRF    1499.2   -1.0  10  11   4  0   BURNUP=33,338 MWD/MTIHM
 73      IRF    1660.1   -1.0  11  12   4  0   BURNUP=37,506 MWD/MTIHM
 74      DEC    1766.1         12   1   4  0    DECAY FOR 106.0 DAYS
 75      IRF    1927     -1.0   1   2   4  0   BURNUP=41,673 MWD/MTIHM
 76      IRF    2087.9   -1.0   2   3   4  0   BURNUP=45,840 MWD/MTIHM
 77      IRF    2248.8   -1.0   3   5   4  0   BURNUP=50,008 MWD/MTIHM
 78      RDA      -9 = IRRADIATED ZIRCALOY-2 CLADDING AT DISCHARGE
 79      MOV       5     -9      0      1.0
 80      RDA  IRRADIATION OF ZIRCALOY-2 CLADDING AT 0.500 FLUX
 81      TIT  IRRAD OF ZIRCALOY-2 CLAD AT 0.500 FLUX (FUEL-GAS PLENUM ZONE)
 82      MOV      -3      1      0     25.4     ZIRCALOY-2 CLADDING
 83      MOV      -3      2      0    304.90    TOTAL ZIRC-2 CLAD (UNIRRAD)
 84      PCH       2      2      2
 85      HED       1                                          CHARGE
 86      IRF     160.9   -0.5   1   2   4  2   BURNUP= 4,167 MWD/MTIHM
 87      IRF     321.8   -0.5   2   3   4  0   BURNUP= 8,335 MWD/MTIHM
 88      IRF     482.7   -0.5   3   4   4  0   BURNUP=12,502 MWD/MTIHM
 89      DEC     588.7          4   5   4  0    DECAY FOR 106.0 DAYS
 90      IRF     749.6   -0.5   5   6   4  0   BURNUP=16,669 MWD/MTIHM
 91      IRF     910.5   -0.5   6   7   4  0   BURNUP=20,837 MWD/MTIHM
 92      IRF    1071.4   -0.5   7   8   4  0   BURNUP=25,004 MWD/MTIHM
 93      DEC    1177.4          8   9   4  0    DECAY FOR 106.0 DAYS
 94      IRF    1338.3   -0.5   9  10   4  0   BURNUP=29,171 MWD/MTIHM
 95      IRF    1499.2   -0.5  10  11   4  0   BURNUP=33,338 MWD/MTIHM
 96      IRF    1660.1   -0.5  11  12   4  0   BURNUP=37,506 MWD/MTIHM
 97      DEC    1766.1         12   1   4  0    DECAY FOR 106.0 DAYS
 98      IRF    1927     -0.5   1   2   4  0   BURNUP=41,673 MWD/MTIHM
 99      IRF    2087.9   -0.5   2   3   4  0   BURNUP=45,840 MWD/MTIHM
100      IRF    2248.8   -0.5   3   6   4  0   BURNUP=50,008 MWD/MTIHM
101      RDA      -9 = IRRADIATED ZIRCALOY-2 CLADDING AT DISCHARGE
102      ADD       6     -9      0      1.0    TOTAL IRRAD ZIRC-2 CLAD
103      PCH      -9     -9     -9
104      RDA  IRRADIATION OF ZIRCALOY-4 CHANNEL AT 1.000 FLUX
105      TIT  IRRADIATION OF ZIRCALOY-4 CHANNEL AT 1.000 FLUX (FUEL ZONE)
106      MOV      -2      1      0    227.50     ZIRCALOY-4 CHANNEL
107      HED       1                                          CHARGE
108      IRF     160.9   -1.0   1   2   4  2   BURNUP= 4,167 MWD/MTIHM
109      IRF     321.8   -1.0   2   3   4  0   BURNUP= 8,335 MWD/MTIHM
110      IRF     482.7   -1.0   3   4   4  0   BURNUP=12,502 MWD/MTIHM
111      DEC     588.7          4   5   4  0    DECAY FOR 106.0 DAYS
112      IRF     749.6   -1.0   5   6   4  0   BURNUP=16,669 MWD/MTIHM
113      IRF     910.5   -1.0   6   7   4  0   BURNUP=20,837 MWD/MTIHM
114      IRF    1071.4   -1.0   7   8   4  0   BURNUP=25,004 MWD/MTIHM
115      DEC    1177.4          8   9   4  0    DECAY FOR 106.0 DAYS
116      IRF    1338.3   -1.0   9  10   4  0   BURNUP=29,171 MWD/MTIHM
117      IRF    1499.2   -1.0  10  11   4  0   BURNUP=33,338 MWD/MTIHM
118      IRF    1660.1   -1.0  11  12   4  0   BURNUP=37,506 MWD/MTIHM
119      DEC    1766.1         12   1   4  0    DECAY FOR 106.0 DAYS
120      IRF    1927     -1.0   1   2   4  0   BURNUP=41,673 MWD/MTIHM
121      IRF    2087.9   -1.0   2   3   4  0   BURNUP=45,840 MWD/MTIHM
122      IRF    2248.8   -1.0   3   7   4  0   BURNUP=50,008 MWD/MTIHM
123      RDA      -8 = IRRADIATED ZIRCALOY-4 CHANNEL AT DISCHARGE
124      MOV       7     -8     0     1.0
125      RDA  IRRADIATION OF ZIRCALOY-4 CHANNEL AT 0.500 FLUX
126      TIT  IRRAD OF ZIRC-4 CHANNEL AT 0.500 FLUX (FUEL-GAS PLENUM ZONE)
127      MOV      -2      1    0     20.70     ZIRCALOY-4 CHANNEL
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MOV      -2      2    0    248.20     TOTAL ZIRC-4 CHANNEL (UNIRR)
PCH       2      2    2
HED       1                                          CHARGE
IRF     160.9   -0.5   1   2   4  2   BURNUP= 4,167 MWD/MTIHM
IRF     321.8   -0.5   2   3   4  0   BURNUP= 8,335 MWD/MTIHM
IRF     482.7   -0.5   3   4   4  0   BURNUP=12,502 MWD/MTIHM
DEC     588.7           4   5   4  0    DECAY FOR 106.0 DAYS
IRF     749.6   -0.5   5   6   4  0   BURNUP=16,669 MWD/MTIHM
IRF     910.5   -0.5   6   7   4  0   BURNUP=20,837 MWD/MTIHM
IRF    1071.4   -0.5   7   8   4  0   BURNUP=25,004 MWD/MTIHM
DEC    1177.4           8   9   4  0    DECAY FOR 106.0 DAYS
IRF    1338.3   -0.5   9  10   4  0   BURNUP=29,171 MWD/MTIHM
IRF    1499.2   -0.5  10  11   4  0   BURNUP=33,338 MWD/MTIHM
IRF    1660.1   -0.5  11  12   4  0   BURNUP=37,506 MWD/MTIHM
DEC    1766.1          12   1   4  0    DECAY FOR 106.0 DAYS
IRF    1927     -0.5   1   2   4  0   BURNUP=41,673 MWD/MTIHM
IRF    2087.9   -0.5   2   3   4  0   BURNUP=45,840 MWD/MTIHM
IRF    2248.8   -0.5   3   8   4  0   BURNUP=50,008 MWD/MTIHM
RDA      -8 = IRRAD ZIRC-4 CHANNEL AT DISCHARGE (FUEL+FUEL-GAS)
ADD       8     -8      0      1.0
PCH      -8     -8     -8
RDA  IRRADIATION OF ZIRCALOY-4 GRID SPACERS & INCONEL SPRINGS
TIT  IRRAD OF ZIRC-4 GRID SPACERS & INCONEL SPRINGS (FUEL ZONE)
MOV      -2      1      0     10.60   ZIRCALOY-4 GRID SPACERS
ADD      -6      1      0      1.80   INCONEL X-750 SPRINGS
PCH       1      1      1
HED       1                                          CHARGE
IRF     160.9   -1.0   1   2   4  2   BURNUP= 4,167 MWD/MTIHM
IRF     321.8   -1.0   2   3   4  0   BURNUP= 8,335 MWD/MTIHM
IRF     482.7   -1.0   3   4   4  0   BURNUP=12,502 MWD/MTIHM
DEC     588.7           4   5   4  0    DECAY FOR 106.0 DAYS
IRF     749.6   -1.0   5   6   4  0   BURNUP=16,669 MWD/MTIHM
IRF     910.5   -1.0   6   7   4  0   BURNUP=20,837 MWD/MTIHM
IRF    1071.4   -1.0   7   8   4  0   BURNUP=25,004 MWD/MTIHM
DEC    1177.4           8   9   4  0    DECAY FOR 106.0 DAYS
IRF    1338.3   -1.0   9  10   4  0   BURNUP=29,171 MWD/MTIHM
IRF    1499.2   -1.0  10  11   4  0   BURNUP=33,338 MWD/MTIHM
IRF    1660.1   -1.0  11  12   4  0   BURNUP=37,506 MWD/MTIHM
DEC    1766.1          12   1   4  0    DECAY FOR 106.0 DAYS
IRF    1927     -1.0   1   2   4  0   BURNUP=41,673 MWD/MTIHM
IRF    2087.9   -1.0   2   3   4  0   BURNUP=45,840 MWD/MTIHM
IRF    2248.8   -1.0   3   9   4  0   BURNUP=50,008 MWD/MTIHM
RDA      -7 = IRRADIATED ZIRCALOY-4 GRID SPACERS AND
RDA             INCONEL X-750 SPRINGS AT DISCHARGE (FUEL ZONE)
MOV       9     -7      0      1.0
PCH      -7     -7     -7
RDA  IRRAD OF SS 304 END PIECES AND INCONEL SPRINGS AT 0.130 FLUX
TIT  IRRAD OF SS304 ENDS & INCX750 SPRINGS AT 0.13 FLUX (END ZONE)
MOV      -4      1      0     37.00  SS 304 ENDS (BOTH TOP & BOTTOM)
ADD      -6      1      0      2.10  INCONEL X-750 EXPANSION SPRINGS
PCH       1      1      1
HED       1                                          CHARGE
IRF     160.9   -0.13  1   2   4  2   BURNUP= 4,167 MWD/MTIHM
IRF     321.8   -0.13  2   3   4  0   BURNUP= 8,335 MWD/MTIHM
IRF     482.7   -0.13  3   4   4  0   BURNUP=12,502 MWD/MTIHM
DEC     588.7           4   5   4  0    DECAY FOR 106.0 DAYS
IRF     749.6   -0.13  5   6   4  0   BURNUP=16,669 MWD/MTIHM
IRF     910.5   -0.13  6   7   4  0   BURNUP=20,837 MWD/MTIHM
IRF    1071.4   -0.13  7   8   4  0   BURNUP=25,004 MWD/MTIHM
DEC    1177.4           8   9   4  0    DECAY FOR 106.0 DAYS
IRF    1338.3   -0.13  9  10   4  0   BURNUP=29,171 MWD/MTIHM
IRF    1499.2   -0.13 10  11   4  0   BURNUP=33,338 MWD/MTIHM
IRF    1660.1   -0.13 11  12   4  0   BURNUP=37,506 MWD/MTIHM
DEC    1766.1          12   1   4  0    DECAY FOR 106.0 DAYS
IRF    1927     -0.13  1   2   4  0   BURNUP=41,673 MWD/MTIHM
IRF    2087.9   -0.13  2   3   4  0   BURNUP=45,840 MWD/MTIHM
IRF    2248.8   -0.13  3  10   4  0   BURNUP=50,008 MWD/MTIHM
RDA  -6 = IRRAD SS 304 ENDS & INCONEL SPRINGS AT DISCH (END ZONE)
MOV      10    -6      0    1.0
PCH      -6    -6     -6
RDA  IRRADIATION OF SS 302 IN PLENUM SPRINGS AT 0.500 FLUX
TIT  IRRAD OF SS302 PLENUM SPRINGS AT 0.5 FLUX (FUEL-GAS PLENUM)
```

```
MOV      -5     1     0    6.00       SS302
PCH       1     1     1
HED       1                                          CHARGE
IRF     160.9   -0.5   1   2   4  2   BURNUP= 4,167 MWD/MTIHM
IRF     321.8   -0.5   2   3   4  0   BURNUP= 8,335 MWD/MTIHM
IRF     482.7   -0.5   3   4   4  0   BURNUP=12,502 MWD/MTIHM
DEC     588.7           4   5   4  0    DECAY FOR 106.0 DAYS
IRF     749.6   -0.5   5   6   4  0   BURNUP=16,669 MWD/MTIHM
IRF     910.5   -0.5   6   7   4  0   BURNUP=20,837 MWD/MTIHM
IRF    1071.4   -0.5   7   8   4  0   BURNUP=25,004 MWD/MTIHM
DEC    1177.4           8   9   4  0    DECAY FOR 106.0 DAYS
IRF    1338.3   -0.5   9  10   4  0   BURNUP=29,171 MWD/MTIHM
IRF    1499.2   -0.5  10  11   4  0   BURNUP=33,338 MWD/MTIHM
IRF    1660.1   -0.5  11  12   4  0   BURNUP=37,506 MWD/MTIHM
DEC    1766.1          12   1   4  0    DECAY FOR 106.0 DAYS
IRF    1927     -0.5   1   2   4  0   BURNUP=41,673 MWD/MTIHM
IRF    2087.9   -0.5   2   3   4  0   BURNUP=45,840 MWD/MTIHM
IRF    2248.8   -0.5   3  11   4  0   BURNUP=50,008 MWD/MTIHM
RDA     -5 = IRRAD SS302 PLENUM SPRINGS AT DISC (FUEL-GAS PLENUM)
MOV     11    -5    0   1.0
PCH     -5    -5   -5
RDA  ***** OUTPUT MODULE *****
TIT  ORIGEN2 V2.1 - UO2 FUEL ONLY - EXTENDED BURNUP (BWRUE)
BAS  1 MTIHM 3.31% UO2; BURNUP=50,008 MWD/MTIHM (4 CYCLE)
HED     -10    FUEL DIS
HED      -1    FUEL CHG
MOV      -1   1   0   1.0
MOV     -10   2   0   1.0
RDA  ***** DECAY MODULE *****
DEC     0.5   2   3   5   2
DEC     1.0   3   4   5   0
DEC     3.0   4   5   5   0
DEC     5.0   5   6   5   0
DEC    10.0   6   7   5   0
DEC    30.0   7   8   5   0
OPTL      6*8  7  8  7  8  14*8
OPTA      6*8  7  8  7  8  14*8
OPTF      6*8  7  8  7  8  14*8
OUT       8   1  -1   0
TIT  ORIGEN2 V2.1 - BWR/6 FUEL ASSEMBLY - EXTENDED BURNUP (BWRUE)
BAS  1 MTIHM 3.31% ENRICHMENT UO2 * 0.1833 BWR/6 ASSEMBLY/1 MTIHM
OPTL      6*8  7  8  7  8  14*8
OPTA      6*8  7  8  7  8  14*8
OPTF      6*8  7  8  7  8  14*8
MOV     -10   1   0   0.1833
ADD      -9   1   0   0.1833
ADD      -8   1   0   0.1833
ADD      -7   1   0   0.1833
ADD      -6   1   0   0.1833
ADD      -5   1   0   0.1833
HED     1    ASSY DIS
RDA  ***** DECAY MODULE *****
DEC     0.5   1   2   5   2
DEC     1.0   2   3   5   0
DEC     3.0   3   4   5   0
DEC     5.0   4   5   5   0
DEC    10.0   5   6   5   0
DEC    30.0   6   7   5   0
OUT       7   1  -1   0
END
2 922340 297.0   922350 33100. 922380 966603. 0      0.0   FUEL 3.31
4 030000 1.0     050000 1.0    060000 89.4    070000 25.0  FUEL IMPU
4 080000 134454. 090000 10.7   110000 15.0    120000 2.0   FUEL IMPU
4 130000 16.7    140000 12.1   150000 35.0    170000 5.3   FUEL IMPU
4 200000 2.0     220000 1.0    230000 3.0     240000 4.0   FUEL IMPU
4 250000 1.7     260000 18.0   270000 1.0     280000 24.0  FUEL IMPU
4 290000 1.0     300000 40.3   420000 10.0    470000 0.1   FUEL IMPU
4 480000 25.0    490000 2.0    500000 4.0     640000 1573. FUEL IMPU
4 740000 2.0     820000 1.0    830000 0.4     0      0.0   FUEL IMPU
0
4 400000 979.11  500000 16.0   260000 2.25    240000 1.25     ZIRC-4
4 280000 0.02    130000 0.024  050000 0.00033 480000 0.00025  ZIRC-4
```

```
272    4 060000 0.120   270000 0.010  290000 0.020   720000 0.078    ZIRC-4
273    4 010000 0.013   250000 0.020  070000 0.080   080000 0.950    ZIRC-4
274    4 160000 0.035   220000 0.020  740000 0.020   230000 0.020    ZIRC-4
275    5 920000 0.0002       0 0.0                                  ZIRC-4
276    0
277    4 400000 979.63  500000 16.0   260000 1.5     240000 1.00     ZIRC-2
278    4 280000 0.5     130000 0.024  050000 0.00033 480000 0.00025  ZIRC-2
279    4 060000 0.120   270000 0.010  290000 0.020   720000 0.078    ZIRC-2
280    4 010000 0.013   250000 0.020  070000 0.080   080000 0.950    ZIRC-2
281    4 160000 0.035   220000 0.020  740000 0.020   230000 0.020    ZIRC-2
282    5 920000 0.0002       0 0.0                                  ZIRC-2
283    0
284    4 260000 688.44  240000 190.0  280000 89.2    250000 20.0     SS-304
285    4 060000 0.8     150000 0.45   160000 0.3     140000 10.0     SS-304
286    4 070000 1.3     270000 0.8         0 0.0                    SS-304
287    0
288    4 260000 697.74  240000 180.0  280000 89.2    250000 20.0     SS-302
289    4 060000 1.5     150000 0.45   160000 0.3     140000 10.0     SS-302
290    4 070000 1.3     270000 0.8         0 0.0                    SS-302
291    0
292    4 260000 67.846  240000 149.66 280000 721.861 130000 7.982 INC-X-750
293    4 060000 0.399   270000 6.485  290000 0.499   250000 6.984 INC-X-750
294    4 070000 1.3     410000 8.98   160000 0.07    140000 2.993 INC-X-750
295    4 220000 24.943       0 0.0                                INC-X-750
296    0
```

pwr343.inp

```
  1      -1
  2      -1
  3      -1
  4      RDA *  WESTINGHOUSE STANDARD 17X17 ARRAY PWR ASSEMBLY
  5      RDA **  3.43% ENRICHMENT UO2 FUEL, 35,000 MWD/MTIHM BURNUP
  6      RDA ***  CROSS SECTION LIBRARY = PWRUS, 3 CYCLE
  7      RDA ****  KEY REFERENCE: ORNL/TM-9591/V1&R1, TABLES 3.1-3.4
  8      RDA *****  J.D. SMITH, SNL/6524, (505) 844-0531
  9      RDA     -1 = FRESH PWR FUEL WITH IMPURITIES (1 MT = 1000 KG)
 10      RDA     -2 = FRESH ZIRCALOY-4 COMPOSITION (1 KG)
 11      RDA     -3 = FRESH SS-304 COMPOSITION (1 KG)
 12      RDA     -4 = FRESH SS-302 COMPOSITION (1 KG)
 13      RDA     -5 = FRESH INCONEL-718 COMPOSITION (1 KG)
 14      RDA     -6 = FRESH NICROBRAZE-50 COMPOSITION (1 KG)
 15      RDA     NOTE:  VECTOR CONTENT CHANGES INDICATED ON RDA CARDS.
 16      CUT     5 1.0E-10 7 1.0E-10 9 1.0E-10 -1
 17      LIP     0 0 0
 18      RDA        DECAY LIB    XSECT LIB                      VAR. XSECT
 19      LIB     0    1 2 3     601 602 603    9   50   0   1       38
 20      RDA      PHOTON LIB
 21      PHO     101 102 103  10
 22      TIT   INITIAL FUEL AND STRUCTURAL COMPOSITION UNIT QUANTITIES
 23      RDA     READ FUEL COMPOSITION INCLUDING IMPURITIES (1000 KG)
 24      INP     -1  1  -1  -1  1  1
 25      RDA     READ  ZIRCALOY-4 COMPOSITION (1.0 KG)
 26      INP     -2  1  -1  -1  1  1
 27      RDA     READ  SS-304 COMPOSITION (1.0 KG)
 28      INP     -3  1  -1  -1  1  1
 29      RDA     READ  SS-302 COMPOSITION (1.0 KG)
 30      INP     -4  1  -1  -1  1  1
 31      RDA     READ  INCONEL-718 COMPOSITION (1.0 KG)
 32      INP     -5  1  -1  -1  1  1
 33      RDA     READ  NICROBRAZE-50 COMPOSITION (1.0 KG)
 34      INP     -6  1  -1  -1  1  1
 35      TIT     IRRADIATION OF 1 MTIHM OF 3.43% ENRICHMENT UO2 PWR FUEL
 36      MOV     -1 1 0 1.0
 37      PCH     1  1  1
 38      HED     1                                              CHARGE
 39      BUP
 40      IRP       97.3    32.0    1   2   4 2  BURNUP=  3,113.6 MWD/MTIHM
 41      IRP      194.7    32.0    2   3   4 0  BURNUP=  6,230.4 MWD/MTIHM
 42      IRP      292.0    32.0    3   4   4 0  BURNUP=  9,344.0 MWD/MTIHM
 43      DEC      322.0            4   5   4 0   DECAY FOR 30.0 DAYS
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```
 44      IRP      419.3    40.0    5   6   4 0  BURNUP= 13,236.0 MWD/MTIHM
 45      IRP      516.7    40.0    6   7   4 0  BURNUP= 17,132.0 MWD/MTIHM
 46      IRP      614.0    40.0    7   8   4 0  BURNUP= 21,024.0 MWD/MTIHM
 47      DEC      644.0            8   9   4 0   DECAY FOR 30.0 DAYS
 48      IRP      741.3    48.0    9  10   4 0  BURNUP= 25,694.4 MWD/MTIHM
 49      IRP      838.6    48.0   10  11   4 0  BURNUP= 30,364.8 MWD/MTIHM
 50      IRP      936.0    48.0   11  12   4 0  BURNUP= 35,040.0 MWD/MTIHM
 51      BUP
 52      RDA     -10 = IRRADIATED FUEL AT DISCHARGE
 53      MOV     12 -10  0 1.0
 54      PCH     -10  -10  -10
 55      RDA     IRRADIATION OF ZIRCALOY-4 AT 1.000 FLUX (FUEL ZONE)
 56      TIT     IRRADIATION OF ZIRCALOY-4 CLADDING AT 1.000 FLUX
 57      MOV     -2 1 0 223.0 ZIRCALOY-4 CLADDING (KG/MTHM), TABLE 3.2
 58      PCH     1  1  1
 59      HED     1                                                    CHARGE
 60      IRF       97.3    -1.0    1   2   4 2  BURNUP=  3,113.6 MWD/MTIHM
 61      IRF      194.7    -1.0    2   3   4 0  BURNUP=  6,230.4 MWD/MTIHM
 62      IRF      292.0    -1.0    3   4   4 0  BURNUP=  9,344.0 MWD/MTIHM
 63      DEC      322.0            4   5   4 0   DECAY FOR 30.0 DAYS
 64      IRF      419.3    -1.0    5   6   4 0  BURNUP= 13,236.0 MWD/MTIHM
 65      IRF      516.7    -1.0    6   7   4 0  BURNUP= 17,132.0 MWD/MTIHM
 66      IRF      614.0    -1.0    7   8   4 0  BURNUP= 21,024.0 MWD/MTIHM
 67      DEC      644.0            8   9   4 0   DECAY FOR 30.0 DAYS
 68      IRF      741.3    -1.0    9  10   4 0  BURNUP= 25,694.4 MWD/MTIHM
 69      IRF      838.6    -1.0   10  11   4 0  BURNUP= 30,364.8 MWD/MTIHM
 70      IRF      936.0    -1.0   11  12   4 0  BURNUP= 35,040.0 MWD/MTIHM
 71      RDA     -9 = IRRADIATED ZIRCALOY-4 AT DISCHARGE
 72      MOV     12  -9  0  1.0
 73      PCH     -9  -9  -9
 74      RDA     IRRADIATION OF INC-718+NICR-50 AT 1.000 FLUX (FUEL ZONE)
 75      TIT     IRRADIATION OF INCONEL-718+NICROBRAZE-50 AT 1.000 FLUX
 76      MOV     -5 1 0 12.8 INCONEL-718 GRID SPACERS (KG/MTHM), TABLE 3.2
 77      ADD     -6 1 0 2.6 NICROBRAZE-50 GRID-BRAZING (KG/MTHM), TABLE 3.2
 78      PCH     1  1  1
 79      HED     1                                                    CHARGE
 80      IRF       97.3    -1.0    1   2   4 2  BURNUP=  3,113.6 MWD/MTIHM
 81      IRF      194.7    -1.0    2   3   4 0  BURNUP=  6,230.4 MWD/MTIHM
 82      IRF      292.0    -1.0    3   4   4 0  BURNUP=  9,344.0 MWD/MTIHM
 83      DEC      322.0            4   5   4 0   DECAY FOR 30.0 DAYS
 84      IRF      419.3    -1.0    5   6   4 0  BURNUP= 13,236.0 MWD/MTIHM
 85      IRF      516.7    -1.0    6   7   4 0  BURNUP= 17,132.0 MWD/MTIHM
 86      IRF      614.0    -1.0    7   8   4 0  BURNUP= 21,024.0 MWD/MTIHM
 87      DEC      644.0            8   9   4 0   DECAY FOR 30.0 DAYS
 88      IRF      741.3    -1.0    9  10   4 0  BURNUP= 25,694.4 MWD/MTIHM
 89      IRF      838.6    -1.0   10  11   4 0  BURNUP= 30,364.8 MWD/MTIHM
 90      IRF      936.0    -1.0   11  12   4 0  BURNUP= 35,040.0 MWD/MTIHM
 91      RDA     -8 = IRRADIATED INCONEL-718 AND NICROBRAZE-50 AT DISCHARGE
 92      MOV     12  -8  0  1.0
 93      PCH     -8  -8  -8
 94      RDA     IRRADIATION OF SS-304 CHANNEL AT 1.000 FLUX (FUEL ZONE)
 95      TIT     IRRADIATION OF SS-304 MISCELLANEOUS/CHANNEL AT 1.000 FLUX
 96      MOV     -3 1 0 9.9 SS-304 CHANNEL (KG/MTHM), TABLE 3.2
 97      PCH     1  1  1
 98      HED     1                                                    CHARGE
 99      IRF       97.3    -1.0    1   2   4 2  BURNUP=  3,113.6 MWD/MTIHM
100      IRF      194.7    -1.0    2   3   4 0  BURNUP=  6,230.4 MWD/MTIHM
101      IRF      292.0    -1.0    3   4   4 0  BURNUP=  9,344.0 MWD/MTIHM
102      DEC      322.0            4   5   4 0   DECAY FOR 30.0 DAYS
103      IRF      419.3    -1.0    5   6   4 0  BURNUP= 13,236.0 MWD/MTIHM
104      IRF      516.7    -1.0    6   7   4 0  BURNUP= 17,132.0 MWD/MTIHM
105      IRF      614.0    -1.0    7   8   4 0  BURNUP= 21,024.0 MWD/MTIHM
106      DEC      644.0            8   9   4 0   DECAY FOR 30.0 DAYS
107      IRF      741.3    -1.0    9  10   4 0  BURNUP= 25,694.4 MWD/MTIHM
108      IRF      838.6    -1.0   10  11   4 0  BURNUP= 30,364.8 MWD/MTIHM
109      IRF      936.0    -1.0   11  12   4 0  BURNUP= 35,040.0 MWD/MTIHM
110      RDA     -7 = IRRADIATED SS-304 AT DISCHARGE
111      MOV     12  -7  0  1.0
112      PCH     -7  -7  -7
113      RDA     IRRADIATION OF SS-304 AT 0.011 FLUX (END FITTING ZONE)
114      TIT     IRRADIATION OF SS-304 END FITTINGS (BOTH) AT 0.011 FLUX
115      MOV     -3 1 0 27.2  SS-304 END FITTINGS (KG/MTHM), TABLE 3.4
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```
PCH     1  1  1
HED     1                                                        CHARGE
IRF       97.3    -0.011  1   2   4 2  BURNUP=  3,113.6 MWD/MTIHM
IRF      194.7    -0.011  2   3   4 0  BURNUP=  6,230.4 MWD/MTIHM
IRF      292.0    -0.011  3   4   4 0  BURNUP=  9,344.0 MWD/MTIHM
DEC      322.0            4   5   4 0   DECAY FOR 30.0 DAYS
IRF      419.3    -0.011  5   6   4 0  BURNUP= 13,236.0 MWD/MTIHM
IRF      516.7    -0.011  6   7   4 0  BURNUP= 17,132.0 MWD/MTIHM
IRF      614.0    -0.011  7   8   4 0  BURNUP= 21,024.0 MWD/MTIHM
DEC      644.0            8   9   4 0   DECAY FOR 30.0 DAYS
IRF      741.3    -0.011  9  10   4 0  BURNUP= 25,694.4 MWD/MTIHM
IRF      838.6    -0.011 10  11   4 0  BURNUP= 30,364.8 MWD/MTIHM
IRF      936.0    -0.011 11  12   4 0  BURNUP= 35,040.0 MWD/MTIHM
RDA     -6 = IRRADIATED SS-304 END PIECES AT DISCHARGE
MOV     12 -6 0 1.0
PCH     -6  -6  -6
RDA     IRRADIATION OF SS-302 AT 0.042 FLUX (FUEL-GAS PLENUM ZONE)
TIT     IRRADIATION OF SS-302 PLENUM SPRINGS AT 0.042 FLUX
MOV     -4 1 0 4.2  SS-302 PLENUM SPRING (KG/MTIHM), TABLE 3.2
ADD     -2 1 0 12.0  ZIRCALOY-4 CLADDING (KG/MTIHM), TABLE 3.2
PCH     1  1  1
HED     1                                                        CHARGE
IRF       97.3    -0.042  1   2   4 2  BURNUP=  3,113.6 MWD/MTIHM
IRF      194.7    -0.042  2   3   4 0  BURNUP=  6,230.4 MWD/MTIHM
IRF      292.0    -0.042  3   4   4 0  BURNUP=  9,344.0 MWD/MTIHM
DEC      322.0            4   5   4 0   DECAY FOR 30.0 DAYS
IRF      419.3    -0.042  5   6   4 0  BURNUP= 13,236.0 MWD/MTIHM
IRF      516.7    -0.042  6   7   4 0  BURNUP= 17,132.0 MWD/MTIHM
IRF      614.0    -0.042  7   8   4 0  BURNUP= 21,024.0 MWD/MTIHM
DEC      644.0            8   9   4 0   DECAY FOR 30.0 DAYS
IRF      741.3    -0.042  9  10   4 0  BURNUP= 25,694.4 MWD/MTIHM
IRF      838.6    -0.042 10  11   4 0  BURNUP= 30,364.8 MWD/MTIHM
IRF      936.0    -0.042 11  12   4 0  BURNUP= 35,040.0 MWD/MTIHM
RDA     -5 = IRRADIATED SS-302 PLENUM SPRINGS AT DISCHARGE
MOV     12 -5 0 1.0
PCH     -5  -5  -5
RDA     ***** OUTPUT MODULE *****
TIT     ORIGEN2 V2.1 - PWR (FUEL ONLY) - STANDARD BURNUP (PWRU)
BAS      1 MTIHM 3.5% UO2; BURNUP=35,000 MWD/MTIHM, 3 CYCLE
HED      -10    FUEL DIS
HED      -1     FUEL CHG
MOV      -1    1    0   1.0
MOV     -10    2    0   1.0
RDA     ***** DECAY MODULE *****
DEC     0.5   2   3   5   2
DEC     1.0   3   4   5   0
DEC     3.0   4   5   5   0
DEC     5.0   5   6   5   0
DEC    10.0   6   7   5   0
DEC    30.0   7   8   5   0
OPTL    4*8   7   8   3*7 19*8
OPTA    4*8   7   8   3*7 19*8
OPTF    4*8   7   8   3*7 19*8
OUT      8    1     -1    0
TIT   ORIGEN2 V2.1 - PWR ASSEMBLY-STANDARD BURNUP (PWRU)
BAS   1 17X17 PWR ASSEMBLY; 3.43% UO2, BURNUP=35,000 MWD/MTIHM, 3 CYCLE
OPTL    4*8   7   8   3*7 19*8
OPTA    4*8   7   8   3*7 19*8
OPTF    4*8   7   8   3*7 19*8
MOV     -10   1   0  0.4614
ADD      -9   1   0  0.4614
ADD      -8   1   0  0.4614
ADD      -7   1   0  0.4614
ADD      -6   1   0  0.4614
ADD      -5   1   0  0.4614
HED     1    ASSY DIS
RDA     ***** DECAY MODULE *****
DEC     0.5   1   2   5   2
DEC     1.0   2   3   5   0
DEC     3.0   3   4   5   0
DEC     5.0   4   5   5   0
DEC    10.0   5   6   5   0
```

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 DEC    30.0   6   7   5   0
 OUT      7    1     -1    0
 END
2 922340 310.8   922350 34300.  922380 965389.2     0 0.0    UO2 3.43%
4 030000 1.0     050000 1.0     060000 89.6    070000 25.0   IMPURITY
4 080000 134454. 090000 10.7    110000 15.0    120000 20.0   IMPURITY
4 130000 16.7    140000 12.1    150000 35.0    170000 5.3    IMPURITY
4 200000 2.0     220000 1.0     230000 3.0     240000 4.0    IMPURITY
4 250000 1.7     260000 18.0    270000 1.0     280000 24.0   IMPURITY
4 290000 1.0     300000 40.3    420000 10.0    470000 0.1    IMPURITY
4 480000 25.0    490000 2.0     500000 4.0     640000 2.5    IMPURITY
4 740000 2.0     820000 1.0     830000 0.4     0      0.0    IMPURITY
 0
4 010000 0.013   050000 0.00033 060000 0.120   070000 0.080    ZIRC-4
4 080000 0.950   130000 0.024   140000 0.0     150000 0.0      ZIRC-4
4 160000 0.035   220000 0.020   230000 0.020   240000 1.25     ZIRC-4
4 250000 0.020   260000 2.25    270000 0.010   280000 0.02     ZIRC-4
4 290000 0.020   400000 979.11  410000 0.0     420000 0.0      ZIRC-4
4 480000 0.00025 500000 16.0    720000 0.078   740000 0.020    ZIRC-4
5 920000 0.0002       0 0.0                                   ZIRC-4
 0
4 010000 0.0     050000 0.0     060000 0.8     070000 1.3      SS-304
4 080000 0.0     130000 0.0     140000 10.0    150000 0.45     SS-304
4 160000 0.3     220000 0.0     230000 0.0     240000 190.0    SS-304
4 250000 20.0    260000 688.44  270000 0.8     280000 89.2     SS-304
4 290000 0.0     400000 0.0     410000 0.0     420000 0.0      SS-304
4 480000 0.0     500000 0.0     720000 0.0     740000 0.0      SS-304
5 920000 0.0          0 0.0                                   SS-304
 0
4 010000 0.0     050000 0.0     060000 1.5     070000 1.3      SS-302
4 080000 0.0     130000 0.0     140000 10.0    150000 0.45     SS-302
4 160000 0.3     220000 0.0     230000 0.0     240000 180.0    SS-302
4 250000 20.0    260000 697.74  270000 0.8     280000 89.2     SS-302
4 290000 0.0     400000 0.0     410000 0.0     420000 0.0      SS-302
4 480000 0.0     500000 0.0     720000 0.0     740000 0.0      SS-302
5 920000 0.0          0 0.0                                   SS-302
 0
4 010000 0.0     050000 0.0     060000 0.4     070000 1.3     INC-718
4 080000 0.0     130000 5.992   140000 1.997   150000 0.0     INC-718
4 160000 0.07    220000 7.99    230000 0.0     240000 189.753 INC-718
4 250000 1.997   260000 179.766 270000 4.694   280000 519.625 INC-718
4 290000 0.999   400000 0.0     410000 55.458  420000 29.961  INC-718
4 480000 0.0     500000 0.0     720000 0.0     740000 0.0     INC-718
5 920000 0.0          0 0.0                                  INC-718
 0
4 010000 0.0     050000 0.05    060000 0.1     070000 0.066   NICR-50
4 080000 0.043   130000 0.1     140000 0.511   150000 103.244 NICR-50
4 160000 0.1     220000 0.1     230000 0.0     240000 149.709 NICR-50
4 250000 0.1     260000 0.471   270000 0.381   280000 744.438 NICR-50
4 290000 0.0     400000 0.1     410000 0.0     420000 0.0     NICR-50
4 480000 0.0     500000 0.0     720000 0.0     740000 0.1     NICR-50
5 920000 0.0          0 0.0                                  NICR-50
 0
```

pwr473.inp

```
 -1
 -1
 -1
 RDA *  WESTINGHOUSE STANDARD 17X17 ARRAY PWR ASSEMBLY
 RDA **  4.73% ENRICHMENT UO2 FUEL, 60,000 MWD/MTIHM BURNUP
 RDA ***  CROSS SECTION LIBRARY = PWRUE, 3 CYCLE
 RDA ****  KEY REFERENCE: ORNL/TM-9591/V1&R1, TABLES 3.1-3.4
 RDA *****  J.D. SMITH, SNL/6524, (505) 844-0531
 RDA     -1 = FRESH PWR FUEL WITH IMPURITIES (1 MT = 1000 KG)
 RDA     -2 = FRESH ZIRCALOY-4 COMPOSITION (1 KG)
 RDA     -3 = FRESH SS-304 COMPOSITION (1 KG)
 RDA     -4 = FRESH SS-302 COMPOSITION (1 KG)
 RDA     -5 = FRESH INCONEL-718 COMPOSITION (1 KG)
 RDA     -6 = FRESH NICROBRAZE-50 COMPOSITION (1 KG)
```

```
RDA     NOTE:  VECTOR CONTENT CHANGES INDICATED ON RDA CARDS.
CUT     5 1.0E-10 7 1.0E-10 9 1.0E-10 -1
LIP     0 0 0
RDA        DECAY LIB    XSECT LIB                        VAR. XSECT
LIB     0    1 2 3     604 605 606    9   50   0   1       39
RDA      PHOTON LIB
PHO     101 102 103  10
TIT   INITIAL FUEL AND STRUCTURAL COMPOSITION UNIT QUANTITIES
RDA     READ FUEL COMPOSITION INCLUDING IMPURITIES (1000 KG)
INP     -1  1  -1  -1  1  1
RDA     READ  ZIRCALOY-4 COMPOSITION (1.0 KG)
INP     -2  1  -1  -1  1  1
RDA     READ  SS-304 COMPOSITION (1.0 KG)
INP     -3  1  -1  -1  1  1
RDA     READ  SS-302 COMPOSITION (1.0 KG)
INP     -4  1  -1  -1  1  1
RDA     READ  INCONEL-718 COMPOSITION (1.0 KG)
INP     -5  1  -1  -1  1  1
RDA     READ  NICROBRAZE-50 COMPOSITION (1.0 KG)
INP     -6  1  -1  -1  1  1
TIT     IRRADIATION OF 1 MTIHM OF 4.73% ENRICHMENT UO2 PWR FUEL
MOV     -1 1 0 1.0
PCH     1  1  1
HED     1                                          FUEL ONLY CHARGE
BUP
IRP      133.5    37.5    1   2   4 2  BURNUP=  5,006.3 MWD/MTIHM
IRP      267.0    37.5    2   3   4 0  BURNUP= 10,012.5 MWD/MTIHM
IRP      400.5    37.5    3   4   4 0  BURNUP= 15,018.8 MWD/MTIHM
IRP      534.0    37.5    4   5   4 0  BURNUP= 20,025.0 MWD/MTIHM
DEC      667.5             5   6   4 0   DECAY FOR 133.5 DAYS
IRP      801.0    37.5    6   7   4 0  BURNUP= 25,031.3 MWD/MTIHM
IRP      934.5    37.5    7   8   4 0  BURNUP= 30,037.5 MWD/MTIHM
IRP     1068.0    37.5    8   9   4 0  BURNUP= 35,043.8 MWD/MTIHM
IRP     1201.5    37.5    9  10   4 0  BURNUP= 40,050.0 MWD/MTIHM
DEC     1335.0           10  11   4 0   DECAY FOR 133.5 DAYS
IRP     1468.5    37.5   11  12   4 0  BURNUP= 45,056.3 MWD/MTIHM
IRP     1602.0    37.5   12   1   4 0  BURNUP= 50,062.5 MWD/MTIHM
IRP     1735.5    37.5    1   2   4 0  BURNUP= 55,068.8 MWD/MTIHM
IRP     1869.0    37.5    2   3   4 0  BURNUP= 60,075.0 MWD/MTIHM
BUP
RDA     -10 = IRRADIATED FUEL AT DISCHARGE
MOV       3  -10    0  1.0
PCH     -10  -10  -10
RDA     IRRADIATION OF ZIRCALOY-4 AT 1.000 FLUX (FUEL ZONE)
TIT     IRRADIATION OF ZIRCALOY-4 CLADDING AT 1.000 FLUX
MOV     -2 1 0 223.0 ZIRCALOY-4 CLADDING (KG/MTHM), TABLE 3.2
PCH     1  1  1
HED     1                                       ZIRCALOY-4 CHARGE
IRF      133.5    -1.0    1   2   4 2  BURNUP=  5,006.3 MWD/MTIHM
IRF      267.0    -1.0    2   3   4 0  BURNUP= 10,012.5 MWD/MTIHM
IRF      400.5    -1.0    3   4   4 0  BURNUP= 15,018.8 MWD/MTIHM
IRF      534.0    -1.0    4   5   4 0  BURNUP= 20,025.0 MWD/MTIHM
DEC      667.5             5   6   4 0   DECAY FOR 133.5 DAYS
IRF      801.0    -1.0    6   7   4 0  BURNUP= 25,031.3 MWD/MTIHM
IRF      934.5    -1.0    7   8   4 0  BURNUP= 30,037.5 MWD/MTIHM
IRF     1068.0    -1.0    8   9   4 0  BURNUP= 35,043.8 MWD/MTIHM
IRF     1201.5    -1.0    9  10   4 0  BURNUP= 40,050.0 MWD/MTIHM
DEC     1335.0           10  11   4 0   DECAY FOR 133.5 DAYS
IRF     1468.5    -1.0   11  12   4 0  BURNUP= 45,056.3 MWD/MTIHM
IRF     1602.0    -1.0   12   1   4 0  BURNUP= 50,062.5 MWD/MTIHM
IRF     1735.5    -1.0    1   2   4 0  BURNUP= 55,068.8 MWD/MTIHM
IRF     1869.0    -1.0    2   3   4 0  BURNUP= 60,075.0 MWD/MTIHM
RDA     -9 = IRRADIATED ZIRCALOY-4 AT DISCHARGE
MOV      3  -9   0 1.0
PCH     -9  -9  -9
RDA     IRRADIATION OF INC-718+NICR-50 AT 1.000 FLUX (FUEL ZONE)
TIT     IRRADIATION OF INCONEL-718+NICROBRAZE-50 AT 1.000 FLUX
MOV     -5 1 0 12.8 INCONEL-718 GRID SPACERS (KG/MTHM), TABLE 3.2
ADD     -6 1 0 2.6 NICROBRAZE-50 GRID-BRAZING (KG/MTHM), TABLE 3.2
PCH     1  1  1
HED     1                                    INC-718+NICR-50 CHARGE
IRF      133.5    -1.0    1   2   4 2  BURNUP=  5,006.3 MWD/MTIHM
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 87      IRF      267.0    -1.0    2   3   4 0  BURNUP= 10,012.5 MWD/MTIHM
 88      IRF      400.5    -1.0    3   4   4 0  BURNUP= 15,018.8 MWD/MTIHM
 89      IRF      534.0    -1.0    4   5   4 0  BURNUP= 20,025.0 MWD/MTIHM
 90      DEC      667.5            5   6   4 0   DECAY FOR 133.5 DAYS
 91      IRF      801.0    -1.0    6   7   4 0  BURNUP= 25,031.3 MWD/MTIHM
 92      IRF      934.5    -1.0    7   8   4 0  BURNUP= 30,037.5 MWD/MTIHM
 93      IRF     1068.0    -1.0    8   9   4 0  BURNUP= 35,043.8 MWD/MTIHM
 94      IRF     1201.5    -1.0    9  10   4 0  BURNUP= 40,050.0 MWD/MTIHM
 95      DEC     1335.0           10  11   4 0   DECAY FOR 133.5 DAYS
 96      IRF     1468.5    -1.0   11  12   4 0  BURNUP= 45,056.3 MWD/MTIHM
 97      IRF     1602.0    -1.0   12   1   4 0  BURNUP= 50,062.5 MWD/MTIHM
 98      IRF     1735.5    -1.0    1   2   4 0  BURNUP= 55,068.8 MWD/MTIHM
 99      IRF     1869.0    -1.0    2   3   4 0  BURNUP= 60,075.0 MWD/MTIHM
100      RDA     -8 = IRRADIATED INCONEL-718 AND NICROBRAZE-50 AT DISCHARGE
101      MOV      3  -8   0 1.0
102      PCH     -8  -8  -8
103      RDA     IRRADIATION OF SS-304 CHANNEL AT 1.000 FLUX (FUEL ZONE)
104      TIT     IRRADIATION OF SS-304 MISCELLANEOUS/CHANNEL AT 1.000 FLUX
105      MOV     -3 1 0 9.9 SS-304 CHANNEL (KG/MTHM), TABLE 3.2
106      PCH     1  1  1
107      HED     1                                        SS-304 CHANNEL CHARGE
108      IRF      133.5    -1.0    1   2   4 2  BURNUP=  5,006.3 MWD/MTIHM
109      IRF      267.0    -1.0    2   3   4 0  BURNUP= 10,012.5 MWD/MTIHM
110      IRF      400.5    -1.0    3   4   4 0  BURNUP= 15,018.8 MWD/MTIHM
111      IRF      534.0    -1.0    4   5   4 0  BURNUP= 20,025.0 MWD/MTIHM
112      DEC      667.5            5   6   4 0   DECAY FOR 133.5 DAYS
113      IRF      801.0    -1.0    6   7   4 0  BURNUP= 25,031.3 MWD/MTIHM
114      IRF      934.5    -1.0    7   8   4 0  BURNUP= 30,037.5 MWD/MTIHM
115      IRF     1068.0    -1.0    8   9   4 0  BURNUP= 35,043.8 MWD/MTIHM
116      IRF     1201.5    -1.0    9  10   4 0  BURNUP= 40,050.0 MWD/MTIHM
117      DEC     1335.0           10  11   4 0   DECAY FOR 133.5 DAYS
118      IRF     1468.5    -1.0   11  12   4 0  BURNUP= 45,056.3 MWD/MTIHM
119      IRF     1602.0    -1.0   12   1   4 0  BURNUP= 50,062.5 MWD/MTIHM
120      IRF     1735.5    -1.0    1   2   4 0  BURNUP= 55,068.8 MWD/MTIHM
121      IRF     1869.0    -1.0    2   3   4 0  BURNUP= 60,075.0 MWD/MTIHM
122      RDA     -7 = IRRADIATED SS-304 AT DISCHARGE
123      MOV      3  -7   0 1.0
124      PCH     -7  -7  -7
125      RDA     IRRADIATION OF SS-304 AT 0.011 FLUX (END FITTING ZONE)
126      TIT     IRRADIATION OF SS-304 END FITTINGS (BOTH) AT 0.011 FLUX
127      MOV     -3 1 0 27.2  SS-304 END FITTINGS (KG/MTHM), TABLE 3.4
128      PCH     1  1  1
129      HED     1                                          SS-304 ENDS CHARGE
130      IRF      133.5    -0.011  1   2   4 2  BURNUP=  5,006.3 MWD/MTIHM
131      IRF      267.0    -0.011  2   3   4 0  BURNUP= 10,012.5 MWD/MTIHM
132      IRF      400.5    -0.011  3   4   4 0  BURNUP= 15,018.8 MWD/MTIHM
133      IRF      534.0    -0.011  4   5   4 0  BURNUP= 20,025.0 MWD/MTIHM
134      DEC      667.5            5   6   4 0   DECAY FOR 133.5 DAYS
135      IRF      801.0    -0.011  6   7   4 0  BURNUP= 25,031.3 MWD/MTIHM
136      IRF      934.5    -0.011  7   8   4 0  BURNUP= 30,037.5 MWD/MTIHM
137      IRF     1068.0    -0.011  8   9   4 0  BURNUP= 35,043.8 MWD/MTIHM
138      IRF     1201.5    -0.011  9  10   4 0  BURNUP= 40,050.0 MWD/MTIHM
139      DEC     1335.0           10  11   4 0   DECAY FOR 133.5 DAYS
140      IRF     1468.5    -0.011 11  12   4 0  BURNUP= 45,056.3 MWD/MTIHM
141      IRF     1602.0    -0.011 12   1   4 0  BURNUP= 50,062.5 MWD/MTIHM
142      IRF     1735.5    -0.011  1   2   4 0  BURNUP= 55,068.8 MWD/MTIHM
143      IRF     1869.0    -0.011  2   3   4 0  BURNUP= 60,075.0 MWD/MTIHM
144      RDA     -6 = IRRADIATED SS-304 END PIECES AT DISCHARGE
145      MOV      3  -6   0 1.0
146      PCH     -6  -6  -6
147      RDA     IRRADIATION OF SS-302 AT 0.042 FLUX (FUEL-GAS PLENUM ZONE)
148      TIT     IRRADIATION OF SS-302 PLENUM SPRINGS AT 0.042 FLUX
149      MOV     -4 1 0 4.2  SS-302 PLENUM SPRING (KG/MTIHM), TABLE 3.2
150      ADD     -2 1 0 12.0  ZIRCALOY-4 CLADDING (KG/MTIHM), TABLE 3.2
151      PCH     1  1  1
152      HED     1                                       SS-302+ZIRC-4 CHARGE
153      IRF      133.5    -0.042  1   2   4 2  BURNUP=  5,006.3 MWD/MTIHM
154      IRF      267.0    -0.042  2   3   4 0  BURNUP= 10,012.5 MWD/MTIHM
155      IRF      400.5    -0.042  3   4   4 0  BURNUP= 15,018.8 MWD/MTIHM
156      IRF      534.0    -0.042  4   5   4 0  BURNUP= 20,025.0 MWD/MTIHM
157      DEC      667.5            5   6   4 0   DECAY FOR 133.5 DAYS
158      IRF      801.0    -0.042  6   7   4 0  BURNUP= 25,031.3 MWD/MTIHM
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      IRF      934.5    -0.042  7   8   4 0  BURNUP= 30,037.5 MWD/MTIHM
      IRF     1068.0    -0.042  8   9   4 0  BURNUP= 35,043.8 MWD/MTIHM
      IRF     1201.5    -0.042  9  10   4 0  BURNUP= 40,050.0 MWD/MTIHM
      DEC     1335.0           10  11   4 0   DECAY FOR 133.5 DAYS
      IRF     1468.5    -0.042 11  12   4 0  BURNUP= 45,056.3 MWD/MTIHM
      IRF     1602.0    -0.042 12   1   4 0  BURNUP= 50,062.5 MWD/MTIHM
      IRF     1735.5    -0.042  1   2   4 0  BURNUP= 55,068.8 MWD/MTIHM
      IRF     1869.0    -0.042  2   3   4 0  BURNUP= 60,075.0 MWD/MTIHM
      RDA     -5 = IRRADIATED SS-302 PLENUM SPRINGS AT DISCHARGE
      MOV      3  -5   0 1.0
      PCH     -5  -5  -5
      RDA     ***** OUTPUT MODULE *****
      TIT     ORIGEN2 V2.1 - PWR FUEL ONLY - EXTENDED BURNUP (PWRUE)
      BAS      1 MTIHM 4.73% UO2; BURNUP=60,000 MWD/MTIHM, 3 CYCLE
      HED      -10    FUEL DIS
      HED      -1     FUEL CHG
      MOV      -1    1    0   1.0
      MOV     -10    2    0   1.0
      RDA     ***** DECAY MODULE *****
      DEC     0.5   2   3   5   2
      DEC     1.0   3   4   5   0
      DEC     3.0   4   5   5   0
      DEC     5.0   5   6   5   0
      DEC    10.0   6   7   5   0
      DEC    30.0   7   8   5   0
      OPTL    4*8   7   8   3*7 19*8
      OPTA    4*8   7   8   3*7 19*8
      OPTF    4*8   7   8   3*7 19*8
      OUT      8    1     -1    0
      TIT   ORIGEN2 V2.1 - PWR ASSEMBLY - EXTENDED BURNUP (PWRUE)
      BAS   1 17X17 PWR ASSEMBLY; 4.73% UO2, BURNUP=60,000 MWD/MTIHM, 3 CYCLE
      OPTL    4*8   7   8   3*7 19*8
      OPTA    4*8   7   8   3*7 19*8
      OPTF    4*8   7   8   3*7 19*8
      MOV     -10   1   0  0.4614
      ADD      -9   1   0  0.4614
      ADD      -8   1   0  0.4614
      ADD      -7   1   0  0.4614
      ADD      -6   1   0  0.4614
      ADD      -5   1   0  0.4614
      HED     1    ASSY DIS
      RDA     ***** DECAY MODULE *****
      DEC     0.5   1   2   5   2
      DEC     1.0   2   3   5   0
      DEC     3.0   3   4   5   0
      DEC     5.0   4   5   5   0
      DEC    10.0   5   6   5   0
      DEC    30.0   6   7   5   0
      OUT      7    1     -1    0
      END
     2 922340 428.5   922350 47300.  922380 952271.5     0 0.0    UO2 4.73%
     4 030000 1.0     050000 1.0     060000 89.6    070000 25.0   IMPURITY
     4 080000 134454. 090000 10.7    110000 15.0    120000 20.0   IMPURITY
     4 130000 16.7    140000 12.1    150000 35.0    170000 5.3    IMPURITY
     4 200000 2.0     220000 1.0     230000 3.0     240000 4.0    IMPURITY
     4 250000 1.7     260000 18.0    270000 1.0     280000 24.0   IMPURITY
     4 290000 1.0     300000 40.3    420000 10.0    470000 0.1    IMPURITY
     4 480000 25.0    490000 2.0     500000 4.0     640000 2.5    IMPURITY
     4 740000 2.0     820000 1.0     830000 0.4     0      0.0    IMPURITY
      0
     4 010000 0.013   050000 0.00033 060000 0.120   070000 0.080    ZIRC-4
     4 080000 0.950   130000 0.024   140000 0.0     150000 0.0      ZIRC-4
     4 160000 0.035   220000 0.020   230000 0.020   240000 1.25     ZIRC-4
     4 250000 0.020   260000 2.25    270000 0.010   280000 0.02     ZIRC-4
     4 290000 0.020   400000 979.11  410000 0.0     420000 0.0      ZIRC-4
     4 480000 0.00025 500000 16.0    720000 0.078   740000 0.020    ZIRC-4
     5 920000 0.0002       0 0.0                                   ZIRC-4
      0
     4 010000 0.0     050000 0.0     060000 0.8     070000 1.3      SS-304
     4 080000 0.0     130000 0.0     140000 10.0    150000 0.45     SS-304
     4 160000 0.3     220000 0.0     230000 0.0     240000 190.0    SS-304
     4 250000 20.0    260000 688.44  270000 0.8     280000 89.2     SS-304
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231     4 290000 0.0     400000 0.0     410000 0.0     420000 0.0      SS-304
232     4 480000 0.0     500000 0.0     720000 0.0     740000 0.0      SS-304
233     5 920000 0.0          0 0.0                                    SS-304
234      0
235     4 010000 0.0     050000 0.0     060000 1.5     070000 1.3      SS-302
236     4 080000 0.0     130000 0.0     140000 10.0    150000 0.45     SS-302
237     4 160000 0.3     220000 0.0     230000 0.0     240000 180.0    SS-302
238     4 250000 20.0    260000 697.74  270000 0.8     280000 89.2     SS-302
239     4 290000 0.0     400000 0.0     410000 0.0     420000 0.0      SS-302
240     4 480000 0.0     500000 0.0     720000 0.0     740000 0.0      SS-302
241     5 920000 0.0          0 0.0                                    SS-302
242      0
243     4 010000 0.0     050000 0.0     060000 0.4     070000 1.3     INC-718
244     4 080000 0.0     130000 5.992   140000 1.997   150000 0.0     INC-718
245     4 160000 0.07    220000 7.99    230000 0.0     240000 189.753 INC-718
246     4 250000 1.997   260000 179.766 270000 4.694   280000 519.625 INC-718
247     4 290000 0.999   400000 0.0     410000 55.458  420000 29.961  INC-718
248     4 480000 0.0     500000 0.0     720000 0.0     740000 0.0     INC-718
249     5 920000 0.0          0 0.0                                   INC-718
250      0
251     4 010000 0.0     050000 0.05    060000 0.1     070000 0.066   NICR-50
252     4 080000 0.043   130000 0.1     140000 0.511   150000 103.244 NICR-50
253     4 160000 0.1     220000 0.1     230000 0.0     240000 149.709 NICR-50
254     4 250000 0.1     260000 0.471   270000 0.381   280000 744.438 NICR-50
255     4 290000 0.0     400000 0.1     410000 0.0     420000 0.0     NICR-50
256     4 480000 0.0     500000 0.0     720000 0.0     740000 0.1     NICR-50
257     5 920000 0.0          0 0.0                                   NICR-50
258      0
259
```

APPENDIX D - SOURCE TERM SPREADSHEETS

D.1 PWR Truck Cask Release Fraction Spreadsheets

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
4	1	Kr	1.00	1.0	0.000	0	0	0.2	1	1	1	1.00E+00	0.800	0.000	0.000	8.00E-01	0.00E+00	0.000	0.00E+00	8.00E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.2	1	1	1	3.00E-08	0.800	0.000	0.000	2.40E-08	0.00E+00	0.000	0.00E+00	2.40E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.2	1	1	1	7.50E-07	0.800	0.000	0.000	6.00E-07	0.00E+00	0.000	0.00E+00	6.00E-07
		Part	1.00	3.00E-05	0.975	0	0	0.2	1	1	1	7.50E-07	0.800	0.000	0.000	6.00E-07	0.00E+00	0.000	0.00E+00	6.00E-07
		CRUD	1.00	0.1	0.975	0	0	0.2	1	1	1	2.50E-03	0.800	0.000	0.000	2.00E-03	0.00E+00	0.000	0.00E+00	2.00E-03
5	2	Kr	0.25	1.0	0.000	0	0	0.460	1	1	1	2.50E-01	0.540	0.000	0.000	1.35E-01	0.00E+00	0.000	0.00E+00	1.35E-01
		Cs	0.25	3.00E-05	0.999	0	0	0.460	1	1	1	7.50E-09	0.540	0.000	0.000	4.05E-09	0.00E+00	0.000	0.00E+00	4.05E-09
		Ru	0.25	3.00E-05	0.975	0	0	0.460	1	1	1	1.88E-07	0.540	0.000	0.000	1.01E-07	0.00E+00	0.000	0.00E+00	1.01E-07
		Part	0.25	3.00E-05	0.975	0	0	0.460	1	1	1	1.88E-07	0.540	0.000	0.000	1.01E-07	0.00E+00	0.000	0.00E+00	1.01E-07
		CRUD	1.00	0.1	0.975	0	0	0.460	1	1	1	2.50E-03	0.540	0.000	0.000	1.35E-03	0.00E+00	0.000	0.00E+00	1.35E-03
	3	Kr	0.25	1.0	0.000	0	0	0.460	0.609	1	1	2.50E-01	0.540	0.180	0.000	1.80E-01	0.00E+00	0.000	0.00E+00	1.80E-01
		Cs	0.25	3.00E-05	0.999	0	0	0.460	0.609	1	1	7.50E-09	0.540	0.180	0.000	5.40E-09	0.00E+00	0.000	0.00E+00	5.40E-09
		Ru	0.25	3.00E-05	0.975	0	0	0.460	0.609	1	1	1.88E-07	0.540	0.180	0.000	1.35E-07	0.00E+00	0.000	0.00E+00	1.35E-07
		Part	0.25	3.00E-05	0.975	0	0	0.460	0.609	1	1	1.88E-07	0.540	0.180	0.000	1.35E-07	0.00E+00	0.000	0.00E+00	1.35E-07
		CRUD	1.00	0.1	0.975	0	0	0.460	0.609	1	1	2.50E-03	0.540	0.180	0.000	1.80E-03	0.00E+00	0.000	0.00E+00	1.80E-03
	4	Kr	0.25	1.0	0.000	1.0	0.000	0.460	0.609	0.280	0.201	2.50E-01	0.540	0.180	0.224	2.36E-01	7.50E-01	0.799	5.99E-01	8.35E-01
		Cs	0.25	3.00E-05	0.999	5.00E-05	0.000	0.460	0.609	0.280	0.201	7.50E-09	0.540	0.180	0.224	7.08E-09	4.50E-05	0.799	3.59E-05	3.60E-05
		Ru	0.25	3.00E-05	0.975	3.00E-05	0.8	0.460	0.609	0.280	0.201	1.88E-07	0.540	0.180	0.224	1.77E-07	4.50E-06	0.799	3.60E-06	3.77E-06
		Part	0.25	3.00E-05	0.975	3.00E-05	0.8	0.460	0.609	0.280	0.201	1.88E-07	0.540	0.180	0.224	1.77E-07	4.50E-06	0.799	3.60E-06	3.77E-06
		CRUD	1.00	0.1	0.975	0.05	0.8	0.460	0.609	0.280	0.201	2.50E-03	0.540	0.180	0.224	2.36E-03	1.00E-03	0.799	7.99E-04	3.16E-03
	5	Kr	0.59	1.0	0.000	0	0	0.274	1	1	1	5.90E-01	0.726	0.000	0.000	4.28E-01	0.00E+00	0.000	0.00E+00	4.28E-01
		Cs	0.59	3.00E-05	0.999	0	0	0.274	1	1	1	1.77E-08	0.726	0.000	0.000	1.29E-08	0.00E+00	0.000	0.00E+00	1.29E-08
		Ru	0.59	3.00E-05	0.975	0	0	0.274	1	1	1	4.43E-07	0.726	0.000	0.000	3.21E-07	0.00E+00	0.000	0.00E+00	3.21E-07
		Part	0.59	3.00E-05	0.975	0	0	0.274	1	1	1	4.43E-07	0.726	0.000	0.000	3.21E-07	0.00E+00	0.000	0.00E+00	3.21E-07
		CRUD	1.00	0.1	0.975	0	0	0.274	1	1	1	2.50E-03	0.726	0.000	0.000	1.82E-03	0.00E+00	0.000	0.00E+00	1.82E-03
	6	Kr	0.59	1.0	0.000	0	0	0.274	0.609	1	1	5.90E-01	0.726	0.107	0.000	4.92E-01	0.00E+00	0.000	0.00E+00	4.92E-01
		Cs	0.59	3.00E-05	0.999	0	0	0.274	0.609	1	1	1.77E-08	0.726	0.107	0.000	1.47E-08	0.00E+00	0.000	0.00E+00	1.47E-08
		Ru	0.59	3.00E-05	0.975	0	0	0.274	0.609	1	1	4.43E-07	0.726	0.107	0.000	3.69E-07	0.00E+00	0.000	0.00E+00	3.69E-07
		Part	0.59	3.00E-05	0.975	0	0	0.274	0.609	1	1	4.43E-07	0.726	0.107	0.000	3.69E-07	0.00E+00	0.000	0.00E+00	3.69E-07
		CRUD	1.00	0.1	0.975	0	0	0.274	0.609	1	1	2.50E-03	0.726	0.107	0.000	2.08E-03	0.00E+00	0.000	0.00E+00	2.08E-03
	7	Kr	0.59	1.0	0.000	1.0	0.000	0.274	0.609	0.167	0.304	5.90E-01	0.726	0.107	0.116	5.60E-01	4.10E-01	0.696	2.85E-01	8.45E-01
		Cs	0.59	3.00E-05	0.999	5.00E-05	0.000	0.274	0.609	0.167	0.304	1.77E-08	0.726	0.107	0.116	1.68E-08	3.82E-05	0.696	2.66E-05	2.66E-05
		Ru	0.59	3.00E-05	0.975	3.00E-05	0.8	0.274	0.609	0.167	0.304	4.43E-07	0.726	0.107	0.116	4.20E-07	2.46E-06	0.696	1.71E-06	2.13E-06
		Part	0.59	3.00E-05	0.975	3.00E-05	0.8	0.274	0.609	0.167	0.304	4.43E-07	0.726	0.107	0.116	4.20E-07	2.46E-06	0.696	1.71E-06	2.13E-06
		CRUD	1.00	0.1	0.975	0.05	0.8	0.274	0.609	0.167	0.304	2.50E-03	0.726	0.107	0.116	2.37E-03	1.00E-03	0.696	6.96E-04	3.07E-03

	v30,v60	v60,v90	>v90
PWR fri	0.25	0.59	1.00

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
	8	Kr	1.00	1.0	0.000	0	0	0.184	1	1	1	1.00E+00	0.816	0.000	0.000	8.16E-01	0.00E+00	0.000	0.00E+00	8.16E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.184	1	1	1	3.00E-08	0.816	0.000	0.000	2.45E-08	0.00E+00	0.000	0.00E+00	2.45E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.184	1	1	1	7.50E-07	0.816	0.000	0.000	6.12E-07	0.00E+00	0.000	0.00E+00	6.12E-07
		Part	1.00	3.00E-05	0.975	0	0	0.184	1	1	1	7.50E-07	0.816	0.000	0.000	6.12E-07	0.00E+00	0.000	0.00E+00	6.12E-07
		CRUD	1.00	0.1	0.975	0	0	0.184	1	1	1	2.50E-03	0.816	0.000	0.000	2.04E-03	0.00E+00	0.000	0.00E+00	2.04E-03
	9	Kr	1.00	1.0	0.000	0	0	0.184	0.609	1	1	1.00E+00	0.816	0.072	0.000	8.88E-01	0.00E+00	0.000	0.00E+00	8.88E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.184	0.609	1	1	3.00E-08	0.816	0.072	0.000	2.66E-08	0.00E+00	0.000	0.00E+00	2.66E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.184	0.609	1	1	7.50E-07	0.816	0.072	0.000	6.66E-07	0.00E+00	0.000	0.00E+00	6.66E-07
		Part	1.00	3.00E-05	0.975	0	0	0.184	0.609	1	1	7.50E-07	0.816	0.072	0.000	6.66E-07	0.00E+00	0.000	0.00E+00	6.66E-07
		CRUD	1.00	0.1	0.975	0	0	0.184	0.609	1	1	2.50E-03	0.816	0.072	0.000	2.22E-03	0.00E+00	0.000	0.00E+00	2.22E-03
	10	Kr	1.00	1.0	0.000	1.0	0.000	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.999	5.00E-05	0.000	0.184	0.609	0.112	0.804	3.00E-08	0.816	0.072	0.022	2.73E-08	3.00E-05	0.196	5.87E-06	5.90E-06
		Ru	1.00	3.00E-05	0.975	3.00E-05	0.8	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		Part	1.00	3.00E-05	0.975	3.00E-05	0.8	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		CRUD	1.00	0.1	0.975	0.05	0.8	0.184	0.609	0.112	0.804	2.50E-03	0.816	0.072	0.022	2.27E-03	1.00E-03	0.196	1.96E-04	2.47E-03
	11	Kr	1.00	1.0	0.000	0	0	0.184	1	1	1	1.00E+00	0.816	0.000	0.000	8.16E-01	0.00E+00	0.000	0.00E+00	8.16E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.184	1	1	1	3.00E-08	0.816	0.000	0.000	2.45E-08	0.00E+00	0.000	0.00E+00	2.45E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.184	1	1	1	7.50E-07	0.816	0.000	0.000	6.12E-07	0.00E+00	0.000	0.00E+00	6.12E-07
		Part	1.00	3.00E-05	0.975	0	0	0.184	1	1	1	7.50E-07	0.816	0.000	0.000	6.12E-07	0.00E+00	0.000	0.00E+00	6.12E-07
		CRUD	1.00	0.1	0.975	0	0	0.184	1	1	1	2.50E-03	0.816	0.000	0.000	2.04E-03	0.00E+00	0.000	0.00E+00	2.04E-03
	12	Kr	1.00	1.0	0.000	0	0	0.184	0.609	1	1	1.00E+00	0.816	0.072	0.000	8.88E-01	0.00E+00	0.000	0.00E+00	8.88E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.184	0.609	1	1	3.00E-08	0.816	0.072	0.000	2.66E-08	0.00E+00	0.000	0.00E+00	2.66E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.184	0.609	1	1	7.50E-07	0.816	0.072	0.000	6.66E-07	0.00E+00	0.000	0.00E+00	6.66E-07
		Part	1.00	3.00E-05	0.975	0	0	0.184	0.609	1	1	7.50E-07	0.816	0.072	0.000	6.66E-07	0.00E+00	0.000	0.00E+00	6.66E-07
		CRUD	1.00	0.1	0.975	0	0	0.184	0.609	1	1	2.50E-03	0.816	0.072	0.000	2.22E-03	0.00E+00	0.000	0.00E+00	2.22E-03
	13	Kr	1.00	1.0	0.000	1.0	0.000	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.999	5.00E-05	0.000	0.184	0.609	0.112	0.804	3.00E-08	0.816	0.072	0.022	2.73E-08	3.00E-05	0.196	5.87E-06	5.90E-06
		Ru	1.00	3.00E-05	0.975	3.00E-05	0.8	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		Part	1.00	3.00E-05	0.975	3.00E-05	0.8	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		CRUD	1.00	0.1	0.975	0.05	0.8	0.184	0.609	0.112	0.804	2.50E-03	0.816	0.072	0.022	2.27E-03	1.00E-03	0.196	1.96E-04	2.47E-03

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
6	14	Kr	0.25	1.0	0.000	1.0	0.0	0.460	0.609	0.280	0.201	2.50E-01	0.540	0.180	0.224	2.36E-01	7.50E-01	0.799	5.99E-01	8.35E-01
		Cs	0.25	3.00E-05	0.999	1.50E-04	0.0	0.460	0.609	0.280	0.201	7.50E-09	0.540	0.180	0.224	7.08E-09	1.20E-04	0.799	9.59E-05	9.59E-05
		Ru	0.25	3.00E-05	0.975	1.30E-04	0.0	0.460	0.609	0.280	0.201	1.88E-07	0.540	0.180	0.224	1.77E-07	1.05E-04	0.799	8.37E-05	8.39E-05
		Part	0.25	3.00E-05	0.975	3.00E-05	0.0	0.460	0.609	0.280	0.201	1.88E-07	0.540	0.180	0.224	1.77E-07	2.25E-05	0.799	1.80E-05	1.82E-05
		CRUD	1.00	0.1	0.975	0.05	0.0	0.460	0.609	0.280	0.201	2.50E-03	0.540	0.180	0.224	2.36E-03	5.00E-03	0.799	4.00E-03	6.35E-03
	15	Kr	0.59	1.0	0.000	1.0	0.0	0.274	0.609	0.167	0.304	5.90E-01	0.726	0.107	0.116	5.60E-01	4.10E-01	0.696	2.85E-01	8.45E-01
		Cs	0.59	3.00E-05	0.999	1.50E-04	0.0	0.274	0.609	0.167	0.304	1.77E-08	0.726	0.107	0.116	1.68E-08	7.92E-05	0.696	5.51E-05	5.51E-05
		Ru	0.59	3.00E-05	0.975	1.30E-04	0.0	0.274	0.609	0.167	0.304	4.43E-07	0.726	0.107	0.116	4.20E-07	7.06E-05	0.696	4.91E-05	4.95E-05
		Part	0.59	3.00E-05	0.975	3.00E-05	0.0	0.274	0.609	0.167	0.304	4.43E-07	0.726	0.107	0.116	4.20E-07	1.23E-05	0.696	8.56E-06	8.98E-06
		CRUD	1.00	0.1	0.975	0.05	0.0	0.274	0.609	0.167	0.304	2.50E-03	0.726	0.107	0.116	2.37E-03	5.00E-03	0.696	3.48E-03	5.85E-03
	16	Kr	1.00	1.0	0.000	1.0	0.0	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.999	1.50E-04	0.0	0.184	0.609	0.112	0.804	3.00E-08	0.816	0.072	0.022	2.73E-08	3.00E-05	0.196	5.87E-06	5.90E-06
		Ru	1.00	3.00E-05	0.975	1.30E-04	0.0	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	2.93E-05	0.196	5.73E-06	6.42E-06
		Part	1.00	3.00E-05	0.975	3.00E-05	0.0	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		CRUD	1.00	0.1	0.975	0.05	0.0	0.184	0.609	0.112	0.804	2.50E-03	0.816	0.072	0.022	2.27E-03	5.00E-03	0.196	9.80E-04	3.25E-03
	17	Kr	1.00	1.0	0.000	1.0	0.0	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.999	1.50E-04	0.0	0.184	0.609	0.112	0.804	3.00E-08	0.816	0.072	0.022	2.73E-08	3.00E-05	0.196	5.87E-06	5.90E-06
		Ru	1.00	3.00E-05	0.975	1.30E-04	0.0	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	2.93E-05	0.196	5.73E-06	6.42E-06
		Part	1.00	3.00E-05	0.975	3.00E-05	0.0	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		CRUD	1.00	0.1	0.975	0.05	0.0	0.184	0.609	0.112	0.804	2.50E-03	0.816	0.072	0.022	2.27E-03	5.00E-03	0.196	9.80E-04	3.25E-03
Fire-Only	18	Kr	0.00	1	0	1.0	0.0	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	1.00E+00	0.839	8.39E-01	8.39E-01
		Cs	0.00	1	0	2.00E-05	0.0	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	2.00E-05	0.839	1.68E-05	1.68E-05
		Ru	0.00	1	0	4.00E-07	0.8	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	8.00E-08	0.839	6.71E-08	6.71E-08
		Part	0.00	1	0	4.00E-07	0.8	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	8.00E-08	0.839	6.71E-08	6.71E-08
		CRUD	0.00	1	1	0.15	0.8	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	3.00E-03	0.839	2.52E-03	2.52E-03

D.2 PWR Rail Cask Release Fraction Spreadsheets

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
4	1	Kr	0.59	1.0	0.000	0	0	0.298	1	1	1	5.90E-01	0.702	0.000	0.000	4.14E-01	0.00E+00	0.000	0.00E+00	4.14E-01
		Cs	0.59	3.00E-05	0.999	0	0	0.298	1	1	1	1.77E-08	0.702	0.000	0.000	1.24E-08	0.00E+00	0.000	0.00E+00	1.24E-08
		Ru	0.59	3.00E-05	0.98	0	0	0.298	1	1	1	3.54E-07	0.702	0.000	0.000	2.49E-07	0.00E+00	0.000	0.00E+00	2.49E-07
		Part	0.59	3.00E-05	0.98	0	0	0.298	1	1	1	3.54E-07	0.702	0.000	0.000	2.49E-07	0.00E+00	0.000	0.00E+00	2.49E-07
		CRUD	1.00	0.1	0.98	0	0	0.298	1	1	1	2.00E-03	0.702	0.000	0.000	1.40E-03	0.00E+00	0.000	0.00E+00	1.40E-03
	2	Kr	1.00	1.0	0.000	0	0	0.2	1	1	1	1.00E+00	0.800	0.000	0.000	8.00E-01	0.00E+00	0.000	0.00E+00	8.00E-01
		Cs	1.00	3.00E-05	0.64	0	0	0.2	1	1	1	1.08E-05	0.800	0.000	0.000	8.64E-06	0.00E+00	0.000	0.00E+00	8.64E-06
		Ru	1.00	3.00E-05	0.45	0	0	0.2	1	1	1	1.65E-05	0.800	0.000	0.000	1.32E-05	0.00E+00	0.000	0.00E+00	1.32E-05
		Part	1.00	3.00E-05	0.45	0	0	0.2	1	1	1	1.65E-05	0.800	0.000	0.000	1.32E-05	0.00E+00	0.000	0.00E+00	1.32E-05
		CRUD	1.00	0.1	0.45	0	0	0.2	1	1	1	5.50E-02	0.800	0.000	0.000	4.40E-02	0.00E+00	0.000	0.00E+00	4.40E-02
	3	Kr	1.00	1.0	0.000	0	0	0.2	1	1	1	1.00E+00	0.800	0.000	0.000	8.00E-01	0.00E+00	0.000	0.00E+00	8.00E-01
		Cs	1.00	3.00E-05	0.26	0	0	0.2	1	1	1	2.22E-05	0.800	0.000	0.000	1.78E-05	0.00E+00	0.000	0.00E+00	1.78E-05
		Ru	1.00	3.00E-05	0.2	0	0	0.2	1	1	1	2.40E-05	0.800	0.000	0.000	1.92E-05	0.00E+00	0.000	0.00E+00	1.92E-05
		Part	1.00	3.00E-05	0.2	0	0	0.2	1	1	1	2.40E-05	0.800	0.000	0.000	1.92E-05	0.00E+00	0.000	0.00E+00	1.92E-05
		CRUD	1.00	0.1	0.2	0	0	0.2	1	1	1	8.00E-02	0.800	0.000	0.000	6.40E-02	0.00E+00	0.000	0.00E+00	6.40E-02
5	4	Kr	0.25	1.0	0.000	0	0	0.460	1	1	1	2.50E-01	0.540	0.000	0.000	1.35E-01	0.00E+00	0.000	0.00E+00	1.35E-01
		Cs	0.25	3.00E-05	0.999	0	0	0.460	1	1	1	7.50E-09	0.540	0.000	0.000	4.05E-09	0.00E+00	0.000	0.00E+00	4.05E-09
		Ru	0.25	3.00E-05	0.975	0	0	0.460	1	1	1	1.88E-07	0.540	0.000	0.000	1.01E-07	0.00E+00	0.000	0.00E+00	1.01E-07
		Part	0.25	3.00E-05	0.975	0	0	0.460	1	1	1	1.88E-07	0.540	0.000	0.000	1.01E-07	0.00E+00	0.000	0.00E+00	1.01E-07
		CRUD	1.00	0.1	0.975	0	0	0.460	1	1	1	2.50E-03	0.540	0.000	0.000	1.35E-03	0.00E+00	0.000	0.00E+00	1.35E-03
	5	Kr	0.25	1.0	0.000	0	0	0.460	0.609	1	1	2.50E-01	0.540	0.180	0.000	1.80E-01	0.00E+00	0.000	0.00E+00	1.80E-01
		Cs	0.25	3.00E-05	0.999	0	0	0.460	0.609	1	1	7.50E-09	0.540	0.180	0.000	5.40E-09	0.00E+00	0.000	0.00E+00	5.40E-09
		Ru	0.25	3.00E-05	0.975	0	0	0.460	0.609	1	1	1.88E-07	0.540	0.180	0.000	1.35E-07	0.00E+00	0.000	0.00E+00	1.35E-07
		Part	0.25	3.00E-05	0.975	0	0	0.460	0.609	1	1	1.88E-07	0.540	0.180	0.000	1.35E-07	0.00E+00	0.000	0.00E+00	1.35E-07
		CRUD	1.00	0.1	0.975	0	0	0.460	0.609	1	1	2.50E-03	0.540	0.180	0.000	1.80E-03	0.00E+00	0.000	0.00E+00	1.80E-03
	6	Kr	0.25	1.0	0.000	1.0	0.000	0.460	0.609	0.280	0.201	2.50E-01	0.540	0.180	0.224	2.36E-01	7.50E-01	0.799	5.99E-01	8.35E-01
		Cs	0.25	3.00E-05	0.999	5.00E-05	0.000	0.460	0.609	0.280	0.201	7.50E-09	0.540	0.180	0.224	7.08E-09	4.50E-05	0.799	3.59E-05	3.60E-05
		Ru	0.25	3.00E-05	0.975	3.00E-05	0.25	0.460	0.609	0.280	0.201	1.88E-07	0.540	0.180	0.224	1.77E-07	1.69E-05	0.799	1.35E-05	1.37E-05
		Part	0.25	3.00E-05	0.975	3.00E-05	0.25	0.460	0.609	0.280	0.201	1.88E-07	0.540	0.180	0.224	1.77E-07	1.69E-05	0.799	1.35E-05	1.37E-05
		CRUD	1.00	0.1	0.975	0.05	0.25	0.460	0.609	0.280	0.201	2.50E-03	0.540	0.180	0.224	2.36E-03	3.75E-03	0.799	3.00E-03	5.36E-03

	v30,v60	v60,v90	>v90
PWR fri	0.25	0.59	1.00

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
5	7	Kr	0.59	1.0	0.000	0	0	0.274	1	1	1	5.90E-01	0.726	0.000	0.000	4.28E-01	0.00E+00	0.000	0.00E+00	4.28E-01
		Cs	0.59	3.00E-05	0.999	0	0	0.274	1	1	1	1.77E-08	0.726	0.000	0.000	1.29E-08	0.00E+00	0.000	0.00E+00	1.29E-08
		Ru	0.59	3.00E-05	0.98	0	0	0.274	1	1	1	3.54E-07	0.726	0.000	0.000	2.57E-07	0.00E+00	0.000	0.00E+00	2.57E-07
		Part	0.59	3.00E-05	0.98	0	0	0.274	1	1	1	3.54E-07	0.726	0.000	0.000	2.57E-07	0.00E+00	0.000	0.00E+00	2.57E-07
		CRUD	1.00	0.1	0.98	0	0	0.274	1	1	1	2.00E-03	0.726	0.000	0.000	1.45E-03	0.00E+00	0.000	0.00E+00	1.45E-03
	8	Kr	0.59	1.0	0.000	0	0	0.274	0.609	1	1	5.90E-01	0.726	0.107	0.000	4.92E-01	0.00E+00	0.000	0.00E+00	4.92E-01
		Cs	0.59	3.00E-05	0.999	0	0	0.274	0.609	1	1	1.77E-08	0.726	0.107	0.000	1.47E-08	0.00E+00	0.000	0.00E+00	1.47E-08
		Ru	0.59	3.00E-05	0.98	0	0	0.274	0.609	1	1	3.54E-07	0.726	0.107	0.000	2.95E-07	0.00E+00	0.000	0.00E+00	2.95E-07
		Part	0.59	3.00E-05	0.98	0	0	0.274	0.609	1	1	3.54E-07	0.726	0.107	0.000	2.95E-07	0.00E+00	0.000	0.00E+00	2.95E-07
		CRUD	1.00	0.1	0.98	0	0	0.274	0.609	1	1	2.00E-03	0.726	0.107	0.000	1.67E-03	0.00E+00	0.000	0.00E+00	1.67E-03
	9	Kr	0.59	1.0	0.000	1.0	0.000	0.274	0.609	0.167	0.304	5.90E-01	0.726	0.107	0.116	5.60E-01	4.10E-01	0.696	2.85E-01	8.45E-01
		Cs	0.59	3.00E-05	0.999	5.00E-05	0.000	0.274	0.609	0.167	0.304	1.77E-08	0.726	0.107	0.116	1.68E-08	3.82E-05	0.696	2.66E-05	2.66E-05
		Ru	0.59	3.00E-05	0.98	3.00E-05	0.25	0.274	0.609	0.167	0.304	3.54E-07	0.726	0.107	0.116	3.36E-07	9.23E-06	0.696	6.42E-06	6.76E-06
		Part	0.59	3.00E-05	0.98	3.00E-05	0.25	0.274	0.609	0.167	0.304	3.54E-07	0.726	0.107	0.116	3.36E-07	9.23E-06	0.696	6.42E-06	6.76E-06
		CRUD	1.00	0.1	0.98	0.05	0.25	0.274	0.609	0.167	0.304	2.00E-03	0.726	0.107	0.116	1.90E-03	3.75E-03	0.696	2.61E-03	4.51E-03
	10	Kr	1.00	1.0	0.000	0	0	0.184	1	1	1	1.00E+00	0.816	0.000	0.000	8.16E-01	0.00E+00	0.000	0.00E+00	8.16E-01
		Cs	1.00	3.00E-05	0.64	0	0	0.184	1	1	1	1.08E-05	0.816	0.000	0.000	8.81E-06	0.00E+00	0.000	0.00E+00	8.81E-06
		Ru	1.00	3.00E-05	0.45	0	0	0.184	1	1	1	1.65E-05	0.816	0.000	0.000	1.35E-05	0.00E+00	0.000	0.00E+00	1.35E-05
		Part	1.00	3.00E-05	0.45	0	0	0.184	1	1	1	1.65E-05	0.816	0.000	0.000	1.35E-05	0.00E+00	0.000	0.00E+00	1.35E-05
		CRUD	1.00	0.1	0.45	0	0	0.184	1	1	1	5.50E-02	0.816	0.000	0.000	4.49E-02	0.00E+00	0.000	0.00E+00	4.49E-02
	11	Kr	1.00	1.0	0.000	0	0	0.184	0.609	1	1	1.00E+00	0.816	0.072	0.000	8.88E-01	0.00E+00	0.000	0.00E+00	8.88E-01
		Cs	1.00	3.00E-05	0.64	0	0	0.184	0.609	1	1	1.08E-05	0.816	0.072	0.000	9.59E-06	0.00E+00	0.000	0.00E+00	9.59E-06
		Ru	1.00	3.00E-05	0.45	0	0	0.184	0.609	1	1	1.65E-05	0.816	0.072	0.000	1.47E-05	0.00E+00	0.000	0.00E+00	1.47E-05
		Part	1.00	3.00E-05	0.45	0	0	0.184	0.609	1	1	1.65E-05	0.816	0.072	0.000	1.47E-05	0.00E+00	0.000	0.00E+00	1.47E-05
		CRUD	1.00	0.1	0.45	0	0	0.184	0.609	1	1	5.50E-02	0.816	0.072	0.000	4.88E-02	0.00E+00	0.000	0.00E+00	4.88E-02
	12	Kr	1.00	1.0	0.000	1.0	0.000	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.64	5.00E-05	0.000	0.184	0.609	0.112	0.804	1.08E-05	0.816	0.072	0.022	9.83E-06	1.92E-05	0.196	3.76E-06	1.36E-05
		Ru	1.00	3.00E-05	0.45	3.00E-05	0.25	0.184	0.609	0.112	0.804	1.65E-05	0.816	0.072	0.022	1.50E-05	0.00E+00	0.196	0.00E+00	1.50E-05
		Part	1.00	3.00E-05	0.45	3.00E-05	0.25	0.184	0.609	0.112	0.804	1.65E-05	0.816	0.072	0.022	1.50E-05	0.00E+00	0.196	0.00E+00	1.50E-05
		CRUD	1.00	0.1	0.45	0.05	0.25	0.184	0.609	0.112	0.804	5.50E-02	0.816	0.072	0.022	5.00E-02	3.75E-03	0.196	7.35E-04	5.08E-02

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
	13	Kr	1.00	1.0	0.000	0	0	0.184	1	1	1	1.00E+00	0.816	0.000	0.000	8.16E-01	0.00E+00	0.000	0.00E+00	8.16E-01
		Cs	1.00	3.00E-05	0.26	0	0	0.184	1	1	1	2.22E-05	0.816	0.000	0.000	1.81E-05	0.00E+00	0.000	0.00E+00	1.81E-05
		Ru	1.00	3.00E-05	0.2	0	0	0.184	1	1	1	2.40E-05	0.816	0.000	0.000	1.96E-05	0.00E+00	0.000	0.00E+00	1.96E-05
		Part	1.00	3.00E-05	0.2	0	0	0.184	1	1	1	2.40E-05	0.816	0.000	0.000	1.96E-05	0.00E+00	0.000	0.00E+00	1.96E-05
		CRUD	1.00	0.1	0.2	0	0	0.184	1	1	1	8.00E-02	0.816	0.000	0.000	6.53E-02	0.00E+00	0.000	0.00E+00	6.53E-02
	14	Kr	1.00	1.0	0.000	0	0	0.184	0.609	1	1	1.00E+00	0.816	0.072	0.000	8.88E-01	0.00E+00	0.000	0.00E+00	8.88E-01
		Cs	1.00	3.00E-05	0.26	0	0	0.184	0.609	1	1	2.22E-05	0.816	0.072	0.000	1.97E-05	0.00E+00	0.000	0.00E+00	1.97E-05
		Ru	1.00	3.00E-05	0.2	0	0	0.184	0.609	1	1	2.40E-05	0.816	0.072	0.000	2.13E-05	0.00E+00	0.000	0.00E+00	2.13E-05
		Part	1.00	3.00E-05	0.2	0	0	0.184	0.609	1	1	2.40E-05	0.816	0.072	0.000	2.13E-05	0.00E+00	0.000	0.00E+00	2.13E-05
		CRUD	1.00	0.1	0.2	0	0	0.184	0.609	1	1	8.00E-02	0.816	0.072	0.000	7.10E-02	0.00E+00	0.000	0.00E+00	7.10E-02
	15	Kr	1.00	1.0	0.000	1.0	0.000	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.26	5.00E-05	0.000	0.184	0.609	0.112	0.804	2.22E-05	0.816	0.072	0.022	2.02E-05	7.80E-06	0.196	1.53E-06	2.17E-05
		Ru	1.00	3.00E-05	0.2	3.00E-05	0.25	0.184	0.609	0.112	0.804	2.40E-05	0.816	0.072	0.022	2.18E-05	0.00E+00	0.196	0.00E+00	2.18E-05
		Part	1.00	3.00E-05	0.2	3.00E-05	0.25	0.184	0.609	0.112	0.804	2.40E-05	0.816	0.072	0.022	2.18E-05	0.00E+00	0.196	0.00E+00	2.18E-05
		CRUD	1.00	0.1	0.2	0.05	0.25	0.184	0.609	0.112	0.804	8.00E-02	0.816	0.072	0.022	7.28E-02	3.75E-03	0.196	7.35E-04	7.35E-02
6	16	Kr	0.25	1.0	0.000	1.0	0.0	0.460	0.609	0.280	0.201	2.50E-01	0.540	0.180	0.224	2.36E-01	7.50E-01	0.799	5.99E-01	8.35E-01
		Cs	0.25	3.00E-05	0.999	1.50E-04	0.0	0.460	0.609	0.280	0.201	7.50E-09	0.540	0.180	0.224	7.08E-09	1.20E-04	0.799	9.59E-05	9.59E-05
		Ru	0.25	3.00E-05	0.975	1.30E-04	0.0	0.460	0.609	0.280	0.201	1.88E-07	0.540	0.180	0.224	1.77E-07	1.05E-04	0.799	8.37E-05	8.39E-05
		Part	0.25	3.00E-05	0.975	3.00E-05	0.0	0.460	0.609	0.280	0.201	1.88E-07	0.540	0.180	0.224	1.77E-07	2.25E-05	0.799	1.80E-05	1.82E-05
		CRUD	1.00	0.1	0.975	0.05	0.0	0.460	0.609	0.280	0.201	2.50E-03	0.540	0.180	0.224	2.36E-03	5.00E-03	0.799	4.00E-03	6.35E-03
	17	Kr	0.59	1.0	0.000	1.0	0.0	0.274	0.609	0.167	0.304	5.90E-01	0.726	0.107	0.116	5.60E-01	4.10E-01	0.696	2.85E-01	8.45E-01
		Cs	0.59	3.00E-05	0.999	1.50E-04	0.0	0.274	0.609	0.167	0.304	1.77E-08	0.726	0.107	0.116	1.68E-08	7.92E-05	0.696	5.51E-05	5.51E-05
		Ru	0.59	3.00E-05	0.98	1.30E-04	0.0	0.274	0.609	0.167	0.304	3.54E-07	0.726	0.107	0.116	3.36E-07	7.06E-05	0.696	4.92E-05	4.95E-05
		Part	0.59	3.00E-05	0.98	3.00E-05	0.0	0.274	0.609	0.167	0.304	3.54E-07	0.726	0.107	0.116	3.36E-07	1.23E-05	0.696	8.56E-06	8.90E-06
		CRUD	1.00	0.1	0.98	0.05	0.0	0.274	0.609	0.167	0.304	2.00E-03	0.726	0.107	0.116	1.90E-03	5.00E-03	0.696	3.48E-03	5.38E-03
	18	Kr	1.00	1.0	0.000	1.0	0.0	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.64	1.50E-04	0.0	0.184	0.609	0.112	0.804	1.08E-05	0.816	0.072	0.022	9.83E-06	1.92E-05	0.196	3.76E-06	1.36E-05
		Ru	1.00	3.00E-05	0.45	1.30E-04	0.0	0.184	0.609	0.112	0.804	1.65E-05	0.816	0.072	0.022	1.50E-05	1.35E-05	0.196	2.65E-06	1.77E-05
		Part	1.00	3.00E-05	0.45	3.00E-05	0.0	0.184	0.609	0.112	0.804	1.65E-05	0.816	0.072	0.022	1.50E-05	0.00E+00	0.196	0.00E+00	1.50E-05
		CRUD	1.00	0.1	0.45	0.05	0.0	0.184	0.609	0.112	0.804	5.50E-02	0.816	0.072	0.022	5.00E-02	5.00E-03	0.196	9.80E-04	5.10E-02
	19	Kr	1.00	1.0	0.000	1.0	0.0	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.26	1.50E-04	0.0	0.184	0.609	0.112	0.804	2.22E-05	0.816	0.072	0.022	2.02E-05	7.80E-06	0.196	1.53E-06	2.17E-05
		Ru	1.00	3.00E-05	0.2	1.30E-04	0.0	0.184	0.609	0.112	0.804	2.40E-05	0.816	0.072	0.022	2.18E-05	6.00E-06	0.196	1.18E-06	2.30E-05
		Part	1.00	3.00E-05	0.2	3.00E-05	0.0	0.184	0.609	0.112	0.804	2.40E-05	0.816	0.072	0.022	2.18E-05	0.00E+00	0.196	0.00E+00	2.18E-05
		CRUD	1.00	0.1	0.2	0.05	0.0	0.184	0.609	0.112	0.804	8.00E-02	0.816	0.072	0.022	7.28E-02	5.00E-03	0.196	9.80E-04	7.38E-02
Fire-Only	20	Kr	0.00	1	0	1.0	0.0	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	1.00E+00	0.839	8.39E-01	8.39E-01
		Cs	0.00	1	0	2.00E-05	0.0	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	2.00E-05	0.839	1.68E-05	1.68E-05
		Ru	0.00	1	0	4.00E-07	0.25	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	3.00E-07	0.839	2.52E-07	2.52E-07
		Part	0.00	1	0	4.00E-07	0.25	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	3.00E-07	0.839	2.52E-07	2.52E-07
		CRUD	0.00	1	1	0.15	0.25	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	1.13E-02	0.839	9.44E-03	9.44E-03

D.3 BWR Truck Cask Release Fraction Spreadsheets

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
4	1	Kr	1.00	1.0	0.000	0	0	0.2	1	1	1	1.00E+00	0.800	0.000	0.000	8.00E-01	0.00E+00	0.000	0.00E+00	8.00E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.2	1	1	1	3.00E-08	0.800	0.000	0.000	2.40E-08	0.00E+00	0.000	0.00E+00	2.40E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.2	1	1	1	7.50E-07	0.800	0.000	0.000	6.00E-07	0.00E+00	0.000	0.00E+00	6.00E-07
		Part	1.00	3.00E-05	0.975	0	0	0.2	1	1	1	7.50E-07	0.800	0.000	0.000	6.00E-07	0.00E+00	0.000	0.00E+00	6.00E-07
		CRUD	1.00	0.1	0.975	0	0	0.2	1	1	1	2.50E-03	0.800	0.000	0.000	2.00E-03	0.00E+00	0.000	0.00E+00	2.00E-03
5	2	Kr	0.03	1.0	0.000	0	0	0.821	1	1	1	3.00E-02	0.179	0.000	0.000	5.37E-03	0.00E+00	0.000	0.00E+00	5.37E-03
		Cs	0.03	3.00E-05	0.999	0	0	0.821	1	1	1	9.00E-10	0.179	0.000	0.000	1.61E-10	0.00E+00	0.000	0.00E+00	1.61E-10
		Ru	0.03	3.00E-05	0.975	0	0	0.821	1	1	1	2.25E-08	0.179	0.000	0.000	4.03E-09	0.00E+00	0.000	0.00E+00	4.03E-09
		Part	0.03	3.00E-05	0.975	0	0	0.821	1	1	1	2.25E-08	0.179	0.000	0.000	4.03E-09	0.00E+00	0.000	0.00E+00	4.03E-09
		CRUD	1.00	0.1	0.975	0	0	0.821	1	1	1	2.50E-03	0.179	0.000	0.000	4.48E-04	0.00E+00	0.000	0.00E+00	4.48E-04
	3	Kr	0.03	1.0	0.000	0	0	0.821	0.609	1	1	3.00E-02	0.179	0.321	0.000	1.50E-02	0.00E+00	0.000	0.00E+00	1.50E-02
		Cs	0.03	3.00E-05	0.999	0	0	0.821	0.609	1	1	9.00E-10	0.179	0.321	0.000	4.50E-10	0.00E+00	0.000	0.00E+00	4.50E-10
		Ru	0.03	3.00E-05	0.975	0	0	0.821	0.609	1	1	2.25E-08	0.179	0.321	0.000	1.13E-08	0.00E+00	0.000	0.00E+00	1.13E-08
		Part	0.03	3.00E-05	0.975	0	0	0.821	0.609	1	1	2.25E-08	0.179	0.321	0.000	1.13E-08	0.00E+00	0.000	0.00E+00	1.13E-08
		CRUD	1.00	0.1	0.975	0	0	0.821	0.609	1	1	2.50E-03	0.179	0.321	0.000	1.25E-03	0.00E+00	0.000	0.00E+00	1.25E-03
	4	Kr	0.03	1.0	0.000	1.0	0.000	0.821	0.609	0.500	0.165	3.00E-02	0.179	0.321	0.418	2.75E-02	9.70E-01	0.835	8.10E-01	8.37E-01
		Cs	0.03	3.00E-05	0.999	5.00E-05	0.000	0.821	0.609	0.500	0.165	9.00E-10	0.179	0.321	0.418	8.26E-10	4.94E-05	0.835	4.12E-05	4.12E-05
		Ru	0.03	3.00E-05	0.975	3.00E-05	0.8	0.821	0.609	0.500	0.165	2.25E-08	0.179	0.321	0.418	2.06E-08	5.82E-06	0.835	4.86E-06	4.88E-06
		Part	0.03	3.00E-05	0.975	3.00E-05	0.8	0.821	0.609	0.500	0.165	2.25E-08	0.179	0.321	0.418	2.06E-08	5.82E-06	0.835	4.86E-06	4.88E-06
		CRUD	1.00	0.1	0.975	0.05	0.8	0.821	0.609	0.500	0.165	2.50E-03	0.179	0.321	0.418	2.29E-03	1.00E-03	0.835	8.35E-04	3.13E-03
	5	Kr	0.20	1.0	0.000	0	0	0.511	1	1	1	2.00E-01	0.489	0.000	0.000	9.78E-02	0.00E+00	0.000	0.00E+00	9.78E-02
		Cs	0.20	3.00E-05	0.999	0	0	0.511	1	1	1	6.00E-09	0.489	0.000	0.000	2.93E-09	0.00E+00	0.000	0.00E+00	2.93E-09
		Ru	0.20	3.00E-05	0.975	0	0	0.511	1	1	1	1.50E-07	0.489	0.000	0.000	7.34E-08	0.00E+00	0.000	0.00E+00	7.34E-08
		Part	0.20	3.00E-05	0.975	0	0	0.511	1	1	1	1.50E-07	0.489	0.000	0.000	7.34E-08	0.00E+00	0.000	0.00E+00	7.34E-08
		CRUD	1.00	0.1	0.975	0	0	0.511	1	1	1	2.50E-03	0.489	0.000	0.000	1.22E-03	0.00E+00	0.000	0.00E+00	1.22E-03
	6	Kr	0.20	1.0	0.000	0	0	0.511	0.609	1	1	2.00E-01	0.489	0.200	0.000	1.38E-01	0.00E+00	0.000	0.00E+00	1.38E-01
		Cs	0.20	3.00E-05	0.999	0	0	0.511	0.609	1	1	6.00E-09	0.489	0.200	0.000	4.13E-09	0.00E+00	0.000	0.00E+00	4.13E-09
		Ru	0.20	3.00E-05	0.975	0	0	0.511	0.609	1	1	1.50E-07	0.489	0.200	0.000	1.03E-07	0.00E+00	0.000	0.00E+00	1.03E-07
		Part	0.20	3.00E-05	0.975	0	0	0.511	0.609	1	1	1.50E-07	0.489	0.200	0.000	1.03E-07	0.00E+00	0.000	0.00E+00	1.03E-07
		CRUD	1.00	0.1	0.975	0	0	0.511	0.609	1	1	2.50E-03	0.489	0.200	0.000	1.72E-03	0.00E+00	0.000	0.00E+00	1.72E-03
	7	Kr	0.20	1.0	0.000	1.0	0.000	0.511	0.609	0.311	0.191	2.00E-01	0.489	0.200	0.252	1.88E-01	8.00E-01	0.809	6.47E-01	8.35E-01
		Cs	0.20	3.00E-05	0.999	5.00E-05	0.000	0.511	0.609	0.311	0.191	6.00E-09	0.489	0.200	0.252	5.64E-09	4.60E-05	0.809	3.72E-05	3.72E-05
		Ru	0.20	3.00E-05	0.975	3.00E-05	0.8	0.511	0.609	0.311	0.191	1.50E-07	0.489	0.200	0.252	1.41E-07	4.80E-06	0.809	3.88E-06	4.02E-06
		Part	0.20	3.00E-05	0.975	3.00E-05	0.8	0.511	0.609	0.311	0.191	1.50E-07	0.489	0.200	0.252	1.41E-07	4.80E-06	0.809	3.88E-06	4.02E-06
		CRUD	1.00	0.1	0.975	0.05	0.8	0.511	0.609	0.311	0.191	2.50E-03	0.489	0.200	0.252	2.35E-03	1.00E-03	0.809	8.09E-04	3.16E-03

	v30,v60	v60,v90	>v90
BWR fri	0.03	0.20	1.00

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
5	8	Kr	1.00	1.0	0.000	0	0	0.184	1	1	1	1.00E+00	0.816	0.000	0.000	8.16E-01	0.00E+00	0.000	0.00E+00	8.16E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.184	1	1	1	3.00E-08	0.816	0.000	0.000	2.45E-08	0.00E+00	0.000	0.00E+00	2.45E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.184	1	1	1	7.50E-07	0.816	0.000	0.000	6.12E-07	0.00E+00	0.000	0.00E+00	6.12E-07
		Part	1.00	3.00E-05	0.975	0	0	0.184	1	1	1	7.50E-07	0.816	0.000	0.000	6.12E-07	0.00E+00	0.000	0.00E+00	6.12E-07
		CRUD	1.00	0.1	0.975	0	0	0.184	1	1	1	2.50E-03	0.816	0.000	0.000	2.04E-03	0.00E+00	0.000	0.00E+00	2.04E-03
	9	Kr	1.00	1.0	0.000	0	0	0.184	0.609	1	1	1.00E+00	0.816	0.072	0.000	8.88E-01	0.00E+00	0.000	0.00E+00	8.88E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.184	0.609	1	1	3.00E-08	0.816	0.072	0.000	2.66E-08	0.00E+00	0.000	0.00E+00	2.66E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.184	0.609	1	1	7.50E-07	0.816	0.072	0.000	6.66E-07	0.00E+00	0.000	0.00E+00	6.66E-07
		Part	1.00	3.00E-05	0.975	0	0	0.184	0.609	1	1	7.50E-07	0.816	0.072	0.000	6.66E-07	0.00E+00	0.000	0.00E+00	6.66E-07
		CRUD	1.00	0.1	0.975	0	0	0.184	0.609	1	1	2.50E-03	0.816	0.072	0.000	2.22E-03	0.00E+00	0.000	0.00E+00	2.22E-03
	10	Kr	1.00	1.0	0.000	1.0	0.000	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.999	5.00E-05	0.000	0.184	0.609	0.112	0.804	3.00E-08	0.816	0.072	0.022	2.73E-08	3.00E-05	0.196	5.87E-06	5.90E-06
		Ru	1.00	3.00E-05	0.975	3.00E-05	0.8	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		Part	1.00	3.00E-05	0.975	3.00E-05	0.8	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		CRUD	1.00	0.1	0.975	0.05	0.8	0.184	0.609	0.112	0.804	2.50E-03	0.816	0.072	0.022	2.27E-03	1.00E-03	0.196	1.96E-04	2.47E-03
	11	Kr	1.00	1.0	0.000	0	0	0.184	1	1	1	1.00E+00	0.816	0.000	0.000	8.16E-01	0.00E+00	0.000	0.00E+00	8.16E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.184	1	1	1	3.00E-08	0.816	0.000	0.000	2.45E-08	0.00E+00	0.000	0.00E+00	2.45E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.184	1	1	1	7.50E-07	0.816	0.000	0.000	6.12E-07	0.00E+00	0.000	0.00E+00	6.12E-07
		Part	1.00	3.00E-05	0.975	0	0	0.184	1	1	1	7.50E-07	0.816	0.000	0.000	6.12E-07	0.00E+00	0.000	0.00E+00	6.12E-07
		CRUD	1.00	0.1	0.975	0	0	0.184	1	1	1	2.50E-03	0.816	0.000	0.000	2.04E-03	0.00E+00	0.000	0.00E+00	2.04E-03
	12	Kr	1.00	1.0	0.000	0	0	0.184	0.609	1	1	1.00E+00	0.816	0.072	0.000	8.88E-01	0.00E+00	0.000	0.00E+00	8.88E-01
		Cs	1.00	3.00E-05	0.999	0	0	0.184	0.609	1	1	3.00E-08	0.816	0.072	0.000	2.66E-08	0.00E+00	0.000	0.00E+00	2.66E-08
		Ru	1.00	3.00E-05	0.975	0	0	0.184	0.609	1	1	7.50E-07	0.816	0.072	0.000	6.66E-07	0.00E+00	0.000	0.00E+00	6.66E-07
		Part	1.00	3.00E-05	0.975	0	0	0.184	0.609	1	1	7.50E-07	0.816	0.072	0.000	6.66E-07	0.00E+00	0.000	0.00E+00	6.66E-07
		CRUD	1.00	0.1	0.975	0	0	0.184	0.609	1	1	2.50E-03	0.816	0.072	0.000	2.22E-03	0.00E+00	0.000	0.00E+00	2.22E-03
	13	Kr	1.00	1.0	0.000	1.0	0.000	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.999	5.00E-05	0.000	0.184	0.609	0.112	0.804	3.00E-08	0.816	0.072	0.022	2.73E-08	3.00E-05	0.196	5.87E-06	5.90E-06
		Ru	1.00	3.00E-05	0.975	3.00E-05	0.8	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		Part	1.00	3.00E-05	0.975	3.00E-05	0.8	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		CRUD	1.00	0.1	0.975	0.05	0.8	0.184	0.609	0.112	0.804	2.50E-03	0.816	0.072	0.022	2.27E-03	1.00E-03	0.196	1.96E-04	2.47E-03

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
6	14	Kr	0.03	1.0	0.000	1.0	0.0	0.821	0.609	0.500	0.165	3.00E-02	0.179	0.321	0.418	2.75E-02	9.70E-01	0.835	8.10E-01	8.37E-01
		Cs	0.03	3.00E-05	0.999	1.50E-04	0.0	0.821	0.609	0.500	0.165	9.00E-10	0.179	0.321	0.418	8.26E-10	1.46E-04	0.835	1.22E-04	1.22E-04
		Ru	0.03	3.00E-05	0.975	1.30E-04	0.0	0.821	0.609	0.500	0.165	2.25E-08	0.179	0.321	0.418	2.06E-08	1.27E-04	0.835	1.06E-04	1.06E-04
		Part	0.03	3.00E-05	0.975	3.00E-05	0.0	0.821	0.609	0.500	0.165	2.25E-08	0.179	0.321	0.418	2.06E-08	2.91E-05	0.835	2.43E-05	2.43E-05
		CRUD	1.00	0.1	0.975	0.05	0.0	0.821	0.609	0.500	0.165	2.50E-03	0.179	0.321	0.418	2.29E-03	5.00E-03	0.835	4.18E-03	6.47E-03
	15	Kr	0.20	1.0	0.000	1.0	0.0	0.511	0.609	0.311	0.191	2.00E-01	0.489	0.200	0.252	1.88E-01	8.00E-01	0.809	6.47E-01	8.35E-01
		Cs	0.20	3.00E-05	0.999	1.50E-04	0.0	0.511	0.609	0.311	0.191	6.00E-09	0.489	0.200	0.252	5.64E-09	1.26E-04	0.809	1.02E-04	1.02E-04
		Ru	0.20	3.00E-05	0.975	1.30E-04	0.0	0.511	0.609	0.311	0.191	1.50E-07	0.489	0.200	0.252	1.41E-07	1.10E-04	0.809	8.89E-05	8.90E-05
		Part	0.20	3.00E-05	0.975	3.00E-05	0.0	0.511	0.609	0.311	0.191	1.50E-07	0.489	0.200	0.252	1.41E-07	2.40E-05	0.809	1.94E-05	1.96E-05
		CRUD	1.00	0.1	0.975	0.05	0.0	0.511	0.609	0.311	0.191	2.50E-03	0.489	0.200	0.252	2.35E-03	5.00E-03	0.809	4.05E-03	6.40E-03
	16	Kr	1.00	1.0	0.000	1.0	0.0	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.999	1.50E-04	0.0	0.184	0.609	0.112	0.804	3.00E-08	0.816	0.072	0.022	2.73E-08	3.00E-05	0.196	5.87E-06	5.90E-06
		Ru	1.00	3.00E-05	0.975	1.30E-04	0.0	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	2.93E-05	0.196	5.73E-06	6.42E-06
		Part	1.00	3.00E-05	0.975	3.00E-05	0.0	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		CRUD	1.00	0.1	0.975	0.05	0.0	0.184	0.609	0.112	0.804	2.50E-03	0.816	0.072	0.022	2.27E-03	5.00E-03	0.196	9.80E-04	3.25E-03
	17	Kr	1.00	1.0	0.000	1.0	0.0	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.999	1.50E-04	0.0	0.184	0.609	0.112	0.804	3.00E-08	0.816	0.072	0.022	2.73E-08	3.00E-05	0.196	5.87E-06	5.90E-06
		Ru	1.00	3.00E-05	0.975	1.30E-04	0.0	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	2.93E-05	0.196	5.73E-06	6.42E-06
		Part	1.00	3.00E-05	0.975	3.00E-05	0.0	0.184	0.609	0.112	0.804	7.50E-07	0.816	0.072	0.022	6.82E-07	0.00E+00	0.196	0.00E+00	6.82E-07
		CRUD	1.00	0.1	0.975	0.05	0.0	0.184	0.609	0.112	0.804	2.50E-03	0.816	0.072	0.022	2.27E-03	5.00E-03	0.196	9.80E-04	3.25E-03
Fire-Only	18	Kr	0.00	1	0	1.0	0.0	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	1.00E+00	0.839	8.39E-01	8.39E-01
		Cs	0.00	1	0	2.00E-05	0.0	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	2.00E-05	0.839	1.68E-05	1.68E-05
		Ru	0.00	1	0	4.00E-07	0.8	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	8.00E-08	0.839	6.71E-08	6.71E-08
		Part	0.00	1	0	4.00E-07	0.8	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	8.00E-08	0.839	6.71E-08	6.71E-08
		CRUD	0.00	1	1	0.15	0.8	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	3.00E-03	0.839	2.52E-03	2.52E-03

D.4 BWR Rail Cask Release Fraction Spreadsheets

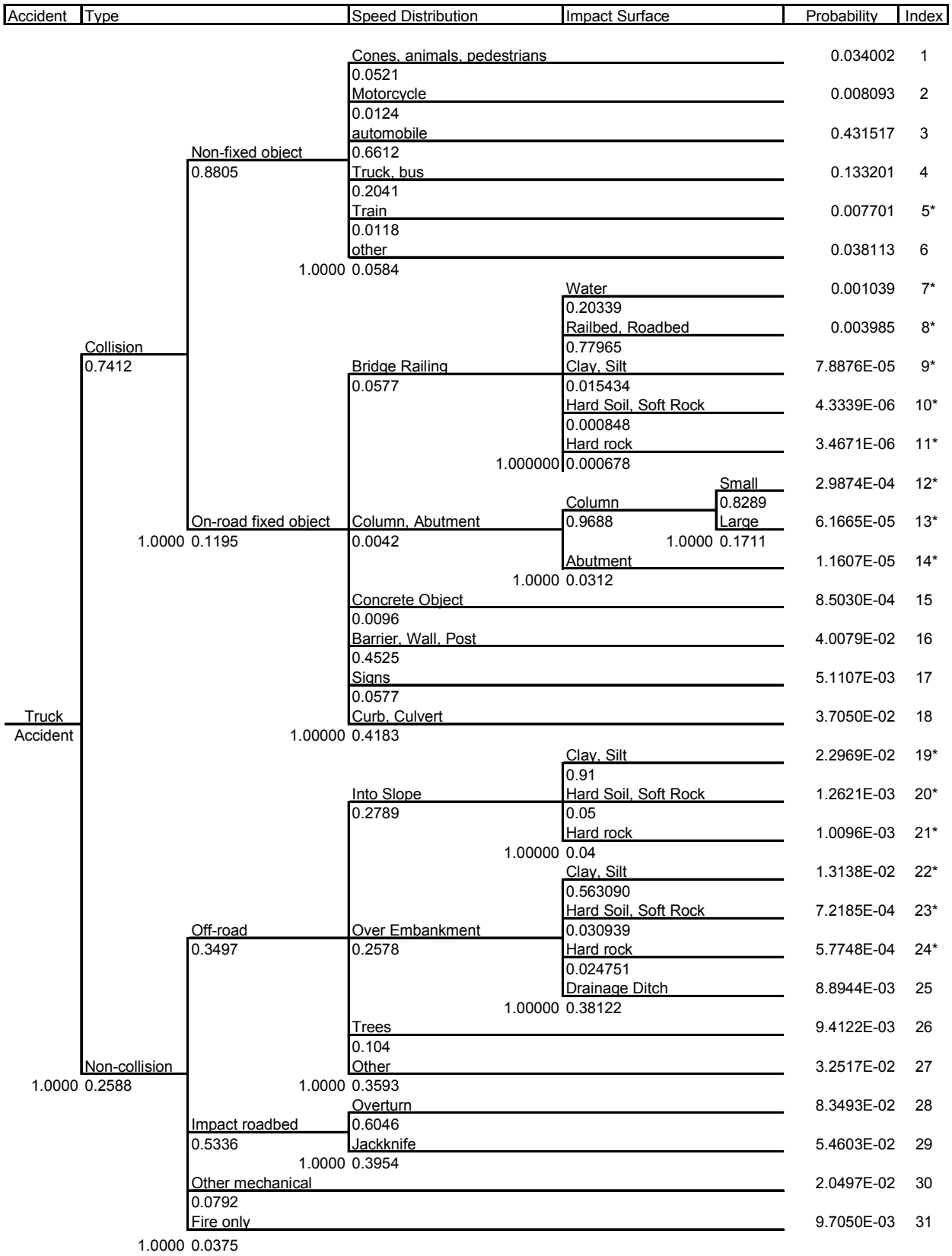
Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
4	1	Kr	0.20	1.0	0.000	0	0	0.556	1	1	1	2.00E-01	0.444	0.000	0.000	8.88E-02	0.00E+00	0.000	0.00E+00	8.88E-02
		Cs	0.20	3.00E-05	0.999	0	0	0.556	1	1	1	6.00E-09	0.444	0.000	0.000	2.66E-09	0.00E+00	0.000	0.00E+00	2.66E-09
		Ru	0.20	3.00E-05	0.98	0	0	0.556	1	1	1	1.20E-07	0.444	0.000	0.000	5.33E-08	0.00E+00	0.000	0.00E+00	5.33E-08
		Part	0.20	3.00E-05	0.98	0	0	0.556	1	1	1	1.20E-07	0.444	0.000	0.000	5.33E-08	0.00E+00	0.000	0.00E+00	5.33E-08
		CRUD	1.00	0.1	0.98	0	0	0.556	1	1	1	2.00E-03	0.444	0.000	0.000	8.88E-04	0.00E+00	0.000	0.00E+00	8.88E-04
	2	Kr	1.00	1.0	0.000	0	0	0.2	1	1	1	1.00E+00	0.800	0.000	0.000	8.00E-01	0.00E+00	0.000	0.00E+00	8.00E-01
		Cs	1.00	3.00E-05	0.64	0	0	0.2	1	1	1	1.08E-05	0.800	0.000	0.000	8.64E-06	0.00E+00	0.000	0.00E+00	8.64E-06
		Ru	1.00	3.00E-05	0.45	0	0	0.2	1	1	1	1.65E-05	0.800	0.000	0.000	1.32E-05	0.00E+00	0.000	0.00E+00	1.32E-05
		Part	1.00	3.00E-05	0.45	0	0	0.2	1	1	1	1.65E-05	0.800	0.000	0.000	1.32E-05	0.00E+00	0.000	0.00E+00	1.32E-05
		CRUD	1.00	0.1	0.45	0	0	0.2	1	1	1	5.50E-02	0.800	0.000	0.000	4.40E-02	0.00E+00	0.000	0.00E+00	4.40E-02
	3	Kr	1.00	1.0	0.000	0	0	0.2	1	1	1	1.00E+00	0.800	0.000	0.000	8.00E-01	0.00E+00	0.000	0.00E+00	8.00E-01
		Cs	1.00	3.00E-05	0.26	0	0	0.2	1	1	1	2.22E-05	0.800	0.000	0.000	1.78E-05	0.00E+00	0.000	0.00E+00	1.78E-05
		Ru	1.00	3.00E-05	0.2	0	0	0.2	1	1	1	2.40E-05	0.800	0.000	0.000	1.92E-05	0.00E+00	0.000	0.00E+00	1.92E-05
		Part	1.00	3.00E-05	0.2	0	0	0.2	1	1	1	2.40E-05	0.800	0.000	0.000	1.92E-05	0.00E+00	0.000	0.00E+00	1.92E-05
		CRUD	1.00	0.1	0.2	0	0	0.2	1	1	1	8.00E-02	0.800	0.000	0.000	6.40E-02	0.00E+00	0.000	0.00E+00	6.40E-02
5	4	Kr	0.03	1.0	0.000	0	0	0.821	1	1	1	3.00E-02	0.179	0.000	0.000	5.37E-03	0.00E+00	0.000	0.00E+00	5.37E-03
		Cs	0.03	3.00E-05	0.999	0	0	0.821	1	1	1	9.00E-10	0.179	0.000	0.000	1.61E-10	0.00E+00	0.000	0.00E+00	1.61E-10
		Ru	0.03	3.00E-05	0.975	0	0	0.821	1	1	1	2.25E-08	0.179	0.000	0.000	4.03E-09	0.00E+00	0.000	0.00E+00	4.03E-09
		Part	0.03	3.00E-05	0.975	0	0	0.821	1	1	1	2.25E-08	0.179	0.000	0.000	4.03E-09	0.00E+00	0.000	0.00E+00	4.03E-09
		CRUD	1.00	0.1	0.975	0	0	0.821	1	1	1	2.50E-03	0.179	0.000	0.000	4.48E-04	0.00E+00	0.000	0.00E+00	4.48E-04
	5	Kr	0.03	1.0	0.000	0	0	0.821	0.609	1	1	3.00E-02	0.179	0.321	0.000	1.50E-02	0.00E+00	0.000	0.00E+00	1.50E-02
		Cs	0.03	3.00E-05	0.999	0	0	0.821	0.609	1	1	9.00E-10	0.179	0.321	0.000	4.50E-10	0.00E+00	0.000	0.00E+00	4.50E-10
		Ru	0.03	3.00E-05	0.975	0	0	0.821	0.609	1	1	2.25E-08	0.179	0.321	0.000	1.13E-08	0.00E+00	0.000	0.00E+00	1.13E-08
		Part	0.03	3.00E-05	0.975	0	0	0.821	0.609	1	1	2.25E-08	0.179	0.321	0.000	1.13E-08	0.00E+00	0.000	0.00E+00	1.13E-08
		CRUD	1.00	0.1	0.975	0	0	0.821	0.609	1	1	2.50E-03	0.179	0.321	0.000	1.25E-03	0.00E+00	0.000	0.00E+00	1.25E-03
	6	Kr	0.03	1.0	0.000	1.0	0.000	0.821	0.609	0.500	0.165	3.00E-02	0.179	0.321	0.418	2.75E-02	9.70E-01	0.835	8.10E-01	8.37E-01
		Cs	0.03	3.00E-05	0.999	5.00E-05	0.000	0.821	0.609	0.500	0.165	9.00E-10	0.179	0.321	0.418	8.26E-10	4.94E-05	0.835	4.12E-05	4.12E-05
		Ru	0.03	3.00E-05	0.975	3.00E-05	0.25	0.821	0.609	0.500	0.165	2.25E-08	0.179	0.321	0.418	2.06E-08	2.18E-05	0.835	1.82E-05	1.82E-05
		Part	0.03	3.00E-05	0.975	3.00E-05	0.25	0.821	0.609	0.500	0.165	2.25E-08	0.179	0.321	0.418	2.06E-08	2.18E-05	0.835	1.82E-05	1.82E-05
		CRUD	1.00	0.1	0.975	0.05	0.25	0.821	0.609	0.500	0.165	2.50E-03	0.179	0.321	0.418	2.29E-03	3.75E-03	0.835	3.13E-03	5.43E-03

	v30,v60	v60,v90	>v90
BWR fri	0.03	0.20	1.00

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
5	7	Kr	0.20	1.0	0.000	0	0	0.511	1	1	1	2.00E-01	0.489	0.000	0.000	9.78E-02	0.00E+00	0.000	0.00E+00	9.78E-02
		Cs	0.20	3.00E-05	0.999	0	0	0.511	1	1	1	6.00E-09	0.489	0.000	0.000	2.93E-09	0.00E+00	0.000	0.00E+00	2.93E-09
		Ru	0.20	3.00E-05	0.98	0	0	0.511	1	1	1	1.20E-07	0.489	0.000	0.000	5.87E-08	0.00E+00	0.000	0.00E+00	5.87E-08
		Part	0.20	3.00E-05	0.98	0	0	0.511	1	1	1	1.20E-07	0.489	0.000	0.000	5.87E-08	0.00E+00	0.000	0.00E+00	5.87E-08
		CRUD	1.00	0.1	0.98	0	0	0.511	1	1	1	2.00E-03	0.489	0.000	0.000	9.78E-04	0.00E+00	0.000	0.00E+00	9.78E-04
	8	Kr	0.20	1.0	0.000	0	0	0.511	0.609	1	1	2.00E-01	0.489	0.200	0.000	1.38E-01	0.00E+00	0.000	0.00E+00	1.38E-01
		Cs	0.20	3.00E-05	0.999	0	0	0.511	0.609	1	1	6.00E-09	0.489	0.200	0.000	4.13E-09	0.00E+00	0.000	0.00E+00	4.13E-09
		Ru	0.20	3.00E-05	0.98	0	0	0.511	0.609	1	1	1.20E-07	0.489	0.200	0.000	8.27E-08	0.00E+00	0.000	0.00E+00	8.27E-08
		Part	0.20	3.00E-05	0.98	0	0	0.511	0.609	1	1	1.20E-07	0.489	0.200	0.000	8.27E-08	0.00E+00	0.000	0.00E+00	8.27E-08
		CRUD	1.00	0.1	0.98	0	0	0.511	0.609	1	1	2.00E-03	0.489	0.200	0.000	1.38E-03	0.00E+00	0.000	0.00E+00	1.38E-03
	9	Kr	0.20	1.0	0.000	1.0	0.000	0.511	0.609	0.311	0.191	2.00E-01	0.489	0.200	0.252	1.88E-01	8.00E-01	0.809	6.47E-01	8.35E-01
		Cs	0.20	3.00E-05	0.999	5.00E-05	0.000	0.511	0.609	0.311	0.191	6.00E-09	0.489	0.200	0.252	5.64E-09	4.60E-05	0.809	3.72E-05	3.72E-05
		Ru	0.20	3.00E-05	0.98	3.00E-05	0.25	0.511	0.609	0.311	0.191	1.20E-07	0.489	0.200	0.252	1.13E-07	1.80E-05	0.809	1.46E-05	1.47E-05
		Part	0.20	3.00E-05	0.98	3.00E-05	0.25	0.511	0.609	0.311	0.191	1.20E-07	0.489	0.200	0.252	1.13E-07	1.80E-05	0.809	1.46E-05	1.47E-05
		CRUD	1.00	0.1	0.98	0.05	0.25	0.511	0.609	0.311	0.191	2.00E-03	0.489	0.200	0.252	1.88E-03	3.75E-03	0.809	3.03E-03	4.91E-03
	10	Kr	1.00	1.0	0.000	0	0	0.184	1	1	1	1.00E+00	0.816	0.000	0.000	8.16E-01	0.00E+00	0.000	0.00E+00	8.16E-01
		Cs	1.00	3.00E-05	0.64	0	0	0.184	1	1	1	1.08E-05	0.816	0.000	0.000	8.81E-06	0.00E+00	0.000	0.00E+00	8.81E-06
		Ru	1.00	3.00E-05	0.45	0	0	0.184	1	1	1	1.65E-05	0.816	0.000	0.000	1.35E-05	0.00E+00	0.000	0.00E+00	1.35E-05
		Part	1.00	3.00E-05	0.45	0	0	0.184	1	1	1	1.65E-05	0.816	0.000	0.000	1.35E-05	0.00E+00	0.000	0.00E+00	1.35E-05
		CRUD	1.00	0.1	0.45	0	0	0.184	1	1	1	5.50E-02	0.816	0.000	0.000	4.49E-02	0.00E+00	0.000	0.00E+00	4.49E-02
	11	Kr	1.00	1.0	0.000	0	0	0.184	0.609	1	1	1.00E+00	0.816	0.072	0.000	8.88E-01	0.00E+00	0.000	0.00E+00	8.88E-01
		Cs	1.00	3.00E-05	0.64	0	0	0.184	0.609	1	1	1.08E-05	0.816	0.072	0.000	9.59E-06	0.00E+00	0.000	0.00E+00	9.59E-06
		Ru	1.00	3.00E-05	0.45	0	0	0.184	0.609	1	1	1.65E-05	0.816	0.072	0.000	1.47E-05	0.00E+00	0.000	0.00E+00	1.47E-05
		Part	1.00	3.00E-05	0.45	0	0	0.184	0.609	1	1	1.65E-05	0.816	0.072	0.000	1.47E-05	0.00E+00	0.000	0.00E+00	1.47E-05
		CRUD	1.00	0.1	0.45	0	0	0.184	0.609	1	1	5.50E-02	0.816	0.072	0.000	4.88E-02	0.00E+00	0.000	0.00E+00	4.88E-02
	12	Kr	1.00	1.0	0.000	1.0	0.000	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.64	5.00E-05	0.000	0.184	0.609	0.112	0.804	1.08E-05	0.816	0.072	0.022	9.83E-06	1.92E-05	0.196	3.76E-06	1.36E-05
		Ru	1.00	3.00E-05	0.45	3.00E-05	0.25	0.184	0.609	0.112	0.804	1.65E-05	0.816	0.072	0.022	1.50E-05	0.00E+00	0.196	0.00E+00	1.50E-05
		Part	1.00	3.00E-05	0.45	3.00E-05	0.25	0.184	0.609	0.112	0.804	1.65E-05	0.816	0.072	0.022	1.50E-05	0.00E+00	0.196	0.00E+00	1.50E-05
		CRUD	1.00	0.1	0.45	0.05	0.25	0.184	0.609	0.112	0.804	5.50E-02	0.816	0.072	0.022	5.00E-02	3.75E-03	0.196	7.35E-04	5.08E-02

Column	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Formula												DE(1-F)	1-I	I(1-J)	K(1-L)	M(N+O+P)	(1-D)G(1-H)	1-L	RS	Q+T
Category	Case	Class	fri	fRCi	fdi	fRCf	fdf	fe1	fe2	fe3	fe4	C1	1-fe1	fe1(1-fe2)	fe3(1-fe4)	T1	C2	1-fe4	T2	frel
	13	Kr	1.00	1.0	0.000	0	0	0.184	1	1	1	1.00E+00	0.816	0.000	0.000	8.16E-01	0.00E+00	0.000	0.00E+00	8.16E-01
		Cs	1.00	3.00E-05	0.26	0	0	0.184	1	1	1	2.22E-05	0.816	0.000	0.000	1.81E-05	0.00E+00	0.000	0.00E+00	1.81E-05
		Ru	1.00	3.00E-05	0.2	0	0	0.184	1	1	1	2.40E-05	0.816	0.000	0.000	1.96E-05	0.00E+00	0.000	0.00E+00	1.96E-05
		Part	1.00	3.00E-05	0.2	0	0	0.184	1	1	1	2.40E-05	0.816	0.000	0.000	1.96E-05	0.00E+00	0.000	0.00E+00	1.96E-05
		CRUD	1.00	0.1	0.2	0	0	0.184	1	1	1	8.00E-02	0.816	0.000	0.000	6.53E-02	0.00E+00	0.000	0.00E+00	6.53E-02
	14	Kr	1.00	1.0	0.000	0	0	0.184	0.609	1	1	1.00E+00	0.816	0.072	0.000	8.88E-01	0.00E+00	0.000	0.00E+00	8.88E-01
		Cs	1.00	3.00E-05	0.26	0	0	0.184	0.609	1	1	2.22E-05	0.816	0.072	0.000	1.97E-05	0.00E+00	0.000	0.00E+00	1.97E-05
		Ru	1.00	3.00E-05	0.2	0	0	0.184	0.609	1	1	2.40E-05	0.816	0.072	0.000	2.13E-05	0.00E+00	0.000	0.00E+00	2.13E-05
		Part	1.00	3.00E-05	0.2	0	0	0.184	0.609	1	1	2.40E-05	0.816	0.072	0.000	2.13E-05	0.00E+00	0.000	0.00E+00	2.13E-05
		CRUD	1.00	0.1	0.2	0	0	0.184	0.609	1	1	8.00E-02	0.816	0.072	0.000	7.10E-02	0.00E+00	0.000	0.00E+00	7.10E-02
	15	Kr	1.00	1.0	0.000	1.0	0.000	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.26	5.00E-05	0.000	0.184	0.609	0.112	0.804	2.22E-05	0.816	0.072	0.022	2.02E-05	7.80E-06	0.196	1.53E-06	2.17E-05
		Ru	1.00	3.00E-05	0.2	3.00E-05	0.25	0.184	0.609	0.112	0.804	2.40E-05	0.816	0.072	0.022	2.18E-05	0.00E+00	0.196	0.00E+00	2.18E-05
		Part	1.00	3.00E-05	0.2	3.00E-05	0.25	0.184	0.609	0.112	0.804	2.40E-05	0.816	0.072	0.022	2.18E-05	0.00E+00	0.196	0.00E+00	2.18E-05
		CRUD	1.00	0.1	0.2	0.05	0.25	0.184	0.609	0.112	0.804	8.00E-02	0.816	0.072	0.022	7.28E-02	3.75E-03	0.196	7.35E-04	7.35E-02
6	16	Kr	0.03	1.0	0.000	1.0	0.0	0.821	0.609	0.500	0.165	3.00E-02	0.179	0.321	0.418	2.75E-02	9.70E-01	0.835	8.10E-01	8.37E-01
		Cs	0.03	3.00E-05	0.999	1.50E-04	0.0	0.821	0.609	0.500	0.165	9.00E-10	0.179	0.321	0.418	8.26E-10	1.46E-04	0.835	1.22E-04	1.22E-04
		Ru	0.03	3.00E-05	0.975	1.30E-04	0.0	0.821	0.609	0.500	0.165	2.25E-08	0.179	0.321	0.418	2.06E-08	1.27E-04	0.835	1.06E-04	1.06E-04
		Part	0.03	3.00E-05	0.975	3.00E-05	0.0	0.821	0.609	0.500	0.165	2.25E-08	0.179	0.321	0.418	2.06E-08	2.91E-05	0.835	2.43E-05	2.43E-05
		CRUD	1.00	0.1	0.975	0.05	0.0	0.821	0.609	0.500	0.165	2.50E-03	0.179	0.321	0.418	2.29E-03	5.00E-03	0.835	4.18E-03	6.47E-03
	17	Kr	0.20	1.0	0.000	1.0	0.0	0.511	0.609	0.311	0.191	2.00E-01	0.489	0.200	0.252	1.88E-01	8.00E-01	0.809	6.47E-01	8.35E-01
		Cs	0.20	3.00E-05	0.999	1.50E-04	0.0	0.511	0.609	0.311	0.191	6.00E-09	0.489	0.200	0.252	5.64E-09	1.26E-04	0.809	1.02E-04	1.02E-04
		Ru	0.20	3.00E-05	0.98	1.30E-04	0.0	0.511	0.609	0.311	0.191	1.20E-07	0.489	0.200	0.252	1.13E-07	1.10E-04	0.809	8.89E-05	8.90E-05
		Part	0.20	3.00E-05	0.98	3.00E-05	0.0	0.511	0.609	0.311	0.191	1.20E-07	0.489	0.200	0.252	1.13E-07	2.40E-05	0.809	1.94E-05	1.95E-05
		CRUD	1.00	0.1	0.98	0.05	0.0	0.511	0.609	0.311	0.191	2.00E-03	0.489	0.200	0.252	1.88E-03	5.00E-03	0.809	4.05E-03	5.93E-03
	18	Kr	1.00	1.0	0.000	1.0	0.0	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.64	1.50E-04	0.0	0.184	0.609	0.112	0.804	1.08E-05	0.816	0.072	0.022	9.83E-06	1.92E-05	0.196	3.76E-06	1.36E-05
		Ru	1.00	3.00E-05	0.45	1.30E-04	0.0	0.184	0.609	0.112	0.804	1.65E-05	0.816	0.072	0.022	1.50E-05	1.35E-05	0.196	2.65E-06	1.77E-05
		Part	1.00	3.00E-05	0.45	3.00E-05	0.0	0.184	0.609	0.112	0.804	1.65E-05	0.816	0.072	0.022	1.50E-05	0.00E+00	0.196	0.00E+00	1.50E-05
		CRUD	1.00	0.1	0.45	0.05	0.0	0.184	0.609	0.112	0.804	5.50E-02	0.816	0.072	0.022	5.00E-02	5.00E-03	0.196	9.80E-04	5.10E-02
	19	Kr	1.00	1.0	0.000	1.0	0.0	0.184	0.609	0.112	0.804	1.00E+00	0.816	0.072	0.022	9.10E-01	0.00E+00	0.196	0.00E+00	9.10E-01
		Cs	1.00	3.00E-05	0.26	1.50E-04	0.0	0.184	0.609	0.112	0.804	2.22E-05	0.816	0.072	0.022	2.02E-05	7.80E-06	0.196	1.53E-06	2.17E-05
		Ru	1.00	3.00E-05	0.2	1.30E-04	0.0	0.184	0.609	0.112	0.804	2.40E-05	0.816	0.072	0.022	2.18E-05	6.00E-06	0.196	1.18E-06	2.30E-05
		Part	1.00	3.00E-05	0.2	3.00E-05	0.0	0.184	0.609	0.112	0.804	2.40E-05	0.816	0.072	0.022	2.18E-05	0.00E+00	0.196	0.00E+00	2.18E-05
		CRUD	1.00	0.1	0.2	0.05	0.0	0.184	0.609	0.112	0.804	8.00E-02	0.816	0.072	0.022	7.28E-02	5.00E-03	0.196	9.80E-04	7.38E-02
Fire-Only	20	Kr	0.00	1	0	1.0	0.0	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	1.00E+00	0.839	8.39E-01	8.39E-01
		Cs	0.00	1	0	2.00E-05	0.0	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	2.00E-05	0.839	1.68E-05	1.68E-05
		Ru	0.00	1	0	4.00E-07	0.25	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	3.00E-07	0.839	2.52E-07	2.52E-07
		Part	0.00	1	0	4.00E-07	0.25	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	3.00E-07	0.839	2.52E-07	2.52E-07
		CRUD	0.00	1	1	0.15	0.25	0.000	0.000	0.000	0.161	0.00E+00	1.000	0.000	0.000	0.00E+00	1.13E-02	0.839	9.44E-03	9.44E-03

D.5 Steel-Lead-Steel Truck Cask Severity Fraction Spreadsheets



P12+P13 = 3.6040E-04

P1+P2+P6= 0.080208

P15-P18= 8.3091E-02

P25-P27= 5.0824E-02

P29+P30= 7.5100E-02

Surface	Hard Rock		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.74353	7.435300E-01
v60	60	58	62	0.97634	0.98383	9.800850E-01
v90	90	0	90	0	0.99956	9.995600E-01
v120=vseal	120	110	150	0.99999	1.0	9.999925E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.74353	7.435300E-01
v60	60	58	62	0.97634	0.98383	9.800850E-01
v90	90	0	90	0	0.99956	9.995600E-01
v120=vseal	120	110	150	0.99999	1.0	9.999925E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.74353	7.435300E-01
v60	60	58	62	0.97634	0.98383	9.800850E-01
v90	90	0	90	0	0.99956	9.995600E-01
v120=vseal	120	110	150	0.99999	1.0	9.999925E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.3656E-01	2.3656E-01	2.3656E-01	2.3656E-01
P(v90)-P(v60)	1.9475E-02	1.9475E-02	1.9475E-02	1.9475E-02
P(vseal)-P(v90)	4.3250E-04	4.3250E-04	4.3250E-04	4.3250E-04
1.0-P(vseal)	7.5000E-06	7.5000E-06	7.5000E-06	7.5000E-06

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.827500E-01
v60	60	0	60	0	1	1.000000E+00
v90	90	0	90	0	1	1.000000E+00
v120=vseal	120	0	120	0	1	1.000000E+00
Corner	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.827500E-01
v60	60	0	60	0	1	1.000000E+00
v90	90	0	90	0	1	1.000000E+00
v120=vseal	120	0	120	0	1	1.000000E+00
Side	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.827500E-01
v60	60	0	60	0	1	1.000000E+00
v90	90	0	90	0	1	1.000000E+00
v120=vseal	120	0	120	0	1	1.000000E+00

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.1725E-01	3.1725E-01	3.1725E-01	3.1725E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.28292	2.829200E-01
v60	60	0	60	0	0.96178	9.617800E-01
v90	90	0	90	0	0.99901	9.990100E-01
v120=vseal	120	115	150	0.99999	1.0	9.999914E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.28292	2.829200E-01
v60	60	0	60	0	0.96178	9.617800E-01
v90	90	0	90	0	0.99901	9.990100E-01
v120=vseal	120	115	150	0.99999	1.0	9.999914E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.28292	2.829200E-01
v60	60	0	60	0	0.96178	9.617800E-01
v90	90	0	90	0	0.99901	9.990100E-01
v120=vseal	120	115	150	0.99999	1.0	9.999914E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	6.7886E-01	6.7886E-01	6.7886E-01	6.7886E-01
P(v90)-P(v60)	3.7230E-02	3.7230E-02	3.7230E-02	3.7230E-02
P(vseal)-P(v90)	9.8143E-04	9.8143E-04	9.8143E-04	9.8143E-04
1.0-P(vseal)	8.5714E-06	8.5714E-06	8.5714E-06	8.5714E-06

Velocity Distribution V4, Scenario 5						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.7421	7.421000E-01
v60	60	58	62	0.97125	0.9806	9.759250E-01
v90	90	0	90	0	0.9993	9.993000E-01
v120=vseal	120	118	150	0.99999	1.0	9.999906E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.7421	7.421000E-01
v60	60	58	62	0.97125	0.9806	9.759250E-01
v90	90	0	90	0	0.9993	9.993000E-01
v120=vseal	120	118	150	0.99999	1.0	9.999906E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.7421	7.421000E-01
v60	60	58	62	0.97125	0.9806	9.759250E-01
v90	90	0	90	0	0.9993	9.993000E-01
v120=vseal	120	118	150	0.99999	1.0	9.999906E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.3383E-01	2.3383E-01	2.3383E-01	2.3383E-01
P(v90)-P(v60)	2.3375E-02	2.3375E-02	2.3375E-02	2.3375E-02
P(vseal)-P(v90)	6.9063E-04	6.9063E-04	6.9063E-04	6.9063E-04
1.0-P(vseal)	9.3750E-06	9.3750E-06	9.3750E-06	9.3750E-06

Surface	Soft Rock/Hard Soil/Concrete		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.8602	8.602000E-01
v60	177	0	177	0	1	1
v90	232	0	232	0	1	1
v120=vseal	273	0	273	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.80877	0.8602	8.216275E-01
v60	123	110	150	0.99999	1.0	9.999933E-01
v90	172	0	172	0	1	1
v120=vseal	245	0	245	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.74353	0.80877	7.761500E-01
v60	86	0	86	0	0.99910	9.991000E-01
v90	135	110	150	0.99999	1.0	9.999963E-01
v120=vseal	209	0	209	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.3980E-01	1.7837E-01	2.2295E-01	1.8610E-01
P(v90)-P(v60)	0.0000E+00	6.7500E-06	8.9625E-04	2.0384E-04
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	3.7500E-06	8.3250E-07
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	38	37.91	39.46	0.9849	0.9945	9.854574E-01
v60	177	0	177	0	1	1
v90	232	0	232	0	1	1
v120=vseal	273	0	273	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34.61	36.29	0.9217	0.9635	9.314036E-01
v60	123	0	123	0	1	1
v90	172	0	172	0	1	1
v120=vseal	245	0	245	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.047085E-01
v60	86	0	86	0	1	1
v90	135	0	135	0	1	1
v120=vseal	209	0	209	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.4543E-02	6.8596E-02	1.9529E-01	9.3696E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24						
End	v	vL	vH	PL	PH	P
v30	38	35	40	0.51279	0.7011	6.257760E-01
v60	177	0	177	0	1	1
v90	232	0	232	0	1	1
v120=vseal	273	0	273	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	0	35	0	0.51279	5.127900E-01
v60	123	115	150	0.99999	1.0	9.999923E-01
v90	172	0	172	0	1	1
v120=vseal	245	0	245	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.28292	0.51279	3.748680E-01
v60	86	85	90	0.99766	0.99901	9.979300E-01
v90	135	115	150	0.99999	1.0	9.999957E-01
v120=vseal	209	0	209	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.7422E-01	4.8720E-01	6.2306E-01	5.1104E-01
P(v90)-P(v60)	0.0000E+00	7.7143E-06	2.0657E-03	4.6416E-04
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	4.2857E-06	9.5143E-07
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V4, Scenario 5						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.84814	8.481400E-01
v60	177	0	177	0	1	1
v90	232	0	232	0	1	1
v120=vseal	273	0	273	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.80022	0.84814	8.122000E-01
v60	123	118	150	0.99999	1.0	9.999916E-01
v90	172	0	172	0	1	1
v120=vseal	245	0	245	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.7421	0.80022	7.711600E-01
v60	86	0	86	0	0.99881	9.988100E-01
v90	135	118	150	0.99999	1.0	9.999953E-01
v120=vseal	209	0	209	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.5186E-01	1.8779E-01	2.2765E-01	1.9463E-01
P(v90)-P(v60)	0.0000E+00	8.4375E-06	1.1853E-03	2.6923E-04
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	4.6875E-06	1.0406E-06
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Clay/Silt		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	84	82	86	0.99825	0.9991	9.986750E-01
v60	277	0	277	0	1	1
v90	367	0	367	0	1	1
v120=vseal	448	0	448	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	0.97634	9.763400E-01
v60	135	110	150	0.99999	1.0	9.999963E-01
v90	195	0	195	0	1	1
v120=vseal	279	0	279	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.74353	0.80877	7.761500E-01
v60	170	0	170	0	1	1
v90	273	0	273	0	1	1
v120=vseal	426	0	426	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.3250E-03	2.3656E-02	2.2385E-01	6.6849E-02
P(v90)-P(v60)	0.0000E+00	3.7500E-06	0.0000E+00	2.7075E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	84	0	84	0	1	1
v60	277	0	277	0	1	1
v90	367	0	367	0	1	1
v120=vseal	448	0	448	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	1	1
v60	135	0	135	0	1	1
v90	195	0	195	0	1	1
v120=vseal	279	0	279	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.047085E-01
v60	170	0	170	0	1	1
v90	273	0	273	0	1	1
v120=vseal	426	0	426	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	0.0000E+00	0.0000E+00	1.9529E-01	4.3355E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24						
End	v	vL	vH	PL	PH	P
v30	84	80	85	0.99547	0.99766	9.972220E-01
v60	277	0	277	0	1	1
v90	367	0	367	0	1	1
v120=vseal	448	0	448	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	55	60	0.93543	0.96178	9.512400E-01
v60	135	115	150	0.99999	1.0	9.999957E-01
v90	195	0	195	0	1	1
v120=vseal	279	0	279	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.28292	0.51279	3.748680E-01
v60	170	0	170	0	1	1
v90	273	0	273	0	1	1
v120=vseal	426	0	426	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.7780E-03	4.8756E-02	6.2513E-01	1.7414E-01
P(v90)-P(v60)	0.0000E+00	4.2857E-06	0.0000E+00	3.0943E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V4, Scenario 5						
End	v	vL	vH	PL	PH	P
v30	84	82	86	0.998	0.99881	9.984050E-01
v60	277	0	277	0	1	1
v90	367	0	367	0	1	1
v120=vseal	448	0	448	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	0.97125	9.712500E-01
v60	135	118	150	0.99999	1.0	9.999953E-01
v90	195	0	195	0	1	1
v120=vseal	279	0	279	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.7421	0.80022	7.711600E-01
v60	170	0	170	0	1	1
v90	273	0	273	0	1	1
v120=vseal	426	0	426	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.5950E-03	2.8745E-02	2.2884E-01	7.1646E-02
P(v90)-P(v60)	0.0000E+00	4.6875E-06	0.0000E+00	3.3844E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Water		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	0.9967	9.967000E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1.0	1.000000E+00
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	0	42	0	0.89961	8.996100E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.3000E-03	0.0000E+00	1.0039E-01	2.2471E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	41.67	43.08	0.9991	0.9998	9.992638E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	0.0000E+00	0.0000E+00	7.3617E-04	1.6343E-04
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24												
End	v		vL		vH		PL	PH	P			
v30		78	75			80	0.99227	0.99547	9.941900E-01			
v60	1		0		1		0	1	1			
v90	1		0		1		0	1	1			
v120=vseal	1		0		1		0	1	1			
Corner	v		vL		vH		PL	PH	P			
v30		150	0			150	0	1.0	1.000000E+00			
v60	1		0		1		0	1	1			
v90	1		0		1		0	1	1			
v120=vseal	1		0		1		0	1	1			
Side	v		vL		vH		PL	PH	P			
v30		42		40		45	0.7011	0.81951	7.484640E-01			
v60	1		0		1		0	1	1			
v90	1		0		1		0	1	1			
v120=vseal	1		0		1		0	1	1			
	End		Corner		Side		Wt Sum					
P(v60)-P(v30)	5.8100E-03		0.0000E+00		2.5154E-01		5.6166E-02					
P(v90)-P(v60)	0.0000E+00		0.0000E+00		0.0000E+00		0.0000E+00					
P(vseal)-P(v90)	0.0000E+00		0.0000E+00		0.0000E+00		0.0000E+00					
1.0-P(vseal)	0.0000E+00		0.0000E+00		0.0000E+00		0.0000E+00					

Velocity Distribution V4, Scenario 5												
End	v		vL		vH		PL	PH	P			
v30		78	0			78	0	0.99672	9.967200E-01			
v60	1		0		1		0	1	1			
v90	1		0		1		0	1	1			
v120=vseal	1		0		1		0	1	1			
Corner	v		vL		vH		PL	PH	P			
v30		150	0			150	0	1.0	1.000000E+00			
v60	1		0		1		0	1	1			
v90	1		0		1		0	1	1			
v120=vseal	1		0		1		0	1	1			
Side	v		vL		vH		PL	PH	P			
v30		42	0			42	0	0.88676	8.867600E-01			
v60	1		0		1		0	1	1			
v90	1		0		1		0	1	1			
v120=vseal	1		0		1		0	1	1			
	End		Corner		Side		Wt Sum					
P(v60)-P(v30)	3.2800E-03		0.0000E+00		1.1324E-01		2.5323E-02					
P(v90)-P(v60)	0.0000E+00		0.0000E+00		0.0000E+00		0.0000E+00					
P(vseal)-P(v90)	0.0000E+00		0.0000E+00		0.0000E+00		0.0000E+00					
1.0-P(vseal)	0.0000E+00		0.0000E+00		0.0000E+00		0.0000E+00					

Surface	Railbed/Roadbed		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.8602	8.602000E-01
v60	277	0	277	0	1	1
v90	367	0	367	0	1	1
v120=vseal	448	0	448	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.80877	0.8602	8.216275E-01
v60	135	110	150	0.99999	1.0	9.999963E-01
v90	195	0	195	0	1	1
v120=vseal	279	0	279	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.74353	0.80877	7.761500E-01
v60	170	0	170	0	1	1
v90	273	0	273	0	1	1
v120=vseal	426	0	426	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.3980E-01	1.7837E-01	2.2385E-01	1.8631E-01
P(v90)-P(v60)	0.0000E+00	3.7500E-06	0.0000E+00	2.7075E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	38	37.91	39.46	0.9849	0.9945	9.854574E-01
v60	277	0	277	0	1	1
v90	367	0	367	0	1	1
v120=vseal	448	0	448	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34.61	36.29	0.9217	0.9635	9.314036E-01
v60	135	0	135	0	1	1
v90	195	0	195	0	1	1
v120=vseal	279	0	279	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.047085E-01
v60	170	0	170	0	1	1
v90	273	0	273	0	1	1
v120=vseal	426	0	426	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.4543E-02	6.8596E-02	1.9529E-01	9.3696E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24						
End	v	vL	vH	PL	PH	P
v30	38	35	40	0.51279	0.7011	6.257760E-01
v60	277	0	277	0	1	1
v90	367	0	367	0	1	1
v120=vseal	448	0	448	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	0	35	0	0.51279	5.127900E-01
v60	135	115	150	0.99999	1.0	9.999957E-01
v90	195	0	195	0	1	1
v120=vseal	279	0	279	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.28292	0.51279	3.748680E-01
v60	170	0	170	0	1	1
v90	273	0	273	0	1	1
v120=vseal	426	0	426	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.7422E-01	4.8721E-01	6.2513E-01	5.1150E-01
P(v90)-P(v60)	0.0000E+00	4.2857E-06	0.0000E+00	3.0943E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V4, Scenario 5						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.84814	8.481400E-01
v60	277	0	277	0	1	1
v90	367	0	367	0	1	1
v120=vseal	448	0	448	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.80022	0.84814	8.122000E-01
v60	135	118	150	0.99999	1.0	9.999953E-01
v90	195	0	195	0	1	1
v120=vseal	279	0	279	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.7421	0.80022	7.711600E-01
v60	170	0	170	0	1	1
v90	273	0	273	0	1	1
v120=vseal	426	0	426	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.5186E-01	1.8780E-01	2.2884E-01	1.9489E-01
P(v90)-P(v60)	0.0000E+00	4.6875E-06	0.0000E+00	3.3844E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Temperature (C)		300 = Ta	350 = Ts	750 = Tb	1000 = Tf	
Time to Temperature (hr)		0	1.04	2.09	5.55	
Modal Study Fire Duration Distribution F1, Scenarios 28-31, tmax = 1.333 hr						
		tL	tH	PL	PH	P(T)
Ts		1.000	1.083	0.9998	0.99991	0.99985301
Tb		0	2.09	0	1	1
Tf		0	5.55	0	1	1
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.99985301		1	1	1.0	P(Ta-Ts) 0.99985301
P(Tb)-P(Ts)	0.00014699		0.2	1	1.0	P(Ts-Tb) 2.9398E-05
1.0-P(Tb)	0.00000000		0.2	0.5	0.5	P(Tb-Tf) 0.0
Modal Study Fire Duration Distribution F2, Scenarios 1,2,6-27, tmax = 1.5 hr						
		tL	tH	PL	PH	P(T)
Ts		1.000	1.083	0.9989	0.9995	0.99918916
Tb		0	2.09	0	1	1
Tf		0	5.55	0	1	1
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.99918916		1	1	1.0	P(Ta-Ts) 0.99918916
P(Tb)-P(Ts)	0.00081084		0.2	1	1.0	P(Ts-Tb) 0.00016217
1.0-P(Tb)	0.00000000		0.2	0.5	0.5	P(Tb-Tf) 0.0
Modal Study Fire Duration Distribution F3, Scenario 4, tmax = 8.0 hr						
		tL	tH	PL	PH	P(T)
Ts		1.000	1.083	0.8257	0.8367	0.83100120
Tb		2.0	3.0	0.8917	0.9287	0.89503000
Tf		5.0	6.0	0.9641	0.9773	0.97136000
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.83100120		1	1	1.0	P(Ta-Ts) 0.83100120
P(Tb)-P(Ts)	0.06402880		0.2	1	1.0	P(Ts-Tb) 0.01280576
1.0-P(Tb)	0.10497000		0.2	0.5	0.5	P(Tb-Tf) 0.00524850
Modal Study Fire Duration Distribution F4, Scenario 3, tmax = 1.833 hr						
		tL	tH	PL	PH	P(T)
Ts		1.000	1.083	0.9898	0.9936	0.99163133
Tb		0	2.09	0	1	1
Tf		0	5.55	0	1	1
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.99163133		1	1	1.0	P(Ta-Ts) 0.99163133
P(Tb)-P(Ts)	0.00836867		0.2	1	1.0	P(Ts-Tb) 0.00167373
1.0-P(Tb)	0.00000000		0.2	0.5	0.5	P(Tb-Tf) 0.0
Modal Study Fire Duration Distribution F5, Scenario 5, tmax = 7.0 hr						
		tL	tH	PL	PH	P(T)
Ts		1.000	1.167	0.88589	0.89828	0.88885766
Tb		2.0	3.0	0.94126	0.96792	0.9436594
Tf		5.0	6.0	0.99056	0.99643	0.9937885
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.88885766		1	1	1.0	P(Ta-Ts) 0.88885766
P(Tb)-P(Ts)	0.05480174		1.0	1	1.0	P(Ts-Tb) 0.05480174
1.0-P(Tb)	0.05634060		1.0	0.5	0.5	P(Tb-Tf) 0.01408515

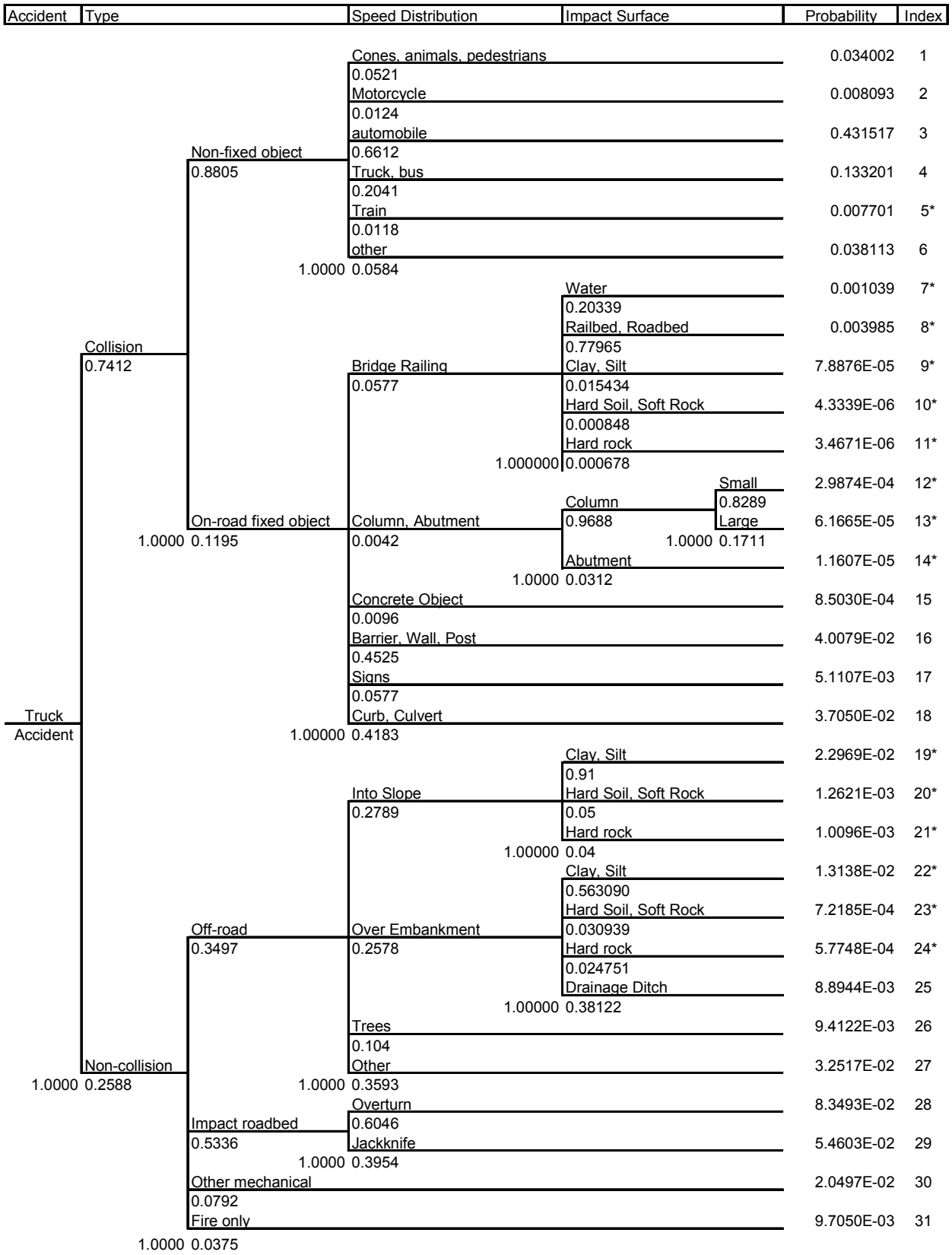
Column	B	C	D	E	F	G	H	I	J	K	L	M
Scenarios (index j)	Sum P(Scj)	Speed Distribution	Impact Surface	P(Spj) v30,v60	v60,v90	v90,vseal	>vseal	P(fire)	Fire Duration Distribution	P(FireSev) Ta-Ts	Ts-Tb	Tb-Tf
11	0.000003467	Bridge, V2	HR	3.1725E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.999189157	0.000162169	0
10	0.000004334		HS/SR/Con	9.3696E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.999189157	0.000162169	0
9	0.000078876		Clay/Silt	4.3355E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.999189157	0.000162169	0
8	0.003984546		Rail/Road	9.3696E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.999189157	0.000162169	0
7	0.001039462		Water	1.6343E-04	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.999189157	0.000162169	0
21	0.001009644	Level, V1	HR	2.3656E-01	1.9475E-02	4.3250E-04	7.5000E-06	0.011	F2	0.999189157	0.000162169	0
20	0.001262055		HS/SR/Con	1.8610E-01	2.0384E-04	8.3250E-07	0.0000E+00	0.011	F2	0.999189157	0.000162169	0
19	0.022969408		Clay/Silt	6.6849E-02	2.7075E-06	0.0000E+00	0.0000E+00	0.011	F2	0.999189157	0.000162169	0
12,13	0.000360402		Column	2.3656E-01	1.9475E-02	4.3250E-04	7.5000E-06	0.004	F2	0.999189157	0.000162169	0
14	0.000011607		Abutment	2.3656E-01	1.9475E-02	4.3250E-04	7.5000E-06	0.004	F2	0.999189157	0.000162169	0
24	0.000577483	Slope, V3	HR	6.7886E-01	3.7230E-02	9.8143E-04	8.5714E-06	0.011	F2	0.999189157	0.000162169	0
23	0.000721854		HS/SR/Con	5.1104E-01	4.6416E-04	9.5143E-07	0.0000E+00	0.011	F2	0.999189157	0.000162169	0
22	0.013137734		Clay/Silt	1.7414E-01	3.0943E-06	0.0000E+00	0.0000E+00	0.011	F2	0.999189157	0.000162169	0
5	0.007700994	Crossing, V4	(Clay/silt)	7.1646E-02	3.3844E-06	0.0000E+00	0.0000E+00	0.009	F5	0.888857665	0.054801735	0.01408515
3	0.431516708		All	0	0	0	0	0.003	F4	0.991631325	0.001673735	0
4	0.133201089		All	0	0	0	0	0.008	F3	0.831001205	0.012805759	0.0052485
1,2,6	0.080207809		All	0	0	0	0	0.009	F2	0.999189157	0.000162169	0
15-18	0.083090707		All	0	0	0	0	0.004	F2	0.999189157	0.000162169	0
25-27	0.050824181		All	0	0	0	0	0.011	F2	0.999189157	0.000162169	0
28	0.083492648		All	0	0	0	0	0.012	F1	0.999853012	2.93976E-05	0
29-30	0.075099992		All	0	0	0	0	0.13	F1	0.999853012	2.93976E-05	0
31	0.009705000		Fire-Only	0	0	0	0	1.00	F1	0.999853012	2.93976E-05	0
All	1.000000											

P(Punc/Shear) 0.001

Case		1	2	3	4	5	6	7	8	9	10
Formula		B*H	B*E*I*K	B*E*I*L	B*E*I*M	B*F*I*K	B*F*I*L	B*F*I*M	B*G*I*K	B*G*I*L	B*G*I*M
Scenario	11	0.000E+00	4.396E-09	7.135E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	10	0.000E+00	1.623E-09	2.634E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	9	0.000E+00	1.367E-08	2.218E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	8	0.000E+00	1.492E-06	2.422E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	7	0.000E+00	6.790E-10	1.102E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	21	7.572E-09	2.625E-06	4.260E-10	0.000E+00	2.161E-07	3.508E-11	0.000E+00	4.799E-09	7.790E-13	0.000E+00
	20	0.000E+00	2.582E-06	4.190E-10	0.000E+00	2.828E-09	4.589E-13	0.000E+00	1.155E-11	1.874E-15	0.000E+00
	19	0.000E+00	1.688E-05	2.739E-09	0.000E+00	6.835E-10	1.109E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	12,13	2.703E-09	3.407E-07	5.530E-11	0.000E+00	2.805E-08	4.553E-12	0.000E+00	6.230E-10	1.011E-13	0.000E+00
	14	8.705E-11	1.097E-08	1.781E-12	0.000E+00	9.034E-10	1.466E-13	0.000E+00	2.006E-11	3.256E-15	0.000E+00
	24	4.950E-09	4.309E-06	6.993E-10	0.000E+00	2.363E-07	3.835E-11	0.000E+00	6.229E-09	1.011E-12	0.000E+00
	23	0.000E+00	4.055E-06	6.581E-10	0.000E+00	3.683E-09	5.977E-13	0.000E+00	7.549E-12	1.225E-15	0.000E+00
	22	0.000E+00	2.514E-05	4.081E-09	0.000E+00	4.468E-10	7.252E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	5	0.000E+00	4.414E-06	2.721E-07	6.994E-08	2.085E-10	1.285E-11	3.304E-12	0.000E+00	0.000E+00	0.000E+00
	3	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0
	1,2,6	0	0	0	0	0	0	0	0	0	0
	15-18	0	0	0	0	0	0	0	0	0	0
	25-27	0	0	0	0	0	0	0	0	0	0
	28	0	0	0	0	0	0	0	0	0	0
	29-30	0	0	0	0	0	0	0	0	0	0
	31	0	0	0	0	0	0	0	0	0	0
Severity Fraction		1.531E-08	6.187E-05	2.815E-07	6.994E-08	4.892E-07	9.222E-11	3.304E-12	1.169E-08	1.897E-12	0.000E+00

Case		11	12	13	14	15	16	17	18
Formula		B*H*I*K	B*H*I*L	B*H*I*M	B*E*I*M*B28	B*F*I*M*B28	B*G*I*M*B28	B*H*I*M*B28	B*I*M
Scenario	11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	9	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	8	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	7	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	21	8.323E-11	1.351E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	12,13	1.080E-11	1.753E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	14	3.479E-13	5.647E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	24	5.440E-11	8.830E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	5	0.000E+00	0.000E+00	0.000E+00	6.994E-11	3.304E-15	0.000E+00	0.000E+00	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	5.5928E-06
	1,2,6	0	0	0	0	0	0	0	0
	15-18	0	0	0	0	0	0	0	0
	25-27	0	0	0	0	0	0	0	0
	28	0	0	0	0	0	0	0	0
	29-30	0	0	0	0	0	0	0	0
	31	0	0	0	0	0	0	0	0
Severity Fraction		1.488E-10	2.415E-14	0.000E+00	6.994E-11	3.304E-15	0.000E+00	0.000E+00	5.593E-06

D.6 Steel-DU-Steel Truck Cask Severity Fraction Spreadsheets


Accident
Type
Speed Distribution
Impact Surface
Probability
Index
Truck Accident
Collision
0.7412
Non-collision
1.0000 0.2588
Non-fixed object
0.8805
On-road fixed object
1.0000 0.1195
Off-road
0.3497
Impact roadbed
0.5336
Other mechanical
0.0792
Fire only
1.0000 0.0375
Cones, animals, pedestrians
0.0521
Motorcycle
0.0124
automobile
0.6612
Truck, bus
0.2041
Train
0.0118
other
1.0000 0.0584
Bridge Railing
0.0577
Column, Abutment
0.0042
Concrete Object
0.0096
Barrier, Wall, Post
0.4525
Signs
0.0577
Curb, Culvert
1.00000 0.4183
Into Slope
0.2789
Over Embankment
0.2578
Trees
0.104
Other
1.0000 0.3593
Overturn
0.6046
Jackknife
1.0000 0.3954
Water
0.20339
Railbed, Roadbed
0.77965
Clay, Silt
0.015434
Hard Soil, Soft Rock
0.000848
Hard rock
1.000000 0.000678
Column
0.9688
Abutment
1.0000 0.0312
Small
0.8289
Large
1.0000 0.1711
Clay, Silt
0.91
Hard Soil, Soft Rock
0.05
Hard rock
1.00000 0.04
Clay, Silt
0.563090
Hard Soil, Soft Rock
0.030939
Hard rock
0.024751
Drainage Ditch
1.00000 0.38122
0.034002 1
0.008093 2
0.431517 3
0.133201 4
0.007701 5*
0.038113 6
0.001039 7*
0.003985 8*
7.8876E-05 9*
4.3339E-06 10*
3.4671E-06 11*
2.9874E-04 12*
6.1665E-05 13*
1.1607E-05 14*
8.5030E-04 15
4.0079E-02 16
5.1107E-03 17
3.7050E-02 18
2.2969E-02 19*
1.2621E-03 20*
1.0096E-03 21*
1.3138E-02 22*
7.2185E-04 23*
5.7748E-04 24*
8.8944E-03 25
9.4122E-03 26
3.2517E-02 27
8.3493E-02 28
5.4603E-02 29
2.0497E-02 30
9.7050E-03 31
1.000000
P12+P13 = 3.6040E-04
P1+P2+P6= 0.080208
P15-P18= 8.3091E-02
P25-P27= 5.0824E-02
P29+P30= 7.5100E-02

Surface	Hard Rock		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.74353	7.435300E-01
v60	60	58	62	0.97634	0.98383	9.800850E-01
v90	90	0	90	0	0.99956	9.995600E-01
v120=vseal	120	110	150	0.99999	1.0	9.999925E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.74353	7.435300E-01
v60	60	58	62	0.97634	0.98383	9.800850E-01
v90	90	0	90	0	0.99956	9.995600E-01
v120=vseal	120	110	150	0.99999	1.0	9.999925E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.74353	7.435300E-01
v60	60	58	62	0.97634	0.98383	9.800850E-01
v90	90	0	90	0	0.99956	9.995600E-01
v120=vseal	120	110	150	0.99999	1.0	9.999925E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.3656E-01	2.3656E-01	2.3656E-01	2.3656E-01
P(v90)-P(v60)	1.9475E-02	1.9475E-02	1.9475E-02	1.9475E-02
P(vseal)-P(v90)	4.3250E-04	4.3250E-04	4.3250E-04	4.3250E-04
1.0-P(vseal)	7.5000E-06	7.5000E-06	7.5000E-06	7.5000E-06

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.827500E-01
v60	60	0	60	0	1	1.000000E+00
v90	90	0	90	0	1	1.000000E+00
v120=vseal	120	0	120	0	1	1.000000E+00
Corner	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.827500E-01
v60	60	0	60	0	1	1.000000E+00
v90	90	0	90	0	1	1.000000E+00
v120=vseal	120	0	120	0	1	1.000000E+00
Side	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.827500E-01
v60	60	0	60	0	1	1.000000E+00
v90	90	0	90	0	1	1.000000E+00
v120=vseal	120	0	120	0	1	1.000000E+00

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.1725E-01	3.1725E-01	3.1725E-01	3.1725E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.28292	2.829200E-01
v60	60	0	60	0	0.96178	9.617800E-01
v90	90	0	90	0	0.99901	9.990100E-01
v120=vseal	120	115	150	0.99999	1.0	9.999914E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.28292	2.829200E-01
v60	60	0	60	0	0.96178	9.617800E-01
v90	90	0	90	0	0.99901	9.990100E-01
v120=vseal	120	115	150	0.99999	1.0	9.999914E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.28292	2.829200E-01
v60	60	0	60	0	0.96178	9.617800E-01
v90	90	0	90	0	0.99901	9.990100E-01
v120=vseal	120	115	150	0.99999	1.0	9.999914E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	6.7886E-01	6.7886E-01	6.7886E-01	6.7886E-01
P(v90)-P(v60)	3.7230E-02	3.7230E-02	3.7230E-02	3.7230E-02
P(vseal)-P(v90)	9.8143E-04	9.8143E-04	9.8143E-04	9.8143E-04
1.0-P(vseal)	8.5714E-06	8.5714E-06	8.5714E-06	8.5714E-06

Velocity Distribution V4, Scenario 5						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.7421	7.421000E-01
v60	60	58	62	0.97125	0.9806	9.759250E-01
v90	90	0	90	0	0.9993	9.993000E-01
v120=vseal	120	118	150	0.99999	1.0	9.999906E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.7421	7.421000E-01
v60	60	58	62	0.97125	0.9806	9.759250E-01
v90	90	0	90	0	0.9993	9.993000E-01
v120=vseal	120	118	150	0.99999	1.0	9.999906E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.7421	7.421000E-01
v60	60	58	62	0.97125	0.9806	9.759250E-01
v90	90	0	90	0	0.9993	9.993000E-01
v120=vseal	120	118	150	0.99999	1.0	9.999906E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.3383E-01	2.3383E-01	2.3383E-01	2.3383E-01
P(v90)-P(v60)	2.3375E-02	2.3375E-02	2.3375E-02	2.3375E-02
P(vseal)-P(v90)	6.9063E-04	6.9063E-04	6.9063E-04	6.9063E-04
1.0-P(vseal)	9.3750E-06	9.3750E-06	9.3750E-06	9.3750E-06

Surface	Soft Rock/Hard Soil/Concrete		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.8602	8.602000E-01
v60	167	0	167	0	1	1
v90	196	0	196	0	1	1
v120=vseal	228	0	228	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.80877	0.8602	8.216275E-01
v60	204	0	204	0	1	1
v90	266	0	266	0	1	1
v120=vseal	316	0	316	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.74353	0.80877	7.761500E-01
v60	142	110	150	0.99999	1.00000	9.999980E-01
v90	210	0	210	0	1	1
v120=vseal	303	0	303	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.3980E-01	1.7837E-01	2.2385E-01	1.8631E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	2.0000E-06	4.4400E-07
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	38	37.91	39.46	0.9849	0.9945	9.854574E-01
v60	167	0	167	0	1	1
v90	196	0	196	0	1	1
v120=vseal	228	0	228	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34.61	36.29	0.9217	0.9635	9.314036E-01
v60	204	0	204	0	1	1
v90	266	0	266	0	1	1
v120=vseal	316	0	316	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.047085E-01
v60	142	0	142	0	1	1
v90	210	0	210	0	1	1
v120=vseal	303	0	303	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.4543E-02	6.8596E-02	1.9529E-01	9.3696E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24						
End	v	vL	vH	PL	PH	P
v30	38	35	40	0.51279	0.7011	6.257760E-01
v60	167	0	167	0	1	1
v90	196	0	196	0	1	1
v120=vseal	228	0	228	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	0	35	0	0.51279	5.127900E-01
v60	204	0	204	0	1	1
v90	266	0	266	0	1	1
v120=vseal	316	0	316	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.28292	0.51279	3.748680E-01
v60	142	115	150	0.99999	1.0	9.999977E-01
v90	210	0	210	0	1	1
v120=vseal	303	0	303	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.7422E-01	4.8721E-01	6.2513E-01	5.1150E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	2.2857E-06	5.0743E-07
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V4, Scenario 5						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.84814	8.481400E-01
v60	167	0	167	0	1	1
v90	196	0	196	0	1	1
v120=vseal	228	0	228	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.80022	0.84814	8.122000E-01
v60	204	0	204	0	1	1
v90	266	0	266	0	1	1
v120=vseal	316	0	316	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.7421	0.80022	7.711600E-01
v60	142	118	150	0.99999	1.0	9.999975E-01
v90	210	0	210	0	1	1
v120=vseal	303	0	303	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.5186E-01	1.8780E-01	2.2884E-01	1.9490E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	2.5000E-06	5.5500E-07
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Clay/Silt		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	84	82	86	0.99825	0.9991	9.986750E-01
v60	253	0	253	0	1	1
v90	303	0	303	0	1	1
v120=vseal	360	0	360	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	0.97634	9.763400E-01
v60	223	0	223	0	1	1
v90	298	0	298	0	1	1
v120=vseal	360	0	360	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.74353	0.80877	7.761500E-01
v60	263	0	263	0	1	1
v90	394	0	394	0	1	1
v120=vseal	575	0	575	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.3250E-03	2.3660E-02	2.2385E-01	6.6851E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	84	0	84	0	1	1
v60	253	0	253	0	1	1
v90	303	0	303	0	1	1
v120=vseal	360	0	360	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	1	1
v60	223	0	223	0	1	1
v90	298	0	298	0	1	1
v120=vseal	360	0	360	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.047085E-01
v60	263	0	263	0	1	1
v90	394	0	394	0	1	1
v120=vseal	575	0	575	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	0.0000E+00	0.0000E+00	1.9529E-01	4.3355E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24						
End	v	vL	vH	PL	PH	P
v30	84	80	85	0.99547	0.99766	9.972220E-01
v60	253	0	253	0	1	1
v90	303	0	303	0	1	1
v120=vseal	360	0	360	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	55	60	0.93543	0.96178	9.512400E-01
v60	223	0	223	0	1	1
v90	298	0	298	0	1	1
v120=vseal	360	0	360	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.28292	0.51279	3.748680E-01
v60	263	0	263	0	1	1
v90	394	0	394	0	1	1
v120=vseal	575	0	575	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.7780E-03	4.8760E-02	6.2513E-01	1.7414E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V4, Scenario 5						
End	v	vL	vH	PL	PH	P
v30	84	82	86	0.998	0.99881	9.984050E-01
v60	253	0	253	0	1	1
v90	303	0	303	0	1	1
v120=vseal	360	0	360	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	0.97125	9.712500E-01
v60	223	0	223	0	1	1
v90	298	0	298	0	1	1
v120=vseal	360	0	360	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.7421	0.80022	7.711600E-01
v60	263	0	263	0	1	1
v90	394	0	394	0	1	1
v120=vseal	575	0	575	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.5950E-03	2.8750E-02	2.2884E-01	7.1649E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Water		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	0.9967	9.967000E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1.0	1.000000E+00
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	0	42	0	0.89961	8.996100E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.3000E-03	0.0000E+00	1.0039E-01	2.2471E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	41.67	43.08	0.9991	0.9998	9.992638E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	0.0000E+00	0.0000E+00	7.3617E-04	1.6343E-04
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24									
End	v		vL		vH		PL	PH	P
v30		78	75			80	0.99227	0.99547	9.941900E-01
v60	1		0		1		0	1	1
v90	1		0		1		0	1	1
v120=vseal	1		0		1		0	1	1
Corner	v		vL		vH		PL	PH	P
v30		150	0			150	0	1.0	1.000000E+00
v60	1		0		1		0	1	1
v90	1		0		1		0	1	1
v120=vseal	1		0		1		0	1	1
Side	v		vL		vH		PL	PH	P
v30		42		40		45	0.7011	0.81951	7.484640E-01
v60	1		0		1		0	1	1
v90	1		0		1		0	1	1
v120=vseal	1		0		1		0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	5.8100E-03	0.0000E+00	2.5154E-01	5.6166E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V4, Scenario 5									
End	v		vL		vH		PL	PH	P
v30		78	0			78	0	0.99672	9.967200E-01
v60	1		0		1		0	1	1
v90	1		0		1		0	1	1
v120=vseal	1		0		1		0	1	1
Corner	v		vL		vH		PL	PH	P
v30		150	0			150	0	1.0	1.000000E+00
v60	1		0		1		0	1	1
v90	1		0		1		0	1	1
v120=vseal	1		0		1		0	1	1
Side	v		vL		vH		PL	PH	P
v30		42	0			42	0	0.88676	8.867600E-01
v60	1		0		1		0	1	1
v90	1		0		1		0	1	1
v120=vseal	1		0		1		0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.2800E-03	0.0000E+00	1.1324E-01	2.5323E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Railbed/Roadbed		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution V1, Scenarios 12-14,19-21						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.8602	8.602000E-01
v60	253	0	253	0	1	1
v90	303	0	303	0	1	1
v120=vseal	360	0	360	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.80877	0.8602	8.216275E-01
v60	223	0	223	0	1	1
v90	298	0	298	0	1	1
v120=vseal	360	0	360	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.74353	0.80877	7.761500E-01
v60	263	0	263	0	1	1
v90	394	0	394	0	1	1
v120=vseal	575	0	575	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.3980E-01	1.7837E-01	2.2385E-01	1.8631E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V2, Scenarios 7-11						
End	v	vL	vH	PL	PH	P
v30	38	37.91	39.46	0.9849	0.9945	9.854574E-01
v60	253	0	253	0	1	1
v90	303	0	303	0	1	1
v120=vseal	360	0	360	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34.61	36.29	0.9217	0.9635	9.314036E-01
v60	223	0	223	0	1	1
v90	298	0	298	0	1	1
v120=vseal	360	0	360	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.047085E-01
v60	263	0	263	0	1	1
v90	394	0	394	0	1	1
v120=vseal	575	0	575	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.4543E-02	6.8596E-02	1.9529E-01	9.3696E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V3, Scenarios 22-24						
End	v	vL	vH	PL	PH	P
v30	38	35	40	0.51279	0.7011	6.257760E-01
v60	253	0	253	0	1	1
v90	303	0	303	0	1	1
v120=vseal	360	0	360	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	0	35	0	0.51279	5.127900E-01
v60	223	0	223	0	1	1
v90	298	0	298	0	1	1
v120=vseal	360	0	360	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.28292	0.51279	3.748680E-01
v60	263	0	263	0	1	1
v90	394	0	394	0	1	1
v120=vseal	575	0	575	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.7422E-01	4.8721E-01	6.2513E-01	5.1150E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution V4, Scenario 5						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.84814	8.481400E-01
v60	253	0	253	0	1	1
v90	303	0	303	0	1	1
v120=vseal	360	0	360	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.80022	0.84814	8.122000E-01
v60	223	0	223	0	1	1
v90	298	0	298	0	1	1
v120=vseal	360	0	360	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.7421	0.80022	7.711600E-01
v60	263	0	263	0	1	1
v90	394	0	394	0	1	1
v120=vseal	575	0	575	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.5186E-01	1.8780E-01	2.2884E-01	1.9490E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Temperature (C)		300 = Ta	350 = Ts	750 = Tb	1000 = Tf	
Time to Temperature (hr)		0	0.59	1.96	5.32	
Modal Study Fire Duration Distribution F1, Scenarios 28-31, tmax = 1.333 hr						
	tL	tH	PL	PH	P(T)	
Ts	0.583	0.667	0.9944	0.997	0.99461667	
Tb	0	1.96	0	1	1	
Tf	0	5.32	0	1	1	
		P(OpD)	P(Co)	P(FT)		
P(Ts)-P(Ta)	0.99461667	1	1	1.0	P(Ta-Ts)	0.99461667
P(Tb)-P(Ts)	0.00538333	0.2	1	1.0	P(Ts-Tb)	0.00107667
1.0-P(Tb)	0.00000000	0.2	0.5	0.5	P(Tb-Tf)	0.0
Modal Study Fire Duration Distribution F2, Scenarios 1,2,6-27, tmax = 1.5 hr						
	tL	tH	PL	PH	P(T)	
Ts	0.583	0.667	0.9643	0.9800	0.96560833	
Tb	0	1.96	0	1	1	
Tf	0	5.32	0	1	1	
		P(OpD)	P(Co)	P(FT)		
P(Ts)-P(Ta)	0.96560833	1	1	1.0	P(Ta-Ts)	0.96560833
P(Tb)-P(Ts)	0.03439167	0.2	1	1.0	P(Ts-Tb)	0.00687833
1.0-P(Tb)	0.00000000	0.2	0.5	0.5	P(Tb-Tf)	0.0
Modal Study Fire Duration Distribution F3, Scenario 4, tmax = 8.0 hr						
	tL	tH	PL	PH	P(T)	
Ts	0.583	0.667	0.6771	0.7322	0.68169167	
Tb	1.917	2.0	0.8882	0.8917	0.89001325	
Tf	5.0	6.0	0.9641	0.9973	0.97472400	
		P(OpD)	P(Co)	P(FT)		
P(Ts)-P(Ta)	0.68169167	1	1	1.0	P(Ta-Ts)	0.68169167
P(Tb)-P(Ts)	0.20832159	0.2	1	1.0	P(Ts-Tb)	0.04166432
1.0-P(Tb)	0.10998675	0.2	0.5	0.5	P(Tb-Tf)	0.00549934
Modal Study Fire Duration Distribution F4, Scenario 3, tmax = 1.833 hr						
	tL	tH	PL	PH	P(T)	
Ts	0.583	0.667	0.9161	0.9456	0.91855833	
Tb	0	1.96	0	1	1	
Tf	0	5.32	0	1	1	
		P(OpD)	P(Co)	P(FT)		
P(Ts)-P(Ta)	0.91855833	1	1	1.0	P(Ta-Ts)	0.91855833
P(Tb)-P(Ts)	0.08144167	0.2	1	1.0	P(Ts-Tb)	0.01628833
1.0-P(Tb)	0.00000000	0.2	0.5	0.5	P(Tb-Tf)	0.0
Modal Study Fire Duration Distribution F5, Scenario 5, tmax = 7.0 hr						
	tL	tH	PL	PH	P(T)	
Ts	0.583	0.667	0.64690	0.73075	0.65388750	
Tb	1.833	2.0	0.93452	0.94126	0.93964563	
Tf	5.0	6.0	0.99056	0.99643	0.99243840	
		P(OpD)	P(Co)	P(FT)		
P(Ts)-P(Ta)	0.65388750	1	1	1.0	P(Ta-Ts)	0.65388750
P(Tb)-P(Ts)	0.28575813	1.0	1	1.0	P(Ts-Tb)	0.28575813
1.0-P(Tb)	0.06035437	1.0	0.5	0.5	P(Tb-Tf)	0.01508859

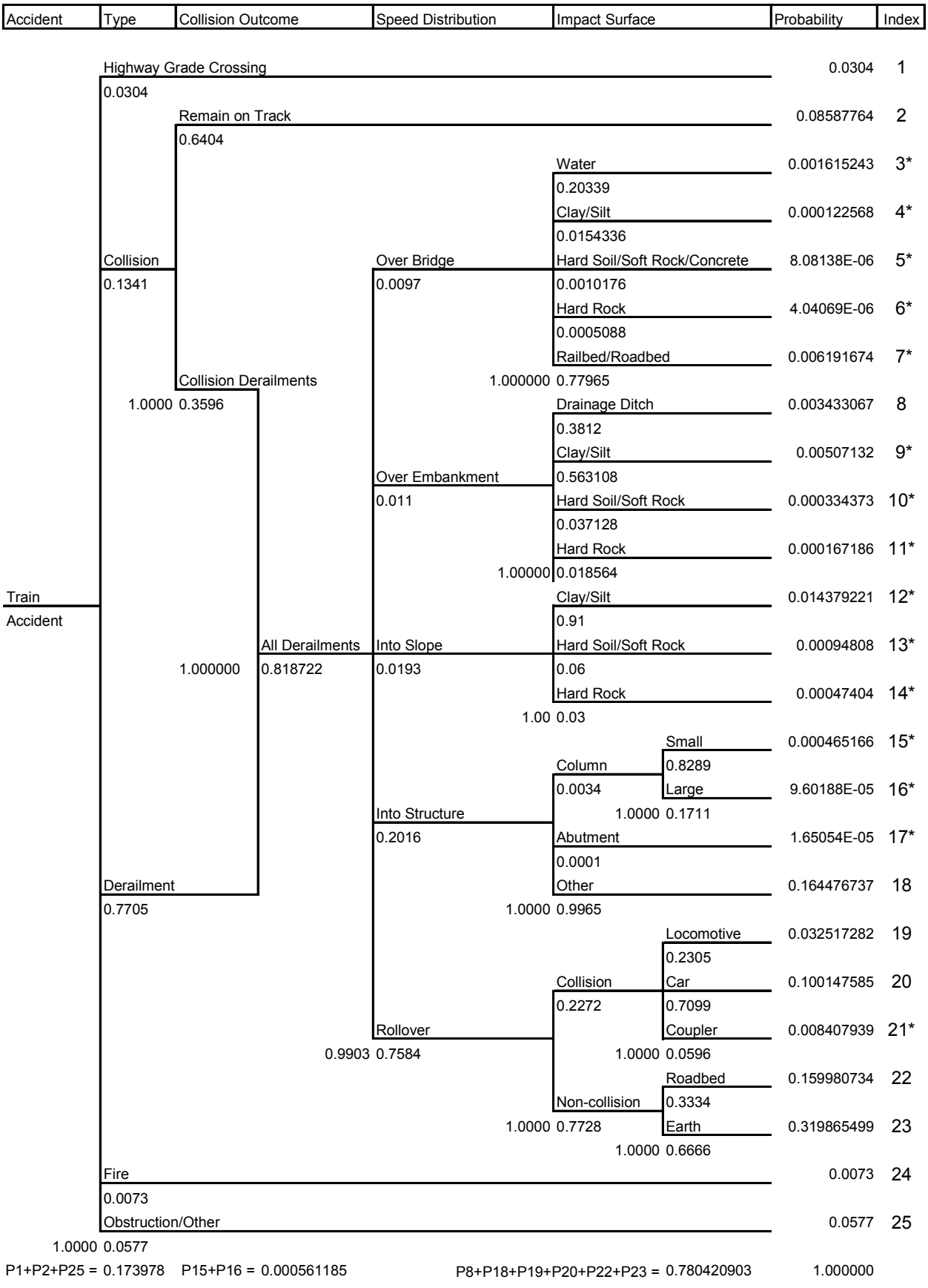
Column	B	C	D	E	F	G	H	I	J	K	L	M
Scenarios (index j)	Sum P(Scj)	Speed Distribution	Impact Surface	P(Spj) v30,v60	v60,v90	v90,vseal	>vseal	P(fire)	Fire Duration Distribution	P(FireSev) Ta-Ts	Ts-Tb	Tb-Tf
11	0.000003467	Bridge, V2	HR	3.1725E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.96560833	0.00687833	0
10	0.000004334		HS/SR/Con	9.3696E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.96560833	0.00687833	0
9	0.000078876		Clay/Silt	4.3355E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.96560833	0.00687833	0
8	0.003984546		Rail/Road	9.3696E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.96560833	0.00687833	0
7	0.001039462		Water	1.6343E-04	0.0000E+00	0.0000E+00	0.0000E+00	0.004	F2	0.96560833	0.00687833	0
21	0.001009644	Level, V1	HR	2.3656E-01	1.9475E-02	4.3250E-04	7.5000E-06	0.011	F2	0.96560833	0.00687833	0
20	0.001262055		HS/SR/Con	1.8631E-01	4.4400E-07	0.0000E+00	0.0000E+00	0.011	F2	0.96560833	0.00687833	0
19	0.022969408		Clay/Silt	6.6851E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.011	F2	0.96560833	0.00687833	0
12,13	0.000360402		Column	2.3656E-01	1.9475E-02	4.3250E-04	7.5000E-06	0.004	F2	0.96560833	0.00687833	0
14	0.000011607		Abutment	2.3656E-01	1.9475E-02	4.3250E-04	7.5000E-06	0.004	F2	0.96560833	0.00687833	0
24	0.000577483	Slope, V3	HR	6.7886E-01	3.7230E-02	9.8143E-04	8.5714E-06	0.011	F2	0.96560833	0.00687833	0
23	0.000721854		HS/SR/Con	5.1150E-01	5.0743E-07	0.0000E+00	0.0000E+00	0.011	F2	0.96560833	0.00687833	0
22	0.013137734		Clay/Silt	1.7414E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.011	F2	0.96560833	0.00687833	0
5	0.007700994	Crossing, V4	(Clay/silt)	7.1649E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.009	F5	0.65388750	0.28575813	0.01508859
3	0.431516708		All	0	0	0	0	0.003	F4	0.91855833	0.01628833	0
4	0.133201089		All	0	0	0	0	0.008	F3	0.68169167	0.04166432	0.00549934
1,2,6	0.080207809		All	0	0	0	0	0.009	F2	0.96560833	0.00687833	0
15-18	0.083090707		All	0	0	0	0	0.004	F2	0.96560833	0.00687833	0
25-27	0.050824181		All	0	0	0	0	0.011	F2	0.96560833	0.00687833	0
28	0.083492648		All	0	0	0	0	0.012	F1	0.99461667	0.00107667	0
29-30	0.075099992		All	0	0	0	0	0.13	F1	0.99461667	0.00107667	0
31	0.009705000		Fire-Only	0	0	0	0	1.00	F1	0.99461667	0.00107667	0
All	1.000000											

P(Punc/Shear) 0.001

Case		1	2	3	4	5	6	7	8	9	10
Formula		B*H	B*E*I*K	B*E*I*L	B*E*I*M	B*F*I*K	B*F*I*L	B*F*I*M	B*G*I*K	B*G*I*L	B*G*I*M
Scenario	11	0.000E+00	4.248E-09	3.026E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	10	0.000E+00	1.568E-09	1.117E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	9	0.000E+00	1.321E-08	9.409E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	8	0.000E+00	1.442E-06	1.027E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	7	0.000E+00	6.561E-10	4.674E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	21	7.572E-09	2.537E-06	1.807E-08	0.000E+00	2.089E-07	1.488E-09	0.000E+00	4.638E-09	3.304E-11	0.000E+00
	20	0.000E+00	2.497E-06	1.779E-08	0.000E+00	5.952E-12	4.240E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	19	0.000E+00	1.631E-05	1.162E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	12,13	2.703E-09	3.293E-07	2.346E-09	0.000E+00	2.711E-08	1.931E-10	0.000E+00	6.021E-10	4.289E-12	0.000E+00
	14	8.705E-11	1.060E-08	7.554E-11	0.000E+00	8.731E-10	6.219E-12	0.000E+00	1.939E-11	1.381E-13	0.000E+00
	24	4.950E-09	4.164E-06	2.966E-08	0.000E+00	2.284E-07	1.627E-09	0.000E+00	6.020E-09	4.288E-11	0.000E+00
	23	0.000E+00	3.922E-06	2.794E-08	0.000E+00	3.891E-12	2.771E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	22	0.000E+00	2.430E-05	1.731E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	5	0.000E+00	3.247E-06	1.419E-06	7.493E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	3	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0
	1,2,6	0	0	0	0	0	0	0	0	0	0
	15-18	0	0	0	0	0	0	0	0	0	0
	25-27	0	0	0	0	0	0	0	0	0	0
	28	0	0	0	0	0	0	0	0	0	0
	29-30	0	0	0	0	0	0	0	0	0	0
	31	0	0	0	0	0	0	0	0	0	0
Severity Fraction		1.531E-08	5.878E-05	1.815E-06	7.493E-08	4.652E-07	3.314E-09	0.000E+00	1.128E-08	8.035E-11	0.000E+00

Case		11	12	13	14	15	16	17	18
Formula		B*H*I*K	B*H*I*L	B*H*I*M	B*E*I*M*B28	B*F*I*M*B28	B*G*I*M*B28	B*H*I*M*B28	B*I*M
Scenario	11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	9	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	8	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	7	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	21	8.043E-11	5.729E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	12,13	1.044E-11	7.437E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	14	3.362E-13	2.395E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	24	5.258E-11	3.745E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0
	5	0.000E+00	0.000E+00	0.000E+00	7.493E-11	0.000E+00	0.000E+00	0.000E+00	0
	3	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	5.8601E-06
	1,2,6	0	0	0	0	0	0	0	0
	15-18	0	0	0	0	0	0	0	0
	25-27	0	0	0	0	0	0	0	0
	28	0	0	0	0	0	0	0	0
	29-30	0	0	0	0	0	0	0	0
	31	0	0	0	0	0	0	0	0
Severity Fraction		1.438E-10	1.024E-12	0.000E+00	7.493E-11	0.000E+00	0.000E+00	0.000E+00	5.860E-06

D.7 Steel-Lead-Steel Rail Cask Severity Fraction Spreadsheets


Accident
Type
Collision Outcome
Speed Distribution
Impact Surface
Probability
Index
Train Accident
Highway Grade Crossing
0.0304
0.0304
1
Remain on Track
0.6404
0.08587764
2
Collision
0.1341
Over Bridge
0.0097
Water
0.001615243
3*
0.20339
Clay/Silt
0.000122568
4*
0.0154336
Hard Soil/Soft Rock/Concrete
8.08138E-06
5*
0.0010176
Hard Rock
4.04069E-06
6*
0.0005088
Railbed/Roadbed
0.006191674
7*
Collision Derailments
1.000000
0.77965
1.0000
0.3596
Drainage Ditch
0.003433067
8
0.3812
Clay/Silt
0.00507132
9*
Over Embankment
0.563108
0.011
Hard Soil/Soft Rock
0.000334373
10*
0.037128
Hard Rock
0.000167186
11*
1.00000
0.018564
Clay/Silt
0.014379221
12*
0.91
All Derailments
Into Slope
Hard Soil/Soft Rock
0.00094808
13*
1.000000
0.818722
0.0193
0.06
Hard Rock
0.00047404
14*
1.00
0.03
Small
0.000465166
15*
Column
0.8289
0.0034
Large
9.60188E-05
16*
Into Structure
1.0000
0.1711
0.2016
Abutment
1.65054E-05
17*
0.0001
Derailment
Other
0.164476737
18
0.7705
1.0000
0.9965
Locomotive
0.032517282
19
0.2305
Collision
Car
0.100147585
20
0.2272
0.7099
Rollover
Coupler
0.008407939
21*
0.9903
0.7584
1.0000
0.0596
Roadbed
0.159980734
22
Non-collision
0.3334
1.0000
0.7728
Earth
0.319865499
23
1.0000
0.6666
Fire
0.0073
0.0073
24
Obstruction/Other
0.0577
0.0577
25
1.0000
P1+P2+P25 = 0.173978
P15+P16 = 0.000561185
P8+P18+P19+P20+P22+P23 = 0.780420903
1.000000

Surface	Hard Rock		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.83709	8.3709E-01
v60	60	58	62	0.98486	0.9898	9.8733E-01
v90	90	0	90	0	0.99957	9.9957E-01
v120=vseal	120	118	150	0.99999	1.0	9.9999E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.83709	8.3709E-01
v60	60	58	62	0.98486	0.9898	9.8733E-01
v90	90	0	90	0	0.99957	9.9957E-01
v120=vseal	120	118	150	0.99999	1.0	9.9999E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.83709	8.3709E-01
v60	60	58	62	0.98486	0.9898	9.8733E-01
v90	90	0	90	0	0.99957	9.9957E-01
v120=vseal	120	118	150	0.99999	1.0	9.9999E-01
	End	Corner	Side	Wt Sum		
P(v60)-P(v30)	1.5024E-01	1.5024E-01	1.5024E-01	1.5024E-01		
P(v90)-P(v60)	1.2240E-02	1.2240E-02	1.2240E-02	1.2240E-02		
P(vseal)-P(v90)	4.2063E-04	4.2063E-04	4.2063E-04	4.2063E-04		
1.0-P(vseal)	9.3750E-06	9.3750E-06	9.3750E-06	9.3750E-06		

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.81495	8.1495E-01
v60	60	58	62	0.9872	0.99204	9.8962E-01
v90	90	0	90	0	0.99985	9.9985E-01
v120=vseal	120	106	150	0.99999	1.0	9.9999E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.81495	8.1495E-01
v60	60	58	62	0.9872	0.99204	9.8962E-01
v90	90	0	90	0	0.99985	9.9985E-01
v120=vseal	120	106	150	0.99999	1.0	9.9999E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.81495	8.1495E-01
v60	60	58	62	0.9872	0.99204	9.8962E-01
v90	90	0	90	0	0.99985	9.9985E-01
v120=vseal	120	106	150	0.99999	1.0	9.9999E-01
	End	Corner	Side	Wt Sum		
P(v60)-P(v30)	1.7467E-01	1.7467E-01	1.7467E-01	1.7467E-01		
P(v90)-P(v60)	1.0230E-02	1.0230E-02	1.0230E-02	1.0230E-02		
P(vseal)-P(v90)	1.4318E-04	1.4318E-04	1.4318E-04	1.4318E-04		
1.0-P(vseal)	6.8182E-06	6.8182E-06	6.8182E-06	6.8182E-06		

Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.8275E-01
v60	60	0	60	0	1	1
v90	90	0	90	0	1	1
v120=vseal	120	0	120	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.8275E-01
v60	60	0	60	0	1	1
v90	90	0	90	0	1	1
v120=vseal	120	0	120	0	1	1
Side	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.8275E-01
v60	60	0	60	0	1	1
v90	90	0	90	0	1	1
v120=vseal	120	0	120	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.1725E-01	3.1725E-01	3.1725E-01	3.1725E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.35837	3.5837E-01
v60	60	0	60	0	0.97727	9.7727E-01
v90	90	0	90	0	0.997	9.9700E-01
v120=vseal	120	110	150	0.99999	1.0	9.9999E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.35837	3.5837E-01
v60	60	0	60	0	0.97727	9.7727E-01
v90	90	0	90	0	0.997	9.9700E-01
v120=vseal	120	110	150	0.99999	1.0	9.9999E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.35837	3.5837E-01
v60	60	0	60	0	0.97727	9.7727E-01
v90	90	0	90	0	0.997	9.9700E-01
v120=vseal	120	110	150	0.99999	1.0	9.9999E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	6.1890E-01	6.1890E-01	6.1890E-01	6.1890E-01
P(v90)-P(v60)	1.9730E-02	1.9730E-02	1.9730E-02	1.9730E-02
P(vseal)-P(v90)	2.9925E-03	2.9925E-03	2.9925E-03	2.9925E-03
1.0-P(vseal)	7.5000E-06	7.5000E-06	7.5000E-06	7.5000E-06

Surface	Soft Rock/Hard Soil/Concrete		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.91147	9.1147E-01
v60	319	0	319	0	1	1
v90	391	0	391	0	1	1
v120=vseal	509	0	509	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.87908	0.91147	8.8718E-01
v60	640	0	640	0	1	1
v90	990	0	990	0	1	1
v120=vseal	990	0	990	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.83709	0.87908	8.5809E-01
v60	207	0	207	0	1	1
v90	289	0	289	0	1	1
v120=vseal	289	0	289	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	8.8530E-02	1.1282E-01	1.4192E-01	1.1792E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.90385	9.0385E-01
v60	319	0	319	0	1	1
v90	391	0	391	0	1	1
v120=vseal	509	0	509	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.86477	0.90385	8.7454E-01
v60	640	0	640	0	1	1
v90	990	0	990	0	1	1
v120=vseal	990	0	990	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.81495	0.86477	8.3986E-01
v60	207	0	207	0	1	1
v90	289	0	289	0	1	1
v120=vseal	289	0	289	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	9.6150E-02	1.2546E-01	1.6014E-01	1.3152E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	38	37.91	39.46	0.9849	0.9945	9.8546E-01
v60	319	0	319	0	1	1
v90	391	0	391	0	1	1
v120=vseal	509	0	509	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34.61	36.29	0.9217	0.9635	9.3140E-01
v60	640	0	640	0	1	1
v90	990	0	990	0	1	1
v120=vseal	990	0	990	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.0471E-01
v60	207	0	207	0	1	1
v90	289	0	289	0	1	1
v120=vseal	289	0	289	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.4543E-02	6.8596E-02	1.9529E-01	9.3696E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	38	35	40	0.60624	0.77834	7.0950E-01
v60	319	0	319	0	1	1
v90	391	0	391	0	1	1
v120=vseal	509	0	509	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	0	35	0	0.60624	6.0624E-01
v60	640	0	640	0	1	1
v90	990	0	990	0	1	1
v120=vseal	990	0	990	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.35837	0.60624	4.5752E-01
v60	207	0	207	0	1	1
v90	289	0	289	0	1	1
v120=vseal	289	0	289	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.9050E-01	3.9376E-01	5.4248E-01	4.2099E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Clay/Silt			
Orientation	End	Corner	Side	
P(orientation)	0.056	0.722	0.222	

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	84	82	86	0.99886	0.99929	9.9908E-01
v60	386	0	386	0	1	1
v90	480	0	480	0	1	1
v120=vseal	635	0	635	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	0.98486	9.8486E-01
v60	133	118	150	0.99999	1.0	9.9999E-01
v90	208	0	208	0	1	1
v120=vseal	223	0	223	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.83709	0.87908	8.5809E-01
v60	180	0	180	0	1	1
v90	256	0	256	0	1	1
v120=vseal	262	0	262	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	9.2500E-04	1.5135E-02	1.4192E-01	4.2484E-02
P(v90)-P(v60)	0.0000E+00	5.3125E-06	0.0000E+00	3.8356E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	84	82	86	0.99948	0.99972	9.9960E-01
v60	386	0	386	0	1	1
v90	480	0	480	0	1	1
v120=vseal	635	0	635	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	0.9872	9.8720E-01
v60	133	106	150	0.99999	1.0	1.0000E+00
v90	208	0	208	0	1	1
v120=vseal	223	0	223	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.81495	0.86477	8.3986E-01
v60	180	0	180	0	1	1
v90	256	0	256	0	1	1
v120=vseal	262	0	262	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	4.0000E-04	1.2796E-02	1.6014E-01	4.4812E-02
P(v90)-P(v60)	0.0000E+00	3.8636E-06	0.0000E+00	2.7895E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	84	0	84	0	1	1
v60	386	0	386	0	1	1
v90	480	0	480	0	1	1
v120=vseal	635	0	635	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	1	1
v60	133	0	133	0	1	1
v90	208	0	208	0	1	1
v120=vseal	223	0	223	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.0471E-01
v60	180	0	180	0	1	1
v90	256	0	256	0	1	1
v120=vseal	262	0	262	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	0.0000E+00	0.0000E+00	1.9529E-01	4.3355E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	84	80	85	0.99852	0.99932	9.9916E-01
v60	386	0	386	0	1	1
v90	480	0	480	0	1	1
v120=vseal	635	0	635	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	55	60	0.95855	0.97727	9.6978E-01
v60	133	110	150	0.99999	1.0	1.0000E+00
v90	208	0	208	0	1	1
v120=vseal	223	0	223	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.35837	0.60624	4.5752E-01
v60	180	0	180	0	1	1
v90	256	0	256	0	1	1
v120=vseal	262	0	262	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	8.4000E-04	3.0214E-02	5.4248E-01	1.4229E-01
P(v90)-P(v60)	0.0000E+00	4.2500E-06	0.0000E+00	3.0685E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Water		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	0.99818	9.9818E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1.0	1.0000E+00
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	0	42	0	0.93606	9.3606E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.8200E-03	0.0000E+00	6.3940E-02	1.4297E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	0.99906	9.9906E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1.0	1.0000E+00
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	0	42	0	0.93246	9.3246E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	9.4000E-04	0.0000E+00	6.7540E-02	1.5047E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	41.67	43.08	0.9991	0.9998	9.9926E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	0.0000E+00	0.0000E+00	7.3617E-04	1.6343E-04
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	78	75	80	0.99692	0.99852	9.9788E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	40	45	0.77834	0.8723	8.1592E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.1200E-03	0.0000E+00	1.8408E-01	4.0984E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Railbed/Roadbed		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.91147	9.1147E-01
v60	386	0	386	0	1	1
v90	480	0	480	0	1	1
v120=vseal	635	0	635	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.87908	0.91147	8.8718E-01
v60	133	118	150	0.99999	1.0	9.9999E-01
v90	208	0	208	0	1	1
v120=vseal	223	0	223	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.83709	0.87908	8.5809E-01
v60	180	0	180	0	1	1
v90	256	0	256	0	1	1
v120=vseal	262	0	262	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	8.8530E-02	1.1282E-01	1.4192E-01	1.1792E-01
P(v90)-P(v60)	0.0000E+00	5.3125E-06	0.0000E+00	3.8356E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.90385	9.0385E-01
v60	386	0	386	0	1	1
v90	480	0	480	0	1	1
v120=vseal	635	0	635	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.86477	0.90385	8.7454E-01
v60	133	106	150	0.99999	1.0	1.0000E+00
v90	208	0	208	0	1	1
v120=vseal	223	0	223	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.81495	0.86477	8.3986E-01
v60	180	0	180	0	1	1
v90	256	0	256	0	1	1
v120=vseal	262	0	262	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	9.6150E-02	1.2546E-01	1.6014E-01	1.3151E-01
P(v90)-P(v60)	0.0000E+00	3.8636E-06	0.0000E+00	2.7895E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	38	37.91	39.46	0.9849	0.9945	1
v60	386	0	386	0	1	1
v90	480	0	480	0	1	1
v120=vseal	635	0	635	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34.61	36.29	0.9217	0.9635	1
v60	133	0	133	0	1	1
v90	208	0	208	0	1	1
v120=vseal	223	0	223	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.0471E-01
v60	180	0	180	0	1	1
v90	256	0	256	0	1	1
v120=vseal	262	0	262	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.4543E-02	6.8596E-02	1.9529E-01	9.3696E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	38	35	40	0.60624	0.77834	7.0950E-01
v60	386	0	386	0	1	1
v90	480	0	480	0	1	1
v120=vseal	635	0	635	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	0	35	0	0.60624	6.0624E-01
v60	133	110	150	0.99999	1.0	1.0000E+00
v90	208	0	208	0	1	1
v120=vseal	223	0	223	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.35837	0.60624	4.5752E-01
v60	180	0	180	0	1	1
v90	256	0	256	0	1	1
v120=vseal	262	0	262	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.9050E-01	3.9376E-01	5.4248E-01	4.2099E-01
P(v90)-P(v60)	0.0000E+00	4.2500E-06	0.0000E+00	3.0685E-06
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Temperature (C)		300 = Ta	350 = Ts	750 = Tb	1000 = Tf	
Time to Temperature (hr)		0	1.06	2.91	6.43	
Modal Study Fire Duration Distribution TF1, Scenarios 1-2, tmax = 7.0 hr						
		tL	tH	PL	PH	P(T)
Ts		1.0	1.167	0.88589	0.89828	0.89034150
Tb		2.0	3.0	0.94126	0.96792	0.96552060
Tf		6.0	7.0	0.99643	1.0	0.99796510
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.89034150		1	1	1.0	P(Ta-Ts) 0.89034150
P(Tb)-P(Ts)	0.07517910		0.2	1	1.0	P(Ts-Tb) 0.01503582
1.0-P(Tb)	0.03447940		0.2	0.5	0.5	P(Tb-Tf) 0.00172397
Modal Study Fire Duration Distribution TF2, Scenarios 3-23, tmax = 11.0 hr						
		tL	tH	PL	PH	P(T)
Ts		1.0	1.167	0.81870	0.83308	0.82386647
Tb		2.0	3.0	0.89665	0.94290	0.93873750
Tf		6.0	7.0	0.98868	0.99380	0.99088160
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.82386647		1	1	1.0	P(Ta-Ts) 0.82386647
P(Tb)-P(Ts)	0.11487103		0.2	1	1.0	P(Ts-Tb) 0.02297421
1.0-P(Tb)	0.06126250		0.2	0.5	0.5	P(Tb-Tf) 0.00306313
Modal Study Fire Duration Distribution TF3, Scenario 24, tmax = 11.0 hr						
		tL	tH	PL	PH	P(T)
Ts		1.0	1.167	0.82036	0.83454	0.82545461
Tb		2.0	3.0	0.89792	0.94342	0.93932500
Tf		6.0	7.0	0.98941	0.99403	0.99139660
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.82545461		1	1	1.0	P(Ta-Ts) 0.82545461
P(Tb)-P(Ts)	0.11387039		0.2	1	1.0	P(Ts-Tb) 0.02277408
1.0-P(Tb)	0.06067500		0.2	0.5	0.5	P(Tb-Tf) 0.00303375

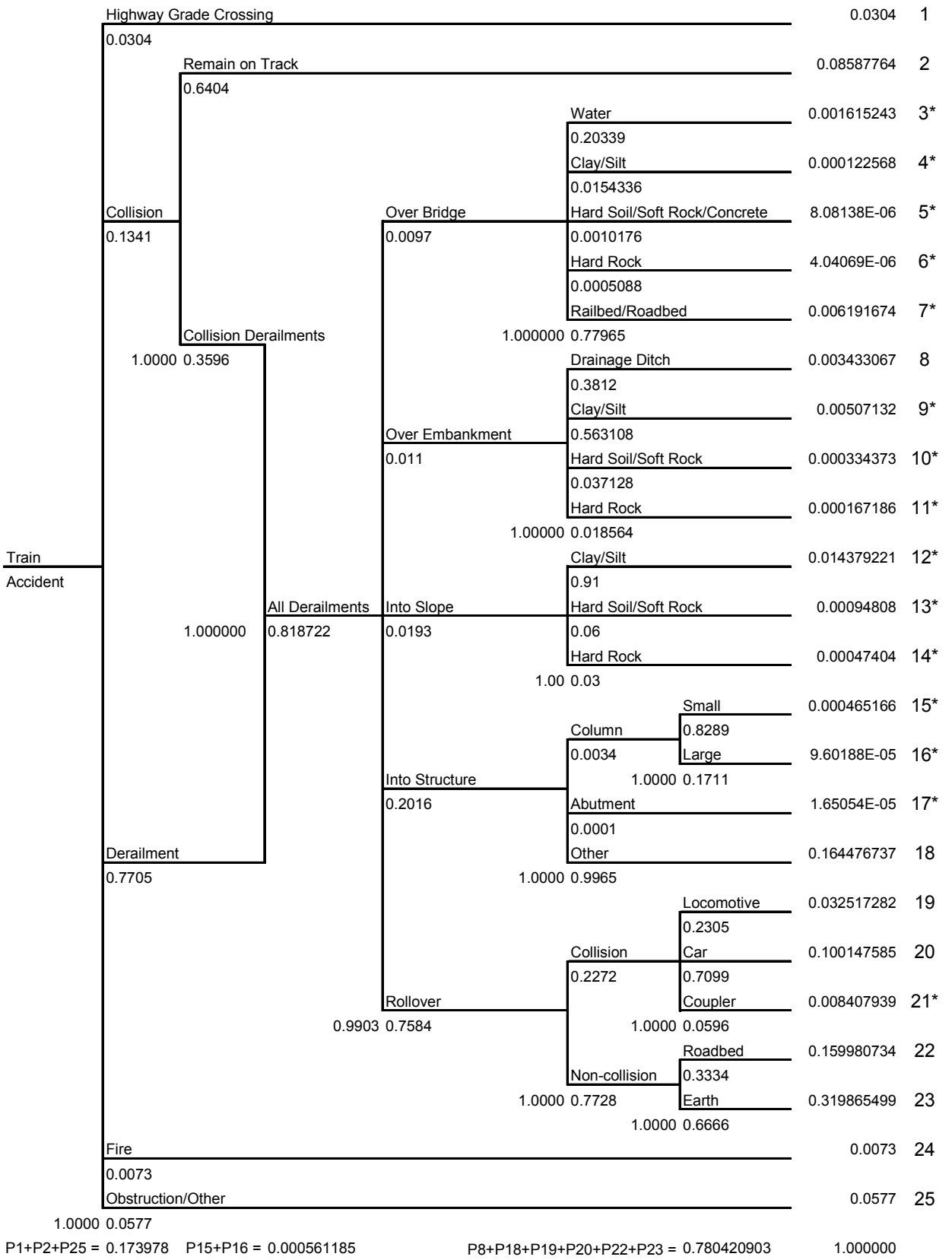
Column	B	C	D	E	F	G	H	I	J	K	L	M
Scenarios (index j)	Sum P(Scj)	Speed Distribution	Impact Surface	P(Spj) v30,v60	v60,v90	v90,vseal	>vseal	P(fire)	Fire Duration Distribution	P(FireSev) Ta-Ts	Ts-Tb	Tb-Tf
3	0.001615243	Bridge, TV3	Water	1.6343E-04	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
4	0.000122568		Clay/Silt	4.3355E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
5	8.08138E-06		HS/SR/Con	9.3696E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
6	4.04069E-06		HR	3.1725E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
7	0.006191674		Rail/Road	9.3696E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
9	0.005071320	Slope,TV4	Clay/Silt	1.4229E-01	3.0685E-06	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
10	0.000334373		HS/SR	4.2099E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
11	0.000167186		HR	6.1890E-01	1.9730E-02	2.9925E-03	7.5000E-06	0.01	TF2	0.823866467	0.022974207	0.003063125
12	0.014379221	Level, TV2	Clay/Silt	4.4812E-02	2.7895E-06	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
13	0.000948080		HS/SR	1.3152E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
14	0.000474040		HR	1.7467E-01	1.0230E-02	1.4318E-04	6.8182E-06	0.01	TF2	0.823866467	0.022974207	0.003063125
15,16	0.000561185	Structure, TV2	Column	1.3152E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
17	1.65054E-05		Abutment	1.3152E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
21	0.008407939	Rollover, TV2	Coupler	1.3152E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.823866467	0.022974207	0.003063125
1,2,25	0.173977640		All	1	1	1	1	0.01	TF1	0.890341497	0.015035821	0.00172397
8,18-20,22,23	0.780420903		All	1	1	1	1	0.01	TF2	0.823866467	0.022974207	0.003063125
24	0.007300000		Fire-Only	1	1	1	1	1.00	TF3	0.825454611	0.022774078	0.00303375
All	1.000000											

P(Punc/Shear)	Scenario 21	0.01	All other scenarios	0.001

Case		1	2	3	4	5	6	7	8	9	10	11	12
Formula		B*F	B*G	B*H	B*E*I*K	B*E*I*L	B*E*I*M	B*F*I*K	B*F*I*L	B*F*I*M	B*G*I*K	B*G*I*L	B*G*I*M
Scenario	3	0.000E+00	0.0000E+00	0.000E+00	2.175E-09	6.065E-11	8.086E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	4	0.000E+00	0.0000E+00	0.000E+00	4.378E-08	1.221E-09	1.628E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	5	0.000E+00	0.0000E+00	0.000E+00	6.238E-09	1.740E-10	2.319E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	6	0.000E+00	0.0000E+00	0.000E+00	1.056E-08	2.945E-10	3.927E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	7	0.000E+00	0.0000E+00	0.000E+00	4.780E-06	1.333E-07	1.777E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	9	1.556E-08	0.0000E+00	0.000E+00	5.945E-06	1.658E-07	2.210E-08	1.282E-10	3.575E-12	4.767E-13	0.000E+00	0.000E+00	0.000E+00
	10	0.000E+00	0.0000E+00	0.000E+00	1.160E-06	3.234E-08	4.312E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	11	3.299E-06	5.0031E-07	1.254E-09	8.525E-07	2.377E-08	3.169E-09	2.718E-08	7.578E-10	1.010E-10	4.122E-09	1.149E-10	1.532E-11
	12	4.011E-08	0.0000E+00	0.000E+00	5.309E-06	1.480E-07	1.974E-08	3.305E-10	9.215E-12	1.229E-12	0.000E+00	0.000E+00	0.000E+00
	13	0.000E+00	0.0000E+00	0.000E+00	1.027E-06	2.865E-08	3.819E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	14	4.849E-06	6.7874E-08	3.232E-09	6.822E-07	1.902E-08	2.536E-09	3.995E-08	1.114E-09	1.485E-10	5.592E-10	1.559E-11	2.079E-12
	15,16	0.000E+00	0.0000E+00	0.000E+00	6.081E-07	1.696E-08	2.261E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	17	0.000E+00	0.0000E+00	0.000E+00	1.788E-08	4.987E-10	6.649E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	21	0.000E+00	0.0000E+00	0.000E+00	9.110E-06	2.540E-07	3.387E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	1,2,25	0	0	0	0	0	0	0	0	0	0	0	0
	8,18-20,22,23	0	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0	0
Severity Fraction		8.204E-06	5.682E-07	4.486E-09	2.955E-05	8.241E-07	1.099E-07	6.759E-08	1.885E-09	2.513E-10	4.681E-09	1.305E-10	1.740E-11

Case		13	14	15	16	17	18	19	20
Formula		B*H*I*K	B*H*I*L	B*H*I*M	B*E*I*M*F22	B*F*I*M*F22	B*G*I*M*F22	B*H*I*M*F22	B*I*M
Scenario	3	0.000E+00	0.000E+00	0.000E+00	8.086E-15	0.000E+00	0.000E+00	0.000E+00	0
	4	0.000E+00	0.000E+00	0.000E+00	1.628E-13	0.000E+00	0.000E+00	0.000E+00	0
	5	0.000E+00	0.000E+00	0.000E+00	2.319E-14	0.000E+00	0.000E+00	0.000E+00	0
	6	0.000E+00	0.000E+00	0.000E+00	3.927E-14	0.000E+00	0.000E+00	0.000E+00	0
	7	0.000E+00	0.000E+00	0.000E+00	1.777E-11	0.000E+00	0.000E+00	0.000E+00	0
	9	0.000E+00	0.000E+00	0.000E+00	2.210E-11	4.767E-16	0.000E+00	0.000E+00	0
	10	0.000E+00	0.000E+00	0.000E+00	4.312E-12	0.000E+00	0.000E+00	0.000E+00	0
	11	1.033E-11	2.881E-13	3.841E-14	3.169E-12	1.010E-13	1.532E-14	3.841E-17	0
	12	0.000E+00	0.000E+00	0.000E+00	1.974E-11	1.229E-15	0.000E+00	0.000E+00	0
	13	0.000E+00	0.000E+00	0.000E+00	3.819E-12	0.000E+00	0.000E+00	0.000E+00	0
	14	2.663E-11	7.425E-13	9.900E-14	2.536E-12	1.485E-13	2.079E-15	9.900E-17	0
	15,16	0.000E+00	0.000E+00	0.000E+00	2.261E-12	0.000E+00	0.000E+00	0.000E+00	0
	17	0.000E+00	0.000E+00	0.000E+00	6.649E-14	0.000E+00	0.000E+00	0.000E+00	0
	21	0.000E+00	0.000E+00	0.000E+00	3.387E-10	0.000E+00	0.000E+00	0.000E+00	0
	1,2,25	0	0	0	0	0	0	0	2.9993E-06
	8,18-20,22,23	0	0	0	0	0	0	0	2.3905E-05
	24	0	0	0	0	0	0	0	2.2146E-05
Severity Fraction		3.696E-11	1.031E-12	1.374E-13	4.147E-10	2.513E-13	1.740E-14	1.374E-16	4.905E-05

D.8 Monolithic Steel Rail Cask Severity Fraction Spreadsheets


Accident
Type
Collision Outcome
Speed Distribution
Impact Surface
Probability
Index
Train Accident
Highway Grade Crossing
0.0304
0.0304
1
Remain on Track
0.6404
0.08587764
2
Collision
0.1341
Over Bridge
0.0097
Water
0.001615243
3*
0.20339
Clay/Silt
0.000122568
4*
0.0154336
Hard Soil/Soft Rock/Concrete
8.08138E-06
5*
0.0010176
Hard Rock
4.04069E-06
6*
0.0005088
Railbed/Roadbed
0.006191674
7*
Collision Derailments
1.000000
0.77965
1.0000
0.3596
Drainage Ditch
0.003433067
8
0.3812
Clay/Silt
0.00507132
9*
Over Embankment
0.563108
0.011
Hard Soil/Soft Rock
0.000334373
10*
0.037128
Hard Rock
0.000167186
11*
1.00000
0.018564
Clay/Silt
0.014379221
12*
0.91
All Derailments
Into Slope
Hard Soil/Soft Rock
0.00094808
13*
1.000000
0.818722
0.0193
0.06
Hard Rock
0.00047404
14*
1.00
0.03
Small
0.000465166
15*
Column
0.8289
0.0034
Large
9.60188E-05
16*
Into Structure
1.0000
0.1711
0.2016
Abutment
1.65054E-05
17*
0.0001
Derailment
Other
0.164476737
18
0.7705
1.0000
0.9965
Locomotive
0.032517282
19
0.2305
Collision
Car
0.100147585
20
0.2272
0.7099
Rollover
Coupler
0.008407939
21*
0.9903
0.7584
1.0000
0.0596
Roadbed
0.159980734
22
Non-collision
0.3334
1.0000
0.7728
Earth
0.319865499
23
1.0000
0.6666
Fire
0.0073
0.0073
24
Obstruction/Other
0.0577
25
1.0000
0.0577
P1+P2+P25 = 0.173978
P15+P16 = 0.000561185
P8+P18+P19+P20+P22+P23 = 0.780420903
1.000000

Surface	Hard Rock		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.83709	8.3709E-01
v60	60	58	62	0.98486	0.9898	9.8733E-01
v90	90	0	90	0	0.99957	9.9957E-01
v120=vseal	120	118	150	0.99999	1.0	9.9999E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.83709	8.3709E-01
v60	60	58	62	0.98486	0.9898	9.8733E-01
v90	90	0	90	0	0.99957	9.9957E-01
v120=vseal	120	118	150	0.99999	1.0	9.9999E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.83709	8.3709E-01
v60	60	58	62	0.98486	0.9898	9.8733E-01
v90	90	0	90	0	0.99957	9.9957E-01
v120=vseal	120	118	150	0.99999	1.0	9.9999E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.5024E-01	1.5024E-01	1.5024E-01	1.5024E-01
P(v90)-P(v60)	1.2240E-02	1.2240E-02	1.2240E-02	1.2240E-02
P(vseal)-P(v90)	4.2063E-04	4.2063E-04	4.2063E-04	4.2063E-04
1.0-P(vseal)	9.3750E-06	9.3750E-06	9.3750E-06	9.3750E-06

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.81495	8.1495E-01
v60	60	58	62	0.9872	0.99204	9.8962E-01
v90	90	0	90	0	0.99985	9.9985E-01
v120=vseal	120	106	150	0.99999	1.0	9.9999E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.81495	8.1495E-01
v60	60	58	62	0.9872	0.99204	9.8962E-01
v90	90	0	90	0	0.99985	9.9985E-01
v120=vseal	120	106	150	0.99999	1.0	9.9999E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.81495	8.1495E-01
v60	60	58	62	0.9872	0.99204	9.8962E-01
v90	90	0	90	0	0.99985	9.9985E-01
v120=vseal	120	106	150	0.99999	1.0	9.9999E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.7467E-01	1.7467E-01	1.7467E-01	1.7467E-01
P(v90)-P(v60)	1.0230E-02	1.0230E-02	1.0230E-02	1.0230E-02
P(vseal)-P(v90)	1.4318E-04	1.4318E-04	1.4318E-04	1.4318E-04
1.0-P(vseal)	6.8182E-06	6.8182E-06	6.8182E-06	6.8182E-06

Monolithic Steel Rail Cask Severity Fractions

Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.8275E-01
v60	60	0	60	0	1	1
v90	90	0	90	0	1	1
v120=vseal	120	0	120	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.8275E-01
v60	60	0	60	0	1	1
v90	90	0	90	0	1	1
v120=vseal	120	0	120	0	1	1
Side	v	vL	vH	PL	PH	P
v30	30	28.95	30.95	0.6124	0.7464	6.8275E-01
v60	60	0	60	0	1	1
v90	90	0	90	0	1	1
v120=vseal	120	0	120	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	3.1725E-01	3.1725E-01	3.1725E-01	3.1725E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.35837	3.5837E-01
v60	60	0	60	0	0.97727	9.7727E-01
v90	90	0	90	0	0.9997	9.9970E-01
v120=vseal	120	110	150	0.99999	1.0	9.9999E-01
Corner	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.35837	3.5837E-01
v60	60	0	60	0	0.97727	9.7727E-01
v90	90	0	90	0	0.9997	9.9970E-01
v120=vseal	120	110	150	0.99999	1.0	9.9999E-01
Side	v	vL	vH	PL	PH	P
v30	30	0	30	0	0.35837	3.5837E-01
v60	60	0	60	0	0.97727	9.7727E-01
v90	90	0	90	0	0.9997	9.9970E-01
v120=vseal	120	110	150	0.99999	1.0	9.9999E-01

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	6.1890E-01	6.1890E-01	6.1890E-01	6.1890E-01
P(v90)-P(v60)	2.2430E-02	2.2430E-02	2.2430E-02	2.2430E-02
P(vseal)-P(v90)	2.9250E-04	2.9250E-04	2.9250E-04	2.9250E-04
1.0-P(vseal)	7.5000E-06	7.5000E-06	7.5000E-06	7.5000E-06

Surface	Soft Rock/Hard Soil/Concrete		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.91147	9.1147E-01
v60	419	0	419	0	1	1
v90	507	0	507	0	1	1
v120=vseal	573	0	573	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.87908	0.91147	8.8718E-01
v60	1129	0	1129	0	1	1
v90	1679	0	1679	0	1	1
v120=vseal	2171	0	2171	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.83709	0.87908	8.5809E-01
v60	256	0	256	0	1	1
v90	451	0	451	0	1	1
v120=vseal	522	0	522	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	8.8530E-02	1.1282E-01	1.4192E-01	1.1792E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.90385	9.0385E-01
v60	419	0	419	0	1	1
v90	507	0	507	0	1	1
v120=vseal	573	0	573	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.86477	0.90385	8.7454E-01
v60	1129	0	1129	0	1	1
v90	1679	0	1679	0	1	1
v120=vseal	2171	0	2171	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.81495	0.86477	8.3986E-01
v60	256	0	256	0	1	1
v90	451	0	451	0	1	1
v120=vseal	522	0	522	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	9.6150E-02	1.2546E-01	1.6014E-01	1.3152E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

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Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	38	37.91	39.46	0.9849	0.9945	9.8546E-01
v60	419	0	419	0	1	1
v90	507	0	507	0	1	1
v120=vseal	573	0	573	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34.61	36.29	0.9217	0.9635	9.3140E-01
v60	1129	0	1129	0	1	1
v90	1679	0	1679	0	1	1
v120=vseal	2171	0	2171	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.0471E-01
v60	256	0	256	0	1	1
v90	451	0	451	0	1	1
v120=vseal	522	0	522	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.4543E-02	6.8596E-02	1.9529E-01	9.3696E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	38	35	40	0.60624	0.77834	7.0950E-01
v60	419	0	419	0	1	1
v90	507	0	507	0	1	1
v120=vseal	573	0	573	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	0	35	0	0.60624	6.0624E-01
v60	1129	0	1129	0	1	1
v90	1679	0	1679	0	1	1
v120=vseal	2171	0	2171	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.35837	0.60624	4.5752E-01
v60	256	0	256	0	1	1
v90	451	0	451	0	1	1
v120=vseal	522	0	522	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.9050E-01	3.9376E-01	5.4248E-01	4.2099E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Clay/Silt		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	84	82	86	0.99886	0.99929	9.9908E-01
v60	521	0	521	0	1	1
v90	632	0	632	0	1	1
v120=vseal	750	0	750	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	0.98486	9.8486E-01
v60	218	0	218	0	1	1
v90	321	0	321	0	1	1
v120=vseal	418	0	418	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.83709	0.87908	8.5809E-01
v60	230	0	230	0	1	1
v90	394	0	394	0	1	1
v120=vseal	505	0	505	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	9.2500E-04	1.5140E-02	1.4192E-01	4.2488E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	84	82	86	0.99948	0.99972	9.9960E-01
v60	521	0	521	0	1	1
v90	632	0	632	0	1	1
v120=vseal	750	0	750	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	0.9872	9.8720E-01
v60	218	0	218	0	1	1
v90	321	0	321	0	1	1
v120=vseal	418	0	418	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.81495	0.86477	8.3986E-01
v60	230	0	230	0	1	1
v90	394	0	394	0	1	1
v120=vseal	505	0	505	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	4.0000E-04	1.2800E-02	1.6014E-01	4.4815E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

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Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	84	0	84	0	1	1
v60	521	0	521	0	1	1
v90	632	0	632	0	1	1
v120=vseal	750	0	750	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	0	58	0	1	1
v60	218	0	218	0	1	1
v90	321	0	321	0	1	1
v120=vseal	418	0	418	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.0471E-01
v60	230	0	230	0	1	1
v90	394	0	394	0	1	1
v120=vseal	505	0	505	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	0.0000E+00	0.0000E+00	1.9529E-01	4.3355E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	84	80	85	0.99852	0.99932	9.9916E-01
v60	521	0	521	0	1	1
v90	632	0	632	0	1	1
v120=vseal	750	0	750	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	58	55	60	0.95855	0.97727	9.6978E-01
v60	218	0	218	0	1	1
v90	321	0	321	0	1	1
v120=vseal	418	0	418	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.35837	0.60624	4.5752E-01
v60	230	0	230	0	1	1
v90	394	0	394	0	1	1
v120=vseal	505	0	505	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	8.4000E-04	3.0218E-02	5.4248E-01	1.4230E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Water		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	0.99818	9.9818E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1.0	1.0000E+00
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	0	42	0	0.93606	9.3606E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.8200E-03	0.0000E+00	6.3940E-02	1.4297E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	0.99906	9.9906E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1.0	1.0000E+00
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	0	42	0	0.93246	9.3246E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	9.4000E-04	0.0000E+00	6.7540E-02	1.5047E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

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Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	78	0	78	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	41.67	43.08	0.9991	0.9998	9.9926E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	0.0000E+00	0.0000E+00	7.3617E-04	1.6343E-04
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	78	75	80	0.99692	0.99852	9.9788E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	150	0	150	0	1	1
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1
Side	v	vL	vH	PL	PH	P
v30	42	40	45	0.77834	0.8723	8.1592E-01
v60	1	0	1	0	1	1
v90	1	0	1	0	1	1
v120=vseal	1	0	1	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.1200E-03	0.0000E+00	1.8408E-01	4.0984E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Surface	Railbed/Roadbed		
Orientation	End	Corner	Side
P(orientation)	0.056	0.722	0.222

Velocity Distribution TV1, Scenarios 1,2,25						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.91147	9.1147E-01
v60	521	0	521	0	1	1
v90	632	0	632	0	1	1
v120=vseal	750	0	750	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.87908	0.91147	8.8718E-01
v60	218	0	218	0	1	1
v90	321	0	321	0	1	1
v120=vseal	418	0	418	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.83709	0.87908	8.5809E-01
v60	230	0	230	0	1	1
v90	394	0	394	0	1	1
v120=vseal	505	0	505	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	8.8530E-02	1.1282E-01	1.4192E-01	1.1792E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV2, Scenarios 12-23						
End	v	vL	vH	PL	PH	P
v30	38	0	38	0	0.90385	9.0385E-01
v60	521	0	521	0	1	1
v90	632	0	632	0	1	1
v120=vseal	750	0	750	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34	38	0.86477	0.90385	8.7454E-01
v60	218	0	218	0	1	1
v90	321	0	321	0	1	1
v120=vseal	418	0	418	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	34	0.81495	0.86477	8.3986E-01
v60	230	0	230	0	1	1
v90	394	0	394	0	1	1
v120=vseal	505	0	505	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	9.6150E-02	1.2546E-01	1.6014E-01	1.3152E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

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Velocity Distribution TV3, Scenarios 3-7						
End	v	vL	vH	PL	PH	P
v30	38	37.91	39.46	0.9849	0.9945	9.8546E-01
v60	521	0	521	0	1	1
v90	632	0	632	0	1	1
v120=vseal	750	0	750	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	34.61	36.29	0.9217	0.9635	9.3140E-01
v60	218	0	218	0	1	1
v90	321	0	321	0	1	1
v120=vseal	418	0	418	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30.95	32.83	0.7464	0.8508	8.0471E-01
v60	230	0	230	0	1	1
v90	394	0	394	0	1	1
v120=vseal	505	0	505	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	1.4543E-02	6.8596E-02	1.9529E-01	9.3696E-02
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Velocity Distribution TV4, Scenarios 8-11						
End	v	vL	vH	PL	PH	P
v30	38	35	40	0.60624	0.77834	7.0950E-01
v60	521	0	521	0	1	1
v90	632	0	632	0	1	1
v120=vseal	750	0	750	0	1	1
Corner	v	vL	vH	PL	PH	P
v30	35	0	35	0	0.60624	6.0624E-01
v60	218	0	218	0	1	1
v90	321	0	321	0	1	1
v120=vseal	418	0	418	0	1	1
Side	v	vL	vH	PL	PH	P
v30	32	30	35	0.35837	0.60624	4.5752E-01
v60	230	0	230	0	1	1
v90	394	0	394	0	1	1
v120=vseal	505	0	505	0	1	1

	End	Corner	Side	Wt Sum
P(v60)-P(v30)	2.9050E-01	3.9376E-01	5.4248E-01	4.2099E-01
P(v90)-P(v60)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
P(vseal)-P(v90)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
1.0-P(vseal)	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Temperature (C)		300 = Ta	350 = Ts	750 = Tb	1000 = Tf	
Time to Temperature (hr)		0	1.37	6.57	11	
Modal Study Fire Duration Distribution TF1, Scenarios 1-2, tmax = 7.0 hr						
		tL	tH	PL	PH	P(T)
Ts		1.333	1.5	0.90934	0.91874	0.91142263
Tb		6.0	7.0	0.99643	1.0	0.99846490
Tf		0	11.0	0	1	1
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.91142263		1	1	1.0	P(Ta-Ts) 0.91142263
P(Tb)-P(Ts)	0.08704227		0.2	1	1.0	P(Ts-Tb) 0.01740845
1.0-P(Tb)	0.00153510		0.2	0.5	0.5	P(Tb-Tf) 7.6755E-05
Modal Study Fire Duration Distribution TF2, Scenarios 3-23, tmax = 11.0 hr						
		tL	tH	PL	PH	P(T)
Ts		1.333	1.5	0.84752	0.86071	0.85044234
Tb		6.0	7.0	0.98868	0.99380	0.99159840
Tf		0	11.0	0	1	1
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.85044234		1	1	1.0	P(Ta-Ts) 0.85044234
P(Tb)-P(Ts)	0.14115606		0.2	1	1.0	P(Ts-Tb) 0.02823121
1.0-P(Tb)	0.00840160		0.2	0.5	0.5	P(Tb-Tf) 0.00042008
Modal Study Fire Duration Distribution TF3, Scenario 24, tmax = 11.0 hr						
		tL	tH	PL	PH	P(T)
Ts		1.333	1.5	0.84874	0.86292	0.85188168
Tb		6.0	7.0	0.98941	0.99403	0.99204340
Tf		0	11.00	0	1	1
			P(OpD)	P(Co)	P(FT)	
P(Ts)-P(Ta)	0.85188168		1	1	1.0	P(Ta-Ts) 0.85188168
P(Tb)-P(Ts)	0.14016172		0.2	1	1.0	P(Ts-Tb) 0.02803234
1.0-P(Tb)	0.00795660		0.2	0.5	0.5	P(Tb-Tf) 0.00039783

Column	B	C	D	E	F	G	H	I	J	K	L	M
Scenarios (index j)	Sum P(Scj)	Speed Distribution	Impact Surface	P(Spj) v30,v60	v60,v90	v90,vseal	>vseal	P(fire)	Fire Duration Distribution	P(FireSev) Ta-Ts	Ts-Tb	Tb-Tf
3	0.001615243	Bridge, TV3	Water	1.6343E-04	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
4	0.000122568		Clay/Silt	4.3355E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
5	8.08138E-06		HS/SR/Con	9.3696E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
6	4.04069E-06		HR	3.1725E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
7	0.006191674		Rail/Road	9.3696E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
9	0.005071320	Slope,TV4	Clay/Silt	1.4230E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
10	0.000334373		HS/SR	4.2099E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
11	0.000167186		HR	6.1890E-01	2.2430E-02	2.9250E-04	7.5000E-06	0.01	TF2	0.850442335	0.028231213	0.00042008
12	0.014379221	Level, TV2	Clay/Silt	4.4815E-02	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
13	0.000948080		HS/SR	1.3152E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
14	0.000474040		HR	1.7467E-01	1.0230E-02	1.4318E-04	6.8182E-06	0.01	TF2	0.850442335	0.028231213	0.00042008
15,16	0.000561185	Structure, TV2	Column	1.3152E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
17	1.65054E-05		Abutment	1.3152E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
21	0.008407939	Rollover, TV2	Coupler	1.3152E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.01	TF2	0.850442335	0.028231213	0.00042008
1,2,25	0.173977640		All	1	1	1	1	0.01	TF1	0.911422635	0.017408453	7.6755E-05
8,18-20,22,23	0.780420903		All	1	1	1	1	0.01	TF2	0.850442335	0.028231213	0.00042008
24	0.007300000		Fire-Only	1	1	1	1	1.00	TF3	0.851881677	0.028032345	0.00039783
All	1.000000											

P(Punc/Shear) Scenario 21 0.01 All other scenarios 0.001

Case		1	2	3	4	5	6	7	8	9	10	11	12
Formula		B*F	B*G	B*H	B*E*I*K	B*E*I*L	B*E*I*M	B*F*I*K	B*F*I*L	B*F*I*M	B*G*I*K	B*G*I*L	B*G*I*M
Scenario	3	0.000E+00	0.000E+00	0.0000E+00	2.245E-09	7.452E-11	1.109E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	4	0.000E+00	0.000E+00	0.0000E+00	4.519E-08	1.500E-09	2.232E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	5	0.000E+00	0.000E+00	0.0000E+00	6.439E-09	2.138E-10	3.181E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	6	0.000E+00	0.000E+00	0.0000E+00	1.090E-08	3.619E-10	5.385E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	7	0.000E+00	0.000E+00	0.0000E+00	4.934E-06	1.638E-07	2.437E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	9	0.000E+00	0.000E+00	0.0000E+00	6.137E-06	2.037E-07	3.031E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	10	0.000E+00	0.000E+00	0.0000E+00	1.197E-06	3.974E-08	5.913E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	11	1.254E-09	4.890E-08	1.2539E-09	8.800E-07	2.921E-08	4.347E-10	3.189E-08	1.059E-09	1.575E-11	4.159E-10	1.381E-11	2.054E-13
	12	0.000E+00	0.000E+00	0.0000E+00	5.480E-06	1.819E-07	2.707E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	13	0.000E+00	0.000E+00	0.0000E+00	1.060E-06	3.520E-08	5.238E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	14	3.232E-09	6.787E-08	3.2321E-09	7.042E-07	2.338E-08	3.478E-10	4.124E-08	1.369E-09	2.037E-11	5.772E-10	1.916E-11	2.851E-13
	15,16	0.000E+00	0.000E+00	0.0000E+00	6.277E-07	2.084E-08	3.100E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	17	0.000E+00	0.000E+00	0.0000E+00	1.846E-08	6.128E-10	9.119E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	21	0.000E+00	0.000E+00	0.0000E+00	9.404E-06	3.122E-07	4.645E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	1,2,25	0	0	0	0	0	0	0	0	0	0	0	0
	8,18-20,22,23	0	0	0	0	0	0	0	0	0	0	0	0
	24	0	0	0	0	0	0	0	0	0	0	0	0
Severity Fraction		4.486E-09	1.168E-07	4.486E-09	3.051E-05	1.013E-06	1.507E-08	7.313E-08	2.428E-09	3.612E-11	9.931E-10	3.297E-11	4.906E-13

Case		13	14	15	16	17	18	19	20
Formula		B*H*I*K	B*H*I*L	B*H*I*M	B*E*I*M*F22	B*F*I*M*F22	B*G*I*M*F22	B*H*I*M*F22	B*I*M
Scenario	3	0.000E+00	0.000E+00	0.000E+00	1.109E-15	0.000E+00	0.000E+00	0.000E+00	0
	4	0.000E+00	0.000E+00	0.000E+00	2.232E-14	0.000E+00	0.000E+00	0.000E+00	0
	5	0.000E+00	0.000E+00	0.000E+00	3.181E-15	0.000E+00	0.000E+00	0.000E+00	0
	6	0.000E+00	0.000E+00	0.000E+00	5.385E-15	0.000E+00	0.000E+00	0.000E+00	0
	7	0.000E+00	0.000E+00	0.000E+00	2.437E-12	0.000E+00	0.000E+00	0.000E+00	0
	9	0.000E+00	0.000E+00	0.000E+00	3.031E-12	0.000E+00	0.000E+00	0.000E+00	0
	10	0.000E+00	0.000E+00	0.000E+00	5.913E-13	0.000E+00	0.000E+00	0.000E+00	0
	11	1.066E-11	3.540E-13	5.267E-15	4.347E-13	1.575E-14	2.054E-16	5.267E-18	0
	12	0.000E+00	0.000E+00	0.000E+00	2.707E-12	0.000E+00	0.000E+00	0.000E+00	0
	13	0.000E+00	0.000E+00	0.000E+00	5.238E-13	0.000E+00	0.000E+00	0.000E+00	0
	14	2.749E-11	9.125E-13	1.358E-14	3.478E-13	2.037E-14	2.851E-16	1.358E-17	0
	15,16	0.000E+00	0.000E+00	0.000E+00	3.100E-13	0.000E+00	0.000E+00	0.000E+00	0
	17	0.000E+00	0.000E+00	0.000E+00	9.119E-15	0.000E+00	0.000E+00	0.000E+00	0
	21	0.000E+00	0.000E+00	0.000E+00	4.645E-11	0.000E+00	0.000E+00	0.000E+00	0
	1,2,25	0	0	0	0	0	0	0	1.3354E-07
	8,18-20,22,23	0	0	0	0	0	0	0	3.2784E-06
	24	0	0	0	0	0	0	0	2.9042E-06
Severity Fraction		3.815E-11	1.266E-12	1.884E-14	5.688E-11	3.612E-14	4.906E-16	1.884E-17	6.316E-06

APPENDIX E - ILLUSTRATIVE LHS AND RADTRAN INPUT AND OUTPUT FILES

E.1 LHS Input File for Truck Distributions

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LATIN HYPERCUBE AND RANDOM SAMPLING PROGRAM

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Run on 22-Apr-99 at 16:26:15□□□ with LHS Version: 2.00 Release 1,
Compiled 01/28/1994


NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

    Random Seed =    69454378

    Number of Variables =  19

    Number of Observations =  200

   The sample was written to the file: LHS.OUT

   Input was read from the file: KEYWORD.DAT

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

    VARIABLE  DISTRIBUTION          RANGE            LABEL

       1     NORMAL WITH THE PARAMETERS BELOW     STOP_TIME__2
                           MU =   1.00                      SIGMA =  0.100

       2     LOGNORMAL WITH THE PARAMETERS BELOW     EVACUATION
                           MEAN =  9.120E-02       ERROR FACTOR =   6.13

       3     CONTINUOUS LINEAR DISTRIBUTION WITH  28 POINTS
              TOTAL_DISTANCE
              X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
              X( 2) =   200.           CUM PROB( 2) =  8.300E-03
              X( 3) =   400.           CUM PROB( 3) =  2.310E-02
              X( 4) =   600.           CUM PROB( 4) =  4.870E-02
              X( 5) =   800.           CUM PROB( 5) =  8.260E-02
              X( 6) =  1.000E+03       CUM PROB( 6) =  0.150
              X( 7) =  1.200E+03       CUM PROB( 7) =  0.206
              X( 8) =  1.400E+03       CUM PROB( 8) =  0.268
              X( 9) =  1.600E+03       CUM PROB( 9) =  0.335
              X(10) =  1.800E+03       CUM PROB(10) =  0.406
              X(11) =  2.000E+03       CUM PROB(11) =  0.463
              X(12) =  2.200E+03       CUM PROB(12) =  0.517
              X(13) =  2.400E+03       CUM PROB(13) =  0.567
              X(14) =  2.600E+03       CUM PROB(14) =  0.608
              X(15) =  2.800E+03       CUM PROB(15) =  0.642
              X(16) =  3.000E+03       CUM PROB(16) =  0.683
              X(17) =  3.200E+03       CUM PROB(17) =  0.720
              X(18) =  3.400E+03       CUM PROB(18) =  0.760
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 X(19) =  3.600E+03       CUM PROB(19) =  0.790
 X(20) =  3.800E+03       CUM PROB(20) =  0.824
 X(21) =  4.000E+03       CUM PROB(21) =  0.866
 X(22) =  4.200E+03       CUM PROB(22) =  0.893
 X(23) =  4.400E+03       CUM PROB(23) =  0.927
 X(24) =  4.600E+03       CUM PROB(24) =  0.963
 X(25) =  4.800E+03       CUM PROB(25) =  0.986
 X(26) =  5.000E+03       CUM PROB(26) =  0.994
 X(27) =  5.200E+03       CUM PROB(27) =  0.998
 X(28) =  5.400E+03       CUM PROB(28) =   1.00


4     CONTINUOUS LINEAR DISTRIBUTION WITH   7 POINTS
 ACCIDENT_RATE__1
 X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
 X( 2) =  1.500E-07       CUM PROB( 2) =  0.146
 X( 3) =  2.000E-07       CUM PROB( 3) =  0.390
 X( 4) =  2.500E-07       CUM PROB( 4) =  0.707
 X( 5) =  3.000E-07       CUM PROB( 5) =  0.927
 X( 6) =  3.500E-07       CUM PROB( 6) =  0.976
 X( 7) =  4.500E-07       CUM PROB( 7) =   1.00


5     CONTINUOUS LINEAR DISTRIBUTION WITH  16 POINTS
 ACCIDENT_RATE__2
 X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
 X( 2) =  5.000E-08       CUM PROB( 2) =  1.890E-02
 X( 3) =  1.500E-07       CUM PROB( 3) =  5.660E-02
 X( 4) =  2.000E-07       CUM PROB( 4) =  0.113
 X( 5) =  2.500E-07       CUM PROB( 5) =  0.207
 X( 6) =  3.000E-07       CUM PROB( 6) =  0.377
 X( 7) =  3.500E-07       CUM PROB( 7) =  0.453
 X( 8) =  4.000E-07       CUM PROB( 8) =  0.547
 X( 9) =  4.500E-07       CUM PROB( 9) =  0.623
 X(10) =  5.000E-07       CUM PROB(10) =  0.717
 X(11) =  5.500E-07       CUM PROB(11) =  0.792
 X(12) =  6.000E-07       CUM PROB(12) =  0.830
 X(13) =  7.000E-07       CUM PROB(13) =  0.849
 X(14) =  7.500E-07       CUM PROB(14) =  0.906
 X(15) =  8.000E-07       CUM PROB(15) =  0.962
 X(16) =  1.100E-06       CUM PROB(16) =   1.00


6     CONTINUOUS LINEAR DISTRIBUTION WITH   5 POINTS
 FRACTION_URBAN
 X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
 X( 2) =  5.000E-02       CUM PROB( 2) =  0.976
 X( 3) =  0.100           CUM PROB( 3) =  0.998
 X( 4) =  0.150           CUM PROB( 4) =  0.999
 X( 5) =  0.200           CUM PROB( 5) =   1.00


7     CONTINUOUS LINEAR DISTRIBUTION WITH  14 POINTS
 FRACTION_SUBURAN
 X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
 X( 2) =  5.000E-02       CUM PROB( 2) =  4.100E-03
 X( 3) =  0.100           CUM PROB( 3) =  9.090E-02
 X( 4) =  0.150           CUM PROB( 4) =  0.252
 X( 5) =  0.200           CUM PROB( 5) =  0.435
 X( 6) =  0.250           CUM PROB( 6) =  0.605
 X( 7) =  0.300           CUM PROB( 7) =  0.746
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              X( 8) =  0.350           CUM PROB( 8) =  0.860
              X( 9) =  0.400           CUM PROB( 9) =  0.936
              X(10) =  0.450           CUM PROB(10) =  0.977
              X(11) =  0.500           CUM PROB(11) =  0.993
              X(12) =  0.550           CUM PROB(12) =  0.998
              X(13) =  0.650           CUM PROB(13) =  0.999
              X(14) =  0.800           CUM PROB(14) =   1.00

0       8     CONTINUOUS LINEAR DISTRIBUTION WITH  15 POINTS
              POP_DEN__1
              X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
              X( 2) =   2.00           CUM PROB( 2) =  3.500E-03
              X( 3) =   4.00           CUM PROB( 3) =  7.140E-02
              X( 4) =   6.00           CUM PROB( 4) =  0.246
              X( 5) =   8.00           CUM PROB( 5) =  0.503
              X( 6) =   10.0           CUM PROB( 6) =  0.566
              X( 7) =   12.0           CUM PROB( 7) =  0.645
              X( 8) =   14.0           CUM PROB( 8) =  0.744
              X( 9) =   16.0           CUM PROB( 9) =  0.843
              X(10) =   18.0           CUM PROB(10) =  0.922
              X(11) =   20.0           CUM PROB(11) =  0.956
              X(12) =   22.0           CUM PROB(12) =  0.976
              X(13) =   24.0           CUM PROB(13) =  0.995
              X(14) =   26.0           CUM PROB(14) =  0.998
              X(15) =   28.0           CUM PROB(15) =   1.00

        9     CONTINUOUS LINEAR DISTRIBUTION WITH  18 POINTS
              POP_DEN__2
              X( 1) =   200.           CUM PROB( 1) =  0.000E+00
              X( 2) =   220.           CUM PROB( 2) =  1.800E-03
              X( 3) =   240.           CUM PROB( 3) =  1.230E-02
              X( 4) =   260.           CUM PROB( 4) =  4.200E-02
              X( 5) =   280.           CUM PROB( 5) =  7.530E-02
              X( 6) =   300.           CUM PROB( 6) =  0.161
              X( 7) =   320.           CUM PROB( 7) =  0.364
              X( 8) =   340.           CUM PROB( 8) =  0.573
              X( 9) =   360.           CUM PROB( 9) =  0.779
              X(10) =   380.           CUM PROB(10) =  0.869
              X(11) =   400.           CUM PROB(11) =  0.921
              X(12) =   420.           CUM PROB(12) =  0.951
              X(13) =   440.           CUM PROB(13) =  0.972
              X(14) =   460.           CUM PROB(14) =  0.979
              X(15) =   480.           CUM PROB(15) =  0.990
              X(16) =   500.           CUM PROB(16) =  0.993
              X(17) =   520.           CUM PROB(17) =  0.995
              X(18) =   540.           CUM PROB(18) =   1.00

       10     CONTINUOUS LINEAR DISTRIBUTION WITH  21 POINTS
              POP_DEN__3
              X( 1) =  1.800E+03       CUM PROB( 1) =  0.000E+00
              X( 2) =  1.850E+03       CUM PROB( 2) =  1.930E-02
              X( 3) =  1.900E+03       CUM PROB( 3) =  2.100E-02
              X( 4) =  1.950E+03       CUM PROB( 4) =  3.330E-02
              X( 5) =  2.000E+03       CUM PROB( 5) =  5.780E-02
              X( 6) =  2.050E+03       CUM PROB( 6) =  0.109
              X( 7) =  2.100E+03       CUM PROB( 7) =  0.207
              X( 8) =  2.150E+03       CUM PROB( 8) =  0.342
              X( 9) =  2.200E+03       CUM PROB( 9) =  0.611
              X(10) =  2.250E+03       CUM PROB(10) =  0.743
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              X(11) =  2.300E+03       CUM PROB(11) =  0.855
              X(12) =  2.350E+03       CUM PROB(12) =  0.895
              X(13) =  2.400E+03       CUM PROB(13) =  0.925
              X(14) =  2.450E+03       CUM PROB(14) =  0.933
              X(15) =  2.500E+03       CUM PROB(15) =  0.939
              X(16) =  2.550E+03       CUM PROB(16) =  0.949
              X(17) =  2.600E+03       CUM PROB(17) =  0.976
              X(18) =  2.650E+03       CUM PROB(18) =  0.979
              X(19) =  2.700E+03       CUM PROB(19) =  0.993
              X(20) =  2.750E+03       CUM PROB(20) =  0.998
              X(21) =  2.800E+03       CUM PROB(21) =   1.00

0      11     CONTINUOUS LINEAR DISTRIBUTION WITH  12 POINTS
              STOP_TIME__1
              X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
              X( 2) =   7.00           CUM PROB( 2) =  6.000E-02
              X( 3) =   10.0           CUM PROB( 3) =  0.170
              X( 4) =   12.0           CUM PROB( 4) =  0.330
              X( 5) =   15.0           CUM PROB( 5) =  0.500
              X( 6) =   17.0           CUM PROB( 6) =  0.650
              X( 7) =   20.0           CUM PROB( 7) =  0.850
              X( 8) =   23.0           CUM PROB( 8) =  0.880
              X( 9) =   25.0           CUM PROB( 9) =  0.920
              X(10) =   28.0           CUM PROB(10) =  0.960
              X(11) =   30.0           CUM PROB(11) =  0.980
              X(12) =   43.0           CUM PROB(12) =   1.00


       12     CONTINUOUS LINEAR DISTRIBUTION WITH   6 POINTS
              VEHICLE_DOSERATE
              X( 1) =  0.170           CUM PROB( 1) =  0.000E+00
              X( 2) =  0.200           CUM PROB( 2) =  8.000E-02
              X( 3) =  0.260           CUM PROB( 3) =  0.240
              X( 4) =  0.340           CUM PROB( 4) =  0.440
              X( 5) =  0.470           CUM PROB( 5) =  0.720
              X( 6) =  0.960           CUM PROB( 6) =   1.00


       13     CONTINUOUS LINEAR DISTRIBUTION WITH   6 POINTS
              PACKAGE_DOSERATE
              X( 1) =  0.170           CUM PROB( 1) =  0.000E+00
              X( 2) =  0.200           CUM PROB( 2) =  8.000E-02
              X( 3) =  0.260           CUM PROB( 3) =  0.240
              X( 4) =  0.340           CUM PROB( 4) =  0.440
              X( 5) =  0.470           CUM PROB( 5) =  0.720
              X( 6) =  0.960           CUM PROB( 6) =   1.00


       14     CONTINUOUS LINEAR DISTRIBUTION WITH   7 POINTS
              VEHICLE_DEN__1
              X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
              X( 2) =   100.           CUM PROB( 2) =  0.102
              X( 3) =   200.           CUM PROB( 3) =  0.449
              X( 4) =   300.           CUM PROB( 4) =  0.735
              X( 5) =   400.           CUM PROB( 5) =  0.878
              X( 6) =   500.           CUM PROB( 6) =  0.980
X( 7) =   600.           CUM PROB( 7) =   1.00


       15     CONTINUOUS LINEAR DISTRIBUTION WITH   9 POINTS
              VEHICLE_DEN__2
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 X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
 X( 2) =   100.           CUM PROB( 2) =  1.600E-02
 X( 3) =   200.           CUM PROB( 3) =  0.121
 X( 4) =   300.           CUM PROB( 4) =  0.321
 X( 5) =   400.           CUM PROB( 5) =  0.528
 X( 6) =   500.           CUM PROB( 6) =  0.757
 X( 7) =   600.           CUM PROB( 7) =  0.892
 X( 8) =   700.           CUM PROB( 8) =  0.965
 X( 9) =   800.           CUM PROB( 9) =   1.00

16     DISCRETE CUMULATIVE DISTRIBUTION WITH   6 POINTS
 PASQUILL
 X( 1) =   1.00           CUM PROB( 1) =  4.300E-02
 X( 2) =   2.00           CUM PROB( 2) =  0.233
 X( 3) =   3.00           CUM PROB( 3) =  0.423
 X( 4) =   4.00           CUM PROB( 4) =  0.639
 X( 5) =   5.00           CUM PROB( 5) =  0.880
 X( 6) =   6.00           CUM PROB( 6) =   1.00

17     DISCRETE CUMULATIVE DISTRIBUTION WITH   7 POINTS
 PERSONS/VEH__1
 X( 1) =   1.00           CUM PROB( 1) =  0.846
 X( 2) =   2.00           CUM PROB( 2) =  0.967
 X( 3) =   3.00           CUM PROB( 3) =  0.987
 X( 4) =   4.00           CUM PROB( 4) =  0.994
 X( 5) =   5.00           CUM PROB( 5) =  0.996
 X( 6) =   6.00           CUM PROB( 6) =  0.997
 X( 7) =   10.0           CUM PROB( 7) =   1.00

18     DISCRETE CUMULATIVE DISTRIBUTION WITH   7 POINTS
 PERSONS/VEH__2
 X( 1) =   1.00           CUM PROB( 1) =  0.846
 X( 2) =   2.00           CUM PROB( 2) =  0.967
 X( 3) =   3.00           CUM PROB( 3) =  0.987
 X( 4) =   4.00           CUM PROB( 4) =  0.994
 X( 5) =   5.00           CUM PROB( 5) =  0.996
 X( 6) =   6.00           CUM PROB( 6) =  0.997
 X( 7) =   10.0           CUM PROB( 7) =   1.00

19     DISCRETE CUMULATIVE DISTRIBUTION WITH   7 POINTS
 PERSONS/VEH__3
 X( 1) =   1.00           CUM PROB( 1) =  0.846
 X( 2) =   2.00           CUM PROB( 2) =  0.967
 X( 3) =   3.00           CUM PROB( 3) =  0.987
 X( 4) =   4.00           CUM PROB( 4) =  0.994
 X( 5) =   5.00           CUM PROB( 5) =  0.996
 X( 6) =   6.00           CUM PROB( 6) =  0.997
 X( 7) =   10.0           CUM PROB( 7) =   1.00
```

E.2 LHS Input File for Rail Distributions

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* * * * * * * * *  L H S  * * * * * * * * *

LATIN HYPERCUBE AND RANDOM SAMPLING PROGRAM

* * * * * * * * * * * * * * * * * * * * * *


Run on  7-Apr-99 at 11:28:44□□□ with LHS Version: 2.00 Release 1,
Compiled 01/28/1994

NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

    Random Seed =    69454378

    Number of Variables =  13

    Number of Observations =  200

   The sample was written to the file: LHS.OUT

   Input was read from the file: KEYWORD.DAT


NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN


    VARIABLE  DISTRIBUTION          RANGE            LABEL

       1     LOGNORMAL WITH THE PARAMETERS BELOW     EVACUATION
                           MEAN =  9.120E-02        ERROR FACTOR =   6.13

       2     CONTINUOUS LINEAR DISTRIBUTION WITH  32 POINTS
              TOTAL_DISTANCE
              X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
              X( 2) =   1.00           CUM PROB( 2) =  1.700E-03
              X( 3) =   200.           CUM PROB( 3) =  7.500E-03
              X( 4) =   400.           CUM PROB( 4) =  2.240E-02
              X( 5) =   600.           CUM PROB( 5) =  4.890E-02
              X( 6) =   800.           CUM PROB( 6) =  8.210E-02
              X( 7) =  1.000E+03       CUM PROB( 7) =  0.129
              X( 8) =  1.200E+03       CUM PROB( 8) =  0.175
              X( 9) =  1.400E+03       CUM PROB( 9) =  0.231
              X(10) =  1.600E+03       CUM PROB(10) =  0.295
              X(11) =  1.800E+03       CUM PROB(11) =  0.352
              X(12) =  2.000E+03       CUM PROB(12) =  0.411
              X(13) =  2.200E+03       CUM PROB(13) =  0.457
              X(14) =  2.400E+03       CUM PROB(14) =  0.518
              X(15) =  2.600E+03       CUM PROB(15) =  0.560
              X(16) =  2.800E+03       CUM PROB(16) =  0.601
              X(17) =  3.000E+03       CUM PROB(17) =  0.642
              X(18) =  3.200E+03       CUM PROB(18) =  0.675
              X(19) =  3.400E+03       CUM PROB(19) =  0.713
              X(20) =  3.600E+03       CUM PROB(20) =  0.740
              X(21) =  3.800E+03       CUM PROB(21) =  0.771
              X(22) =  4.000E+03       CUM PROB(22) =  0.800
              X(23) =  4.200E+03       CUM PROB(23) =  0.832
              X(24) =  4.400E+03       CUM PROB(24) =  0.862
              X(25) =  4.600E+03       CUM PROB(25) =  0.898
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X(26) =  4.800E+03       CUM PROB(26) =  0.935
X(27) =  5.000E+03       CUM PROB(27) =  0.973
X(28) =  5.200E+03       CUM PROB(28) =  0.988
X(29) =  5.400E+03       CUM PROB(29) =  0.996
X(30) =  5.600E+03       CUM PROB(30) =  0.998
X(31) =  6.000E+03       CUM PROB(31) =  0.999
X(32) =  6.600E+03       CUM PROB(32) =   1.00
```

```
3     CONTINUOUS LINEAR DISTRIBUTION WITH  21 POINTS
 ACCIDENT_RATE__1
X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
X( 2) =  5.000E-09       CUM PROB( 2) =  2.080E-02
X( 3) =  1.000E-08       CUM PROB( 3) =  4.170E-02
X( 4) =  1.500E-08       CUM PROB( 4) =  0.125
X( 5) =  2.000E-08       CUM PROB( 5) =  0.250
X( 6) =  2.500E-08       CUM PROB( 6) =  0.375
X( 7) =  3.000E-08       CUM PROB( 7) =  0.562
X( 8) =  3.500E-08       CUM PROB( 8) =  0.625
X( 9) =  4.000E-08       CUM PROB( 9) =  0.646
X(10) =  4.500E-08       CUM PROB(10) =  0.708
X(11) =  5.000E-08       CUM PROB(11) =  0.750
X(12) =  6.500E-08       CUM PROB(12) =  0.771
X(13) =  7.500E-08       CUM PROB(13) =  0.833
X(14) =  8.000E-08       CUM PROB(14) =  0.854
X(15) =  9.000E-08       CUM PROB(15) =  0.875
X(16) =  9.500E-08       CUM PROB(16) =  0.896
X(17) =  1.050E-07       CUM PROB(17) =  0.917
X(18) =  1.150E-07       CUM PROB(18) =  0.938
X(19) =  1.450E-07       CUM PROB(19) =  0.958
X(20) =  1.800E-07       CUM PROB(20) =  0.979
X(21) =  1.900E-07       CUM PROB(21) =   1.00
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4     CONTINUOUS LINEAR DISTRIBUTION WITH  21 POINTS
 ACCIDENT_RATE__2
X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
X( 2) =  5.000E-09       CUM PROB( 2) =  2.080E-02
X( 3) =  1.000E-08       CUM PROB( 3) =  4.170E-02
X( 4) =  1.500E-08       CUM PROB( 4) =  0.125
X( 5) =  2.000E-08       CUM PROB( 5) =  0.250
X( 6) =  2.500E-08       CUM PROB( 6) =  0.375
X( 7) =  3.000E-08       CUM PROB( 7) =  0.562
X( 8) =  3.500E-08       CUM PROB( 8) =  0.625
X( 9) =  4.000E-08       CUM PROB( 9) =  0.646
X(10) =  4.500E-08       CUM PROB(10) =  0.708
X(11) =  5.000E-08       CUM PROB(11) =  0.750
X(12) =  6.500E-08       CUM PROB(12) =  0.771
X(13) =  7.500E-08       CUM PROB(13) =  0.833
X(14) =  8.000E-08       CUM PROB(14) =  0.854
X(15) =  9.000E-08       CUM PROB(15) =  0.875
X(16) =  9.500E-08       CUM PROB(16) =  0.896
X(17) =  1.050E-07       CUM PROB(17) =  0.917
X(18) =  1.150E-07       CUM PROB(18) =  0.938
X(19) =  1.450E-07       CUM PROB(19) =  0.958
X(20) =  1.800E-07       CUM PROB(20) =  0.979
X(21) =  1.900E-07       CUM PROB(21) =   1.00
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 5     CONTINUOUS LINEAR DISTRIBUTION WITH  21 POINTS
       ACCIDENT_RATE__3
       X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
       X( 2) =  5.000E-09       CUM PROB( 2) =  2.080E-02
       X( 3) =  1.000E-08       CUM PROB( 3) =  4.170E-02
       X( 4) =  1.500E-08       CUM PROB( 4) =  0.125
       X( 5) =  2.000E-08       CUM PROB( 5) =  0.250
       X( 6) =  2.500E-08       CUM PROB( 6) =  0.375
       X( 7) =  3.000E-08       CUM PROB( 7) =  0.562
       X( 8) =  3.500E-08       CUM PROB( 8) =  0.625
       X( 9) =  4.000E-08       CUM PROB( 9) =  0.646
       X(10) =  4.500E-08       CUM PROB(10) =  0.708
       X(11) =  5.000E-08       CUM PROB(11) =  0.750
       X(12) =  6.500E-08       CUM PROB(12) =  0.771
       X(13) =  7.500E-08       CUM PROB(13) =  0.833
       X(14) =  8.000E-08       CUM PROB(14) =  0.854
       X(15) =  9.000E-08       CUM PROB(15) =  0.875
       X(16) =  9.500E-08       CUM PROB(16) =  0.896
       X(17) =  1.050E-07       CUM PROB(17) =  0.917
       X(18) =  1.150E-07       CUM PROB(18) =  0.938
       X(19) =  1.450E-07       CUM PROB(19) =  0.958
       X(20) =  1.800E-07       CUM PROB(20) =  0.979
       X(21) =  1.900E-07       CUM PROB(21) =   1.00


 6     CONTINUOUS LINEAR DISTRIBUTION WITH   5 POINTS
       FRACTION_URBAN
       X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
       X( 2) =  1.000E-02       CUM PROB( 2) =  2.650E-02
       X( 3) =  5.000E-02       CUM PROB( 3) =  0.862
       X( 4) =  0.100           CUM PROB( 4) =  0.984
       X( 5) =  0.150           CUM PROB( 5) =   1.00


 7     CONTINUOUS LINEAR DISTRIBUTION WITH  15 POINTS
       FRACTION_SUBURAN
       X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
       X( 2) =  1.000E-02       CUM PROB( 2) =  3.300E-03
       X( 3) =  5.000E-02       CUM PROB( 3) =  1.330E-02
       X( 4) =  0.100           CUM PROB( 4) =  0.139
       X( 5) =  0.150           CUM PROB( 5) =  0.316
       X( 6) =  0.200           CUM PROB( 6) =  0.492
       X( 7) =  0.250           CUM PROB( 7) =  0.619
       X( 8) =  0.300           CUM PROB( 8) =  0.768
       X( 9) =  0.350           CUM PROB( 9) =  0.865
       X(10) =  0.400           CUM PROB(10) =  0.932
       X(11) =  0.450           CUM PROB(11) =  0.962
       X(12) =  0.500           CUM PROB(12) =  0.992
       X(13) =  0.550           CUM PROB(13) =  0.998
       X(14) =  0.600           CUM PROB(14) =  0.999
       X(15) =  0.650           CUM PROB(15) =   1.00


 8     CONTINUOUS LINEAR DISTRIBUTION WITH  14 POINTS
       POP_DEN__1
       X( 1) =  0.000E+00       CUM PROB( 1) =  0.000E+00
       X( 2) =   2.00           CUM PROB( 2) =  5.200E-03
       X( 3) =   4.00           CUM PROB( 3) =  6.820E-02
       X( 4) =   6.00           CUM PROB( 4) =  0.220
       X( 5) =   8.00           CUM PROB( 5) =  0.462
       X( 6) =   10.0           CUM PROB( 6) =  0.575
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          X( 7) =    12.0           CUM PROB( 7) =  0.671
          X( 8) =    14.0           CUM PROB( 8) =  0.823
          X( 9) =    16.0           CUM PROB( 9) =  0.925
          X(10) =    18.0           CUM PROB(10) =  0.970
          X(11) =    20.0           CUM PROB(11) =  0.991
          X(12) =    22.0           CUM PROB(12) =  0.996
          X(13) =    24.0           CUM PROB(13) =  0.998
          X(14) =    26.0           CUM PROB(14) =   1.00

 9      CONTINUOUS LINEAR DISTRIBUTION WITH  28 POINTS
         POP_DEN__2
          X( 1) =    200.           CUM PROB( 1) =  0.000E+00
          X( 2) =    220.           CUM PROB( 2) =  3.500E-03
          X( 3) =    240.           CUM PROB( 3) =  7.000E-03
          X( 4) =    250.           CUM PROB( 4) =  1.050E-02
          X( 5) =    260.           CUM PROB( 5) =  1.750E-02
          X( 6) =    270.           CUM PROB( 6) =  2.800E-02
          X( 7) =    280.           CUM PROB( 7) =  4.030E-02
          X( 8) =    290.           CUM PROB( 8) =  4.380E-02
          X( 9) =    300.           CUM PROB( 9) =  5.600E-02
          X(10) =    310.           CUM PROB(10) =  8.580E-02
          X(11) =    320.           CUM PROB(11) =  0.124
          X(12) =    330.           CUM PROB(12) =  0.173
          X(13) =    340.           CUM PROB(13) =  0.277
          X(14) =    350.           CUM PROB(14) =  0.401
          X(15) =    360.           CUM PROB(15) =  0.566
          X(16) =    370.           CUM PROB(16) =  0.700
          X(17) =    380.           CUM PROB(17) =  0.804
          X(18) =    390.           CUM PROB(18) =  0.872
          X(19) =    400.           CUM PROB(19) =  0.909
          X(20) =    410.           CUM PROB(20) =  0.944
          X(21) =    420.           CUM PROB(21) =  0.965
          X(22) =    430.           CUM PROB(22) =  0.979
          X(23) =    440.           CUM PROB(23) =  0.986
          X(24) =    450.           CUM PROB(24) =  0.990
          X(25) =    460.           CUM PROB(25) =  0.993
          X(26) =    470.           CUM PROB(26) =  0.995
          X(27) =    480.           CUM PROB(27) =  0.996
          X(28) =    500.           CUM PROB(28) =   1.00

10      CONTINUOUS LINEAR DISTRIBUTION WITH  23 POINTS
         POP_DEN__3
          X( 1) =  0.000E+00        CUM PROB( 1) =  0.000E+00
          X( 2) =  1.800E+03        CUM PROB( 2) =  3.500E-03
          X( 3) =  1.850E+03        CUM PROB( 3) =  5.300E-03
          X( 4) =  1.900E+03        CUM PROB( 4) =  1.050E-02
          X( 5) =  1.950E+03        CUM PROB( 5) =  2.980E-02
          X( 6) =  2.000E+03        CUM PROB( 6) =  5.090E-02
          X( 7) =  2.050E+03        CUM PROB( 7) =  9.300E-02
          X( 8) =  2.100E+03        CUM PROB( 8) =  0.193
          X( 9) =  2.150E+03        CUM PROB( 9) =  0.298
          X(10) =  2.200E+03        CUM PROB(10) =  0.391
          X(11) =  2.250E+03        CUM PROB(11) =  0.454
          X(12) =  2.300E+03        CUM PROB(12) =  0.551
          X(13) =  2.350E+03        CUM PROB(13) =  0.661
          X(14) =  2.400E+03        CUM PROB(14) =  0.765
          X(15) =  2.450E+03        CUM PROB(15) =  0.828
          X(16) =  2.500E+03        CUM PROB(16) =  0.851
          X(17) =  2.550E+03        CUM PROB(17) =  0.886
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              X(18) =  2.600E+03       CUM PROB(18) =  0.914
              X(19) =  2.650E+03       CUM PROB(19) =  0.958
              X(20) =  2.700E+03       CUM PROB(20) =  0.968
              X(21) =  2.750E+03       CUM PROB(21) =  0.991
              X(22) =  2.800E+03       CUM PROB(22) =  0.998
              X(23) =  3.000E+03       CUM PROB(23) =   1.00

0      11     CONTINUOUS LINEAR DISTRIBUTION WITH   7 POINTS
              VEHICLE_DOSERATE
              X( 1) =  0.700           CUM PROB( 1) =  0.000E+00
              X( 2) =  0.820           CUM PROB( 2) =  8.000E-02
              X( 3) =   1.00           CUM PROB( 3) =  0.210
              X( 4) =   1.25           CUM PROB( 4) =  0.380
              X( 5) =   1.63           CUM PROB( 5) =  0.630
              X( 6) =   2.77           CUM PROB( 6) =  0.870
              X( 7) =   5.36           CUM PROB( 7) =   1.00

       12     CONTINUOUS LINEAR DISTRIBUTION WITH   7 POINTS
              PACKAGE_DOSERATE
              X( 1) =  0.700           CUM PROB( 1) =  0.000E+00
              X( 2) =  0.820           CUM PROB( 2) =  8.000E-02
              X( 3) =   1.00           CUM PROB( 3) =  0.210
              X( 4) =   1.25           CUM PROB( 4) =  0.380
              X( 5) =   1.63           CUM PROB( 5) =  0.630
              X( 6) =   2.77           CUM PROB( 6) =  0.870
              X( 7) =   5.36           CUM PROB( 7) =   1.00

       13     DISCRETE CUMULATIVE DISTRIBUTION WITH   6 POINTS
              PASQUILL
              X( 1) =   1.00           CUM PROB( 1) =  4.300E-02
              X( 2) =   2.00           CUM PROB( 2) =  0.233
              X( 3) =   3.00           CUM PROB( 3) =  0.423
              X( 4) =   4.00           CUM PROB( 4) =  0.639
              X( 5) =   5.00           CUM PROB( 5) =  0.880
              X( 6) =   6.00           CUM PROB( 6) =   1.00
```

E.3 RADTRAN 5 Output for Last Observation, Truck Shipments

```
        RRRR    AAA   DDDD   TTTTT  RRRR    AAA   N   N  55555
        R   R  A   A  D   D    T    R   R  A   A  NN  N  5
        R   R  A   A  D   D    T    R   R  A   A  N N N  5
        RRRR   A   A  D   D    T    RRRR   A   A  N  NN  5555
        R R    AAAAA  D   D    T    R R    AAAAA  N   N      5
        R  R   A   A  D   D    T    R  R   A   A  N   N  5   5
        R   R  A   A  DDDD     T    R   R  A   A  N   N  5555

                        RADTRAN 5.0   APRIL 14, 1999

                                INPUT ECHO
                                ----------


 && PWR Spent Fuel Assembly, 3-year Cooled, 1 Assembly
 TITLE JLS Severity and Release Fractions for SLS TRUCK
 INPUT STANDARD
STD: 0 10 18                                  && DIMEN=NSEV NRAD NAREAS
STD: 1 3 3 0                                  && PARM=IRNKC IANA ISEN IPSQSB
STD: .TRUE.                                   && FORM = UNIT
STD: 2.3E12                                   && NEVAL FOR CF252
STD: 9.25E5 5.77E6 1.27E6                     && RPCTHY FOR I125, I129, I131
STD: 0.0 0.0 0.0 0.0 0.0                      && TRANSFER GAMMA
STD: 7.42E-3 2.02E-2 6.17E-5 3.17E-8 0.0      && TRANSFER NEUTRON
STD: 30.0  24.0                               && MITDDIST  MITDVEL
STD: 1  2.0   .0018                           && ITRAIN FMINCL DDRWEF
STD: 33.44555031 68.04334531 105.1150817 243.9395252 369.3912316 && CNTR LINE
STD: 561.3603894 1018.172412 1627.547574 2308.398677 4269.177161 && DISTANCES
STD: 5468.445215 11136.34588 13096.71743 21333.92069 40502.11047 && FOR AVE.
STD: 69985.92559 89859.94324 120877.9559 0 0 0 0 0 0 0 0 0 0 0 0 && US CLOUD
STD: 4.59E+02 1.53E+03 3.94E+03 1.25E+04 3.04E+04 6.85E+04 1.76E+05 4.45E+05
STD:  8.59E+05 2.55E+06 4.45E+06 1.03E+07 2.16E+07 5.52E+07 1.77E+08 4.89E+08
STD:  8.12E+08 1.35E+09 0 0 0 0 0 0 0 0 0 0 0 0     && AREADA
STD: 3.42E-03 1.72E-03 8.58E-04 3.42E-04 1.72E-04 8.58E-05 3.42E-05 1.72E-05
STD:  8.58E-06 3.42E-06 1.72E-06 8.58E-07 3.42E-07 1.72E-07 8.58E-08 5.42E-08
STD:  4.30E-08 3.42E-08 0 0 0 0 0 0 0 0 0 0 0 0     && DFLEV
STD: 3.05 6.1 9.1 12.2 15.2 30.5 61. 91.4 152.4 305. 0. 0. 0. 0. 0.
STD: 3.05 6.1 9.1 12.2 15.2 30.5 61. 91.4 152.4 305. 0. 0. 0. 0. 0.
STD: 3.05 6.1 9.1 12.2 15.2 30.5 61. 91.4 152.4 305. 0. 0. 0. 0. 0.
STD: 0.5                                  && SMLPKG
STD: 1.0  0.87  0.018                     && SHIELDING FACTORS RR  RS  RU
STD: 30.0 30.0 800.0                      && OFFLINK {FREEWAY}
STD: 27.0 30.0 800.0                      && OFFLINK {NON-FREEWAY}
STD: 5.0 8.0 800.0                        && OFFLINK {CITY STREETS}
STD: 30.0 30.0 800.0                      && OFFLINK {RAILWAY}
STD: 200.0 200.0 1000.0                   && OFFLINK {WATERWAY}
STD: 15.0  3.0  3.0  3.0  4.0             && ONLINK {FWAY NONFWY STREET RAIL ADJ}
STD: 6.0  4.0  40.0                       && RPD FNOATT INTERDICT
STD: 0.05   0.2   3.3E-4                  && BDF CULVL BRATE
STD: 0.52  0.1                            && UBF USWF
STD: 1.0  10.0 1.0                        && EVACUATION SURVEY CAMPAIGN
STD: 0.0  0.0     1.5E-8  5.3E-8          && HIGHWAY - RURAL - NONRAD
STD: 0.0  0.0     3.7E-9  1.3E-8          && HIGHWAY - SUBURBAN - NONRAD
STD: 0.0  1.0E-7  2.1E-9  7.5E-9          && HIGHWAY - URBAN - NONRAD
STD: 0.0  0.0    1.81E-9  2.64E-8         && GENERAL FREIGHT - R - NONRAD
STD: 0.0  0.0    1.81E-9  2.64E-8         && GENERAL FREIGHT - S - NONRAD
STD: 0.0  1.3E-7 1.81E-9  2.64E-8         && GENERAL FREIGHT - U - NONRAD
STD: 0.0  0.0    1.27E-7  1.85E-6         && DEDICATED RAIL - R - NONRAD
```

```
STD: 0.0  0.0    1.27E-7  1.85E-6     && DEDICATED RAIL - S - NONRAD
STD: 0.0  6.5E-7 1.27E-7  1.85E-6     && DEDICATED RAIL - U - NONRAD
STD: 0.0 0.0 0.0 0.0 0.0 0.0          && PSPROB
STD: 0.67  0.67  0.42                 && TIMENDE NON-DISPERSAL EVAC TIME
STD: 2 2 1                            && FLAGS=IUOPT IACC REGCHECK
STD: 5E-4, 4E-4, 1.3E-4               && LCFCON(1), LCFCON(2), GECON
STD: R5INGEST.BIN                     && INGESTION FILE
 FORM UNIT
 DIMEN 19 10 18
 PARM 1 3 1 1
 SEVERITY
    NPOP=1
      NMODE=1
        1.53E-08  6.19E-05  2.82E-07  6.99E-08  4.89E-07  9.22E-11
        3.30E-12  1.17E-08  1.90E-12  0.00E+00  1.49E-10  2.41E-14
        0.00E+00  6.99E-11  3.30E-15  0.00E+00  0.00E+00  5.59E-06
        1.00E+00
    NPOP=2
      NMODE=1
        1.53E-08  6.19E-05  2.82E-07  6.99E-08  4.89E-07  9.22E-11
        3.30E-12  1.17E-08  1.90E-12  0.00E+00  1.49E-10  2.41E-14
        0.00E+00  6.99E-11  3.30E-15  0.00E+00  0.00E+00  5.59E-06
        1.00E+00
    NPOP=3
      NMODE=1
        1.53E-08  6.19E-05  2.82E-07  6.99E-08  4.89E-07  9.22E-11
        3.30E-12  1.17E-08  1.90E-12  0.00E+00  1.49E-10  2.41E-14
        0.00E+00  6.99E-11  3.30E-15  0.00E+00  0.00E+00  5.59E-06
        1.00E+00
 RELEASE
    GROUP=PARTS
       RFRAC
        6.00E-07  1.00E-07  1.30E-07  3.80E-06  3.20E-07  3.70E-07
        2.10E-06  6.10E-07  6.70E-07  6.80E-07  6.10E-07  6.70E-07
        6.80E-07  1.80E-05  9.00E-06  6.80E-07  6.80E-07  6.70E-08
        0.00E+00
       AERSOL
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        0.00E+00
       RESP
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        0.00E+00
       DEPVEL   0.0100

    GROUP=CESIUM
       RFRAC
        2.40E-08  4.10E-09  5.40E-09  3.60E-05  1.30E-08  1.50E-08
        2.70E-05  2.40E-08  2.70E-08  5.90E-06  2.40E-08  2.70E-08
        5.90E-06  9.60E-05  5.50E-05  5.90E-06  5.90E-06  1.70E-05
        0.00E+00
```

```
   AERSOL
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    0.00E+00
   RESP
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    0.00E+00
   DEPVEL   0.0100
GROUP=RUTH
   RFRAC
    6.00E-07  1.00E-07  1.30E-07  3.80E-06  3.20E-07  3.70E-07
    2.10E-06  6.10E-07  6.70E-07  6.80E-07  6.10E-07  6.70E-07
    6.80E-07  8.40E-05  5.00E-05  6.40E-06  6.40E-06  6.70E-08
    0.00E+00
   AERSOL
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    0.00E+00
   RESP
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    0.00E+00
   DEPVEL   0.0100
GROUP=CRUD
   RFRAC
    2.00E-03  1.40E-03  1.80E-03  3.20E-03  1.80E-03  2.10E-03
    3.10E-03  2.00E-03  2.20E-03  2.50E-03  2.00E-03  2.20E-03
    2.50E-03  6.40E-03  5.90E-03  3.30E-03  3.30E-03  2.50E-03
    0.00E+00
   AERSOL
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    0.00E+00
   RESP
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    0.00E+00
   DEPVEL   0.0100
GROUP=GAS
   RFRAC
    8.00E-01  1.40E-01  1.80E-01  8.40E-01  4.30E-01  4.90E-01
    8.50E-01  8.20E-01  8.90E-01  9.10E-01  8.20E-01  8.90E-01
    9.10E-01  8.40E-01  8.50E-01  9.10E-01  9.10E-01  8.40E-01
    0.00E+00
   AERSOL
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    0.00E+00
```

```
      RESP
       1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
       1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
       1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
       0.00E+00
      DEPVEL   0.0000
   PSPROB
       0.00E+00  0.00E+00  0.00E+00  0.00E+00  1.00E+00  0.00E+00
DEFINE AM242M
       5.55E+04  5.13E-03  1.17E-04  9.65E-07  0.00E+00  0.00E+00
       3.00E+00  5.30E+06  9.00E+06
       NONE
DEFINE CM243
       1.04E+04  1.35E-01  2.18E-02  4.00E-05  0.00E+00  0.00E+00
       3.00E+00  2.50E+07  2.00E+07
       NONE
PACKAGE      SFUEL  3.030E-01 1.000 0.000    5.20
        EU154       8.420E+03 PARTS
        PM147       2.580E+04 PARTS
        CM242       3.760E+02 PARTS
        AM242M      1.330E+01 PARTS
        CM243       2.880E+01 PARTS
        AM243       2.510E+01 PARTS
        CS134       6.990E+04 CESIUM
        CS137       7.900E+04 CESIUM
        CE144       3.870E+04 PARTS
        RU106       4.430E+04 RUTH
        SR90        5.360E+04 PARTS
        PU239       2.140E+02 PARTS
        PU240       4.280E+02 PARTS
        AM241       4.360E+02 PARTS
        PU241       6.520E+04 PARTS
        CM244       5.620E+03 PARTS
        PU238       4.810E+03 PARTS
        CO60        5.780E+01 CRUD
        KR85        5.870E+03 GAS
        END

VEHICLE  -1 TRUCK       1.810E-01 1.000 0.000    5.20    1.00
                          2.00    7.40 1.000    2.00

        SFUEL         1.00
MODSTD
   EVACUATION 4.390E-02
FLAGS
   IUOPT 2
EOF
LINK LINK_1     TRUCK      1360.13  88.6  1.0    5.93  256.00 2.70E-08 R 1
0.50
LINK LINK_2     TRUCK       194.81  88.6  1.0  356.00  263.00 4.78E-07 S 1
0.00
LINK LINK_3     TRUCK        55.06  88.6  1.0 2670.00  930.00 5.20E-07 U 1
0.00
STOP STOP_      TRUCK      30000.00   1.00   10.00 1.000  14.200
STOP Public     TRUCK       340.00  10.00  800.00 0.200  14.200
EOF
```

NON-RADIOLOGICAL RISK (FATALITIES)
****

	NORMAL OCCUPATIONAL	NORMAL NON-OCCUPATIONAL	ACCIDENT OCCUPATIONAL	ACCIDENT NON-OCCUPATIONAL
LINK_1	0.00E+00	0.00E+00	4.08E-05	1.44E-04
LINK_2	0.00E+00	0.00E+00	1.44E-06	5.07E-06
LINK_3	0.00E+00	1.10E-05	2.31E-07	8.26E-07
TOTALS:	0.00E+00	1.10E-05	4.25E-05	1.50E-04

REGULATORY CHECKS

THE SHIPMENT BY TRUCK IS DESIGNATED AS EXCLUSIVE USE
BUT IS NOT REQUIRED TO BE SO DESIGNATED BY REGULATIONS

CALCULATIONAL INFORMATION FOR PASQUILL CATEGORY E

IN CALCULATING THE DEPLETION FOR THE FOLLOWING GROUPS,
THE CONCENTRATIONS IN THE LISTED AREA HAVE BECOME NEGATIVE.
THE CONTAMINATION AND CONCENTRATIONS IN THE LISTED AREA AND
LARGER HAVE BEEN SET TO ZERO.

GROUP PARTS AREA 15
GROUP CESIUM AREA 15
GROUP RUTH AREA 15
GROUP CRUD AREA 15

FOR TRUCK AREAS WITH TOTAL CONTAMINATION RATIO GREATER THAN 40.000

(THE AREAS MARKED WITH AN 'X' ARE INTERDICTED AND HAVE
NO 50 YEAR GROUNDSHINE DOSE AND NO INGESTION DOSE.)

AREA/SEVERITY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
2	X	-	-	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-
3	-	-	-	X	-	-	X	-	-	X	-	-	X	X	X	X	X	X	-
4	-	-	-	X	-	-	X	-	-	-	-	-	-	X	X	-	-	X	-
5	-	-	-	X	-	-	X	-	-	-	-	-	-	X	X	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

INCIDENT-FREE SUMMARY
******** **** *******

IN-TRANSIT POPULATION EXPOSURE IN PERSON-REM

	PASSENGER	CREW	OFF LINK	ON LINK	TOTALS
LINK_1	0.00E+00	4.09E-04	3.82E-06	4.28E-05	4.56E-04
LINK_2	0.00E+00	5.86E-05	2.86E-05	6.30E-06	9.35E-05
LINK_3	0.00E+00	1.66E-05	1.25E-06	6.30E-06	2.41E-05
RURAL	0.00E+00	4.09E-04	3.82E-06	4.28E-05	4.56E-04
SUBURB	0.00E+00	5.86E-05	2.86E-05	6.30E-06	9.35E-05
URBAN	0.00E+00	1.66E-05	1.25E-06	6.30E-06	2.41E-05
TOTALS:	0.00E+00	4.84E-04	3.36E-05	5.54E-05	5.73E-04

MAXIMUM INDIVIDUAL IN-TRANSIT DOSE

TRUCK 7.71E-09 REM

STOP EXPOSURE IN PERSON-REM

ANNULAR AREA	STOP_	1.24E-02
ANNULAR AREA	Public	5.36E-05
	TOTAL:	1.25E-02

ACCIDENT SUMMARY
******** *******

EXPECTED VALUES OF POPULATION RISK IN PERSON REM

	GROUND	INHALED	RESUSPD	CLOUDSH	TOTAL
LINK_1	1.09E-09	2.25E-10	9.83E-10	2.39E-12	2.30E-09
LINK_2	1.65E-07	3.43E-08	1.50E-07	3.64E-10	3.50E-07
LINK_3	2.39E-07	4.94E-08	2.16E-07	5.25E-10	5.05E-07
RURAL	1.09E-09	2.25E-10	9.83E-10	2.39E-12	2.30E-09
SUBURB	1.65E-07	3.43E-08	1.50E-07	3.64E-10	3.50E-07
URBAN	2.39E-07	4.94E-08	2.16E-07	5.25E-10	5.05E-07
TOTALS:	4.05E-07	8.39E-08	3.67E-07	8.91E-10	8.57E-07

SOCIETAL INGESTION RISK - PERSON-REM

LINK	GONADS	EFFECTIVE
LINK_1	8.91E-09	8.82E-09
TOTAL	8.91E-09	8.82E-09

SOCIETAL INGESTION RISK BY ORGAN - PERSON-REM

LINK	BREAST	LUNGS	RED MARR	BONE SUR	THYROID	REMAINDER
LINK_1	7.45E-09	7.59E-09	8.98E-09	1.14E-08	7.55E-09	9.75E-09
TOTAL	7.45E-09	7.59E-09	8.98E-09	1.14E-08	7.55E-09	9.75E-09

EXPECTED RISK VALUES - OTHER

LINK	EARLY FATALITY	EARLY MORBIDITY
LINK_1	0.00E+00	0.00E+00
LINK_2	0.00E+00	0.00E+00
LINK_3	0.00E+00	0.00E+00
TOTAL	0.00E+00	0.00E+00

EOI
END OF RUN

E.4 RADTRAN 5 Output for Last Observation, Rail Shipments

```
RRRR    AAA   DDDD   TTTTT  RRRR    AAA   N   N  55555
R   R  A   A  D   D    T    R   R  A   A  NN  N  5
R   R  A   A  D   D    T    R   R  A   A  N N N  5
RRRR   A   A  D   D    T    RRRR   A   A  N  NN  5555
R R    AAAAA  D   D    T    R R    AAAAA  N   N      5
R  R   A   A  D   D    T    R  R   A   A  N   N  5   5
R   R  A   A  DDDD     T    R   R  A   A  N   N  5555

                    RADTRAN 5.0   APRIL 14, 1999

                            INPUT ECHO
                            ----------


 && PWR Spent Fuel, 3-year Cooled, 24 Assemblies
 TITLE JLS Severity and Release Fractions for MONO RAIL
 INPUT STANDARD
STD: 0 10 18                                  && DIMEN=NSEV NRAD NAREAS
STD: 1 3 3 0                                  && PARM=IRNKC IANA ISEN IPSQSB
STD: .TRUE.                                   && FORM = UNIT
STD: 2.3E12                                   && NEVAL FOR CF252
STD: 9.25E5 5.77E6 1.27E6                     && RPCTHY FOR I125, I129, I131
STD: 0.0 0.0 0.0 0.0 0.0                      && TRANSFER GAMMA
STD: 7.42E-3 2.02E-2 6.17E-5 3.17E-8 0.0      && TRANSFER NEUTRON
STD: 30.0  24.0                               && MITDDIST  MITDVEL
STD: 1  2.0   .0018                           && ITRAIN FMINCL DDRWEF
STD: 33.44555031 68.04334531 105.1150817 243.9395252 369.3912316 && CNTR LINE
STD: 561.3603894 1018.172412 1627.547574 2308.398677 4269.177161 && DISTANCES
STD: 5468.445215 11136.34588 13096.71743 21333.92069 40502.11047 && FOR AVE.
STD: 69985.92559 89859.94324 120877.9559 0 0 0 0 0 0 0 0 0 0 0 0 && US CLOUD
STD: 4.59E+02 1.53E+03 3.94E+03 1.25E+04 3.04E+04 6.85E+04 1.76E+05 4.45E+05
STD:  8.59E+05 2.55E+06 4.45E+06 1.03E+07 2.16E+07 5.52E+07 1.77E+08 4.89E+08
STD:  8.12E+08 1.35E+09 0 0 0 0 0 0 0 0 0 0 0 0     && AREADA
STD: 3.42E-03 1.72E-03 8.58E-04 3.42E-04 1.72E-04 8.58E-05 3.42E-05 1.72E-05
STD:  8.58E-06 3.42E-06 1.72E-06 8.58E-07 3.42E-07 1.72E-07 8.58E-08 5.42E-08
STD:  4.30E-08 3.42E-08 0 0 0 0 0 0 0 0 0 0 0 0     && DFLEV
STD: 3.05 6.1 9.1 12.2 15.2 30.5 61. 91.4 152.4 305. 0. 0. 0. 0. 0.
STD: 3.05 6.1 9.1 12.2 15.2 30.5 61. 91.4 152.4 305. 0. 0. 0. 0. 0.
STD: 3.05 6.1 9.1 12.2 15.2 30.5 61. 91.4 152.4 305. 0. 0. 0. 0. 0.
STD: 0.5                                      && SMLPKG
STD: 1.0  0.87  0.018                         && SHIELDING FACTORS RR  RS  RU
STD: 30.0 30.0 800.0                          && OFFLINK {FREEWAY}
STD: 27.0 30.0 800.0                          && OFFLINK {NON-FREEWAY}
STD: 5.0 8.0 800.0                            && OFFLINK {CITY STREETS}
STD: 30.0 30.0 800.0                          && OFFLINK {RAILWAY}
STD: 200.0 200.0 1000.0                       && OFFLINK {WATERWAY}
STD: 15.0  3.0  3.0  3.0  4.0                 && ONLINK {FWAY NONFWY STREET RAIL ADJ}
STD: 6.0  4.0  40.0                           && RPD FNOATT INTERDICT
STD: 0.05   0.2   3.3E-4                      && BDF CULVL BRATE
STD: 0.52  0.1                                && UBF USWF
STD: 1.0  10.0 1.0                            && EVACUATION SURVEY CAMPAIGN
STD: 0.0  0.0     1.5E-8  5.3E-8              && HIGHWAY - RURAL - NONRAD
STD: 0.0  0.0     3.7E-9  1.3E-8              && HIGHWAY - SUBURBAN - NONRAD
STD: 0.0  1.0E-7  2.1E-9  7.5E-9              && HIGHWAY - URBAN - NONRAD
STD: 0.0  0.0    1.81E-9  2.64E-8             && GENERAL FREIGHT - R - NONRAD
STD: 0.0  0.0    1.81E-9  2.64E-8             && GENERAL FREIGHT - S - NONRAD
STD: 0.0  1.3E-7 1.81E-9  2.64E-8             && GENERAL FREIGHT - U - NONRAD
```

```
STD: 0.0  0.0    1.27E-7  1.85E-6      && DEDICATED RAIL - R - NONRAD
STD: 0.0  0.0    1.27E-7  1.85E-6      && DEDICATED RAIL - S - NONRAD
STD: 0.0  6.5E-7 1.27E-7  1.85E-6      && DEDICATED RAIL - U - NONRAD
STD: 0.0 0.0 0.0 0.0 0.0 0.0           && PSPROB
STD: 0.67  0.67  0.42                  && TIMENDE NON-DISPERSAL EVAC TIME
STD: 2 2 1                             && FLAGS=IUOPT IACC REGCHECK
STD: 5E-4, 4E-4, 1.3E-4                && LCFCON(1), LCFCON(2), GECON
STD: R5INGEST.BIN                      && INGESTION FILE
 FORM UNIT
 DIMEN 21 10 18
 PARM 1 3 1 1
 SEVERITY
    NPOP=1
      NMODE=2
        4.49E-09  1.17E-07  4.49E-09  3.05E-05  1.01E-06  1.51E-08
        7.31E-08  2.43E-09  3.61E-11  9.93E-10  3.30E-11  4.91E-13
        3.81E-11  1.27E-12  1.88E-14  5.69E-11  3.61E-14  4.91E-16
        1.88E-17  6.32E-06  1.00E+00
    NPOP=2
      NMODE=2
        4.49E-09  1.17E-07  4.49E-09  3.05E-05  1.01E-06  1.51E-08
        7.31E-08  2.43E-09  3.61E-11  9.93E-10  3.30E-11  4.91E-13
        3.81E-11  1.27E-12  1.88E-14  5.69E-11  3.61E-14  4.91E-16
        1.88E-17  6.32E-06  1.00E+00
    NPOP=3
      NMODE=2
        4.49E-09  1.17E-07  4.49E-09  3.05E-05  1.01E-06  1.51E-08
        7.31E-08  2.43E-09  3.61E-11  9.93E-10  3.30E-11  4.91E-13
        3.81E-11  1.27E-12  1.88E-14  5.69E-11  3.61E-14  4.91E-16
        1.88E-17  6.32E-06  1.00E+00

 RELEASE
    GROUP=PARTS
       RFRAC
        2.50E-07  1.30E-05  1.90E-05  1.00E-07  1.30E-07  1.40E-05
        2.60E-07  2.90E-07  6.80E-06  1.30E-05  1.50E-05  1.50E-05
        2.00E-05  2.10E-05  2.20E-05  1.80E-05  8.90E-06  1.50E-05
        2.20E-05  2.50E-07  0.00E+00
       AERSOL
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  0.00E+00
       RESP
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
        1.00E+00  1.00E+00  0.00E+00
       DEPVEL   0.0100
    GROUP=CESIUM
       RFRAC
        1.20E-08  8.60E-06  1.80E-05  4.10E-09  5.40E-09  3.60E-05
        1.30E-08  1.50E-08  2.70E-05  8.80E-06  9.60E-06  1.40E-05
        1.80E-05  2.00E-05  2.20E-05  9.60E-05  5.50E-05  1.40E-05
        2.20E-05  1.70E-05  0.00E+00
```

```
   AERSOL
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  0.00E+00
   RESP
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  0.00E+00
   DEPVEL   0.0100
GROUP=RUTH
   RFRAC
    2.50E-07  1.30E-05  1.90E-05  1.00E-07  1.30E-07  1.40E-05
    2.60E-07  2.90E-07  6.80E-06  1.30E-05  1.50E-05  1.50E-05
    2.00E-05  2.10E-05  2.20E-05  8.40E-05  5.00E-05  1.80E-05
    2.30E-05  2.50E-07  0.00E+00
   AERSOL
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  0.00E+00
   RESP
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  0.00E+00
   DEPVEL   0.0100
GROUP=CRUD
   RFRAC
    1.40E-03  4.40E-02  6.40E-02  1.40E-03  1.80E-03  5.40E-03
    1.50E-03  1.70E-03  4.50E-03  4.50E-02  4.90E-02  5.10E-02
    6.50E-02  7.10E-02  7.40E-02  6.40E-03  5.40E-03  5.10E-02
    7.40E-02  9.40E-03  0.00E+00
   AERSOL
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  0.00E+00
   RESP
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  0.00E+00
   DEPVEL   0.0100
GROUP=GAS
   RFRAC
    4.10E-01  8.00E-01  8.00E-01  1.40E-01  1.80E-01  8.40E-01
    4.30E-01  4.90E-01  8.50E-01  8.20E-01  8.90E-01  9.10E-01
    8.20E-01  8.90E-01  9.10E-01  8.40E-01  8.50E-01  9.10E-01
    9.10E-01  8.40E-01  0.00E+00
   AERSOL
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
    1.00E+00  1.00E+00  0.00E+00
```

```
      RESP
       1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
       1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
       1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00  1.00E+00
       1.00E+00  1.00E+00  0.00E+00
      DEPVEL   0.0000
   PSPROB
       0.00E+00  0.00E+00  0.00E+00  1.00E+00  0.00E+00  0.00E+00
 DEFINE AM242M
       5.55E+04  5.13E-03  1.17E-04  9.65E-07  0.00E+00  0.00E+00
       3.00E+00  5.30E+06  9.00E+06
       NONE
 DEFINE CM243
       1.04E+04  1.35E-01  2.18E-02  4.00E-05  0.00E+00  0.00E+00
       3.00E+00  2.50E+07  2.00E+07
       NONE

 PACKAGE      SFUEL  1.565E+00 1.000 0.000    4.80
        EU154       8.420E+03 PARTS
        PM147       2.580E+04 PARTS
        CM242       3.760E+02 PARTS
        AM242M      1.330E+01 PARTS
        CM243       2.880E+01 PARTS
        AM243       2.510E+01 PARTS
        CS134       6.990E+04 CESIUM
        CS137       7.900E+04 CESIUM
        CE144       3.870E+04 PARTS
        RU106       4.430E+04 RUTH
        SR90        5.360E+04 PARTS
        PU239       2.140E+02 PARTS
        PU240       4.280E+02 PARTS
        AM241       4.360E+02 PARTS
        PU241       6.520E+04 PARTS
        CM244       5.620E+03 PARTS
        PU238       4.810E+03 PARTS
        CO60        5.780E+01 CRUD
        KR85        5.870E+03 GAS
        END

VEHICLE   2 RAIL        2.080E+00 1.000 0.000    4.80    1.00
                           5.00   10.00 1.000    2.00
        SFUEL        24.00
 MODSTD
    EVACUATION 5.333E-02
 FLAGS
    IUOPT 2
 EOF
 LINK LINK_1   RAIL      2891.15  64.4  3.0    6.29    1.00 2.39E-08 R 3 0.50
 LINK LINK_2   RAIL       199.57  40.3  3.0  330.44    5.00 2.71E-08 S 3 0.00
 LINK LINK_3   RAIL        61.18  24.1  3.0 2289.40    5.00 2.89E-08 U 3 0.00
 STOP STOP_CR    RAIL          8.00 400.00  800.00 0.100  30.000
 STOP STOP_CS    RAIL        340.00 400.00  800.00 0.100  30.000
 STOP STOP_R     RAIL          8.00  30.00  800.00 1.000  47.000
 STOP STOP_S     RAIL        340.00  30.00  800.00 1.000  12.000
 EOF
```

NON-RADIOLOGICAL RISK (FATALITIES)
****

	NORMAL OCCUPATIONAL	NORMAL NON-OCCUPATIONAL	ACCIDENT OCCUPATIONAL	ACCIDENT NON-OCCUPATIONAL
LINK_1	0.00E+00	0.00E+00	1.05E-05	1.53E-04
LINK_2	0.00E+00	0.00E+00	7.22E-07	1.05E-05
LINK_3	0.00E+00	1.59E-05	2.21E-07	3.23E-06
TOTALS:	0.00E+00	1.59E-05	1.14E-05	1.66E-04

REGULATORY CHECKS

CALCULATIONAL INFORMATION FOR PASQUILL CATEGORY D

FOR RAIL AREAS WITH TOTAL CONTAMINATION RATIO GREATER THAN 40.000
(THE AREAS MARKED WITH AN 'X' ARE INTERDICTED AND HAVE NO 50 YEAR GROUNDSHINE DOSE AND NO INGESTION DOSE.)

AREA/SEVERITY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-
4	-	X	X	-	-	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-
5	-	X	X	-	-	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-
6	-	X	X	-	-	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-
7	-	X	X	-	-	X	-	-	X	X	X	X	X	X	X	X	X	X	X	X	-
8	-	X	X	-	-	X	-	-	X	X	X	X	X	X	X	X	X	X	X	-	-
9	-	-	X	-	-	X	-	-	-	-	-	X	X	X	X	X	X	X	X	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

INCIDENT-FREE SUMMARY
******** **** *******

IN-TRANSIT POPULATION EXPOSURE IN PERSON-REM

	PASSENGER	CREW	OFF LINK	ON LINK	TOTALS
LINK_1	0.00E+00	5.95E-03	1.27E-04	4.74E-05	6.12E-03
LINK_2	0.00E+00	4.11E-04	6.42E-04	4.18E-05	1.09E-03
LINK_3	0.00E+00	1.26E-04	4.72E-05	3.58E-05	2.09E-04
RURAL	0.00E+00	5.95E-03	1.27E-04	4.74E-05	6.12E-03
SUBURB	0.00E+00	4.11E-04	6.42E-04	4.18E-05	1.09E-03
URBAN	0.00E+00	1.26E-04	4.72E-05	3.58E-05	2.09E-04

RAIL WORKER CLASSIFICATION 2.29E-03

TOTALS:	0.00E+00	8.77E-03	8.17E-04	1.25E-04	7.43E-03

MAXIMUM INDIVIDUAL IN-TRANSIT DOSE

RAIL 8.29E-08 REM

STOP EXPOSURE IN PERSON-REM

ANNULAR AREA	STOP_CR	2.27E-06
ANNULAR AREA	STOP_CS	9.63E-05
ANNULAR AREA	STOP_R	1.68E-04
ANNULAR AREA	STOP_S	1.83E-03
	TOTAL:	2.09E-03

ACCIDENT SUMMARY
******** *******

EXPECTED VALUES OF POPULATION RISK IN PERSON REM

	GROUND	INHALED	RESUSPD	CLOUDSH	TOTAL
LINK_1	3.21E-08	7.08E-09	3.09E-08	2.23E-11	7.01E-08
LINK_2	1.32E-07	2.91E-08	1.27E-07	9.16E-11	2.88E-07
LINK_3	1.87E-07	4.13E-08	1.80E-07	1.30E-10	4.09E-07
RURAL	3.21E-08	7.08E-09	3.09E-08	2.23E-11	7.01E-08
SUBURB	1.32E-07	2.91E-08	1.27E-07	9.16E-11	2.88E-07
URBAN	1.87E-07	4.13E-08	1.80E-07	1.30E-10	4.09E-07
TOTALS:	3.51E-07	7.75E-08	3.38E-07	2.44E-10	7.67E-07

SOCIETAL INGESTION RISK - PERSON-REM

LINK	GONADS	EFFECTIVE
LINK_1	2.67E-07	2.63E-07
TOTAL	2.67E-07	2.63E-07

SOCIETAL INGESTION RISK BY ORGAN - PERSON-REM

LINK	BREAST	LUNGS	RED MARR	BONE SUR	THYROID	REMAINDER
LINK_1	2.25E-07	2.29E-07	2.63E-07	3.14E-07	2.28E-07	2.91E-07
TOTAL	2.25E-07	2.29E-07	2.63E-07	3.14E-07	2.28E-07	2.91E-07

EXPECTED RISK VALUES - OTHER

LINK	EARLY FATALITY	EARLY MORBIDITY
LINK_1	0.00E+00	9.17E-16
LINK_2	0.00E+00	3.77E-15
LINK_3	0.00E+00	5.12E-15
TOTAL	0.00E+00	9.81E-15

EOI
END OF RUN