

Question for Discussion:

A question was raised by Southwest Research Institute (SwRI) regarding fiber mass units, which were labeled as pounds mass (lbm), at the STP meeting of 02/04/15. The table in question (RoverD table) cited weld locations capable of introducing more fine fiber mass to the containment pool than was tested during a July 2008 STP flume test.

STP's understanding is that SwRI stated they obtained similar numeric values but only when units of kilograms are applied.

Confirmatory Comparison:

It is not clear what steps SwRI followed to generate or extract comparative information from CASA Grande v1.6. The numeric results STP presented require non-standard output methods that must be obtained from the vendor (Alion). Also, independent verification of results obtained should be done to ensure correct values are being obtained. In the following, process steps and verification are summarized.

Extensive QA comparisons have been performed between manually directed CAD calculations of total debris volume and automated CASA Grande calculations of total debris volume within a ZOI. A comparison of a spherical DEGB ZOI at weld point "31-RC-1402-NSS-RSG-1D-ON-SE" located on the Loop D Crossover Leg (31-in.) shows good agreement between manual CAD extraction and the automated CASA calculation (Table 1 below). Further partitioning of total fiber into size fractions by fractional composition shows identical agreement between manual and automated evaluation when starting with the same total volume.

Table 1: Volumetric insulation debris quantities from LBLOCA at weld 31-RC-1402-NSS-RSG-1D-ON-SE

Insulation Type	ZOI Size	CAD Debris Volume (ft³)	CASA Debris Volume (ft³)
<i>Microtherm</i> ¹	28.6D	0.013	1.7
	7.0D	317.2	326.3
<i>Nukon</i>	11.9D	553.6	578.4
	17.0D	810.2	829.7
<i>Thermal Wrap</i>	7.0D	295.0	283.4
	11.9D	623.3	606.6
	17.0D	1,134.8	1,138.7

¹Most microtherm exists within pipe penetrations of the secondary shield wall that are difficult to isolate manually.

Recommended Procedure:

The mass of fine fiber introduced to the containment pool from each break scenario is not a standard output of CASA Grande v1.6, which was provided for review to SwRI. Alion recommends that a knowledgeable user follow the steps below to extract fine-fiber quantity from CASA in units of pounds mass. Highlighted lines show suggested code to implement the instructions:

1. Open CASA02.m and navigate to Line 3007
2. Add a statement for storing the following three variables in a new variable: LDFGSize, MicroTh, and LatentFiberSmp

- a. LDFGsize: Nbrk x 3
 - i. Column 1 = LDFG Fines Generated – Must be Converted to lbm using density (2.4 lbm/ft3)
 - ii. Column 2 = LDFG Small Generated – Must be Converted to lbm using density (2.4 lbm/ft3)
 - iii. Column 3 = LDFG Large Generated – Must be Converted to lbm using density (2.4 lbm/ft3)
- b. MicroTh: Nbrk x 1
 - i. Column 1 = Microtherm Generated – Must be Multiplied by fiber constituent fraction (0.03)
 - ii. Column 1 = Microtherm Generated – Must be Converted to lbm using density (15 lbm/ft3)
- c. LatentFiberSmp: Nbrk x 1
 - i. Column 1 = Latent Fiber Generated – Must be Converted to lbm using density (2.4 lbm/ft3)

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RoverDGen = [LDFGSize * 2.4, Microth * 0.03 * 15, LatentFiberSmp * 2.4];
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3. Use the following Equation to Compute the Mass of RoverD Debris Transported:

Total Fiber Fines Transported =	(0.018 + 0.967) * LDFG Fines Generated +	[LDFG Fines]
	(0.018) * LDFG Smalls Generated +	[Eroded Small Fines]
	(0.010) * LDFG Larges Generated+	[Eroded Large Fines]
	(0.018 + 0.967) * MicroTherm Fiber Generated +	[MicroTherm Fines]
	(0.060 + 0.890) * Latent Fiber Generated	[Latent Fiber Fines]

```
Fracts = [0.985, 0.018, 0.010, 0.985, 0.950];
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Fracts = repmat(Fracts, Nbrk, 1);
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RoverDTrans = RoverDGen.*Fracts;
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4. Extract desired breaks by matching weld attributes