

STP CASA Grande Information (Non-Proprietary Version)

CASA01 JT4

Contains No Proprietary Information
Alion Science and Technology


```

% (units consistent with freq dists and CAD data)

% List Number of Defined Break Size Limits
% ie. SB,MB,LB (3 designations)
% However more sizes are allowable
3

% List Sizes
0.5  2.0  6.0

%-----

% CAD and Plotting Options (1/0 = Y/N)

% Show CAD Reproduction
0

% Show Concrete and Gratings
0

% Produce Intro Movie and Stop
0

% Debris Passage Correlation
0

% Sample Flow Rates
0

% Random Input Distributions
0

% ZOI Radial Inflation Factor(Plotting Only)
50

% ZOI Plotting Interval (# of breaks between plots)
25

%-----
%   spatial resolution for discretizing insulation
%   (must repeat weld target sort if these are changed. delete all master
%   files and rerun with new delL and Nangbin)

% Linear Resolution (in.)
6

%Azimuthal Bins in 2 Pi Radians on Pipes
12

%-----

% Head Loss Option
% porosity calc (1/2 = vol / mass weighting)
% (vol weighting was found to be more conservative)
1
%-----

% Synonyms tables for nonstandard welds, hangars and valves and Equipment

% Number of Valve synonyms
5
% Valve Synonyms
Valve VALVE MOV XRH FCV

% Number of Hangar Labels
14
% Hangar Synonyms
Hangar Hanger HL AF GU SS SH RR RH
"Work Point" "work point" "Work point" "work Point" "WORK POINT"

% Number of Weld Synonyms
4

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% Weld Synonyms
FW Weld WELD FS

% Number of Steam Generator Synonyms
2

% Steam Generator Synonyms
SG SteamGenerator

% Number of Reactor Coolant Pump Synonyms
2

% Reactor Coolant Pump Synonyms
RCP ReactorCoolantPump

% Number of Pressurizer Synonyms
3

% Pressurizer Synonyms
PZR PRZR Pressurizer

% Number of RHR Synonyms
2

% RHR Synonyms
RHR ResidualHeatRemoval

%-----
%Statistics Sampling Options

%Sampling Method
% (0/1/2/3 = CASA default / MatLab default / shuffle / read file)
2

%If Option 3 specified, set file name in case folder below
%If not LEAVE BLANK

% max # LHS bins in LLOCA for max: DEGB (DEGB counts as 1)
% Nmax:brk = 2 => 2044 total breaks
% Nmax:brk = 3 => 2100 total breaks
% Nmax:brk = 5 => 2250 total breaks
% Nmax:brk = 10 => 3070 total breaks
5

% # LHS replicates (batches) for each frequency CCDF
20

% # epistemic freq envelope samples
% current models process ~110 cases per minute
15

% logarithmic base for sampling epistemic frequency envelope
2

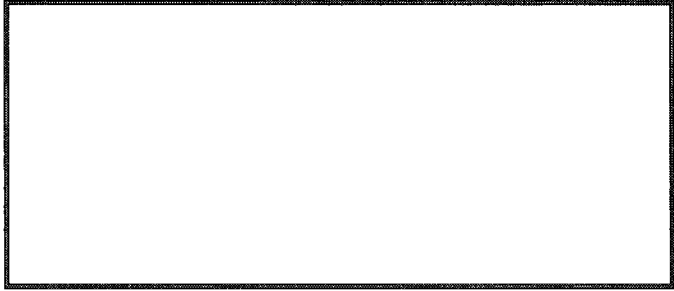
% lower limit of highest epistemic frequency bin
0.99

% # interpolation pts in each break freq ccdf
1000

% logarithmic base for sampling break size
% (double check routine before changing this from base 10)
10
```

%Insulation Characteristics

% Number of Low Density Fiberglass Zones
3



Redacted

% Number of Debris Types
8

% Debris Types
NUKON NUKON_2 MICROTHERM RMI LEAD "THERMAL WRAP" IOZ ALKYD

%Debris treated as LDFG
% 1/0 --> yes/no
1 1 0 0 0 1 0 0

%Debris treated as microtherm
% 1/0 --> yes/no
0 0 1 0 0 0 0 0

% Damage Radii with statistics definitions
% Material X Statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
17 0 0 99999 1 0 0
1
17 0 0 99999 1 0 0
1
28.6 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
17 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0

% Debris Properties Table

% (denote particulate/fiber = sphere/cylinder = 1/2)
% (do NOT add to or reorder this list unless code is modified)

```
% (inventory of fibers with cylindrical geom must be given in ft^3)
% (can 'fake' the diameter to match a given Sv using std geom formulas)
% (inventory of particulates with spherical geom must be given in lbm)
% (this list MUST include every debris type of interest)
% (if unknown, set "manufactured" density of particulate to ~20% of Rho_mat)
% (based on comparison of FeO2 to BWR sludge compaction density)
```

	'label'	DebrisPropi	'Geom'	'Diam'	'Rho_mat'	'Rho_mfc'
% native units			'sph,cyl'	'um'	'lbm/ft^3'	'lbm/ft^3'
% calc units			'sph,cyl'	'm'	'kg/m^3'	'kg/m^3'
	"LDFG - fines"	2	7	175	2.4	2.4
	"LDFG - small"	2	7	175	2.4	2.4
	"LDFG - large"	2	7	175	2.4	2.4
	"uTherm - filaments"	2	6	165	2.4	2.4
	"uTherm - SiO2"	1	2.5	137	27.4	27.4
	"uTherm - TiO2"	1	20	262	52.4	52.4
	"QualCoat - epoxy"	1	10	94	36.66	36.66
	"QualCoat - IOZ"	1	10	208	81.12	81.12
	"Crud"	1	15	350	70.0	70.0
	"UQCoat - epoxyfine"	1	152	124	48.36	48.36
	"UQCoat - epoxyFchp"	1	1143	124	48.36	48.36
	"UQCoat - epoxySchp"	1	1143	124	48.36	48.36
	"UQCoat - epoxyLchp"	1	1143	124	48.36	48.36
	"UQCoat - epoxyCrIs"	1	1143	124	48.36	48.36
	"UnQualCoat - alkyd"	1	10	207	80.73	80.73
	"UnQualCoat - enamel"	1	10	93	36.27	36.27
	"UnQualCoat - IOZ"	1	10	244	95.16	95.16
	"Latent - particulate"	1	17.3	169	33.80	33.80
	"Latent - fiber"	2	7	175	2.4	2.4

Diameters of SiO2 and TiO2
are improperly reversed

```
%-----
% microTherm constituents (low density concrete with fiber binder)
% mfc'd density (lbm/ft3)
15.0
```

```
% mass fraction filamentsflf_read
0.03
```

```
% mass fraction of SiO2
0.58
```

```
% mass fraction of TiO2
0.39
```

```
% debris type start and stop times (min after break)
% (rate assumed to be uniform from Tstart to Tend)
% (rate calc uses inventories defined above)
% (introduce "instant" sources over 1 delT)
% (debris from UQCoat cannot have Tstarts=0)
% (timing is presently independent of break size)
```

```
% Start Times
0 0 0 0 0 0 0 0 0 10
10 10 10 10 10 10 10 0 0

% Stop Times
10 10 10 10 10 10 10 10 10 2160
2160 2160 2160 2160 2160 2160 2160 10 10
```

```
%-----
% Noninsulation Debris Quantities
```

```
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
```

```

%           first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% qual epoxy in ZOI (lbm)
1
105 0 0 99999 1 0 0

% qual IOZ in ZOI (lbm)
1
39 0 0 99999 1 0 0

% crud fines (lbm)
1
24 0 0 99999 1 0 0

% unqual epoxy fine (lbm)
% (uniform dist)
2 2
234 0 117 234 2 0 0 117 234 0.5 0.5

% unqual epoxy fine chip (lbm)
% (uniform dist)
2 2
709 0 355 709 2 0 0 355 709 0.5 0.5

% unqual epoxy small chip (lbm)
% (uniform dist)
2 2
180 0 90 180 2 0 0 90 180 0.5 0.5

% unqual epoxy large chip (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual epoxy curls (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual alkyd (lbm)
1
271 0 0 99999 1 0 0

% unqual enamel (lbm)
1
267 0 0 99999 1 0 0

% unqual IOZ (lbm)
1
369 0 0 99999 1 0 0

% latent pariculate (lbm)
1
170 0 0 99999 1 0 0

% latent fiber (ft^3)
1
12.5 0 0 99999 1 0 0

%-----
% Time points along accident progression
% (assume all trains of injection on initially, w/spray on setpoint trip)
% (assume HPSI and LPSI both run, but LPSI flow negligible until depress)
% (1 of 3 spray pumps can be turned off, all HPSI can be turned off for M,L)

```


% (for degraded condition with < max trains, DON'T exercise any options)

% max time of interest (hr)
36

*****Recirculation Times*****
%Number of break sizes for recirc table
7

%Recirc Time Table
1.5 2 4 6 8 12 27.5 %Break Size (in.)
337 79 56 44 38 31 30 %Time to recirc (min)

*****Other LOCA Times*****
% time to ONE spray pump off (min) (S,M,L)
% (if 0.0, NO spray pumps run)
% With Statistics
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
20 5 0 99999 1 0 0
1
20 5 0 99999 1 0 0

% time to ALL spray pumps off (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
390 5 390 420 1 0 0
1
390 10 390 420 1 0 0
1
390 15 390 450 1 0 0

% time to retire 1 full train (min) (S,M,L)
% (this prob never happens, keep as option)
% (it would be the train with spray off already)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:

```

% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0

% earliest time for chem prod (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0

% time to hot leg injection (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5

%-----
% Chemical Product Variables

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```

% pool temp (degF) where chem prods form
% With statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
140 5 0 99999 1 0 0

% bump factor for chems when t>=Tchem and T<=ChemTemp (S,M,L)
% (spec mean as if min=0, but set min and max to shifted range)
% (preselect mean and max to set desired tail prob in last sample pt)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
1.25 0.64 1 15.3 3 1 10          % truncated exponential
3 2
1.50 0.44444 1 18.2 3 1 10 1 2 0.5 0.5      % truncated exponential
3 2
2.00 0.25 1 24 3 1 10 1 10 1 0.5          % truncated exponential

-----
% thresholds of concern
% (logical distribution functions. NOT part of sequence variability)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% core blockage limit (g/FA) HL breaks
1

```

99999 0 0 0 1 0 0

% core blockage limit (g/FA) CL break

1

99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for HL brk before HL inject

% (should never fail by this mode)

1

99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for CL brk before HL injection

1

7.5 0 0 0 1 0 0

% limit for strainer buckling (ft h2o)

1

9.35 0 0 0 1 0 0

% void fraction at pump inlet (@ train)

1

0.02 0 0 0 1 0 0

%Plant State Table Data

% Operable Trains

% Train X Pump Matrix

% three trains operable (Case 01)

%	lpsi	hpsi	spray
	1	1	1 %A
	1	1	1 %B
	1	1	1 %C

% two trains operable (Case 22)

%	lpsi	hpsi	spray
	1	1	1 %A
	1	1	1 %B
	0	0	0 %C

% one train operable (Case 43)

%	lpsi	hpsi	spray
	1	1	1 %A
	0	0	0 %B
	0	0	0 %C

% two LHSI pumps failed (Case 09)

%	lpsi	hpsi	spray
	1	1	1 %A
	0	1	1 %B
	0	1	1 %C

% one train fail + one additional LHSI fail (Case 26)

%	lpsi	hpsi	spray
	1	1	1 %A
	0	1	1 %B
	0	0	0 %C

% # reactor coolant pumps (in CAD)

4

% # pressurizers (in CAD)

1

% # RHF pumps (in CAD)

3

% # steam generators (in CAD)

4

```

% time increment for evaluation (min)
5

% misc debris area (ft^2) total in containment
1
100 0 0 99999 1 0 0
% fraction of misc debris overlap (arrives @ t0)
0.25

% thin-bed thickness (in)
0.0625

% clip ZOI with walls (1/0 = y/n)
1

% const fiber filtration eff in fuel
1.0

% strainer height (ft)
3.25

% containment rel humidity
1.00

% sump rel humidity
1.00

% # fuel assemblies
193

% inflation of delP before chem bump
1
5 1 1 10 1 0 0

%*****Min Flow to Cool Core*****

%Number of time and flow rate points
30
% Time post SCRAM (hr)
% Must be equal to number of time and flow rate points

0.0028      0.0042      0.0056
0.0111      0.0167      0.0222
0.0278      0.0417      0.0556
0.1111      0.1667      0.2222
0.2778      0.4167      0.5556
1.1111      1.6667      2.2222
2.7778      4.1667      5.5556
11.1111     16.6667     22.2222
27.7778     41.6667     111.1111
166.6667    222.2222    277.7778

%% Flow Rate (gpm)
% Must be equal to number of time and flow rate points

1414.7000   1323.5000   1260.9000   1113.4000   1030.5000
973.3000    931.3000    859.3000    812.3000    711.0000
654.7000    614.2000    581.8000    523.1000    480.9000
388.1000    342.4000    315.1000    295.7000    265.1000
245.5000    204.2000    182.7000    168.7000    158.1000
139.8000    99.0000     84.1000     74.4000     67.7000

%*****Special Weld *****
% single-case tracer (weld location name - from table)
% specialweld = '31-RC-1102-NSS-1.1';
% If special weld input select 1 else 0
0

```

```

% If 1 write weld name
% else leave blank

% nominal pool volume (ft^3) and area (ft^2)
% (uniform distribution between min and max pool volumes - S,M,L)
2 2
0 0 0 0 2 0 0 43464 61993 .5 .5 %SBLOCA
2 2
0 0 0 0 2 0 0 39533 69444 .5 .5 %MBLOCA
2 2
0 0 0 0 2 0 0 45201 69263 .5 .5 %LBLOCA

% Pool Area (ft^2)
12301

% clean strainer attributes
% clean area of ONE strainer (ft^2)
1.8185e+003
% clean area of one OLD strainer (ft^2)
%155.4

% max clean strainer head loss (ft h2o)
0.22

% single pump runout volume rates (gpm) (S, M, L)
% high-pressure max injection rates
1620
% low-pressure injection rate
2800

% Containment Spray Rate (all states except Case 43)
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5

% Containment Spray Rate (Case 43)
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5

%-----
% geometric loading table for a single train:
% thickness x(in) and strainer area A(ft^2) as functions of debris volume
% V(ft^3). see supplementary routine StrainerArea for geometry definition
% and assumptions. must be single-valued functions. May be slight mismatch
% in compression for thickness estimation between this table and delP routine,
% but low flow rate indicates low fiber compression.
% V(ft^3) x(in) A (ft^2)

% switch table on/off = 1/0, list length of table
% if 0 a flat approximation will be used
% for old strainers
1 28

% Table Values
% If Table off leave blank
0 0 1.8185e+003
8.1790e+001 5.0000e-001 4.1900e+002
8.1800e+001 5.0100e-001 4.1931e+002
2.8016e+002 8.1421e+000 4.4718e+002
4.7853e+002 1.5783e+001 5.9256e+002

```

```

6.7689e+002 2.3424e+001 7.4768e+002
8.7526e+002 3.1065e+001 9.1253e+002
1.0736e+003 3.8706e+001 1.0871e+003
1.2720e+003 4.6348e+001 1.2714e+003
1.4703e+003 5.3989e+001 1.4655e+003
1.6687e+003 6.1630e+001 1.6692e+003
1.8671e+003 6.9271e+001 1.8827e+003
2.0654e+003 7.6912e+001 2.1060e+003
2.2638e+003 8.4553e+001 2.3389e+003
2.4622e+003 9.2194e+001 2.5816e+003
2.6605e+003 9.9835e+001 2.8341e+003
2.8589e+003 1.0748e+002 3.0962e+003
3.0573e+003 1.1512e+002 3.3681e+003
3.2556e+003 1.2276e+002 3.6497e+003
3.4540e+003 1.3040e+002 3.9411e+003
3.6524e+003 1.3804e+002 4.2422e+003
3.8507e+003 1.4568e+002 4.5530e+003
4.0491e+003 1.5332e+002 4.8735e+003
4.2474e+003 1.6096e+002 5.2038e+003
4.4458e+003 1.6860e+002 5.5438e+003
4.6442e+003 1.7625e+002 5.8935e+003
4.8425e+003 1.8389e+002 6.2530e+003
5.0409e+003 1.9153e+002 6.6222e+003

```

```

%-----
% initiating event frequency and bounded Johnson fit
%   NUREG-1829 current-day exceedance frequencies (without SG breaks)
%   (# breaks/cal yr of sizes > x)
%   Interpolated values for LOCA bins MUST be consistent with LOCAbins def
%   UT Austin fit of epistemic envelope using bounded Johnson pdf.
%   Parameters MUST be listed in column order (gamma,delta,xi,lamda)
% each row varies by size, each column varies by file (then transposed)

```

```

% Break Frequency Table Name
"Present-Day Exceedance Frequency"

```

```

% Break Sizes in Ascending Order
% These are fixed values
% For Documentation Purpose only
0.5 1.625 2 3 6 7 14 31

```

```

% Frequency Table
% These are fixed values
% For Documentation Purpose only
% Break Size X Percentile
6.8e-5 5.0e-6 3.69e-6 2.1e-7 6.30e-8 1.4e-8 4.1e-10 3.5e-11 % 5th file
6.3e-4 8.9e-5 6.57e-5 3.4e-6 1.08e-6 3.1e-7 1.2e-08 1.2e-09 % 50th file
1.9e-3 4.2e-4 3.10e-4 1.6e-5 5.20e-6 1.6e-6 2.0e-07 2.9e-08 % mean
7.1e-3 1.6e-3 1.18e-3 6.1e-5 1.98e-5 6.1e-6 5.8e-07 8.1e-08 % 95th file

```

```

% Table Percentile Values
0.05 0.5 NaN 0.95 % Don't Use Mean for Fitting

```

```

% Johnson Parameters
% These are fixed values
% For Documentation Purpose only
% gamma      delta      xi      lambda
1.650950E+00 5.256964E-01 4.117000E-05 1.420000E-02
1.646304E+00 4.593913E-01 2.530000E-06 3.200000E-03
1.646308E+00 4.593851E-01 1.870000E-06 2.360550E-03
1.646605E+00 4.589467E-01 1.200000E-07 1.220000E-04
1.646403E+00 4.566256E-01 3.000000E-08 3.965000E-05
1.645739E+00 4.487957E-01 6.023625E-09 1.220000E-05
1.645211E+00 3.587840E-01 2.892430E-10 1.160000E-06
1.645072E+00 3.343493E-01 2.636770E-11 1.600000E-07

```

```

%-----
% Strainer-Test Penetration Parameters

```

```

% area of test module (ft^2)
91.44

```

```

% fraction of sheddable debris
% (uniform empirical) - (unitless)
2 2
0 0 0 0 2 0 0 0.00956 0.0272 0.5 0.5

% shedding rate (1/min)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.008236 0.0546 0.5 0.5

% filter efficiency per g (slope)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.000339 0.003723 0.5 0.5

% filter fit cut point (g)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 790 880 0.5 0.5

% initial filter eff (intercept)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.656 0.706 0.5 0.5

% filter efficiency match pt
% (set equal to 1.0 always)
1
1 0 0 0 1 0 0

% filter exp rate const (1/g)
% (bimodal empirical)
2 3
0 0 0 0 2 1 0 0.0011254 0.0013073 0.031787 0.10000 0.45000 0.1000

%-----
% Debris Transport Factors
% (enter conservative values here, random variables populated below)

% ZOI-generated debris
% (LDFG fines, LDFG small, LDFG large, uTherm fines, qual coat fines, crud fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment break)

% these factors were used for Full Batch 2
0.70 0.60 0.22 0.70 0.70 0.70 %F_BD_upr
0.30 0.25 0.00 0.30 0.30 0.30 %F_BD_lwr
0.53 0.27 0.00 0.53 0.53 0.53 %F_WD_UCin
0.47 0.19 0.00 0.47 0.47 0.47 %F_WD_UCan
0.00 0.27 0.00 0.00 0.00 0.00 %F_WD_Ecin
0.00 0.00 0.00 0.00 0.00 0.00 %F_WD_BCan
0.02 0.00 0.00 0.02 0.02 0.02 %F_PF_sump
0.05 0.00 0.00 0.05 0.05 0.05 %F_PF_nact
1.00 0.64 0.00 1.00 1.00 1.00 %F_Rcrc_lwr
1.00 0.64 0.00 1.00 1.00 1.00 %F_Rcrc_WDin
1.00 0.58 0.00 1.00 1.00 1.00 %F_Rcrc_WDan
0.00 0.01 0.01 0.00 0.00 0.00 %F_Ersn_spry
0.00 0.07 0.07 0.00 0.00 0.00 %F_Ersn_pool

% Unqualified coatings outside ZOI
% (epoxy fines, epoxy fine chips, epoxy small chips, epoxy large chips,
% epoxy curls, alkyd, baked enamel, IOZ fines)

```



```
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for MB/LBLOCA in SG compartment)
```

```
1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 % F_fail
0.15 0.15 0.15 0.15 0.15 0.54 0.00 0.83 % F_upr
0.02 0.02 0.02 0.02 0.02 0.46 1.00 0.17 % F_lwr
0.83 0.83 0.83 0.83 0.83 0.00 0.00 0.00 % F_R:
0.06 0.06 0.06 0.06 0.06 0.06 0.00 0.06 % F_spry
1.00 0.41 0.00 0.00 1.00 1.00 1.00 1.00 % F_rcrc
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 % F_R:rcrc
```

```
% Latent Debris
% (particulate, fiber)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment)
```

```
0.00 0.00 %F_BD_upr (1)
1.00 1.00 %F_BD_lwr (2)
1.00 1.00 %F_WD (3)
0.02 0.02 %F_PF_sump (4)
0.05 0.05 %F_PF_nact (5)
1.00 1.00 %F_Rcrc_lwr (6)
```

```
%-----
%Time and Temperature Data
```

```
%Number of Time and Temperature Data Points
162
```

```
% time vector (hr) for small-break temperature profile
% (FIRST entry is assumed 2B@ t=0. constant-value extrapolation imposed.
% (time dependent temps ARE currently used in calc, one history for each LOCA)
```

```
% time vector (hour) for small (and medium) breaks
```

```
0.0000 0.0847 0.0864 0.0881 0.0897 0.0914 0.0931 0.0947
0.0964 0.0981 0.0997 0.1014 0.1031 0.1047 0.1064 0.1081
0.1097 0.1139 0.1306 0.1472 0.1639 0.1806 0.1972 0.2139
0.2306 0.2472 0.2639 0.2806 0.2972 0.3139 0.3306 0.3472
0.3639 0.3806 0.3972 0.4139 0.4306 0.4472 0.4639 0.4806
0.4972 0.5139 0.5306 0.5472 0.5639 0.5806 0.5972 0.6139
0.6306 0.6472 0.6639 0.6806 0.6972 0.7139 0.7306 0.7472
0.7639 0.7806 0.7972 0.8139 0.8306 0.8472 0.8639 0.8806
0.8972 0.9139 0.9306 0.9472 0.9639 0.9806 0.9972 1.0139
1.0306 1.0472 1.0639 1.0806 1.3611 1.6944 2.0278 2.3611
2.6944 3.0278 3.3611 3.6944 4.0278 4.3611 4.6944 5.0278
5.3611 5.6944 6.0278 6.3611 6.6944 7.0278 7.3611 7.6944
8.0278 8.3611 8.6944 9.0278 9.3611 9.6944 10.0278 20.0833
32.0833 44.0833 56.0833 68.0833 80.0833 92.0833 104.0833
116.0833 128.0833 140.0833 152.0833 164.0833
176.0833 188.0833 200.0833 212.0833 224.0833
236.0833 248.0833 260.0833 272.0833 283.3333
297.2222 308.3333 319.4444 333.3333 344.4444
355.5556 369.4444 380.5556 391.6667 402.7778
416.6667 427.7778 438.8889 452.7778 463.8889
475.0000 488.8889 500.0000 511.1111 525.0000
536.1111 547.2222 561.1111 572.2222 583.3333
597.2222 608.3333 619.4444 633.3333 644.4444
655.5556 669.4444 680.5556 691.6667 702.7778
716.6667
```

```
% temperature(F) profile for small (and medium) breaks
119.6000 131.2987 140.1689 150.3314 156.1240
159.2343 162.1567 164.5680 166.6937 168.5685
170.2457 171.7175 172.9577 174.0415 174.9570
175.7084 176.3081 177.5299 164.4935 132.7076
124.0848 123.6914 123.5988 123.5641 123.5529
```

124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for medium (and small) break temperature profile
% (FIRST entry is assumed 2E@ t=0, constant-value extrapolation imposed.

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081
0.1097	0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139
0.2306	0.2472	0.2639	0.2806	0.2972	0.3139	0.3306	0.3472
0.3639	0.3806	0.3972	0.4139	0.4306	0.4472	0.4639	0.4806
0.4972	0.5139	0.5306	0.5472	0.5639	0.5806	0.5972	0.6139
0.6306	0.6472	0.6639	0.6806	0.6972	0.7139	0.7306	0.7472
0.7639	0.7806	0.7972	0.8139	0.8306	0.8472	0.8639	0.8806
0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972	1.0139
1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278
5.3611	5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944
8.0278	8.3611	8.6944	9.0278	9.3611	9.6944	10.0278	20.0833
32.0833	44.0833	56.0833	68.0833	80.0833	92.0833	104.0833	
116.0833	128.0833	140.0833	152.0833	164.0833			
176.0833	188.0833	200.0833	212.0833	224.0833			
236.0833	248.0833	260.0833	272.0833	283.3333			
297.2222	308.3333	319.4444	333.3333	344.4444			
355.5556	369.4444	380.5556	391.6667	402.7778			
416.6667	427.7778	438.8889	452.7778	463.8889			
475.0000	488.8889	500.0000	511.1111	525.0000			
536.1111	547.2222	561.1111	572.2222	583.3333			
597.2222	608.3333	619.4444	633.3333	644.4444			
655.5556	669.4444	680.5556	691.6667	702.7778			
716.6667							

% Temperature(F) profile for medium breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374

173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for large breaks

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947	
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081	0.1097
0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139	0.2306	0.2472
0.2639	0.2806	0.2972	0.3139	0.3306	0.3472	0.3639	0.3806	0.3972
0.4139	0.4306	0.4472	0.4639	0.4806	0.4972	0.5139	0.5306	0.5472
0.5639	0.5806	0.5972	0.6139	0.6306	0.6472	0.6639	0.6806	0.6972
0.7139	0.7306	0.7472	0.7639	0.7806	0.7972	0.8139	0.8306	0.8472
0.8639	0.8806	0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972
1.0139	1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278	5.3611
5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944	8.0278	8.3611
8.6944	9.0278	9.3611	9.6944	10.0278	20.0833	32.0833	44.0833	56.0833
68.0833	80.0833	92.0833	104.0833	116.0833	128.0833	140.0833		
152.0833	164.0833	176.0833	188.0833	200.0833	212.0833	224.0833	236.0833	248.0833
260.0833	272.0833	283.3333	297.2222	308.3333	319.4444	333.3333	344.4444	355.5556
369.4444	380.5556	391.6667	402.7778	416.6667	427.7778	438.8889	452.7778	463.8889
475.0000	488.8889	500.0000	511.1111	525.0000	536.1111	547.2222	561.1111	572.2222
583.3333	597.2222	608.3333	619.4444	633.3333	644.4444	655.5556	669.4444	680.5556
691.6667	702.7778	716.6667						

% Temperature (F) profile for large breaks

119.8113	213.9295	242.3104	255.0268	255.7907	253.1617			
252.9372	252.5390	251.9023	250.9733	249.7169	245.8894			
235.9856	224.0051	212.9495	203.5499	195.7225	179.5894			
199.8048	174.8143	174.8276	177.3518	180.7405	183.2333			
185.1644	186.4925	187.2579	187.8270	188.1924	188.4266			
188.5605	188.5934	188.5042	188.3375	189.3187	189.7570			
189.0923	188.5202	188.0148	187.5621	187.4103	187.0671			
186.7330	186.4249	186.1559	186.7640	186.5012	186.2557			
186.0555	185.9119	185.8265	185.8062	185.8495	185.9526			
186.1092	187.8900	187.9673	187.9196	187.9119	187.9385			
187.9954	188.0710	188.1647	188.2538	188.3385	188.4003			
189.0996	188.9199	188.7439	188.5614	188.3622	188.1314			
187.8597	187.5387	187.1667	186.7559	178.4091	171.8762			
166.5421	162.2238	158.1410	154.9818	151.7673	148.9234			
146.0834	143.7967	141.6054	139.5251	137.9892	136.4819			
134.8865	136.9000	136.6489	135.3569	134.3103	133.2941			
132.4453	131.9467	132.0536	132.1915	131.3055	130.7946			
130.2765	123.0489	118.1991	114.9095	112.4170	110.4096			
108.7290	107.2834	106.0152	104.8855	103.8671	102.9399			
102.0890	101.3027	100.5720	99.8894	99.2491	98.6461	98.0763		
97.5362	97.0229	96.5339	96.0669	95.6474	95.1520	94.7720	94.4055	
93.9649	93.6254	93.2967	92.9000	92.5932	92.2953	92.0057	91.6547	
91.3822	91.1168	90.7942	90.5432	90.2982	89.9998	89.7671	89.5396	

89.2620 89.0452 88.8328 88.5733 88.3703 88.1712 87.9276 87.7368
87.5494 87.3198 87.1398 86.9628 86.7457 86.5753 86.4076 86.2427
86.0401

```

%-----
% NPSH parameters:
%   (specify any # of pipe segments in common header)
%
% major HL variables

% absolute roughness of the pipe (ft)
0.00015

% Number of Pipe Segments
6

% pipe diameters (ft)
1.27 .99 1.27 .84 1.27 .99

% pipe lengths (ft)
66.96 25.41 12.00 25.46 11.50 24.91

% depth of common header (ft)
25.83 25.65 25.83 % LPSI, HPSI, SPRY

% NPSH required for each pump (ft water)
12 12 12      % LPSI, HPSI, SPRY

% minor HL variables
% # of elbows, tees, entrances, and branches per pipe segment
%   [(# of 90 degree) (# of 45 degree) (# of gate valves) (# of entrances) (# of
%   tee runs) (# of tee branches)]

4 2 1 1 0 0      % segment AB
3 0 0 0 0 1      % segment BC
0 0 0 0 1 0      % segment BD
3 0 0 0 0 1      % segment DE
0 0 0 0 1 0      % segment DF
3 0 0 0 0 1      % segment FG

%-----
% Newly Added Options

% Use Old Degas Routine? (0 = No, 1 = Yes)
0

% Use Old NPSH Routine? (0 = No, 1 = Yes)
0

% Use Old SI Pump Flow Equation? (0 = No, 1 = Yes)
0

% Use Old Strainer Properties? (0 = No, 1 = Yes)
0

% Use Common Random Numbers Across Frequency Replications? (0 = No, 1 = Yes)
0

% Enable All Plots? (0 = No, 1 = Yes)
1

% Enable Parallel Calculations (0 = No, 1 = Yes)
% CAUTION - USE ONLY IF YOUR KNOW YOUR PC MEETS SPECIFICATIONS!!!!
0

% Number of Parallel Threads
4

% Use Optimal Frequency Bins for 15 Freps (0 = No, 1 = Yes)
1

```

% Use Old Debris Source Rate (Before Error Correction)? (0 = No, 1 = Yes)
1

% Use Old Latent Debris Transport Equations (Before Error Correction)? (0 = No, 1 = Yes)
1

Attachment 8

STP CASA Grande Information (Non-Proprietary Version)

CASA09 JT4

Contains No Proprietary Information
Alion Science and Technology


```

% LOCA bin definitions
% (units consistent with freq dists and CAD data)

% List Number of Defined Break Size Limits
% ie. SB,MB,LB (3 designations)
% However more sizes are allowable
3

% List Sizes
0.5 2.0 6.0

%-----

% CAD and Plotting Options (1/0 = Y/N)

% Show CAD Reproduction
0

% Show Concrete and Gratings
0

% Produce Intro Movie and Stop
0

% Debris Passage Correlation
0

% Sample Flow Rates
0

% Random Input Distributions
0

% ZOI Radial Inflation Factor(Plotting Only)
50

% ZOI Plotting Interval (# of breaks between plots)
25

%-----
% spatial resolution for discretizing insulation
% (must repeat weld target sort if these are changed. delete all master
% files and rerun with new delL and Nangbin)

% Linear Resolution (in.)
6

%Azimuthal Bins in 2 Pi Radians on Pipes
12

%-----
% Head Loss Option
% porosity calc (1/2 = vol / mass weighting)
% (vol weighting was found to be more conservative)
1
%-----
% Synonyms tables for nonstandard welds, hangars and valves and Equipment

% Number of Valve synonyms
5
% Valve Synonyms
Valve VALVE MOV XRH FCV

% Number of Hangar Labels
14
% Hangar Synonyms
Hangar Hanger HL AF GU SS SH RR RH
"Work Point" "work point" "Work point" "work Point" "WORK POINT"

% Number of Weld Synonyms

```

4

```
% Weld Synonyms
FW Weld WELD FS
```

```
% Number of Steam Generator Synonyms
2
```

```
% Steam Generator Synonyms
SG SteamGenerator
```

```
% Number of Reactor Coolant Pump Synonyms
2
```

```
% Reactor Coolant Pump Synonyms
RCP ReactorCoolantPump
```

```
% Number of Pressurizer Synonyms
3
```

```
% Pressurizer Synonyms
PZR PRZR Pressurizer
```

```
% Number of RHR Synonyms
2
```

```
% RHR Synonyms
RHR ResidualHeatRemoval
```

```
%-----
%Statistics Sampling Options
```

```
%Sampling Method
% (0/1/2/3 = CASA default / MatLab default / shuffle / read file)
2
```

```
%If Option 3 specified, set file name in case folder below
%If not LEAVE BLANK
```

```
% max # LHS bins in LLOCA for max DEGB (DEGB counts as 1)
% Nmaxbrk = 2 => 2044 total breaks
% Nmaxbrk = 3 => 2100 total breaks
% Nmaxbrk = 5 => 2250 total breaks
% Nmaxbrk = 10 => 3070 total breaks
5
```

```
% # LHS replicates (batches) for each frequency CCDF
20
```

```
% # epistemic freq envelope samples
% current models process ~110 cases per minute
15
```

```
% logarithmic base for sampling epistemic frequency envelope
2
```

```
% lower limit of highest epistemic frequency bin
0.99
```

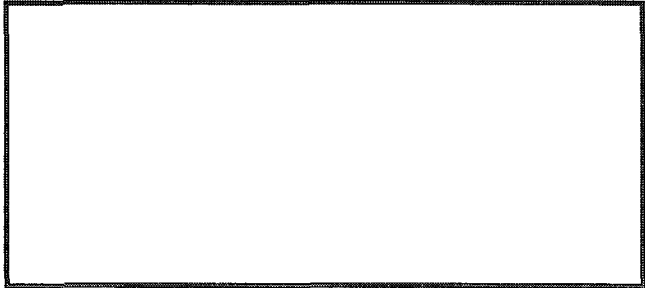
```
% # interpolation pts in each break freq ccdf
1000
```

```
% logarithmic base for sampling break size
```

% (double check routine before changing this from base 10)
10

%-----
%Insulation Characteristics

% Number of Low Density Fiberglass Zones
3



Redacted

% Number of Debris Types
8

% Debris Types
NUKON NUKON_2 MICROTHERM RMI LEAD "THERMAL WRAP" IOZ ALKYD

%Debris treated as LDFG
% 1/0 --> yes/no
1 1 0 0 0 1 0 0

%Debris treated as microtherm
% 1/0 --> yes/no
0 0 1 0 0 0 0 0

% Damage Radii with statistics definitions
% Material X Statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.

% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6

%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

1
17 0 0 99999 1 0 0

1
17 0 0 99999 1 0 0

1
28.6 0 0 99999 1 0 0

1
1 0 0 99999 1 0 0

1
1 0 0 99999 1 0 0

1
17 0 0 99999 1 0 0

1
1 0 0 99999 1 0 0

1
1 0 0 99999 1 0 0

%-----

% Debris Properties Table

% (denote particulate/fiber = sphere/cylinder = 1/2)
 % (do NOT add to or reorder this list unless code is modified)
 % (inventory of fibers with cylindrical geom must be given in ft^3)
 % (can 'fake' the diameter to match a given Sv using std geom formulas)
 % (inventory of particulates with spherical geom must be given in lbm)
 % (this list MUST include every debris type of interest)
 % (if unknown, set "manufactured" density of particulate to ~20% of Rho_mat)
 % (based on comparison of FeO2 to BWR sludge compaction density)

% label'	DebrisPropi	'Geom'	'Diam'	'Rho_mat'	'Rho_mfc'
% native units		'sph,cyl'	'um'	'lbm/ft^3'	'lbm/ft^3'
% calc units		'sph,cyl'	'm'	'kg/m^3'	'kg/m^3'
"LDFG - fines"	2	7	175	2.4	
"LDFG - small"	2	7	175	2.4	
"LDFG - large"	2	7	175	2.4	
"uTherm - filaments"	2	6	165	2.4	
"uTherm - SiO2"	1	2.5	137	27.4	
"uTherm - TiO2"	1	20	262	52.4	
"QualCoat - epoxy"	1	10	94	36.66	
"QualCoat - IOZ"	1	10	208	81.12	
"Crud"	1	15	350	70.0	
"UQCoat - epoxyfine"	1	152	124	48.36	
"UQCoat - epoxyFchp"	1	1143	124	48.36	
"UQCoat - epoxySchp"	1	1143	124	48.36	
"UQCoat - epoxyLchp"	1	1143	124	48.36	
"UQCoat - epoxyCrls"	1	1143	124	48.36	
"UnQualCoat - alkyd"	1	10	207	80.73	
"UnQualCoat - enamel"	1	10	93	36.27	
"UnQualCoat - IOZ"	1	10	244	95.16	
"Latent - particulate"	1	17.3	169	33.80	
"Latent - fiber"	2	7	175	2.4	

Diameters of SiO2 and TiO2 are improperly reversed

 % microTherm constituents (low density concrete with fiber binder)
 % mfc'd density (lbm/ft3)
 15.0

% mass fraction filamentsflf_read
 0.03

% mass fraction of SiO2
 0.58

% mass fraction of TiO2
 0.39

% debris type start and stop times (min after break)
 % (rate assumed to be uniform from Tstart to Tend)
 % (rate calc uses inventories defined above)
 % (introduce "instant" sources over 1 delT)
 % (debris from UQCoat cannot have Tstartsrc=0)
 % (timing is presently independent of break size)

% Start Times									
0	0	0	0	0	0	0	0	0	10
10	10	10	10	10	10	10	0	0	
% Stop Times									
10	10	10	10	10	10	10	10	10	2160
2160	2160	2160	2160	2160	2160	2160	10	10	

 % Noninsulation Debris Quantities

% random-variable definitions:
 % (1) first parameter (mean/geom mean/mean)
 % (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
 % (3) lower limit

```

% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%  3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% qual epoxy in ZOI (lbm)
1
105 0 0 99999 1 0 0

% qual IOZ in ZOI (lbm)
1
39 0 0 99999 1 0 0

% crud fines (lbm)
1
24 0 0 99999 1 0 0

% unqual epoxy fine (lbm)
% (uniform dist)
2 2
234 0 117 234 2 0 0 117 234 0.5 0.5

% unqual epoxy fine chip (lbm)
% (uniform dist)
2 2
709 0 355 709 2 0 0 355 709 0.5 0.5

% unqual epoxy small chip (lbm)
% (uniform dist)
2 2
180 0 90 180 2 0 0 90 180 0.5 0.5

% unqual epoxy large chip (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual epoxy curls (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual alkyd (lbm)
1
271 0 0 99999 1 0 0

% unqual enamel (lbm)
1
267 0 0 99999 1 0 0

% unqual IOZ (lbm)
1
369 0 0 99999 1 0 0

% latent pariculate (lbm)
1
170 0 0 99999 1 0 0

% latent fiber (ft^3)
1
12.5 0 0 99999 1 0 0

```

```

%-----
%   Time points along accident progression
%   (assume all trains of injection on initially, w/spray on setpoint trip)
%   (assume HPSI and LPSI both run, but LPSI flow negligible until depress)
%   (1 of 3 spray pumps can be turned off, all HPSI can be turned off for M,L)
%   (for degraded condition with < max trains, DON'T exercise any options)

% max: time of interest (hr)
36

%*****Recirculation Times*****
%Number of break sizes for recirc table
7

%Recirc Time Table
1.5 2 4 6 8 12 27.5   %Break Size (in.)
337 79 56 44 38 31 30 %Time to recirc (min)

%*****Other LOCA Times*****
% time to ONE spray pump off (min) (S,M,L)
% (if 0.0, NO spray pumps run)
% With Statistics
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0   0   0   99999 1   0   0
1
20  5   0   99999 1   0   0
1
20  5   0   99999 1   0   0

% time to ALL spray pumps off (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
390 5 390 420 1 0 0
1
390 10 390 420 1 0 0
1
390 15 390 450 1 0 0

```

```

% time to retire 1 full train (min) (S,M,L)
% (this prob never happens, keep as option)
% (it would be the train with spray off already)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0

% earliest time for chem prod (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0

% time to hot leg injection (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
2 2

```

```

360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5

```

```

%-----
% Chemical Product Variables

% pool temp (degF) where chem prods form
% With statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
140 5 0 99999 1 0 0

% bump factor for chems when t>=Tchem and T<=ChemTemp (S,M,L)
% (spec mean as if min=0, but set min and max to shifted range)
% (preselect mean and max to set desired tail prob in last sample pt)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
1.25 0.64 1 15.3 3 1 10          % truncated exponential
3 2
1.50 0.44444 1 18.2 3 1 10 1 2 0.5 0.5    % truncated exponential
3 2
2.00 0.25 1 24 3 1 10 1 10 1 0.5        % truncated exponential

%-----
% thresholds of concern
% (logical distribution functions. NOT part of sequence variability)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.

```



```

% Provide distribution type
% if (2) or empirical provide number of spray pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% core blockage limit (g/FA) HL breaks
1
99999 0 0 0 1 0 0

% core blockage limit (g/FA) CL break
1
99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for HL brk before HL inject
% (should never fail by this mode)
1
99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for CL brk before HL injection
1
7.5 0 0 0 1 0 0

% limit for strainer buckling (ft h2o)
1
9.35 0 0 0 1 0 0

% void fraction at pump inlet (@ train)
1
0.02 0 0 0 1 0 0

%-----
%Plant State Table Data

% Operable Trains
% Train X Pump Matrix:

% three trains operable (Case 01)
%   lpsi   hpsi   spray
%   1     1     1 %A
%   1     1     1 %B
%   1     1     1 %C

% two trains operable (Case 22)
%   lpsi   hpsi   spray
%   1     1     1 %A
%   1     1     1 %B
%   0     0     0 %C

% one train operable (Case 43)
%   lpsi   hpsi   spray
%   1     1     1 %A
%   0     0     0 %B
%   0     0     0 %C

% two LHSI pumps failed (Case 09)
%   lpsi   hpsi   spray
%   1     1     1 %A
%   0     1     1 %B
%   0     1     1 %C

% one train fail + one additional LHSI fail (Case 26)
%   lpsi   hpsi   spray
%   1     1     1 %A
%   0     1     1 %B
%   0     0     0 %C

% # reactor coolant pumps (in CAD)

```

```

4
% # pressurizers (in CAD)
1

% # RHR pumps (in CAD)
3

% # steam generators (in CAD)
4

% time increment for evaluation (min)
5

% misc debris area (ft^2) total in containment
1
100 0 0 99999 1 0 0
% fraction of misc debris overlap (arrives @ t0)
0.25

% thin-bed thickness (in)
0.0625

% clip ZOI with walls (1/0 = y/n)
1

% const fiber filtration eff in fuel
1.0

% strainer height (ft)
3.25

% containment rel humidity
1.00

% sump rel humidity
1.00

% # fuel assemblies
193

% inflation of delP before chem bump
1
5 1 1 10 1 0 0

%*****Min Flow to Cool Core*****

%Number of time and flow rate points
30
% Time post SCRAM (hr)
% Must be equal to number of time and flow rate points

0.0028      0.0042      0.0056
0.0111      0.0167      0.0222
0.0278      0.0417      0.0556
0.1111      0.1667      0.2222
0.2778      0.4167      0.5556
1.1111      1.6667      2.2222
2.7778      4.1667      5.5556
11.1111     16.6667     22.2222
27.7778     41.6667     111.1111
166.6667    222.2222    277.7778

%% Flow Rate (gpm)
% Must be equal to number of time and flow rate points
1414.7000   1323.5000   1260.9000   1113.4000   1030.5000

```

973.3000	931.3000	859.3000	812.3000	711.0000
654.7000	614.2000	581.8000	523.1000	480.9000
388.1000	342.4000	315.1000	295.7000	265.1000
245.5000	204.2000	182.7000	168.7000	158.1000
139.8000	99.0000	84.1000	74.4000	67.7000

```
*****Special Weld *****
```

```
% single-case tracer (weld location name - from table)
% specialweld = '31-RC-1102-NSS-1.1';
% If special weld input select 1 else 0
0
% If 1 write weld name
% else leave blank
```

```
% nominal pool volume (ft^3) and area (ft^2)
% (uniform distribution between min and max: pool volumes - S,M,L)
2 2
0 0 0 0 2 0 0 43464 61993 .5 .5 %SBLOCA
2 2
0 0 0 0 2 0 0 39533 69444 .5 .5 %MBLOCA
2 2
0 0 0 0 2 0 0 45201 69263 .5 .5 %LBLOCA
```

```
% Pool Area (ft^2)
12301
```

```
% clean strainer attributes
% clean area of ONE strainer (ft^2)
1.8185e+003
% clean area of one OLD strainer (ft^2)
%155.4
```

```
% max clean strainer head loss (ft h2o)
0.22
```

```
% single pump runout volume rates (gpm) (S, M, L)
% high-pressure max injection rates
1620
% low-pressure injection rate
2800
```

```
% Containment Spray Rate (all states except Case 43)
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
```

```
% Containment Spray Rate (Case 43)
2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
```

```
% -----
% geometric loading table for a single train:
% thickness x(in) and strainer area A(ft^2) as functions of debris volume
% V(ft^3). see supplementary routine StrainerArea for geometry definition
% and assumptions. must be single-valued functions. May be slight mismatch
% in compression for thickness estimation between this table and delF routine,
% but low flow rate indicates low fiber compression.
% V(ft^3) x(in) A (ft^2)
```

```

% switch table on/off = 1/0, list length of table
% if 0 a flat approximation will be used
% for old strainers
1 28

% Table Values
% If Table off leave blank
0      0      1.8185e+003
8.1790e+001 5.0000e-001 4.1900e+002
8.1800e+001 5.0100e-001 4.1931e+002
2.8016e+002 8.1421e+000 4.4718e+002
4.7853e+002 1.5783e+001 5.9256e+002
6.7689e+002 2.3424e+001 7.4768e+002
8.7526e+002 3.1065e+001 9.1253e+002
1.0736e+003 3.8706e+001 1.0871e+003
1.2720e+003 4.6348e+001 1.2714e+003
1.4703e+003 5.3989e+001 1.4655e+003
1.6687e+003 6.1630e+001 1.6692e+003
1.8671e+003 6.9271e+001 1.8827e+003
2.0654e+003 7.6912e+001 2.1060e+003
2.2638e+003 8.4553e+001 2.3389e+003
2.4622e+003 9.2194e+001 2.5816e+003
2.6605e+003 9.9835e+001 2.8341e+003
2.8589e+003 1.0748e+002 3.0962e+003
3.0573e+003 1.1512e+002 3.3681e+003
3.2556e+003 1.2276e+002 3.6497e+003
3.4540e+003 1.3040e+002 3.9411e+003
3.6524e+003 1.3804e+002 4.2422e+003
3.8507e+003 1.4568e+002 4.5530e+003
4.0491e+003 1.5332e+002 4.8735e+003
4.2474e+003 1.6096e+002 5.2038e+003
4.4458e+003 1.6860e+002 5.5438e+003
4.6442e+003 1.7625e+002 5.8935e+003
4.8425e+003 1.8389e+002 6.2530e+003
5.0409e+003 1.9153e+002 6.6222e+003

%-----
% initiating event frequency and bounded Johnson fit
% NUREG-1829 current-day exceedance frequencies (without SG breaks)
% (# breaks/cal yr of sizes > x)
% Interpolated values for LOCA bins MUST be consistent with LOCABins def
% UT Austin fit of epistemic envelope using bounded Johnson pdf.
% Parameters MUST be listed in column order (gamma,delta,xi,lamda)
% each row varies by size, each column varies by %ile (then transposed)

% Break Frequency Table Name
"Present-Day Exceedance Frequency"

% Break Sizes in Ascending Order
% These are fixed values
% For Documentation Purpose only
0.5 1.625 2 3 6 7 14 31

% Frequency Table
% These are fixed values
% For Documentation Purpose only
% Break Size X Percentile
6.8e-5 5.0e-6 3.69e-6 2.1e-7 6.30e-8 1.4e-8 4.1e-10 3.5e-11 % 5th %ile
6.3e-4 8.9e-5 6.57e-5 3.4e-6 1.08e-6 3.1e-7 1.2e-08 1.2e-09 % 50th %ile
1.9e-3 4.2e-4 3.10e-4 1.6e-5 5.20e-6 1.6e-6 2.0e-07 2.9e-08 % mean
7.1e-3 1.6e-3 1.18e-3 6.1e-5 1.98e-5 6.1e-6 5.8e-07 8.1e-08 % 95th %ile

% Table Percentile Values
0.05 0.5 NaN 0.95 % Don't Use Mean for Fitting

% Johnson Parameters
% These are fixed values
% For Documentation Purpose only
% gamma delta xi lambda
1.650950E+00 5.256964E-01 4.117000E-05 1.420000E-02

```

```

1.646304E+00  4.593913E-01  2.530000E-06  3.200000E-03
1.646308E+00  4.593851E-01  1.870000E-06  2.360550E-03
1.646605E+00  4.589467E-01  1.200000E-07  1.220000E-04
1.646403E+00  4.566256E-01  3.000000E-08  3.965000E-05
1.645739E+00  4.487957E-01  6.023625E-09  1.220000E-05
1.645211E+00  3.587840E-01  2.892430E-10  1.160000E-06
1.645072E+00  3.343493E-01  2.636770E-11  1.600000E-07

```

```

%-----
% Strainer-Test Penetration Parameters

```

```

% area of test module (ft^2)
91.44

```

```

% fraction of sheddable debris
% (uniform empirical) - (unitless)
2 2
0 0 0 0 2 0 0 0.00956 0.0272 0.5 0.5

```

```

% shedding rate (1/min)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.008236 0.0546 0.5 0.5

```

```

% filter efficiency per g (slope)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.000339 0.003723 0.5 0.5

```

```

% filter fit cut point (g)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 790 880 0.5 0.5

```

```

% initial filter eff (intercept)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.656 0.706 0.5 0.5

```

```

% filter efficiency match pt
% (set equal to 1.0 always)
1
1 0 0 0 1 0 0

```

```

% filter exp rate const (1/g)
% (bimodal empirical)
2 3
0 0 0 0 2 1 0 0.0011254 0.0013078 0.031787 0.10000 0.45000 0.1000

```

```

%-----
% Debris Transport Factors
% (enter conservative values here, random variables populated below)

```

```

% ZOI-generated debris
% (LDFG fines, LDFG small, LDFG large, uTherm fines, qual coat fines, crud fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment break)

```

```

% these factors were used for Full Batch 2

```

```

0.70 0.60 0.22 0.70 0.70 0.70      %F_BD_upr
0.30 0.25 0.00 0.30 0.30 0.30      %F_BD_lwr
0.53 0.27 0.00 0.53 0.53 0.53      %F_WD_UCin
0.47 0.19 0.00 0.47 0.47 0.47      %F_WD_UCan

```

```

0.00 0.27 0.00 0.00 0.00 0.00      %F_WD_BCIn
0.00 0.00 0.00 0.00 0.00 0.00      %F_WD_BCan
0.02 0.00 0.00 0.02 0.02 0.02      %F_PF_sump
0.05 0.00 0.00 0.05 0.05 0.05      %F_PF_nact
1.00 0.64 0.00 1.00 1.00 1.00      %F_Rcrc_lwr
1.00 0.64 0.00 1.00 1.00 1.00      %F_Rcrc_WDin
1.00 0.58 0.00 1.00 1.00 1.00      %F_Rcrc_WDan
0.00 0.01 0.01 0.00 0.00 0.00      %F_Ersn_spry
0.00 0.07 0.07 0.00 0.00 0.00      %F_Ersn_pcol

% Unqualified coatings outside ZOI
% (epoxy fines, epoxy fine chips, epoxy small chips, epoxy large chips,
% epoxy curls, alkyd, baked enamel, IOZ fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for MB/LBLOCA in SG compartment)

1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 % F_fail
0.15 0.15 0.15 0.15 0.15 0.54 0.00 0.83 % F_upr
0.02 0.02 0.02 0.02 0.02 0.46 1.00 0.17 % F_lwr
0.83 0.83 0.83 0.83 0.83 0.00 0.00 0.00 % F_Rx
0.06 0.06 0.06 0.06 0.06 0.06 0.00 0.06 % F_spry
1.00 0.41 0.00 0.00 1.00 1.00 1.00 1.00 % F_rcrc
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 % F_R:rcrc

% Latent Debris
% (particulate, fiber)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment)

0.00 0.00      %F_BD_upr      (1)
1.00 1.00      %F_BD_lwr      (2)
1.00 1.00      %F_WD          (3)
0.02 0.02      %F_PF_sump      (4)
0.05 0.05      %F_PF_nact      (5)
1.00 1.00      %F_Rcrc_lwr      (6)

%-----
%Time and Temperature Data

%Number of Time and Temperature Data Points
162

% time vector (hr) for small-break temperature profile
% (FIRST entry is assumed 2B@ t=0. constant-value extrapolation imposed.
% (time dependent temps ARE currently used in calc, one history for each LOCA)

% time vector (hour) for small (and medium) breaks
0.0000 0.0847 0.0864 0.0881 0.0897 0.0914 0.0931 0.0947
0.0964 0.0981 0.0997 0.1014 0.1031 0.1047 0.1064 0.1081
0.1097 0.1139 0.1306 0.1472 0.1639 0.1806 0.1972 0.2139
0.2306 0.2472 0.2639 0.2806 0.2972 0.3139 0.3306 0.3472
0.3639 0.3806 0.3972 0.4139 0.4306 0.4472 0.4639 0.4806
0.4972 0.5139 0.5306 0.5472 0.5639 0.5806 0.5972 0.6139
0.6306 0.6472 0.6639 0.6806 0.6972 0.7139 0.7306 0.7472
0.7639 0.7806 0.7972 0.8139 0.8306 0.8472 0.8639 0.8806
0.8972 0.9139 0.9306 0.9472 0.9639 0.9806 0.9972 1.0139
1.0306 1.0472 1.0639 1.0806 1.3611 1.6944 2.0278 2.3611
2.6944 3.0278 3.3611 3.6944 4.0278 4.3611 4.6944 5.0278
5.3611 5.6944 6.0278 6.3611 6.6944 7.0278 7.3611 7.6944
8.0278 8.3611 8.6944 9.0278 9.3611 9.6944 10.0278 20.0833
32.0833 44.0833 56.0833 68.0833 80.0833 92.0833 104.0833
116.0833 128.0833 140.0833 152.0833 164.0833
176.0833 188.0833 200.0833 212.0833 224.0833
236.0833 248.0833 260.0833 272.0833 283.3333

```

297.2222	308.3333	319.4444	333.3333	344.4444
355.5556	369.4444	380.5556	391.6667	402.7778
416.6667	427.7778	438.8889	452.7778	463.8889
475.0000	488.8889	500.0000	511.1111	525.0000
536.1111	547.2222	561.1111	572.2222	583.3333
597.2222	608.3333	619.4444	633.3333	644.4444
655.5556	669.4444	680.5556	691.6667	702.7778
716.6667				

% temperature(F) profile for small (and medium) breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6910	102.6450
102.5250	102.5160			

% time vector (hr) for medium (and small) break temperature profile
 % (FIRST entry is assumed 2E@ t=0. constant-value extrapolation imposed.

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081
0.1097	0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139
0.2306	0.2472	0.2639	0.2806	0.2972	0.3139	0.3306	0.3472
0.3639	0.3806	0.3972	0.4139	0.4306	0.4472	0.4639	0.4806
0.4972	0.5139	0.5306	0.5472	0.5639	0.5806	0.5972	0.6139
0.6306	0.6472	0.6639	0.6806	0.6972	0.7139	0.7306	0.7472
0.7639	0.7806	0.7972	0.8139	0.8306	0.8472	0.8639	0.8806
0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972	1.0139
1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278
5.3611	5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944
8.0278	8.3611	8.6944	9.0278	9.3611	9.6944	10.0278	20.0833
32.0833	44.0833	56.0833	68.0833	80.0833	92.0833	104.0833	
116.0833	128.0833	140.0833	152.0833	164.0833			
176.0833	188.0833	200.0833	212.0833	224.0833			
236.0833	248.0833	260.0833	272.0833	283.3333			
297.2222	308.3333	319.4444	333.3333	344.4444			
355.5556	369.4444	380.5556	391.6667	402.7778			
416.6667	427.7778	438.8889	452.7778	463.8889			
475.0000	488.8889	500.0000	511.1111	525.0000			
536.1111	547.2222	561.1111	572.2222	583.3333			
597.2222	608.3333	619.4444	633.3333	644.4444			

655.5556 669.4444 680.5556 691.6667 702.7778
716.6667

% Temperature(F) profile for medium breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for large breaks

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947	
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081	0.1097
0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139	0.2306	0.2472
0.2639	0.2806	0.2972	0.3139	0.3306	0.3472	0.3639	0.3806	0.3972
0.4139	0.4306	0.4472	0.4639	0.4806	0.4972	0.5139	0.5306	0.5472
0.5639	0.5806	0.5972	0.6139	0.6306	0.6472	0.6639	0.6806	0.6972
0.7139	0.7306	0.7472	0.7639	0.7806	0.7972	0.8139	0.8306	0.8472
0.8639	0.8806	0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972
1.0139	1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278	5.3611
5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944	8.0278	8.3611
8.6944	9.0278	9.3611	9.6944	10.0278	20.0833	32.0833	44.0833	56.0833
68.0833	80.0833	92.0833	104.0833	116.0833	128.0833	140.0833		
152.0833	164.0833	176.0833	188.0833	200.0833	212.0833	224.0833	236.0833	248.0833
224.0833	236.0833	248.0833	260.0833	272.0833	283.3333	297.2222	308.3333	319.4444
319.4444	333.3333	344.4444	355.5556	369.4444	380.5556	391.6667	402.7778	416.6667
416.6667	427.7778	438.8889	452.7778	463.8889	475.0000	488.8889	500.0000	511.1111
511.1111	525.0000	536.1111	547.2222	561.1111	572.2222	583.3333	597.2222	608.3333
608.3333	619.4444	633.3333	644.4444	655.5556	669.4444	680.5556	691.6667	702.7778
702.7778	716.6667							

% Temperature (F) profile for large breaks

119.8113	213.9295	242.3104	255.0268	255.7907	253.1617			
252.9372	252.5390	251.9023	250.9733	249.7169	245.8894			
235.9856	224.0051	212.9495	203.5499	195.7225	179.5894			
199.8048	174.8143	174.8276	177.3518	180.7405	183.2333			
185.1644	186.4925	187.2579	187.8270	188.1924	188.4266			
188.5605	188.5934	188.5042	188.3375	189.3187	189.7570			


```

189.0923    188.5202    188.0148    187.5621    187.4103    187.0671
186.7330    186.4249    186.1559    186.7640    186.5012    186.2557
186.0555    185.9119    185.8265    185.8062    185.8495    185.9526
186.1092    187.8900    187.9673    187.9196    187.9119    187.9385
187.9954    188.0710    188.1647    188.2538    188.3365    188.4003
189.0996    188.9199    188.7439    188.5614    188.3622    188.1314
187.8597    187.5387    187.1667    186.7559    178.4091    171.8762
166.5421    162.2238    158.1410    154.9818    151.7673    148.9234
146.0834    143.7967    141.6054    139.5251    137.9892    136.4819
134.8865    136.9000    136.6489    135.3569    134.3103    133.2941
132.4453    131.9467    132.0536    132.1915    131.3055    130.7946
130.2765    123.0489    118.1991    114.9095    112.4170    110.4096
108.7290    107.2834    106.0152    104.8855    103.8671    102.9399
102.0890    101.3027    100.5720    99.8894 99.2491 98.6461 98.0763
97.5362 97.0229 96.5339 96.0669 95.6474 95.1520 94.7720 94.4055
93.9649 93.6254 93.2967 92.9000 92.5932 92.2953 92.0057 91.6547
91.3822 91.1168 90.7942 90.5432 90.2982 89.9998 89.7671 89.5396
89.2620 89.0452 88.8328 88.5733 88.3703 88.1712 87.9276 87.7368
87.5494 87.3198 87.1398 86.9628 86.7457 86.5753 86.4076 86.2427
86.0401

```

```

%-----
% NPSH parameters:
%   (specify any # of pipe segments in common header)
%
% major HL variables

% absolute roughness of the pipe (ft)
0.00015

% Number of Pipe Segments
6

% pipe diameters (ft)
1.27 .99 1.27 .84 1.27 .99

% pipe lengths (ft)
66.96 25.41 12.00 25.46 11.50 24.91

% depth of common header (ft)
25.83 25.65 25.83 % LPSI, HPSI, SPRY

% NPSH required for each pump (ft water)
12 12 12      % LPSI, HPSI, SPRY

% minor HL variables
% # of elbows, tees, entrances, and branches per pipe segment
% [(# of 90 degree) (# of 45 degree) (# of gate valves) (# of entrances) (# of
%   tee runs) (# of tee branches)]

4 2 1 1 0 0    % segment AB
3 0 0 0 0 1    % segment EC
0 0 0 0 1 0    % segment BD
3 0 0 0 0 1    % segment DE
0 0 0 0 1 0    % segment DF
3 0 0 0 0 1    % segment FG

%-----
% Newly Added Options

% Use Old Degas Routine? (0 = No, 1 = Yes)
0

% Use Old NPSH Routine? (0 = No, 1 = Yes)
0

% Use Old SI Pump Flow Equation? (0 = No, 1 = Yes)
0

% Use Old Strainer Properties? (0 = No, 1 = Yes)

```

0

% Use Common Random Numbers Across Frequency Replications? (0 = No, 1 = Yes)
0

% Enable All Plots? (0 = No, 1 = Yes)
1

% Enable Parallel Calculations (0 = No, 1 = Yes)
% CAUTION - USE ONLY IF YOU KNOW YOUR PC MEETS SPECIFICATIONS!!!!
0

% Number of Parallel Threads
4

% Use Optimal Frequency Bins for 15 Freps (0 = No, 1 = Yes)
1

% Use Old Debris Source Rate (Before Error Correction)? (0 = No, 1 = Yes)
1

% Use Old Latent Debris Transport Equations (Before Error Correction)? (0 = No, 1 = Yes)
1

Attachment 9

STP CASA Grande Information (Non-Proprietary Version)

CASA22 JT4

Contains No Proprietary Information
Alion Science and Technology


```
% LOCA bin definitions
% (units consistent with freq dists and CAD data)

% List Number of Defined Break Size Limits
% ie. SB,MB,LB (3 designations)
% However more sizes are allowable
3

% List Sizes
0.5 2.0 6.0

%-----

% CAD and Plotting Options (1/0 = Y/N)

% Show CAD Reproduction
0

% Show Concrete and Gratings
0

% Produce Intro Movie and Stop
0

% Debris Passage Correlation
0

% Sample Flow Rates
0

% Random Input Distributions
0

% ZOI Radial Inflation Factor(Plotting Only)
50

% ZOI Plotting Interval (# of breaks between plots)
25

%-----
% spatial resolution for discretizing insulation
% (must repeat weld target sort if these are changed. delete all master
% files and rerun with new dell and Nangbin)

% Linear Resolution (in.)
6

%Azimuthal Bins in 2 Pi Radians on Pipes
12

%-----
% Head Loss Option
% porosity calc (1/2 = vol. / mass weighting)
% (vol weighting was found to be more conservative)
1
%-----
% Synonyms tables for nonstandard welds, hangars and valves and Equipment

% Number of Valve synonyms
5
% Valve Synonyms
Valve VALVE MOV XRH FCV

% Number of Hangar Labels
14
% Hangar Synonyms
Hangar Hanger HL AF GU SS SH RR PH
"Work Point" "work point" "Work point" "work Point" "WORK POINT"

% Number of Weld Synonyms
```

4

```
% Weld Synonyms
FW Weld WELD FS

% Number of Steam Generator Synonyms
2

% Steam Generator Synonyms
SG SteamGenerator

% Number of Reactor Coolant Pump Synonyms
2

% Reactor Coolant Pump Synonyms
RCP ReactorCoolantPump

% Number of Pressurizer Synonyms
3

% Pressurizer Synonyms
FZR PRZR Pressurizer

% Number of RHR Synonyms
2

% RHR Synonyms
RHR ResidualHeatRemoval

%-----
%Statistics Sampling Options

%Sampling Method
% (0/1/2/3 = CASA default / MatLab default / shuffle / read file)
2

%If Option 3 specified, set file name in case folder below
%If not LEAVE BLANK

% max: # LHS bins in LLOCA for max: DEGB (DEGB counts as 1)
% Nmax:brk = 2 => 2044 total breaks
% Nmax:brk = 3 => 2100 total breaks
% Nmax:brk = 5 => 2250 total breaks
% Nmax:brk = 10 => 3070 total breaks
5

% # LHS replicates (batches) for each frequency CCDF
20

% # epistemic freq envelope samples
% current models process ~110 cases per minute
15

% logarithmic base for sampling epistemic frequency envelope
2

% lower limit of highest epistemic frequency bin
0.99

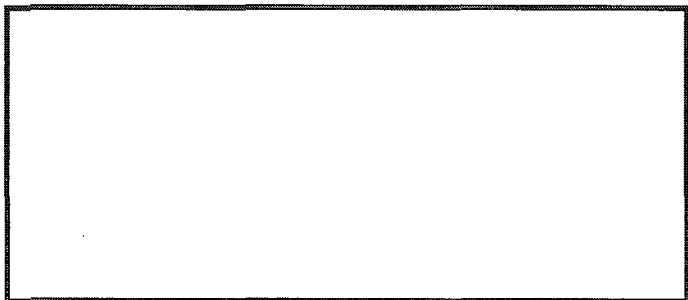
% # interpolation pts in each break freq ccdf
1000

% logarithmic base for sampling break size
```

% (double check routine before changing this from base 10)
10

%Insulation Characteristics

% Number of Low Density Fiberglass Zones
3



Redacted

% Number of Debris Types
8

% Debris Types
NUKON NUKON_2 MICROTHERM RMI LEAD "THERMAL WRAP" IOZ ALKYD

%Debris treated as LDFG
% 1/0 --> yes/no
1 1 0 0 0 1 0 0

%Debris treated as microtherm
% 1/0 --> yes/no
0 0 1 0 0 0 0 0

% Damage Radii with statistics definitions
% Material X Statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
17 0 0 99999 1 0 0
1
17 0 0 99999 1 0 0
1
28.6 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
17 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0


```

%-----
% Debris Properties Table

% (denote particulate/fiber = sphere/cylinder = 1/2)
% (do NOT add to or reorder this list unless code is modified)
% (inventory of fibers with cylindrical geom must be given in ft^3)
% (can 'fake' the diameter to match a given Sv using std geom formulas)
% (inventory of particulates with spherical geom must be given in lbm)
% (this list MUST include every debris type of interest)
% (if unknown, set "manufactured" density of particulate to ~20% of Rho_mat)
% (based on comparison of FeO2 to BWR sludge compaction density)
    
```

% native units	% calc units	'label'	DebrisPropi	'Geom'	'Diam'	'Rho_mat'	'Rho_mfc'
				'um'	'lbm/ft^3'	'lbm/ft^3'	
				'm'	'kg/m^3'	'kg/m^3'	
		"LDFG - fines"	2	7	175	2.4	
		"LDFG - small"	2	7	175	2.4	
		"LDFG - large"	2	7	175	2.4	
		"uTherm - filaments"	2	6	165	2.4	
		"uTherm - SiO2"	1	2.5	137	27.4	
		"uTherm - TiO2"	1	20	262	52.4	
		"QualCoat - epoxy"	1	10	94	36.66	
		"QualCoat - IOZ"	1	10	208	81.12	
		"Crud"	1	15	350	70.0	
		"UQCoat - epoxyfine"	1	152	124	48.36	
		"UQCoat - epoxyFchp"	1	1143	124	48.36	
		"UQCoat - epoxySchp"	1	1143	124	48.36	
		"UQCoat - epoxyLchp"	1	1143	124	48.36	
		"UQCoat - epoxyCrIs"	1	1143	124	48.36	
		"UnQualCoat - alkyd"	1	10	207	80.73	
		"UnQualCoat - enamel"	1	10	93	36.27	
		"UnQualCoat - IOZ"	1	10	244	95.16	
		"Latent - particulate"	1	17.3	169	33.80	
		"Latent - fiber"	2	7	175	2.4	

Diameters of SiO2 and TiO2 are improperly reversed

```

%-----
% microTherm constituents (low density concrete with fiber binder)
% mfc'd density (lbm/ft3)
15.0
    
```

```

% mass fraction filamentsflf_read
0.03
    
```

```

% mass fraction of SiO2
0.58
    
```

```

% mass fraction of TiO2
0.39
    
```

```

% debris type start and stop times (min after break)
% (rate assumed to be uniform from Tstart to Tend)
% (rate calc uses inventories defined above)
% (introduce "instant" sources over 1 delT)
% (debris from UQCoat cannot have Tstartsrc=0)
% (timing is presently independent of break size)
    
```

```

% Start Times
0      0      0      0      0      0      0      0      0      10
10     10     10     10     10     10     10     0      0

% Stop Times
10     10     10     10     10     10     10     10     10     2160
2160   2160   2160   2160   2160   2160   2160   10     10
    
```

```

%-----
% Noninsulation Debris Quantities
    
```

```

% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
    
```

```
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% qual epoxy in ZOI (lbm)
1
105 0 0 99999 1 0 0

% qual IOZ in ZOI (lbm)
1
39 0 0 99999 1 0 0

% crud fines (lbm)
1
24 0 0 99999 1 0 0

% unqual epoxy fine (lbm)
% (uniform dist)
2 2
234 0 117 234 2 0 0 117 234 0.5 0.5

% unqual epoxy fine chip (lbm)
% (uniform dist)
2 2
709 0 355 709 2 0 0 355 709 0.5 0.5

% unqual epoxy small chip (lbm)
% (uniform dist)
2 2
180 0 90 180 2 0 0 90 180 0.5 0.5

% unqual epoxy large chip (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual epoxy curls (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual alkyd (lbm)
1
271 0 0 99999 1 0 0

% unqual enamel (lbm)
1
267 0 0 99999 1 0 0

% unqual IOZ (lbm)
1
369 0 0 99999 1 0 0

% latent pariculate (lbm)
1
170 0 0 99999 1 0 0

% latent fiber (ft^3)
1
```

12.5 0 0 99999 1 0 0

```

%-----
% Time points along accident progression
% (assume all trains of injection on initially, w/spray on setpoint trip)
% (assume HPSI and LPSI both run, but LPSI flow negligible until depress)
% (1 of 3 spray pumps can be turned off, all HPSI can be turned off for M,L)
% (for degraded condition with < max trains, DON'T exercise any options)

```

```

% max time of interest (hr)
36

```

```

%*****Recirculation Times*****
%Number of break sizes for recirc table
7

```

```

%Recirc Time Table
1.5 2 4 6 8 12 27.5 %Break Size (in.)
337 79 56 44 38 31 30 %Time to recirc (min)

```

```

%*****Other LOCA Times*****
% time to ONE spray pump off (min) (S,M,L)
% (if 0.0, NO spray pumps run)
% With Statistics
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
20 5 0 99999 1 0 0
1
20 5 0 99999 1 0 0

```

```

% time to ALL spray pumps off (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
390 5 390 420 1 0 0
1
390 10 390 420 1 0 0
1

```

390 15 390 450 1 0 0

```

% time to retire 1 full train (min) (S,M,L)
% (this prob never happens, keep as option)
% (it would be the train with spray off already)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0

% earliest time for chem prod (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0

% time to hot leg injection (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

```

```

2 2
360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5

```

```

%-----
% Chemical Product Variables

```

```

% pool temp (degF) where chem prods form
% With statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
140 5 0 99999 1 0 0

```

```

% bump factor for chems when t>=Tchem and T<=ChemTemp (S,M,L)
% (spec mean as if min=0, but set min and max to shifted range)
% (preselect mean and max to set desired tail prob in last sample pt)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
1.25 0.64 1 15.3 3 1 10          % truncated exponential
3 2
1.50 0.44444 1 18.2 3 1 10 1 2 0.5 0.5    % truncated exponential
3 2
2.00 0.25 1 24 3 1 10 1 10 1 0.5        % truncated exponential

```

```

%-----
% thresholds of concern
% (logical distribution functions. NOT part of sequence variability)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,

```

```

%           first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% core blockage limit (g/FA) HL breaks
1
99999 0 0 0 1 0 0

% core blockage limit (g/FA) CL break
1
99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for HL brk before HL inject
% (should never fail by this mode)
1
99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for CL brk before HL injection
1
7.5 0 0 0 1 0 0

% limit for strainer buckling (ft h2o)
1
9.35 0 0 0 1 0 0

% void fraction at pump inlet (@ train)
1
0.02 0 0 0 1 0 0

%-----
%Plant State Table Data

% Operable Trains
% Train X Pump Matrix

% three trains operable (Case 01)
%   lpsi      hpsi      spray
%   1         1         1 %A
%   1         1         1 %B
%   1         1         1 %C

% two trains operable (Case 22)
%   lpsi      hpsi      spray
%   1         1         1 %A
%   1         1         1 %B
%   0         0         0 %C

% one train operable (Case 43)
%   lpsi      hpsi      spray
%   1         1         1 %A
%   0         0         0 %B
%   0         0         0 %C

% two LHSI pumps failed (Case 09)
%   lpsi      hpsi      spray
%   1         1         1 %A
%   0         1         1 %B
%   0         1         1 %C

% one train fail + one additional LHSI fail (Case 26)
%   lpsi      hpsi      spray
%   1         1         1 %A
%   0         1         1 %B
%   0         0         0 %C

```

```

% # reactor coolant pumps (in CAD)
4

% # pressurizers (in CAD)
1

% # RHR pumps (in CAD)
3

% # steam generators (in CAD)
4

% time increment for evaluation (min)
5

% misc debris area (ft^2) total in containment
1
100 0 0 99999 1 0 0
% fraction of misc debris overlap (arrives @ t0)
0.25

% thin-bed thickness (in)
0.0625

% clip ZOI with walls (1/0 = y/n)
1

% const fiber filtration eff in fuel
1.0

% strainer height (ft)
3.25

% containment rel humidity
1.00

% sump rel humidity
1.00

% # fuel assemblies
193

% inflation of delP before chem bump
1
5 1 1 10 1 0 0

%*****Min Flow to Cool Core*****

%Number of time and flow rate points

30
% Time post SCRAM (hr)
% Must be equal to number of time and flow rate points

0.0028      0.0042      0.0056
0.0111      0.0167      0.0222
0.0278      0.0417      0.0556
0.1111      0.1667      0.2222
0.2778      0.4167      0.5556
1.1111      1.6667      2.2222
2.7778      4.1667      5.5556
11.1111     16.6667     22.2222
27.7778     41.6667     111.1111
166.6667    222.2222    277.7778

%% Flow Rate (gpm)
% Must be equal to number of time and flow rate points

```

1414.7000	1323.5000	1260.9000	1113.4000	1030.5000
973.3000	931.3000	859.3000	812.3000	711.0000
654.7000	614.2000	581.8000	523.1000	480.9000
388.1000	342.4000	315.1000	295.7000	265.1000
245.5000	204.2000	182.7000	168.7000	158.1000
139.8000	99.0000	84.1000	74.4000	67.7000

```
*****Special Weld *****
```

```
% single-case tracer (weld location name - from table)
% specialweld = '31-RC-1102-MSS-1.1';
% If special weld input select 1 else 0
0
% If 1 write weld name
% else leave blank:
```

```
% nominal pool volume (ft^3) and area (ft^2)
% (uniform distribution between min and max pool volumes - S,M,L)
```

```
2 2
0 0 0 0 2 0 0 43464 61993 .5 .5 %SBLOCA
2 2
0 0 0 0 2 0 0 39533 69444 .5 .5 %MBLOCA
2 2
0 0 0 0 2 0 0 45201 69263 .5 .5 %LBLOCA
```

```
% Pool Area (ft^2)
12301
```

```
% clean strainer attributes
% clean area of ONE strainer (ft^2)
1.8185e+003
% clean area of one OLD strainer (ft^2)
%155.4
```

```
% max clean strainer head loss (ft h2o)
0.22
```

```
% single pump runout volume rates (gpm) (S, M, L)
% high-pressure max injection rates
1620
% low-pressure injection rate
2800
```

```
% Containment Spray Rate (all states except Case 43)
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
```

```
% Containment Spray Rate (Case 43)
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
```

```
%-----
% geometric loading table for a single train:
% thickness x(in) and strainer area A(ft^2) as functions of debris volume
% V(ft^3). see supplementary routine StrainerArea for geometry definition
% and assumptions. must be single-valued functions. May be slight mismatch
% in compression for thickness estimation between this table and delP routine,
% but low flow rate indicates low fiber compression.
% V(ft^3) x(in) A (ft^2)
```



```

% switch table on/off = 1/0, list length of table
% if 0 a flat approximation will be used
% for old strainers
1 28

% Table Values
% If Table off leave blank
0      0      1.8185e+003
8.1790e+001 5.0000e-001 4.1900e+002
8.1800e+001 5.0100e-001 4.1931e+002
2.8016e+002 8.1421e+000 4.4718e+002
4.7853e+002 1.5783e+001 5.9256e+002
6.7689e+002 2.3424e+001 7.4768e+002
8.7526e+002 3.1065e+001 9.1253e+002
1.0736e+003 3.8706e+001 1.0871e+003
1.2720e+003 4.6348e+001 1.2714e+003
1.4703e+003 5.3989e+001 1.4655e+003
1.6687e+003 6.1630e+001 1.6692e+003
1.8671e+003 6.9271e+001 1.8827e+003
2.0654e+003 7.6912e+001 2.1060e+003
2.2638e+003 8.4553e+001 2.3389e+003
2.4622e+003 9.2194e+001 2.5816e+003
2.6605e+003 9.9835e+001 2.8341e+003
2.8589e+003 1.0748e+002 3.0962e+003
3.0573e+003 1.1512e+002 3.3681e+003
3.2556e+003 1.2276e+002 3.6497e+003
3.4540e+003 1.3040e+002 3.9411e+003
3.6524e+003 1.3804e+002 4.2422e+003
3.8507e+003 1.4568e+002 4.5530e+003
4.0491e+003 1.5332e+002 4.8735e+003
4.2474e+003 1.6096e+002 5.2038e+003
4.4458e+003 1.6860e+002 5.5438e+003
4.6442e+003 1.7625e+002 5.8935e+003
4.8425e+003 1.8389e+002 6.2530e+003
5.0409e+003 1.9153e+002 6.6222e+003

-----
% initiating event frequency and bounded Johnson fit
% NUREG-1829 current-day exceedance frequencies (without SG breaks)
% (# breaks/cal yr of sizes > xi)
% Interpolated values for LOCA bins MUST be consistent with LOCABins def
% UT Austin fit of epistemic envelope using bounded Johnson pdf.
% Parameters MUST be listed in column order (gamma,delta,xi,lamda)
% each row varies by size, each column varies by file (then transposed)

% Break Frequency Table Name
"Present-Day Exceedance Frequency"

% Break Sizes in Ascending Order
% These are fixed values
% For Documentation Purpose only
0.5 1.625 2 3 6 7 14 31

% Frequency Table
% These are fixed values
% For Documentation Purpose only
% Break Size X Percentile
6.8e-5 5.0e-6 3.69e-6 2.1e-7 6.30e-8 1.4e-8 4.1e-10 3.5e-11 % 5th file
6.3e-4 8.9e-5 6.57e-5 3.4e-6 1.08e-6 3.1e-7 1.2e-08 1.2e-09 % 50th file
1.9e-3 4.2e-4 3.10e-4 1.6e-5 5.20e-6 1.6e-6 2.0e-07 2.9e-08 % mean
7.1e-3 1.6e-3 1.18e-3 6.1e-5 1.98e-5 6.1e-6 5.8e-07 8.1e-08 % 95th file

% Table Percentile Values
0.05 0.5 NaN 0.95 % Don't Use Mean for Fitting

% Johnson Parameters
% These are fixed values
% For Documentation Purpose only
% gamma      delta      xi      lambda

```

```

1.650950E+00  5.256964E-01  4.117000E-05  1.420000E-02
1.646304E+00  4.593913E-01  2.530000E-06  3.200000E-03
1.646308E+00  4.593851E-01  1.870000E-06  2.360550E-03
1.646605E+00  4.589467E-01  1.200000E-07  1.220000E-04
1.646403E+00  4.566256E-01  3.000000E-08  3.965000E-05
1.645739E+00  4.487957E-01  6.023625E-09  1.220000E-05
1.645211E+00  3.587840E-01  2.892430E-10  1.160000E-06
1.645072E+00  3.343493E-01  2.636770E-11  1.600000E-07

```

```

%-----
% Strainer-Test Penetration Parameters

```

```

% area of test module (ft^2)
91.44

```

```

% fraction of sheddable debris
% (uniform empirical) - (unitless)
2 2
0 0 0 0 2 0 0 0.00956 0.0272 0.5 0.5

```

```

% shedding rate (1/min)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.008236 0.0546 0.5 0.5

```

```

% filter efficiency per g (slope)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.000339 0.003723 0.5 0.5

```

```

% filter fit cut point (g)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 790 880 0.5 0.5

```

```

% initial filter eff (intercept)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.656 0.706 0.5 0.5

```

```

% filter efficiency match pt
% (set equal to 1.0 always)
1
1 0 0 0 1 0 0

```

```

% filter exp rate const (1/g)
% (bimodal empirical)
2 3
0 0 0 0 2 1 0 0.0011254 0.0013078 0.031787 0.10000 0.45000 0.1000

```

```

%-----
% Debris Transport Factors

```

```

% (enter conservative values here, random variables populated below)

```

```

% ZOI-generated debris
% (LDFG fines, LDFG small, LDFG large, uTherm fines, qual coat fines, crud fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment break)

```

```

% these factors were used for Full Batch 2

```

```

0.70 0.60 0.22 0.70 0.70 0.70      %F_BD_upr
0.30 0.25 0.00 0.30 0.30 0.30      %F_BD_lwr
0.53 0.27 0.00 0.53 0.53 0.53      %F_WD_UCin

```

```

0.47 0.19 0.00 0.47 0.47 0.47      %F_WD_UCan
0.00 0.27 0.00 0.00 0.00 0.00      %F_WD_BCin
0.00 0.00 0.00 0.00 0.00 0.00      %F_WD_BCan
0.02 0.00 0.00 0.02 0.02 0.02      %F_PF_sump
0.05 0.00 0.00 0.05 0.05 0.05      %F_PF_nact
1.00 0.64 0.00 1.00 1.00 1.00      %F_RcRc_lwr
1.00 0.64 0.00 1.00 1.00 1.00      %F_RcRc_WDin
1.00 0.58 0.00 1.00 1.00 1.00      %F_RcRc_WDan
0.00 0.01 0.01 0.00 0.00 0.00      %F_Ersn_spry
0.00 0.07 0.07 0.00 0.00 0.00      %F_Ersn_pool

```

```

% Unqualified coatings outside ZOI
% (epoxy fines, epoxy fine chips, epoxy small chips, epoxy large chips,
% epoxy curls, alkyd, baked enamel, IOZ fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for MB/LBLOCA in SG compartment)

```

```

1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00      % F_fail
0.15 0.15 0.15 0.15 0.15 0.54 0.00 0.83      % F_upr
0.02 0.02 0.02 0.02 0.02 0.46 1.00 0.17      % F_lwr
0.83 0.83 0.83 0.83 0.83 0.00 0.00 0.00      % F_Rc
0.06 0.06 0.06 0.06 0.06 0.06 0.00 0.06      % F_spry
1.00 0.41 0.00 0.00 1.00 1.00 1.00 1.00      % F_rcrc
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00      % F_RcRcRc

```

```

% Latent Debris
% (particulate, fiber)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment)

```

```

0.00 0.00      %F_BD_upr      (1)
1.00 1.00      %F_BD_lwr      (2)
1.00 1.00      %F_WD          (3)
0.02 0.02      %F_PF_sump      (4)
0.05 0.05      %F_PF_nact      (5)
1.00 1.00      %F_RcRc_lwr      (6)

```

```

%-----
%Time and Temperature Data

```

```

%Number of Time and Temperature Data Points
162

```

```

% time vector (hr) for small-break temperature profile
% (FIRST entry is assumed CB@ t=0. constant-value extrapolation imposed.
% (time dependent temps ARE currently used in calc, one history for each LOCA)

```

```

% time vector (hour) for small (and medium) breaks

```

```

0.0000 0.0847 0.0864 0.0881 0.0897 0.0914 0.0931 0.0947
0.0964 0.0981 0.0997 0.1014 0.1031 0.1047 0.1064 0.1081
0.1097 0.1139 0.1306 0.1472 0.1639 0.1806 0.1972 0.2139
0.2306 0.2472 0.2639 0.2806 0.2972 0.3139 0.3306 0.3472
0.3639 0.3806 0.3972 0.4139 0.4306 0.4472 0.4639 0.4806
0.4972 0.5139 0.5306 0.5472 0.5639 0.5806 0.5972 0.6139
0.6306 0.6472 0.6639 0.6806 0.6972 0.7139 0.7306 0.7472
0.7639 0.7806 0.7972 0.8139 0.8306 0.8472 0.8639 0.8806
0.8972 0.9139 0.9306 0.9472 0.9639 0.9806 0.9972 1.0139
1.0306 1.0472 1.0639 1.0806 1.3611 1.6944 2.0278 2.3611
2.6944 3.0278 3.3611 3.6944 4.0278 4.3611 4.6944 5.0278
5.3611 5.6944 6.0278 6.3611 6.6944 7.0278 7.3611 7.6944
8.0278 8.3611 8.6944 9.0278 9.3611 9.6944 10.0278 20.0833
32.0833 44.0833 56.0833 68.0833 80.0833 92.0833 104.0833
116.0833 128.0833 140.0833 152.0833 164.0833
176.0833 188.0833 200.0833 212.0833 224.0833

```

236.0833	248.0833	260.0833	272.0833	283.3333
297.2222	308.3333	319.4444	333.3333	344.4444
355.5556	369.4444	380.5556	391.6667	402.7778
416.6667	427.7778	438.8889	452.7778	463.8889
475.0000	488.8889	500.0000	511.1111	525.0000
536.1111	547.2222	561.1111	572.2222	583.3333
597.2222	608.3333	619.4444	633.3333	644.4444
655.5556	669.4444	680.5556	691.6667	702.7778
716.6667				

% temperature(F) profile for small (and medium) breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for medium (and small) break temperature profile
 % (FIRST entry is assumed 2B@ t=0. constant-value extrapolation imposed.

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081
0.1097	0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139
0.2306	0.2472	0.2639	0.2806	0.2972	0.3139	0.3306	0.3472
0.3639	0.3806	0.3972	0.4139	0.4306	0.4472	0.4639	0.4806
0.4972	0.5139	0.5306	0.5472	0.5639	0.5806	0.5972	0.6139
0.6306	0.6472	0.6639	0.6806	0.6972	0.7139	0.7306	0.7472
0.7639	0.7806	0.7972	0.8139	0.8306	0.8472	0.8639	0.8806
0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972	1.0139
1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278
5.3611	5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944
8.0278	8.3611	8.6944	9.0278	9.3611	9.6944	10.0278	20.0833
32.0833	44.0833	56.0833	68.0833	80.0833	92.0833	104.0833	
116.0833	128.0833	140.0833	152.0833	164.0833			
176.0833	188.0833	200.0833	212.0833	224.0833			
236.0833	248.0833	260.0833	272.0833	283.3333			
297.2222	308.3333	319.4444	333.3333	344.4444			
355.5556	369.4444	380.5556	391.6667	402.7778			
416.6667	427.7778	438.8889	452.7778	463.8889			
475.0000	488.8889	500.0000	511.1111	525.0000			
536.1111	547.2222	561.1111	572.2222	583.3333			

597.2222	608.3333	619.4444	633.3333	644.4444
655.5556	669.4444	680.5556	691.6667	702.7778
716.6667				

% Temperature (F) profile for medium breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for large breaks

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947		
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081	0.1097	
0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139	0.2306	0.2472	
0.2639	0.2806	0.2972	0.3139	0.3306	0.3472	0.3639	0.3806	0.3972	
0.4139	0.4306	0.4472	0.4639	0.4806	0.4972	0.5139	0.5306	0.5472	
0.5639	0.5806	0.5972	0.6139	0.6306	0.6472	0.6639	0.6806	0.6972	
0.7139	0.7306	0.7472	0.7639	0.7806	0.7972	0.8139	0.8306	0.8472	
0.8639	0.8806	0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972	
1.0139	1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611	
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278	5.3611	
5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944	8.0278	8.3611	
8.6944	9.0278	9.3611	9.6944	10.0278	20.0833	32.0833	44.0833	56.0833	
68.0833	80.0833	92.0833	104.0833	116.0833	128.0833	140.0833			
152.0833	164.0833	176.0833	188.0833	200.0833	212.0833	224.0833			
224.0833	236.0833	248.0833	260.0833	272.0833	283.3333				
297.2222	308.3333	319.4444	333.3333	344.4444	355.5556				
369.4444	380.5556	391.6667	402.7778	416.6667	427.7778				
438.8889	452.7778	463.8889	475.0000	488.8889	500.0000				
511.1111	525.0000	536.1111	547.2222	561.1111	572.2222				
583.3333	597.2222	608.3333	619.4444	633.3333	644.4444				
655.5556	669.4444	680.5556	691.6667	702.7778	716.6667				

% Temperature (F) profile for large breaks

119.8113	213.9295	242.3104	255.0268	255.7907	253.1617		
252.9372	252.5390	251.9023	250.9733	249.7169	245.8894		
235.9856	224.0051	212.9495	203.5499	195.7225	179.5894		
199.8048	174.8143	174.8276	177.3518	180.7405	183.2333		
185.1644	186.4925	187.2579	187.8270	188.1924	188.4266		

```

188.5605 188.5934 188.5042 188.3375 189.3187 189.7570
189.0923 188.5202 188.0148 187.5621 187.4103 187.0671
186.7330 186.4249 186.1559 186.7640 186.5012 186.2557
186.0555 185.9119 185.8265 185.8062 185.8495 185.9526
186.1092 187.8900 187.9673 187.9196 187.9119 187.9385
187.9954 188.0710 188.1647 188.2538 188.3385 189.4003
189.0996 188.9199 188.7439 188.5614 188.3622 188.1314
187.8597 187.5387 187.1667 186.7559 178.4091 171.8762
166.5421 162.2238 158.1410 154.9818 151.7673 148.9234
146.0834 143.7967 141.6054 139.5251 137.9892 136.4819
134.8865 136.9000 136.6489 135.3569 134.3103 133.2941
132.4453 131.9467 132.0536 132.1915 131.3055 130.7946
130.2765 123.0489 118.1991 114.9095 112.4170 110.4096
108.7290 107.2834 106.0152 104.8855 103.8671 102.9399
102.0890 101.3027 100.5720 99.8894 99.2491 98.6461 98.0763
97.5362 97.0229 96.5339 96.0669 95.6474 95.1520 94.7720 94.4055
93.9649 93.6254 93.2967 92.9000 92.5932 92.2953 92.0057 91.6547
91.3822 91.1168 90.7942 90.5432 90.2982 89.9998 89.7671 89.5396
89.2620 89.0452 88.8328 88.5733 88.3703 88.1712 87.9276 87.7368
87.5494 87.3198 87.1398 86.9628 86.7457 86.5753 86.4076 86.2427
86.0401

```

```

%-----
% NPSH parameters:
% (specify any # of pipe segments in common header)
%
% major HL variables

% absolute roughness of the pipe (ft)
0.00015

% Number of Pipe Segments
6

% pipe diameters (ft)
1.27 .99 1.27 .84 1.27 .99

% pipe lengths (ft)
66.96 25.41 12.00 25.46 11.50 24.91

% depth of common header (ft)
25.83 25.65 25.83 % LPSI, HPSI, SPRY

% NPSH required for each pump (ft water)
12 12 12 % LPSI, HPSI, SPRY

% minor HL variables
% # of elbows, tees, entrances, and branches per pipe segment
% [(# of 90 degree) (# of 45 degree) (# of gate valves) (# of entrances) (# of
% tee runs) (# of tee branches)]

4 2 1 1 0 0 % segment AB
3 0 0 0 0 1 % segment BC
0 0 0 0 1 0 % segment BD
3 0 0 0 0 1 % segment DE
0 0 0 0 1 0 % segment DF
3 0 0 0 0 1 % segment EG

%-----
% Newly Added Options

% Use Old Degas Routine? (0 = No, 1 = Yes)
0

% Use Old NPSH Routine? (0 = No, 1 = Yes)
0

% Use Old SI Pump Flow Equation? (0 = No, 1 = Yes)
0

```

% Use Old Strainer Properties? (0 = No, 1 = Yes)
0

% Use Common Random Numbers Across Frequency Replications? (0 = No, 1 = Yes)
0

% Enable All Plots? (0 = No, 1 = Yes)
1

% Enable Parallel Calculations (0 = No, 1 = Yes)
% CAUTION - USE ONLY IF YOUR KNOW YOUR PC MEETS SPECIFICATIONS!!!!!!
0

% Number of Parallel Threads
4

% Use Optimal Frequency Bins for 15 Freps (0 = No, 1 = Yes)
1

% Use Old Debris Source Rate (Before Error Correction)? (0 = No, 1 = Yes)
1

% Use Old Latent Debris Transport Equations (Before Error Correction)? (0 = No, 1 = Yes)
1

Attachment 10

STP CASA Grande Information (Non-Proprietary Version)

CASA26 JT4

NOC-AE-14003081

Contains No Proprietary Information
Alien Science and Technology


```
% LOCA bin definitions
% (units consistent with freq dists and CAD data)

% List Number of Defined Break Size Limits
% ie. SB,MB,LB (3 designations)
% However more sizes are allowable
3

% List Sizes
0.5 2.0 6.0

%-----
% CAD and Plotting Options (1/0 = Y/N)

% Show CAD Reproduction
0

% Show Concrete and Gratings
0

% Produce Intro Movie and Stop
0

% Debris Passage Correlation
0

% Sample Flow Rates
0

% Random Input Distributions
0

% ZOI Radial Inflation Factor(Plotting Only)
50

% ZOI Plotting Interval (# of breaks between plots)
25

%-----
% spatial resolution for discretizing insulation
% (must repeat weld target sort if these are changed. delete all master
% files and rerun with new delL and Nangbin)

% Linear Resolution (in.)
6

%Azimuthal Bins in 2 Pi Radians on Pipes
12

%-----
% Head Loss Option
% porosity calc (1/2 = vol / mass weighting)
% (vol weighting was found to be more conservative)
1

%-----
% Synonyms tables for nonstandard welds, hangars and valves and Equipment

% Number of Valve synonyms
5
% Valve Synonyms
Valve VALVE MOV XRH FCV

% Number of Hangar Labels
14
% Hangar Synonyms
Hangar Hanger HL AF GU SS SH RR RH
"Work Point" "work point" "Work point" "work Point" "WORK POINT"

% Number of Weld Synonyms
```

4

```
% Weld Synonyms
FW Weld WELD FS
```

```
% Number of Steam Generator Synonyms
2
```

```
% Steam Generator Synonyms
SG SteamGenerator
```

```
% Number of Reactor Coolant Pump Synonyms
2
```

```
% Reactor Coolant Pump Synonyms
RCP ReactorCoolantPump
```

```
% Number of Pressurizer Synonyms
3
```

```
% Pressurizer Synonyms
PZR PRZR Pressurizer
```

```
% Number of RHR Synonyms
2
```

```
% RHR Synonyms
RHR ResidualHeatRemoval
```

```
%-----
%Statistics Sampling Options
```

```
%Sampling Method
% (0/1/2/3 = CASA default / MatLab default / shuffle / read file)
2
```

```
%If Option 3 specified, set file name in case folder below
%If not LEAVE BLANK
```

```
% max # LHS bins in LLOCA for max DEGB (DEGB counts as 1)
% Nmax:brk = 2 => 2044 total breaks
% Nmax:brk = 3 => 2100 total breaks
% Nmax:brk = 5 => 2250 total breaks
% Nmax:brk = 10 => 3070 total breaks
5
```

```
% # LHS replicates (batches) for each frequency CCDF
20
```

```
% # epistemic freq envelope samples
% current models process ~110 cases per minute
15
```

```
% logarithmic base for sampling epistemic frequency envelope
2
```

```
% lower limit of highest epistemic frequency bin
0.99
```

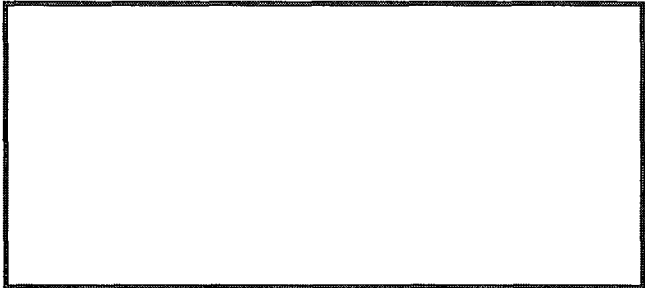
```
% # interpolation pts in each break: freq ccdf
1000
```

```
% logarithmic base for sampling break size
```

% (double check routine before changing this from base 10)
10

%Insulation Characteristics

% Number of Low Density Fiberglass Zones
3



Redacted

% Number of Debris Types
8

% Debris Types
NUKON NUKON_2 MICROTHERM RMI LEAD "THERMAL WRAP" IOZ ALKYD

%Debris treated as LDFG
% 1/0 --> yes/no
1 1 0 0 0 1 0 0

%Debris treated as microtherm
% 1/0 --> yes/no
0 0 1 0 0 0 0 0

% Damage Radii with statistics definitions
% Material X Statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
17 0 0 99999 1 0 0
1
17 0 0 99999 1 0 0
1
28.6 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
17 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0

% Debris Properties Table

% (denote particulate/fiber = sphere/cylinder = 1/2)
 % (do NOT add to or reorder this list unless code is modified)
 % (inventory of fibers with cylindrical geom must be given in ft^3)
 % (can 'fake' the diameter to match a given Sv using std geom formulas)
 % (inventory of particulates with spherical geom must be given in lbm)
 % (this list MUST include every debris type of interest)
 % (if unknown, set "manufactured" density of particulate to ~20% of Rho_mat)
 % (based on comparison of FeO2 to EWR sludge compaction density)

	'label'	DebrisPropi	'Geom'	'Diam'	'Rho_mat'	'Rho_mfc'
% native units			'sph,cyl'	'um'	'lbm/ft^3'	'lbm/ft^3'
% calc units			'sph,cyl'	'm'	'kg/m^3'	'kg/m^3'
	"LDFG - fines"	2	7	175	2.4	
	"LDFG - small"	2	7	175	2.4	
	"LDFG - large"	2	7	175	2.4	
	"uTherm - filaments"	2	6	165	2.4	
	"uTherm - SiO2"	1	2.5	137	27.4	
	"uTherm - TiO2"	1	20	262	52.4	
	"QualCoat - epoxy"	1	10	94	36.66	
	"QualCoat - IOZ"	1	10	208	81.12	
	"Crud"	1	15	350	70.0	
	"UQCoat - epoxyfine"	1	152	124	48.36	
	"UQCoat - epoxyFchp"	1	1143	124	48.36	
	"UQCoat - epoxySchp"	1	1143	124	48.36	
	"UQCoat - epoxyLchp"	1	1143	124	48.36	
	"UQCoat - epoxyCrls"	1	1143	124	48.36	
	"UnQualCoat - alkyd"	1	10	207	80.73	
	"UnQualCoat - enamel"	1	10	93	36.27	
	"UnQualCoat - IOZ"	1	10	244	95.16	
	"Latent - particulate"	1	17.3	169	33.80	
	"Latent - fiber"	2	7	175	2.4	

Diameters of SiO2 and TiO2 are improperly reversed

 % microTherm constituents (low density concrete with fiber binder)
 % mfc'd density (lbm/ft3)
 15.0

% mass fraction filamentsflf_read
 0.03

% mass fraction of SiO2
 0.58

% mass fraction of TiO2
 0.39

% debris type start and stop times (min after break)
 % (rate assumed to be uniform from Tstart to Tend)
 % (rate calc uses inventories defined above)
 % (introduce "instant" sources over 1 delT)
 % (debris from UQCoat cannot have Tstarts=0)
 % (timing is presently independent of break size)

% Start Times									
0	0	0	0	0	0	0	0	0	10
10	10	10	10	10	10	10	0	0	
% Stop Times									
10	10	10	10	10	10	10	10	10	2160
2160	2160	2160	2160	2160	2160	2160	10	10	

 % Noninsulation Debris Quantities

% random-variable definitions:
 % (1) first parameter (mean/geom mean/mean)
 % (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
 % (3) lower limit

```
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% qual epoxy in ZOI (lbm)
1
105 0 0 99999 1 0 0

% qual IOZ in ZOI (lbm)
1
39 0 0 99999 1 0 0

% crud fines (lbm)
1
24 0 0 99999 1 0 0

% unqual epoxy fine (lbm)
% (uniform dist)
2 2
234 0 117 234 2 0 0 117 234 0.5 0.5

% unqual epoxy fine chip (lbm)
% (uniform dist)
2 2
709 0 355 709 2 0 0 355 709 0.5 0.5

% unqual epoxy small chip (lbm)
% (uniform dist)
2 2
180 0 90 180 2 0 0 90 180 0.5 0.5

% unqual epoxy large chip (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual epoxy curls (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual alkyd (lbm)
1
271 0 0 99999 1 0 0

% unqual enamel (lbm)
1
267 0 0 99999 1 0 0

% unqual IOZ (lbm)
1
369 0 0 99999 1 0 0

% latent pariculate (lbm)
1
170 0 0 99999 1 0 0

% latent fiber (ft^3)
1
12.5 0 0 99999 1 0 0
```

```

%-----
% Time points along accident progression
% (assume all trains of injection on initially, w/spray on setpoint trip)
% (assume HPSI and LPSI both run, but LPSI flow negligible until depress)
% (1 of 3 spray pumps can be turned off, all HPSI can be turned off for M,L)
% (for degraded condition with < max trains, DON'T exercise any options)

% max time of interest (hr)
36

%*****Recirculation Times*****
%Number of break sizes for recirc table
7

%Recirc Time Table
1.5 2 4 6 8 12 27.5 %Break Size (in.)
337 79 56 44 38 31 30 %Time to recirc (min)

%*****Other LOCA Times*****
% time to ONE spray pump off (min) (S,M,L)
% (if 0.0, NO spray pumps run)
% With Statistics
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
20 5 0 99999 1 0 0
1
20 5 0 99999 1 0 0

% time to ALL spray pumps off (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
390 5 390 420 1 0 0
1
390 10 390 420 1 0 0
1
390 15 390 450 1 0 0

```



```

% time to retire 1 full train (min) (S,M,L)
% (this prob never happens, keep as option)
% (it would be the train with spray off already)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0

% earliest time for chem prod (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0

% time to hot leg injection (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
2 2

```

```

360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5

```

```

%-----
% Chemical Product Variables

% pool temp (degF) where chem prods form
% With statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
140 5 0 99999 1 0 0

% bump factor for chems when t>=Tchem and T<=ChemTemp (S,M,L)
% (spec mean as if min=0, but set min and max to shifted range)
% (preselect mean and max to set desired tail prob in last sample pt)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
1.25 0.64 1 15.3 3 1 10 % truncated exponential
3 2
1.50 0.44444 1 18.2 3 1 10 1 2 0.5 0.5 % truncated exponential
3 2
2.00 0.25 1 24 3 1 10 1 10 1 0.5 % truncated exponential

%-----
% thresholds of concern
% (logical distribution functions. NOT part of sequence variability)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.

```

```

% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% core blockage limit (g/FA) HL breaks
1
99999 0 0 0 1 0 0

% core blockage limit (g/FA) CL break
1
99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for HL brk before HL inject
% (should never fail by this mode)
1
99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for CL brk before HL injection
1
7.5 0 0 0 1 0 0

% limit for strainer buckling (ft h2o)
1
9.35 0 0 0 1 0 0

% void fraction at pump inlet (@ train)
1
0.02 0 0 0 1 0 0

%-----
%Plant State Table Data

% Operable Trains
% Train X Pump Matrix

% three trains operable (Case 01)
%      lpsi      hpsi      spray
%      1          1          1 %A
%      1          1          1 %B
%      1          1          1 %C

% two trains operable (Case 22)
%      lpsi      hpsi      spray
%      1          1          1 %A
%      1          1          1 %B
%      0          0          0 %C

% one train operable (Case 43)
%      lpsi      hpsi      spray
%      1          1          1 %A
%      0          0          0 %B
%      0          0          0 %C

% two LHSI pumps failed (Case 09)
%      lpsi      hpsi      spray
%      1          1          1 %A
%      0          1          1 %B
%      0          1          1 %C

% one train fail + one additional LHSI fail (Case 26)
%      lpsi      hpsi      spray
%      1          1          1 %A
%      0          1          1 %B
%      0          0          0 %C

% # reactor coolant pumps (in CAD)

```

```

4

% # pressurizers (in CAD)
1

% # RHR pumps (in CAD)
3

% # steam generators (in CAD)
4

% time increment for evaluation (min)
5

% misc debris area (ft^2) total in containment
1
100 0 0 99999 1 0 0
% fraction of misc debris overlap (arrives @ t0)
0.25

% thin-bed thickness (in)
0.0625

% clip ZOI with walls (1/0 = y/n)
1

% const fiber filtration eff in fuel
1.0

% strainer height (ft)
3.25

% containment rel humidity
1.00

% sump rel humidity
1.00

% # fuel assemblies
193

% inflation of delP before chem bump
1
5 1 1 10 1 0 0

%*****Min Flow to Cool Core*****

%Number of time and flow rate points
30
% Time post SCRAM (hr)
% Must be equal to number of time and flow rate points

0.0028      0.0042      0.0056
0.0111      0.0167      0.0222
0.0278      0.0417      0.0556
0.1111      0.1667      0.2222
0.2778      0.4167      0.5556
1.1111      1.6667      2.2222
2.7778      4.1667      5.5556
11.1111     16.6667     22.2222
27.7778     41.6667     111.1111
166.6667    222.2222    277.7778

%% Flow Rate (gpm)
% Must be equal to number of time and flow rate points

1414.7000   1323.5000   1260.9000   1113.4000   1030.5000

```

973.3000	931.3000	859.3000	812.3000	711.0000
654.7000	614.2000	581.8000	523.1000	480.9000
388.1000	342.4000	315.1000	295.7000	265.1000
245.5000	204.2000	182.7000	168.7000	158.1000
139.8000	99.0000	84.1000	74.4000	67.7000

```
%*****Special Weld *****
```

```
% single-case tracer (weld location - from table)
% specialweld = '31-RC-1102-NSS-1.1';
% If special weld input select 1 else 0
0
% If 1 write weld name
% else leave blank:
```

```
% nominal pool volume (ft^3) and area (ft^2)
% (uniform distribution between min and max pool volumes - S,M,L)
2 2
0 0 0 0 2 0 0 43464 61993 .5 .5 %SBLOCA
2 2
0 0 0 0 2 0 0 39533 69444 .5 .5 %MBLOCA
2 2
0 0 0 0 2 0 0 45201 69263 .5 .5 %LBLOCA
```

```
% Pool Area (ft^2)
12301
```

```
% clean strainer attributes
% clean area of ONE strainer (ft^2)
1.8185e+003
% clean area of one OLD strainer (ft^2)
%155.4
```

```
% max clean strainer head loss (ft h2o)
0.22
```

```
% single pump runout volume rates (gpm) (S, M, L)
% high-pressure max injection rates
1620
% low-pressure injection rate
2800
```

```
% Containment Spray Rate (all states except Case 43)
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
2 2
0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
```

```
% Containment Spray Rate (Case 43)
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
%2 2
%0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
```

```
% -----
% geometric loading table for a single train:
% thickness x(in) and strainer area A(ft^2) as functions of debris volume
% V(ft^3). see supplementary routine StrainerArea for geometry definition
% and assumptions. must be single-valued functions. May be slight mismatch
% in compression for thickness estimation between this table and delP routine,
% but low flow rate indicates low fiber compression.
% V(ft^3) x(in) A (ft^2)
```

% switch table on/off = 1/0, list length of table
% if 0 a flat approximation will be used
% for old strainers
1 28

% Table Values
% If Table off leave blank
0 0 1.8185e+003
8.1790e+001 5.0000e-001 4.1900e+002
8.1800e+001 5.0100e-001 4.1931e+002
2.8016e+002 8.1421e+000 4.4718e+002
4.7853e+002 1.5783e+001 5.9256e+002
6.7689e+002 2.3424e+001 7.4768e+002
8.7526e+002 3.1065e+001 9.1253e+002
1.0736e+003 3.8706e+001 1.0871e+003
1.2720e+003 4.6348e+001 1.2714e+003
1.4703e+003 5.3989e+001 1.4655e+003
1.6687e+003 6.1630e+001 1.6692e+003
1.8671e+003 6.9271e+001 1.8827e+003
2.0654e+003 7.6912e+001 2.1060e+003
2.2638e+003 8.4553e+001 2.3389e+003
2.4622e+003 9.2194e+001 2.5816e+003
2.6605e+003 9.9835e+001 2.8341e+003
2.8589e+003 1.0748e+002 3.0962e+003
3.0573e+003 1.1512e+002 3.3681e+003
3.2556e+003 1.2276e+002 3.6497e+003
3.4540e+003 1.3040e+002 3.9411e+003
3.6524e+003 1.3804e+002 4.2422e+003
3.8507e+003 1.4568e+002 4.5530e+003
4.0491e+003 1.5332e+002 4.8735e+003
4.2474e+003 1.6096e+002 5.2038e+003
4.4458e+003 1.6860e+002 5.5438e+003
4.6442e+003 1.7625e+002 5.8935e+003
4.8425e+003 1.8389e+002 6.2530e+003
5.0409e+003 1.9153e+002 6.6222e+003

% initiating event frequency and bounded Johnson fit
% NUREG-1829 current-day exceedance frequencies (without SG breaks)
% (# breaks/cal yr of sizes > x)
% Interpolated values for LOCA bins MUST be consistent with LOCAbins def
% UT Austin fit of epistemic envelope using bounded Johnson pdf.
% Parameters MUST be listed in column order (gamma,delta,xi,lamda)
% each row varies by size, each column varies by %ile (then transposed)

% Break Frequency Table Name
"Present-Day Exceedance Frequency"

% Break Sizes in Ascending Order
% These are fixed values
% For Documentation Purpose only
0.5 1.625 2 3 6 7 14 31

% Frequency Table
% These are fixed values
% For Documentation Purpose only
% Break Size X Percentile
6.8e-5 5.0e-6 3.69e-6 2.1e-7 6.30e-8 1.4e-8 4.1e-10 3.5e-11 % 5th %ile
6.3e-4 8.9e-5 6.57e-5 3.4e-6 1.08e-6 3.1e-7 1.2e-08 1.2e-09 % 50th %ile
1.9e-3 4.2e-4 3.10e-4 1.6e-5 5.20e-6 1.6e-6 2.0e-07 2.9e-08 % mean
7.1e-3 1.6e-3 1.18e-3 6.1e-5 1.98e-5 6.1e-6 5.8e-07 8.1e-08 % 95th %ile

% Table Percentile Values
0.05 0.5 NaN 0.95 % Don't Use Mean for Fitting

% Johnson Parameters
% These are fixed values
% For Documentation Purpose only
% gamma delta xi lambda
1.650950E+00 5.256964E-01 4.117000E-05 1.420000E-02

```

1.646304E+00  4.593913E-01  2.530000E-06  3.200000E-03
1.646308E+00  4.593851E-01  1.870000E-06  2.360550E-03
1.646605E+00  4.589467E-01  1.200000E-07  1.220000E-04
1.646403E+00  4.566256E-01  3.000000E-08  3.965000E-05
1.645739E+00  4.487957E-01  6.023625E-09  1.220000E-05
1.645211E+00  3.587840E-01  2.892430E-10  1.160000E-06
1.645072E+00  3.343493E-01  2.636770E-11  1.600000E-07

```

```

%-----
% Strainer-Test Penetration Parameters

```

```

% area of test module (ft^2)
91.44

% fraction of sheddable debris
% (uniform empirical) - (unitless)
2 2
0 0 0 0 2 0 0 0.00956 0.0272 0.5 0.5

```

```

% shedding rate (1/min)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.008236 0.0546 0.5 0.5

```

```

% filter efficiency per g (slope)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.000339 0.003723 0.5 0.5

```

```

% filter fit cut point (g)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 790 880 0.5 0.5

```

```

% initial filter eff (intercept)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.656 0.706 0.5 0.5

```

```

% filter efficiency match pt
% (set equal to 1.0 always)
1
1 0 0 0 1 0 0

```

```

% filter exp rate const (1/g)
% (bimodal empirical)
2 3
0 0 0 0 2 1 0 0.0011254 0.0013078 0.031787 0.10000 0.45000 0.1000

```

```

%-----
% Debris Transport Factors

```

```

% (enter conservative values here, random variables populated below)

```

```

% ZOI-generated debris
% (LDFG fines, LDFG small, LDFG large, uTherm fines, qual coat fines, crud fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment break)

```

```

% these factors were used for Full Batch 2

```

```

0.70 0.60 0.22 0.70 0.70 0.70      %F_BD_upr
0.30 0.25 0.00 0.30 0.30 0.30      %F_BD_lwr
0.53 0.27 0.00 0.53 0.53 0.53      %F_WD_UCin
0.47 0.19 0.00 0.47 0.47 0.47      %F_WD_UCan

```

```

0.00 0.27 0.00 0.00 0.00 0.00      %F_WD_BcIn
0.00 0.00 0.00 0.00 0.00 0.00      %F_WD_BcAn
0.02 0.00 0.00 0.02 0.02 0.02      %F_PF_sump
0.05 0.00 0.00 0.00 0.05 0.05 0.05 %F_PF_nact
1.00 0.64 0.00 1.00 1.00 1.00      %F_Rcrc_lwr
1.00 0.64 0.00 1.00 1.00 1.00      %F_Rcrc_WDin
1.00 0.58 0.00 1.00 1.00 1.00      %F_Rcrc_WDan
0.00 0.01 0.01 0.00 0.00 0.00      %F_Ersn_spry
0.00 0.07 0.07 0.00 0.00 0.00      %F_Ersn_pool

```

```

% Unqualified coatings outside ZOI
% (epoxy fines, epoxy fine chips, epoxy small chips, epoxy large chips,
% epoxy curls, alkyd, baked enamel, IOZ fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for MB/LBLOCA in SG compartment)

```

```

1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 % F_fail
0.15 0.15 0.15 0.15 0.15 0.54 0.00 0.83 % F_upr
0.02 0.02 0.02 0.02 0.02 0.46 1.00 0.17 % F_lwr
0.83 0.83 0.83 0.83 0.83 0.00 0.00 0.00 % F_Rx
0.06 0.06 0.06 0.06 0.06 0.06 0.00 0.06 % F_spry
1.00 0.41 0.00 0.00 1.00 1.00 1.00 1.00 % F_rcrc
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 % F_Rxrcrc

```

```

% Latent Debris
% (particulate, fiber)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment)

```

```

0.00 0.00      %F_BD_upr      (1)
1.00 1.00      %F_BD_lwr      (2)
1.00 1.00      %F_WD          (3)
0.02 0.02      %F_PF_sump     (4)
0.05 0.05      %F_PF_nact     (5)
1.00 1.00      %F_Rcrc_lwr     (6)

```

```

%-----
%Time and Temperature Data

```

```

%Number of Time and Temperature Data Points
162

```

```

% time vector (hr) for small-break temperature profile
% (FIRST entry is assumed 2B@ t=0. constant-value extrapolation imposed.
% (time dependent temps ARE currently used in calc, one history for each LOCA)

```

```

% time vector (hour) for small (and medium) breaks

0.0000 0.0847 0.0864 0.0881 0.0897 0.0914 0.0931 0.0947
0.0964 0.0981 0.0997 0.1014 0.1031 0.1047 0.1064 0.1081
0.1097 0.1139 0.1306 0.1472 0.1639 0.1806 0.1972 0.2139
0.2306 0.2472 0.2639 0.2806 0.2972 0.3139 0.3306 0.3472
0.3639 0.3806 0.3972 0.4139 0.4306 0.4472 0.4639 0.4806
0.4972 0.5139 0.5306 0.5472 0.5639 0.5806 0.5972 0.6139
0.6306 0.6472 0.6639 0.6806 0.6972 0.7139 0.7306 0.7472
0.7639 0.7806 0.7972 0.8139 0.8306 0.8472 0.8639 0.8806
0.8972 0.9139 0.9306 0.9472 0.9639 0.9806 0.9972 1.0139
1.0306 1.0472 1.0639 1.0806 1.3611 1.6944 2.0278 2.3611
2.6944 3.0278 3.3611 3.6944 4.0278 4.3611 4.6944 5.0278
5.3611 5.6944 6.0278 6.3611 6.6944 7.0278 7.3611 7.6944
8.0278 8.3611 8.6944 9.0278 9.3611 9.6944 10.0278 20.0833
32.0833 44.0833 56.0833 68.0833 80.0833 92.0833 104.0833
116.0833 128.0833 140.0833 152.0833 164.0833
176.0833 188.0833 200.0833 212.0833 224.0833
236.0833 248.0833 260.0833 272.0833 283.3333

```


297.2222	308.3333	319.4444	333.3333	344.4444
355.5556	369.4444	380.5556	391.6667	402.7778
416.6667	427.7778	438.8889	452.7778	463.8889
475.0000	488.8889	500.0000	511.1111	525.0000
536.1111	547.2222	561.1111	572.2222	583.3333
597.2222	608.3333	619.4444	633.3333	644.4444
655.5556	669.4444	680.5556	691.6667	702.7778
716.6667				

% temperature(F) profile for small (and medium) breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for medium (and small) break temperature profile
 % (FIRST entry is assumed 2B@ t=0. constant-value extrapolation imposed.

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081
0.1097	0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139
0.2306	0.2472	0.2639	0.2806	0.2972	0.3139	0.3306	0.3472
0.3639	0.3806	0.3972	0.4139	0.4306	0.4472	0.4639	0.4806
0.4972	0.5139	0.5306	0.5472	0.5639	0.5806	0.5972	0.6139
0.6306	0.6472	0.6639	0.6806	0.6972	0.7139	0.7306	0.7472
0.7639	0.7806	0.7972	0.8139	0.8306	0.8472	0.8639	0.8806
0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972	1.0139
1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278
5.3611	5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944
8.0278	8.3611	8.6944	9.0278	9.3611	9.6944	10.0278	20.0833
32.0833	44.0833	56.0833	68.0833	80.0833	92.0833	104.0833	
116.0833	128.0833	140.0833	152.0833	164.0833			
176.0833	188.0833	200.0833	212.0833	224.0833			
236.0833	248.0833	260.0833	272.0833	283.3333			
297.2222	308.3333	319.4444	333.3333	344.4444			
355.5556	369.4444	380.5556	391.6667	402.7778			
416.6667	427.7778	438.8889	452.7778	463.8889			
475.0000	488.8889	500.0000	511.1111	525.0000			
536.1111	547.2222	561.1111	572.2222	583.3333			
597.2222	608.3333	619.4444	633.3333	644.4444			

655.5556 669.4444 680.5556 691.6667 702.7778
 716.6667

% Temperature(F) profile for medium breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for large breaks

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947		
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081	0.1097	
0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139	0.2306	0.2472	
0.2639	0.2806	0.2972	0.3139	0.3306	0.3472	0.3639	0.3806	0.3972	
0.4139	0.4306	0.4472	0.4639	0.4806	0.4972	0.5139	0.5306	0.5472	
0.5639	0.5806	0.5972	0.6139	0.6306	0.6472	0.6639	0.6806	0.6972	
0.7139	0.7306	0.7472	0.7639	0.7806	0.7972	0.8139	0.8306	0.8472	
0.8639	0.8806	0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972	
1.0139	1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611	
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278	5.3611	
5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944	8.0278	8.3611	
8.6944	9.0278	9.3611	9.6944	10.0278	20.0833	32.0833	44.0833	56.0833	
68.0833	80.0833	92.0833	104.0833	116.0833	128.0833	140.0833			
152.0833	164.0833	176.0833	188.0833	200.0833	212.0833	224.0833	236.0833	248.0833	260.0833
272.0833	283.3333	297.2222	308.3333	319.4444	333.3333	344.4444	355.5556	369.4444	380.5556
391.6667	402.7778	416.6667	427.7778	438.8889	452.7778	463.8889	475.0000	488.8889	500.0000
511.1111	525.0000	536.1111	547.2222	561.1111	572.2222	583.3333	597.2222	608.3333	619.4444
633.3333	644.4444	655.5556	669.4444	680.5556	691.6667	702.7778	716.6667		

% Temperature (F) profile for large breaks

119.8113	213.9295	242.3104	255.0268	255.7907	253.1617				
252.9372	252.5390	251.9023	250.9733	249.7169	245.8894				
235.9856	224.0051	212.9495	203.5499	195.7225	179.5894				
199.8048	174.8143	174.8276	177.3518	180.7405	183.2333				
185.1644	186.4925	187.2579	187.8270	188.1924	188.4266				
188.5605	188.5934	188.5042	188.3375	189.3187	189.7570				

```

189.0923 188.5202 188.0148 187.5621 187.4103 187.0671
186.7330 186.4249 186.1559 186.7640 186.5012 186.2557
186.0555 185.9119 185.8265 185.8062 185.8495 185.9526
186.1092 187.8900 187.9673 187.9196 187.9119 187.9385
187.9954 188.0710 188.1647 188.2538 188.3385 188.4003
189.0996 188.9199 188.7439 188.5614 188.3622 188.1314
187.8597 187.5387 187.1667 186.7559 178.4091 171.8762
166.5421 162.2238 158.1410 154.9818 151.7673 148.9234
146.0834 143.7967 141.6054 139.5251 137.9892 136.4819
134.8865 136.9000 136.6489 135.3569 134.3103 133.2941
132.4453 131.9467 132.0536 132.1915 131.3055 130.7946
130.2765 123.0489 118.1991 114.9095 112.4170 110.4096
108.7290 107.2834 106.0152 104.8855 103.8671 102.9399
102.0890 101.3027 100.5720 99.8894 99.2491 98.6461 98.0763
97.5362 97.0229 96.5339 96.0669 95.6474 95.1520 94.7720 94.4055
93.9649 93.6254 93.2967 92.9000 92.5932 92.2953 92.0057 91.6547
91.3822 91.1168 90.7942 90.5432 90.2982 89.9998 89.7671 89.5396
89.2620 89.0452 88.8328 88.5733 88.3703 88.1712 87.9276 87.7368
87.5494 87.3198 87.1398 86.9628 86.7457 86.5753 86.4076 86.2427
86.0401

```

```

%-----
% NPSH parameters:
%   (specify any # of pipe segments in common header)
%
% major HL variables

% absolute roughness of the pipe (ft)
0.00015

% Number of Pipe Segments
6

% pipe diameters (ft)
1.27 .99 1.27 .84 1.27 .99

% pipe lengths (ft)
66.96 25.41 12.00 25.46 11.50 24.91

% depth of common header (ft)
25.83 25.65 25.83 % LPSI, HPSI, SPRY

% NPSH required for each pump (ft water)
12 12 12      % LPSI, HPSI, SPRY

% minor HL variables
% # of elbows, tees, entrances, and branches per pipe segment
%   [(# of 90 degree) (# of 45 degree) (# of gate valves) (# of entrances) (# of
%   tee runs) (# of tee branches)]

4 2 1 1 0 0 % segment AB
3 0 0 0 0 1 % segment BC
0 0 0 0 1 0 % segment BD
3 0 0 0 0 1 % segment DE
0 0 0 0 1 0 % segment DF
3 0 0 0 0 1 % segment FG

%-----
% Newly Added Options

% Use Old Degas Routine? (0 = No, 1 = Yes)
0

% Use Old NPSH Routine? (0 = No, 1 = Yes)
0

% Use Old SI Pump Flow Equation? (0 = No, 1 = Yes)
0

% Use Old Strainer Properties? (0 = No, 1 = Yes)

```

0

% Use Common Random Numbers Across Frequency Replications? (0 = No, 1 = Yes)

0

% Enable All Plots? (0 = No, 1 = Yes)

1

% Enable Parallel Calculations (0 = No, 1 = Yes)

% CAUTION - USE ONLY IF YOUR KNOW YOUR PC MEETS SPECIFICATIONS!!!!

0

% Number of Parallel Threads

4

% Use Optimal Frequency Bins for 15 Freps (0 = No, 1 = Yes)

1

% Use Old Debris Source Rate (Before Error Correction)? (0 = No, 1 = Yes)

1

% Use Old Latent Debris Transport Equations (Before Error Correction)? (0 = No, 1 = Yes)

1

Attachment 11

STP CASA Grande Information (Non-Proprietary Version)

CASA43 JT4

Contains No Proprietary Information
Alion Science and Technology

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%LANLANLANLANLANLANLANLANLANLANLANLANLANLANLANLANLANLANLANLANLANLANLA%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
% Define Case Folders (Main Project Folder)
"/work/02405/jjtejada/yje00/matlab_code/Demo Plant"
```

```
% Define Working Folders
```

```
% Analysis Folder (~../Case/Analysis)
"Analytic Results"
```

```
% Run Subfolder (~../Case/Analysis/run)
"Tornado"
```

```
% Run Sub_Subfolder (~../Case/Analysis/run/run_sub)
"SIMCON"
```

```
% Run Sub_Sub_Subfolder (~../Case/Analysis/run/run_sub/run_sub_sub)
"Delta Pump Case 43 Shuffle"
```

```
% CAD Folder Name (~../Case/CAD)
"CAD Files"
```

```
% Concrete Sub-Folder (~../Case/CAD/Concrete)
"Concrete Data"
```

```
% Equipment Sub-Folder (~../Case/CAD/Equipment)
"Equip Data"
```

```
% Grating Sub-Folder (~../Case/CAD/Grating)
"Grating Data"
```

```
% Pipe Sub-Folder (~../Case/CAD/Pipes)
"Pipe Data"
```

```
% Fequency Folder (~../Case/Frequency)
"Freq Data"
```

```
% Break Frequency (~../Case/Frequency/Break)
"LOCA Frequency and Weld Inputs - 12-7-12 R1.xls:"
```

```
% Break Fequency Table (~../Case/Frequency/Break/Table)
"LOCA Data"
```

```
% Weld Case File (~../Case/Frequency/Weld)
"LOCA Frequency and Weld Inputs - 12-7-12 R1.xls:"
```

```
% Weld Case Table (~../Case/Frequency/Weld/Table)
"Weld Table"
```

```
%-----
% multiplicative spatial unit conversions
% rectify all CAD elements for consistency
% applied to ALL length units within each CAD file
```

```
% Concrete Multiplier
1.0
```

```
% Equipment Multiplier
1.0
```

```
% Grating Multiplier
1.0
```

```
% Pipe Multiplier
```

```
1.0
```

```
%-----
```

```

% LOCA bin definitions
% (units consistent with freq dists and CAD data)

% List Number of Defined Break Size Limits
% ie. SB,MB,LE (3 designations)
% However more sizes are allowable
3

% List Sizes
0.5 2.0 6.0

%-----
% CAD and Plotting Options (1/0 = Y/N)

% Show CAD Reproduction
0

% Show Concrete and Gratings
0

% Produce Intro Movie and Stop
0

% Debris Passage Correlation
0

% Sample Flow Rates
0

% Random Input Distributions
0

% ZOI Radial Inflation Factor(Plotting Only)
50

% ZOI Plotting Interval (# of breaks between plots)
25

%-----
% spatial resolution for discretizing insulation
% (must repeat weld target sort if these are changed. delete all master
% files and rerun with new dell and Nangbin)

% Linear Resolution (in.)
6

%Azimuthal Bins in 2 Pi Radians on Pipes
12

%-----
% Head Loss Option
% porosity calc (1/2 = vol / mass weighting)
% (vol weighting was found to be more conservative)
1

%-----
% Synonyms tables for nonstandard welds, hangars and valves and Equipment

% Number of Valve synonyms
5
% Valve Synonyms
Valve VALVE MOV XRH FCV

% Number of Hangar Labels
14
% Hangar Synonyms
Hangar Hanger HL AF GU SS SH RR RH
"Work Point" "work point" "Work point" "work Point" "WORK POINT"

% Number of Weld Synonyms

```


4

```
% Weld Synonyms
FW Weld WELD FS
```

```
% Number of Steam Generator Synonyms
2
```

```
% Steam Generator Synonyms
SG SteamGenerator
```

```
% Number of Reactor Coolant Pump Synonyms
2
```

```
% Reactor Coolant Pump Synonyms
RCP ReactorCoolantPump
```

```
% Number of Pressurizer Synonyms
3
```

```
% Pressurizer Synonyms
PZR PRZR Pressurizer
```

```
% Number of RHR Synonyms
2
```

```
% RHR Synonyms
RHR ResidualHeatRemoval
```

```
%-----
%Statistics Sampling Options
```

```
%Sampling Method
% (0/1/2/3 = CASA default / MatLab default / shuffle / read file)
2
```

```
%If Option 3 specified, set file name in case folder below
%If not LEAVE BLANK
```

```
% max # LHS bins in LLOCA for max DEGB (DEGB counts as 1)
% Nmaxbrk = 2 => 2044 total breaks
% Nmaxbrk = 3 => 2100 total breaks
% Nmaxbrk = 5 => 2250 total breaks
% Nmaxbrk = 10 => 3070 total breaks
5
```

```
% # LHS replicates (batches) for each frequency CCDF
20
```

```
% # epistemic freq envelope samples
% current models process ~110 cases per minute
15
```

```
% logarithmic base for sampling epistemic frequency envelope
2
```

```
% lower limit of highest epistemic frequency bin
0.99
```

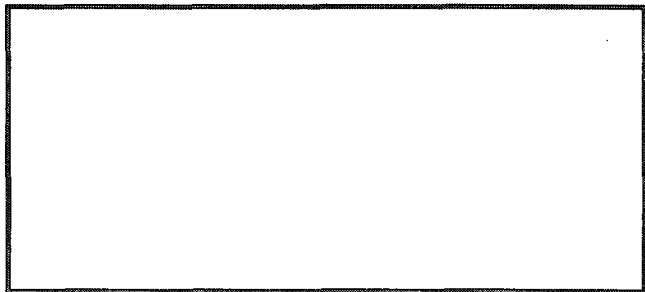
```
% # interpolation pts in each break freq ccdf
1000
```

```
% logarithmic base for sampling break size
```

% (double check routine before changing this from base 10)
10

%Insulation Characteristics

% Number of Low Density Fiberglass Zones
3



Redacted

% Number of Debris Types
8

% Debris Types
NUKON NUKON_2 MICROTHERM RMI LEAD "THERMAL WRAP" IOZ ALKYD

%Debris treated as LDFG
% 1/0 --> yes/no
1 1 0 0 0 1 0 0

%Debris treated as microtherm
% 1/0 --> yes/no
0 0 1 0 0 0 0 0

% Damage Radii with statistics definitions
% Material X Statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6

%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
17 0 0 99999 1 0 0
1
17 0 0 99999 1 0 0
1
28.6 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
17 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0
1
1 0 0 99999 1 0 0

% Debris Properties Table

% (denote particulate/fiber = sphere/cylinder = 1/2)
 % (do NOT add to or reorder this list unless code is modified)
 % (inventory of fibers with cylindrical geom must be given in ft^3)
 % (can 'fake' the diameter to match a given Sv using std geom formulas)
 % (inventory of particulates with spherical geom must be given in lbm)
 % (this list MUST include every debris type of interest)
 % (if unknown, set "manufactured" density of particulate to ~20% of Rho_mat)
 % (based on comparison of FeO2 to BWR sludge compaction density)

	'label'	DebrisPropi	'Geom'	'Diam'	'Rho_mat'	'Rho_mfc'
% native units		'sph,cyl'	'um'	'lbm/ft^3'	'lbm/ft^3'	
% calc units		'sph,cyl'	'm'	'kg/m^3'	'kg/m^3'	
	"LDFG - fines"	2	7	175	2.4	
	"LDFG - small"	2	7	175	2.4	
	"LDFG - large"	2	7	175	2.4	
	"uTherm - filaments"	2	6	165	2.4	
	"uTherm - SiO2"	1	2.5	137	27.4	
	"uTherm - TiO2"	1	20	262	52.4	
	"QualCoat - epoxy"	1	10	94	36.66	
	"QualCoat - IOZ"	1	10	208	81.12	
	"Crud"	1	15	350	70.0	
	"UQCoat - epoxyfine"	1	152	124	48.36	
	"UQCoat - epoxyFchp"	1	1143	124	48.36	
	"UQCoat - epoxySchp"	1	1143	124	48.36	
	"UQCoat - epoxyLchp"	1	1143	124	48.36	
	"UQCoat - epoxyCrls"	1	1143	124	48.36	
	"UnQualCoat - alkyd"	1	10	207	80.73	
	"UnQualCoat - enamel"	1	10	93	36.27	
	"UnQualCoat - IOZ"	1	10	244	95.16	
	"Latent - particulate"	1	17.3	169	33.80	
	"Latent - fiber"	2	7	175	2.4	

Diameters of SiO2 and TiO2 are improperly reversed

 % microTherm constituents (low density concrete with fiber binder)
 % mfc'd density (lbm/ft3)
 15.0

% mass fraction filamentsflf_read
 0.03

% mass fraction of SiO2
 0.58

% mass fraction of TiO2
 0.39

% debris type start and stop times (min after break)
 % (rate assumed to be uniform from Tstart to Tend)
 % (rate calc uses inventories defined above)
 % (introduce "instant" sources over 1 delT)
 % (debris from UQCoat cannot have Tstartsrc=0)
 % (timing is presently independent of break size)

% Start Times									
0	0	0	0	0	0	0	0	0	10
10	10	10	10	10	10	10	0	0	
% Stop Times									
10	10	10	10	10	10	10	10	10	2160
2160	2160	2160	2160	2160	2160	2160	10	10	

 % Noninsulation Debris Quantities

% random-variable definitions:
 % (1) first parameter (mean/geom mean/mean)
 % (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
 % (3) lower limit

```
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% qual epoxy in ZOI (lbm)
1
105 0 0 99999 1 0 0

% qual IOZ in ZOI (lbm)
1
39 0 0 99999 1 0 0

% crud fines (lbm)
1
24 0 0 99999 1 0 0

% unqual epoxy fine (lbm)
% (uniform dist)
2 2
234 0 117 234 2 0 0 117 234 0.5 0.5

% unqual epoxy fine chip (lbm)
% (uniform dist)
2 2
709 0 355 709 2 0 0 355 709 0.5 0.5

% unqual epoxy small chip (lbm)
% (uniform dist)
2 2
180 0 90 180 2 0 0 90 180 0.5 0.5

% unqual epoxy large chip (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual epoxy curls (lbm)
% (uniform dist)
2 2
391 0 196 391 2 0 0 196 391 0.5 0.5

% unqual alkyd (lbm)
1
271 0 0 99999 1 0 0

% unqual enamel (lbm)
1
267 0 0 99999 1 0 0

% unqual IOZ (lbm)
1
369 0 0 99999 1 0 0

% latent pariculate (lbm)
1
170 0 0 99999 1 0 0

% latent fiber (ft^3)
1
12.5 0 0 99999 1 0 0
```

```

%-----
% Time points along accident progression
% (assume all trains of injection on initially, w/spray on setpoint trip)
% (assume HPSI and LPSI both run, but LPSI flow negligible until depress)
% (1 of 3 spray pumps can be turned off, all HPSI can be turned off for M,L)
% (for degraded condition with < max trains, DON'T exercise any options)

% max time of interest (hr)
36

%*****Recirculation Times*****
%Number of break sizes for recirc table
7

%Recirc Time Table
1.5 2 4 6 8 12 27.5 %Break Size (in.)
337 79 56 44 38 31 30 %Time to recirc (min)

%*****Other LOCA Times*****
% time to ONE spray pump off (min) (S,M,L)
% (if 0.0, NO spray pumps run)
% With Statistics
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
20 5 0 99999 1 0 0
1
20 5 0 99999 1 0 0

% time to ALL spray pumps off (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
% first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
390 5 390 420 1 0 0
1
390 10 390 420 1 0 0
1
390 15 390 450 1 0 0

```

```

% time to retire 1 full train (min) (S,M,L)
% (it would be the train with spray off already)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0
1
99999 0 0 99999 1 0 0

% earliest time for chem prod (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0
1
0 0 0 99999 1 0 0

% time to hot leg injection (min) (S,M,L)
% One Row for each size designation (see LOCA bin definitions)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%     first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
2 2

```

```

360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5
2 2
360 0 345 360 2 0 0 345 360 0.5 0.5

```

```

%-----
% Chemical Product Variables

```

```

% pool temp (degF) where chem prods form
% With statistics
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
140 5 0 99999 1 0 0

```

```

% bump factor for chems when t>=Tchem and T<=ChemTemp (S,M,L)
% (spec mean as if min=0, but set min and max to shifted range)
% (preselect mean and max: to set desired tail prob in last sample pt)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.
% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6
1
1.25 0.64 1 15.3 3 1 10          % truncated exponential
3 2
1.50 0.44444 1 18.2 3 1 10 1 2 0.5 0.5      % truncated exponential
3 2
2.00 0.25 1 24 3 1 10 1 10 1 0.5          % truncated exponential

```

```

%-----
% thresholds of concern
% (logical distribution functions. NOT part of sequence variability)
% random-variable definitions:
% (1) first parameter (mean/geom mean/mean)
% (2) second parameter (std dev/geom std dev) (zero sigma returns mean)
% (3) lower limit
% (4) upper limit
% (5) library distribution (1/2/3 = normal/empirical/TBD ...)
% (6) conservative direction (0/1 = low/hi)
% (7) logarithmic sample base (0 = linear scale)
% (8 ...) empirical pdf must provide equal # of x then y values,
%       first four entries are ignored.

```

```

% Provide distribution type
% if (2) or empirical provide number of xy pairs
% ie. below where 3 pairs are 1 2 3 4 5 6
%2 3
%1 0 0 99999 2 0 0 1 2 3 4 5 6

% core blockage limit (g/FA) HL breaks
1
99999 0 0 0 1 0 0

% core blockage limit (g/FA) CL break
1
99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for HL brk before HL inject
% (should never fail by this mode)
1
99999 0 0 0 1 0 0

% boron ppt limit (g/FA) for CL brk before HL injection
1
7.5 0 0 0 1 0 0

% limit for strainer buckling (ft h2o)
1
9.35 0 0 0 1 0 0

% void fraction at pump inlet (@ train)
1
0.02 0 0 0 1 0 0

-----
%Plant State Table Data

% Operable Trains
% Train X Pump Matrix:

% three trains operable (Case 01)
%   lpsi   hpsi   spray
%   1       1       1 %A
%   1       1       1 %B
%   1       1       1 %C

% two trains operable (Case 22)
%   lpsi   hpsi   spray
%   1       1       1 %A
%   1       1       1 %B
%   0       0       0 %C

% one train operable (Case 43)
%   lpsi   hpsi   spray
%   1       1       1 %A
%   0       0       0 %B
%   0       0       0 %C

% two LHSI pumps failed (Case 09)
%   lpsi   hpsi   spray
%   1       1       1 %A
%   0       1       1 %B
%   0       1       1 %C

% one train fail + one additional LHSI fail (Case 26)
%   lpsi   hpsi   spray
%   1       1       1 %A
%   0       1       1 %B
%   0       0       0 %C

% # reactor coolant pumps (in CAD)

```


4

% # pressurizers (in CAD)

1

% # RHR pumps (in CAD)

3

% # steam generators (in CAD)

4

% time increment for evaluation (min)

5

% misc debris area (ft^2) total in containment

1

100 0 0 99999 1 0 0

% fraction of misc debris overlap (arrives @ t0)

0.25

% thin-bed thickness (in)

0.0625

% clip ZOI with walls (1/0 = y/n)

1

% const fiber filtration eff in fuel

1.0

% strainer height (ft)

3.25

% containment rel humidity

1.00

% sump rel humidity

1.00

% # fuel assemblies

193

% inflation of delP before chem bump

1

5 1 1 10 1 0 0

%*****Min Flow to Cool Core*****

%Number of time and flow rate points

30

% Time post SCRAM (hr)

% Must be equal to number of time and flow rate points

0.0028	0.0042	0.0056
0.0111	0.0167	0.0222
0.0278	0.0417	0.0556
0.1111	0.1667	0.2222
0.2778	0.4167	0.5556
1.1111	1.6667	2.2222
2.7778	4.1667	5.5556
11.1111	16.6667	22.2222
27.7778	41.6667	111.1111
166.6667	222.2222	277.7778

%% Flow Rate (gpm)

% Must be equal to number of time and flow rate points

1414.7000 1323.5000 1260.9000 1113.4000 1030.5000

973.3000	931.3000	859.3000	812.3000	711.0000
654.7000	614.2000	581.8000	523.1000	480.9000
388.1000	342.4000	315.1000	295.7000	265.1000
245.5000	204.2000	182.7000	168.7000	158.1000
139.8000	99.0000	84.1000	74.4000	67.7000

```
*****Special Weld *****
```

```
% single-case tracer (weld location name - from table)
% specialweld = '31-RC-1102-NSS-1.1';
% If special weld input select 1 else 0
0
% If 1 write weld name
% else leave blank
```

```
% nominal pool volume (ft^3) and area (ft^2)
% (uniform distribution between min and max pool volumes - S,M,L)
2 2
0 0 0 0 2 0 0 43464 61993 .5 .5 %SBLOCA
2 2
0 0 0 0 2 0 0 39533 69444 .5 .5 %MBLOCA
2 2
0 0 0 0 2 0 0 45201 69263 .5 .5 %LBLOCA
```

```
% Pool Area (ft^2)
12301
```

```
% clean strainer attributes
% clean area of ONE strainer (ft^2)
1.8185e+003
% clean area of one OLD strainer (ft^2)
%155.4
```

```
% max clean strainer head loss (ft h2o)
0.22
```

```
% single pump runout volume rates (gpm) (S, M, L)
% high-pressure max injection rates
1620
% low-pressure injection rate
2800
```

```
% Containment Spray Rate (all states except Case 43)
%2 2
%0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
%2 2
%0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
%2 2
%0 0 1932 2350 2 0 0 1932 2350 0.5 0.5
```

```
% Containment Spray Rate (Case 43)
2 2
0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
2 2
0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
2 2
0 0 2080 2600 2 0 0 2080 2600 0.5 0.5
```

```
-----
% geometric loading table for a single train:
% thickness x(in) and strainer area A(ft^2) as functions of debris volume
% V(ft^3). see supplementary routine StrainerArea for geometry definition
% and assumptions. must be single-valued functions. May be slight mismatch
% in compression for thickness estimation between this table and delp routine,
% but low flow rate indicates low fiber compression.
% V(ft^3) x(in) A (ft^2)
```

```

% switch table on/off = 1/0, list length of table
% if 0 a flat approximation will be used
% for old strainers
1 28

% Table Values
% If Table off leave blank
0      0      1.8185e+003
8.1790e+001  5.0000e-001  4.1900e+002
8.1800e+001  5.0100e-001  4.1931e+002
2.8016e+002  8.1421e+000  4.4718e+002
4.7853e+002  1.5783e+001  5.9256e+002
6.7689e+002  2.3424e+001  7.4768e+002
8.7526e+002  3.1065e+001  9.1253e+002
1.0736e+003  3.8706e+001  1.0871e+003
1.2720e+003  4.6348e+001  1.2714e+003
1.4703e+003  5.3989e+001  1.4655e+003
1.6687e+003  6.1630e+001  1.6692e+003
1.8671e+003  6.9271e+001  1.8827e+003
2.0654e+003  7.6912e+001  2.1060e+003
2.2638e+003  8.4553e+001  2.3389e+003
2.4622e+003  9.2194e+001  2.5816e+003
2.6605e+003  9.9835e+001  2.8341e+003
2.8589e+003  1.0748e+002  3.0962e+003
3.0573e+003  1.1512e+002  3.3681e+003
3.2556e+003  1.2276e+002  3.6497e+003
3.4540e+003  1.3040e+002  3.9411e+003
3.6524e+003  1.3804e+002  4.2422e+003
3.8507e+003  1.4568e+002  4.5530e+003
4.0491e+003  1.5332e+002  4.8735e+003
4.2474e+003  1.6096e+002  5.2038e+003
4.4458e+003  1.6860e+002  5.5438e+003
4.6442e+003  1.7625e+002  5.8935e+003
4.8425e+003  1.8389e+002  6.2530e+003
5.0409e+003  1.9153e+002  6.6222e+003

%-----
% initiating event frequency and bounded Johnson fit
% NUREG-1829 current-day exceedance frequencies (without SG breaks)
% (# breaks/cal yr of sizes > x)
% Interpolated values for LOCA bins MUST be consistent with LOCABins def
% UT Austin fit of epistemic envelope using bounded Johnson pdf.
% Parameters MUST be listed in column order (gamma,delta,xi,lamda)
% each row varies by size, each column varies by %ile (then transposed)

% Break Frequency Table Name
"Present-Day Exceedance Frequency"

% Break Sizes in Ascending Order
% These are fixed values
% For Documentation Purpose only
0.5 1.625 2 3 6 7 14 31

% Frequency Table
% These are fixed values
% For Documentation Purpose only
% Break Size X Percentile
6.8e-5 5.0e-6 3.69e-6 2.1e-7 6.30e-8 1.4e-8 4.1e-10 3.5e-11 % 5th %ile
6.3e-4 8.9e-5 6.57e-5 3.4e-6 1.08e-6 3.1e-7 1.2e-08 1.2e-09 % 50th %ile
1.9e-3 4.2e-4 3.10e-4 1.6e-5 5.20e-6 1.6e-6 2.0e-07 2.9e-08 % mean
7.1e-3 1.6e-3 1.18e-3 6.1e-5 1.98e-5 6.1e-6 5.8e-07 8.1e-08 % 95th %ile

% Table Percentile Values
0.05 0.5 NaN 0.95 % Dcn't Use Mean for Fitting

% Johnson Parameters
% These are fixed values
% For Documentation Purpose only
% gamma      delta      xi      lambda
1.650950E+00  5.256964E-01  4.117000E-05  1.420000E-02

```

```

1.646304E+00  4.593913E-01  2.530000E-06  3.200000E-03
1.646308E+00  4.593851E-01  1.870000E-06  2.360550E-03
1.646605E+00  4.589467E-01  1.200000E-07  1.220000E-04
1.646403E+00  4.566256E-01  3.000000E-08  3.965000E-05
1.645739E+00  4.487957E-01  6.023625E-09  1.220000E-05
1.645211E+00  3.587840E-01  2.892430E-10  1.160000E-06
1.645072E+00  3.343493E-01  2.636770E-11  1.600000E-07

```

```

%-----
% Strainer-Test Penetration Parameters

```

```

% area of test module (ft^2)
91.44

```

```

% fraction of sheddable debris
% (uniform empirical) - (unitless)
2 2
0 0 0 0 2 0 0 0.00956 0.0272 0.5 0.5

```

```

% shedding rate (1/min)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.008236 0.0546 0.5 0.5

```

```

% filter efficiency per g (slope)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.000339 0.003723 0.5 0.5

```

```

% filter fit cut point (g)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 790 880 0.5 0.5

```

```

% initial filter eff (intercept)
% (uniform empirical)
2 2
0 0 0 0 2 0 0 0.656 0.706 0.5 0.5

```

```

% filter efficiency match pt
% (set equal to 1.0 always)
1
1 0 0 0 1 0 0

```

```

% filter exp rate const (1/g)
% (bimodal empirical)
2 3
0 0 0 0 2 1 0 0.0011254 0.0013078 0.031787 0.10000 0.45000 0.1000

```

```

%-----
% Debris Transport Factors
% (enter conservative values here, random variables populated below)

```

```

% ZOI-generated debris
% (LDFG fines, LDFG small, LDFG large, uTherm fines, qual coat fines, crud fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment break)

```

```

% these factors were used for Full Batch 2

```

```

0.70 0.60 0.22 0.70 0.70 0.70      %F_BD_upr
0.30 0.25 0.00 0.30 0.30 0.30      %F_BD_lwr
0.53 0.27 0.00 0.53 0.53 0.53      %F_WD_UCin
0.47 0.19 0.00 0.47 0.47 0.47      %F_WD_UCan

```

```

0.00 0.27 0.00 0.00 0.00 0.00      %F_WD_BCIn
0.00 0.00 0.00 0.00 0.00 0.00      %F_WD_BCan
0.02 0.00 0.00 0.02 0.02 0.02      %F_PF_sump
0.05 0.00 0.00 0.05 0.05 0.05      %F_PF_nact
1.00 0.64 0.00 1.00 1.00 1.00      %F_Rcrc_lwr
1.00 0.64 0.00 1.00 1.00 1.00      %F_Rcrc_WDin
1.00 0.58 0.00 1.00 1.00 1.00      %F_Rcrc_WDan
0.00 0.01 0.01 0.00 0.00 0.00      %F_Ersn_spry
0.00 0.07 0.07 0.00 0.00 0.00      %F_Ersn_pool
    
```

```

% Unqualified coatings outside ZOI
% (epoxy fines, epoxy fine chips, epoxy small chips, epoxy large chips,
% epoxy curls, alkyd, baked enamel, IOZ fines)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for MB/LELOCA in SG compartment)
    
```

```

1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 % F_fail
0.15 0.15 0.15 0.15 0.15 0.54 0.00 0.83 % F_upr
0.02 0.02 0.02 0.02 0.02 0.46 1.00 0.17 % F_lwr
0.83 0.83 0.83 0.83 0.83 0.00 0.00 0.00 % F_Rx
0.06 0.06 0.06 0.06 0.06 0.06 0.00 0.06 % F_spry
1.00 0.41 0.00 0.00 1.00 1.00 1.00 1.00 % F_rcrc
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 % F_Rxrcrc
    
```

```

% Latent Debris
% (particulate, fiber)
% (columns must ALWAYS be defined in this order left to right)
% (rows must ALWAYS be defined in this order top to bottom)
% (present values from Vol 3 for SG compartment)
    
```

```

0.00 0.00      %F_BD_upr      (1)
1.00 1.00      %F_BD_lwr      (2)
1.00 1.00      %F_WD          (3)
0.02 0.02      %F_PF_sump     (4)
0.05 0.05      %F_PF_nact     (5)
1.00 1.00      %F_Rcrc_lwr     (6)
    
```

 %Time and Temperature Data

```

%Number of Time and Temperature Data Points
162
    
```

```

% time vector (hr) for small-break temperature profile
% (FIRST entry is assumed 2B@ t=0. constant-value extrapolation imposed.
% (time dependent temps ARE currently used in calc, one history for each LOCA)
    
```

```

% time vector (hour) for small (and medium) breaks

0.0000 0.0847 0.0864 0.0881 0.0897 0.0914 0.0931 0.0947
0.0964 0.0981 0.0997 0.1014 0.1031 0.1047 0.1064 0.1081
0.1097 0.1139 0.1306 0.1472 0.1639 0.1806 0.1972 0.2139
0.2306 0.2472 0.2639 0.2806 0.2972 0.3139 0.3306 0.3472
0.3639 0.3806 0.3972 0.4139 0.4306 0.4472 0.4639 0.4806
0.4972 0.5139 0.5306 0.5472 0.5639 0.5806 0.5972 0.6139
0.6306 0.6472 0.6639 0.6806 0.6972 0.7139 0.7306 0.7472
0.7639 0.7806 0.7972 0.8139 0.8306 0.8472 0.8639 0.8806
0.8972 0.9139 0.9306 0.9472 0.9639 0.9806 0.9972 1.0139
1.0306 1.0472 1.0639 1.0806 1.0972 1.1139 1.1306 1.1472
2.6944 3.0278 3.3611 3.6944 4.0278 4.3611 4.6944 5.0278
5.3611 5.6944 6.0278 6.3611 6.6944 7.0278 7.3611 7.6944
8.0278 8.3611 8.6944 9.0278 9.3611 9.6944 10.0278 20.0833
32.0833 44.0833 56.0833 68.0833 80.0833 92.0833 104.0833
116.0833 128.0833 140.0833 152.0833 164.0833
176.0833 188.0833 200.0833 212.0833 224.0833
236.0833 248.0833 260.0833 272.0833 283.3333
    
```

297.2222	308.3333	319.4444	333.3333	344.4444
355.5556	369.4444	380.5556	391.6667	402.7778
416.6667	427.7778	438.8889	452.7778	463.8889
475.0000	488.8889	500.0000	511.1111	525.0000
536.1111	547.2222	561.1111	572.2222	583.3333
597.2222	608.3333	619.4444	633.3333	644.4444
655.5556	669.4444	680.5556	691.6667	702.7778
716.6667				

% temperature(F) profile for small (and medium) breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2090	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.7250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for medium (and small) break temperature profile
% (FIRST entry is assumed 2B@ t=0. constant-value extrapolation imposed.

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081
0.1097	0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139
0.2306	0.2472	0.2639	0.2806	0.2972	0.3139	0.3306	0.3472
0.3639	0.3806	0.3972	0.4139	0.4306	0.4472	0.4639	0.4806
0.4972	0.5139	0.5306	0.5472	0.5639	0.5806	0.5972	0.6139
0.6306	0.6472	0.6639	0.6806	0.6972	0.7139	0.7306	0.7472
0.7639	0.7806	0.7972	0.8139	0.8306	0.8472	0.8639	0.8806
0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972	1.0139
1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278
5.3611	5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944
8.0278	8.3611	8.6944	9.0278	9.3611	9.6944	10.0278	20.0833
32.0833	44.0833	56.0833	68.0833	80.0833	92.0833	104.0833	
116.0833	128.0833	140.0833	152.0833	164.0833			
176.0833	188.0833	200.0833	212.0833	224.0833			
236.0833	248.0833	260.0833	272.0833	283.3333			
297.2222	308.3333	319.4444	333.3333	344.4444			
355.5556	369.4444	380.5556	391.6667	402.7778			
416.6667	427.7778	438.8889	452.7778	463.8889			
475.0000	488.8889	500.0000	511.1111	525.0000			
536.1111	547.2222	561.1111	572.2222	583.3333			
597.2222	608.3333	619.4444	633.3333	644.4444			

655.5556 669.4444 680.5556 691.6667 702.7778
 716.6667

% Temperature(F) profile for medium breaks

119.6000	131.2987	140.1689	150.3314	156.1240
159.2343	162.1567	164.5680	166.6937	168.5685
170.2457	171.7175	172.9577	174.0415	174.9570
175.7084	176.3081	177.5299	164.4935	132.7076
124.0848	123.6914	123.5988	123.5641	123.5529
124.4938	127.6399	129.7484	131.0391	149.8002
158.2393	162.7694	165.4960	167.3851	168.6688
169.7687	170.9814	171.9993	172.8771	173.7150
174.4595	175.0903	175.6074	176.0061	176.2923
176.4625	176.4855	176.3916	176.2055	175.9468
175.6184	175.2411	174.8243	174.3902	173.9374
173.4284	172.8459	172.2319	171.6143	171.0143
170.4548	169.9507	169.5034	169.1086	168.7661
168.4824	168.2551	168.0847	167.9707	167.9020
167.8705	167.8665	167.8947	167.9451	168.0131
168.0978	170.0607	170.9606	171.4105	170.8721
169.8110	168.7942	168.1132	165.3090	164.1228
163.0112	161.4436	159.9385	158.1298	158.4517
156.5706	151.6937	163.7090	160.9624	158.1118
156.1579	154.6151	153.2333	151.9641	150.8191
149.7667	148.7924	147.8649	136.2080	129.0230
124.9790	122.1450	120.1310	118.4710	117.3160
116.4980	115.6160	114.7100	113.8960	113.1730
112.5210	111.9240	111.3580	110.8590	110.3930
109.9930	109.5770	109.2090	108.9100	108.5930
108.2810	107.9680	107.7100	107.4730	107.1620
106.9430	106.7150	106.4770	106.2500	106.1240
105.8930	105.6660	105.5410	105.3160	105.1930
105.0690	104.8440	104.8250	104.6070	104.3770
104.3660	104.1400	104.0230	103.9050	103.7910
103.6730	103.5660	103.4520	103.3350	103.1450
103.1000	102.9130	102.8680	102.6810	102.6450
102.5250	102.5160			

% time vector (hr) for large breaks

0.0000	0.0847	0.0864	0.0881	0.0897	0.0914	0.0931	0.0947	
0.0964	0.0981	0.0997	0.1014	0.1031	0.1047	0.1064	0.1081	0.1097
0.1139	0.1306	0.1472	0.1639	0.1806	0.1972	0.2139	0.2306	0.2472
0.2639	0.2806	0.2972	0.3139	0.3306	0.3472	0.3639	0.3806	0.3972
0.4139	0.4306	0.4472	0.4639	0.4806	0.4972	0.5139	0.5306	0.5472
0.5639	0.5806	0.5972	0.6139	0.6306	0.6472	0.6639	0.6806	0.6972
0.7139	0.7306	0.7472	0.7639	0.7806	0.7972	0.8139	0.8306	0.8472
0.8639	0.8806	0.8972	0.9139	0.9306	0.9472	0.9639	0.9806	0.9972
1.0139	1.0306	1.0472	1.0639	1.0806	1.3611	1.6944	2.0278	2.3611
2.6944	3.0278	3.3611	3.6944	4.0278	4.3611	4.6944	5.0278	5.3611
5.6944	6.0278	6.3611	6.6944	7.0278	7.3611	7.6944	8.0278	8.3611
8.6944	9.0278	9.3611	9.6944	10.0278	20.0833	32.0833	44.0833	56.0833
68.0833	80.0833	92.0833	104.0833	116.0833	128.0833	140.0833		
152.0833	164.0833	176.0833	188.0833	200.0833	212.0833	224.0833	236.0833	248.0833
252.0833	264.0833	276.0833	288.0833	300.0833	312.0833	324.0833	336.0833	348.0833
352.0833	364.0833	376.0833	388.0833	400.0833	412.0833	424.0833	436.0833	448.0833
452.0833	464.0833	476.0833	488.0833	500.0833	512.0833	524.0833	536.0833	548.0833
568.0833	580.0833	592.0833	604.0833	616.0833	628.0833	640.0833	652.0833	664.0833
680.0833	692.0833	704.0833	716.0833	728.0833	740.0833	752.0833	764.0833	776.0833
788.0833	800.0833	812.0833	824.0833	836.0833	848.0833	860.0833	872.0833	884.0833
896.0833	908.0833	920.0833	932.0833	944.0833	956.0833	968.0833	980.0833	992.0833
1004.0833	1016.0833	1028.0833	1040.0833	1052.0833	1064.0833	1076.0833	1088.0833	1100.0833
1112.0833	1124.0833	1136.0833	1148.0833	1160.0833	1172.0833	1184.0833	1196.0833	1208.0833
1216.0833	1228.0833	1240.0833	1252.0833	1264.0833	1276.0833	1288.0833	1300.0833	1312.0833
1324.0833	1336.0833	1348.0833	1360.0833	1372.0833	1384.0833	1396.0833	1408.0833	1420.0833
1432.0833	1444.0833	1456.0833	1468.0833	1480.0833	1492.0833	1504.0833	1516.0833	1528.0833
1544.0833	1556.0833	1568.0833	1580.0833	1592.0833	1604.0833	1616.0833	1628.0833	1640.0833
1652.0833	1664.0833	1676.0833	1688.0833	1700.0833	1712.0833	1724.0833	1736.0833	1748.0833
1760.0833	1772.0833	1784.0833	1796.0833	1808.0833	1820.0833	1832.0833	1844.0833	1856.0833
1868.0833	1880.0833	1892.0833	1904.0833	1916.0833	1928.0833	1940.0833	1952.0833	1964.0833
1976.0833	1988.0833	2000.0833	2012.0833	2024.0833	2036.0833	2048.0833	2060.0833	2072.0833
2084.0833	2096.0833	2108.0833	2120.0833	2132.0833	2144.0833	2156.0833	2168.0833	2180.0833
2192.0833	2204.0833	2216.0833	2228.0833	2240.0833	2252.0833	2264.0833	2276.0833	2288.0833
2300.0833	2312.0833	2324.0833	2336.0833	2348.0833	2360.0833	2372.0833	2384.0833	2396.0833
2408.0833	2420.0833	2432.0833	2444.0833	2456.0833	2468.0833	2480.0833	2492.0833	2504.0833
2516.0833	2528.0833	2540.0833	2552.0833	2564.0833	2576.0833	2588.0833	2600.0833	2612.0833
2624.0833	2636.0833	2648.0833	2660.0833	2672.0833	2684.0833	2696.0833	2708.0833	2720.0833
2732.0833	2744.0833	2756.0833	2768.0833	2780.0833	2792.0833	2804.0833	2816.0833	2828.0833
2840.0833	2852.0833	2864.0833	2876.0833	2888.0833	2900.0833	2912.0833	2924.0833	2936.0833
2948.0833	2960.0833	2972.0833	2984.0833	2996.0833	3008.0833	3020.0833	3032.0833	3044.0833
3056.0833	3068.0833	3080.0833	3092.0833	3104.0833	3116.0833	3128.0833	3140.0833	3152.0833
3164.0833	3176.0833	3188.0833	3200.0833	3212.0833	3224.0833	3236.0833	3248.0833	3260.0833
3272.0833	3284.0833	3296.0833	3308.0833	3320.0833	3332.0833	3344.0833	3356.0833	3368.0833
3380.0833	3392.0833	3404.0833	3416.0833	3428.0833	3440.0833	3452.0833	3464.0833	3476.0833
3488.0833	3500.0833	3512.0833	3524.0833	3536.0833	3548.0833	3560.0833	3572.0833	3584.0833
3596.0833	3608.0833	3620.0833	3632.0833	3644.0833	3656.0833	3668.0833	3680.0833	3692.0833
3704.0833	3716.0833	3728.0833	3740.0833	3752.0833	3764.0833	3776.0833	3788.0833	3800.0833
3812.0833	3824.0833	3836.0833	3848.0833	3860.0833	3872.0833	3884.0833	3896.0833	3908.0833
3920.0833	3932.0833	3944.0833	3956.0833	3968.0833	3980.0833	3992.0833	4004.0833	4016.0833
4028.0833	4040.0833	4052.0833	4064.0833	4076.0833	4088.0833	4100.0833	4112.0833	4124.0833
4136.0833	4148.0833	4160.0833	4172.0833	4184.0833	4196.0833	4208.0833	4220.0833	4232.0833
4244.0833	4256.0833	4268.0833	4280.0833	4292.0833	4304.0833	4316.0833	4328.0833	4340.0833
4352.0833	4364.0833	4376.0833	4388.0833	4400.0833	4412.0833	4424.0833	4436.0833	4448.0833
4460.0833	4472.0833	4484.0833	4496.0833	4508.0833	4520.0833	4532.0833	4544.0833	4556.0833
4568.0833	4580.0833	4592.0833	4604.0833	4616.0833	4628.0833	4640.0833	4652.0833	4664.0833
4676.0833	4688.0833	4700.0833	4712.0833	4724.0833	4736.0833	4748.0833	4760.0833	4772.0833
4784.0833	4796.0833	4808.0833	4820.0833	4832.0833	4844.0833	4856.0833	4868.0833	4880.0833
4892.0833	4904.0833	4916.0833	4928.0833	4940.0833	4952.0833	4964.0833	4976.0833	4988.0833
5000.0833	5012.0833	5024.0833	5036.0833	5048.0833	5060.0833	5072.0833	5084.0833	5096.0833
5108.0833	5120.0833	5132.0833	5144.0833	5156.0833	5168.0833	5180.0833	5192.0833	5204.0833
5216.0833	5228.0833	5240.0833	5252.0833	5264.0833	5276.0833	5288.0833	5300.0833	5312.0833
5324.0833	5336.0833	5348.0833	5360.0833	5372.0833	5384.0833	5396.0833	5408.0833	5420.0833
5432.0833	5444.0833	5456.0833	5468.0833	5480.0833	5492.0833	5504.0833	5516.0833	5528.0833
5540.0833	5552.0833	5564.0833	5576.0833	5588.0833	5600.0833	5612.0833	5624.0833	5636.0833
5648.0833	5660.0833	5672.0833	5684.0833	5696.0833	5708.0833	5720.0833	5732.0833	5744.0833
5756.0833	5768.0833	5780.0833	5792.0833	5804.0833	5816.0833	5828.0833	5840.0833	5852.0833
5864.0833	5876.0833	5888.0833	5900.0833	5912.0833	5924.0833	5936.0833	5948.0833	5960.0833
5972.0833	5984.0833	5996.0833	6008.0833	6020.0833	6032.0833	6044.0833	6056.0833	6068.0833
6080.0833	6092.0833	6104.0833	6116.0833	6128.0833	6140.0833	6152.0833	6164.0833	6176.0833
6188.0833	6200.0833	6212.0833	6224.0833	6236.0833	6248.0833	6260.0833	6272.0833	6284.0833
6296.0833	6308.0833	6320.0833	6332.0833	6344.0833	6356.0833	6368.0833	6380.0833	6392.0833
6404.0833	6416.0833	6428.0833	6440.0833	6452.0833	6464.0833	6476.0833	6488.0833	6500.0833
6512.0833	6524.0833	6536.0833	6548.0833	6560.0833	6572.0833	6584.0833	6596.0833	6608.0833
6620.0833	6632.0833	6644.0833	6656.0833	6668.0833	6680.0833	6692.0833	6704.0833	6716.0833
6728.0833	6740.0833	6752.0833	6764.0833	6776.0833	6788.0833	6800.0833	6812.0833	6824.0833
6836.0833	6848.0833	6860.0833	6872.0833	6884.0833	6896.0833	6908.0833	6920.0833	6932.0833
6944.0833	6956.0833	6968.0833	6980.0833	6992.0833	7004.0833	7016.0833	7028.0833	7040.0833
7052.0833	7064.0833	7076.0833	7088.0833	7100.				

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189.0923 188.5202 188.0148 187.5621 187.4103 187.0671
186.7330 186.4249 186.1559 186.7640 186.5012 186.2557
186.0555 185.9119 185.8265 185.8062 185.8495 185.9526
186.1092 187.8900 187.9673 187.9196 187.9119 187.9385
187.9954 188.0710 188.1647 188.2538 188.3385 188.4003
189.0996 188.9199 188.7439 188.5614 188.3622 188.1314
187.8597 187.5387 187.1667 186.7559 178.4091 171.8762
166.5421 162.2238 158.1410 154.9818 151.7673 148.9234
146.0834 143.7967 141.6054 139.5251 137.9892 136.4819
134.8865 136.9000 136.6489 135.3569 134.3103 133.2941
132.4453 131.9467 132.0536 132.1915 131.3055 130.7946
130.2765 123.0489 118.1991 114.9095 112.4170 110.4096
108.7290 107.2834 106.0152 104.8855 103.8671 102.9399
102.0890 101.3027 100.5720 99.8894 99.2491 98.6461 98.0763
97.5362 97.0229 96.5339 96.0669 95.6474 95.1520 94.7720 94.4055
93.9649 93.6254 93.2967 92.9000 92.5932 92.2953 92.0057 91.6547
91.3822 91.1168 90.7942 90.5432 90.2982 89.9998 89.7671 89.5396
89.2620 89.0452 88.8328 88.5733 88.3703 88.1712 87.9276 87.7368
87.5494 87.3198 87.1398 86.9628 86.7457 86.5753 86.4076 86.2427
86.0401

```

```

%-----
% NPSH parameters:
%   (specify any # of pipe segments in common header)
%
% major HL variables

% absolute roughness of the pipe (ft)
0.00015

% Number of Pipe Segments
6

% pipe diameters (ft)
1.27 .99 1.27 .84 1.27 .99

% pipe lengths (ft)
66.96 25.41 12.00 25.46 11.50 24.91

% depth of common header (ft)
25.83 25.65 25.83 % LPSI, HPSI, SPRY

% NPSH required for each pump (ft water)
12 12 12 % LPSI, HPSI, SPRY

% minor HL variables
% # of elbows, tees, entrances, and branches per pipe segment
%   [(# of 90 degree) (# of 45 degree) (# of gate valves) (# of entrances) (# of
%   tee runs) (# of tee branches)]

4 2 1 1 0 0 % segment AB
3 0 0 0 0 1 % segment BC
0 0 0 0 1 0 % segment BD
3 0 0 0 0 1 % segment DE
0 0 0 0 1 0 % segment DF
3 0 0 0 0 1 % segment FG

%-----
% Newly Added Options

% Use Old Degas Routine? (0 = No, 1 = Yes)
0

% Use Old NPSH Routine? (0 = No, 1 = Yes)
0

% Use Old SI Pump Flow Equation? (0 = No, 1 = Yes)
0

% Use Old Strainer Properties? (0 = No, 1 = Yes)

```


0

% Use Common Random Numbers Across Frequency Replications? (0 = No, 1 = Yes)
0

% Enable All Plots? (0 = No, 1 = Yes)
1

% Enable Parallel Calculations (0 = No, 1 = Yes)
% CAUTION - USE ONLY IF YOUR KNOW YOUR PC MEETS SPECIFICATIONS!!!!
0

% Number of Parallel Threads
4

% Use Optimal Frequency Bins for 15 Freps (0 = No, 1 = Yes)
1

% Use Old Debris Source Rate (Before Error Correction)? (0 = No, 1 = Yes)
1

% Use Old Latent Debris Transport Equations (Before Error Correction)? (0 = No, 1 = Yes)
1