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International Agreement Report

Application of RELAP5/MOD3.1 Code to the LOFT Test L3-6

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ABSTRACT

A calculation of LOFT Experiment L3-6, a small break equivalent to a 4-in. diameter rupture in the cold leg of a four-loop commercial pressurized water reactor, has been performed to help validate RELAP5/MOD3.1 for this application.

The version of the code to be used is SCDAP/RELAP5/MOD3.1.8d0.

Three calculations were carried out in order to study the sensitivity to change break nozzle superheated discharge coefficient.

Conducted comparative analysis of the LOFT L3-6 experiment shows on the whole a reasonable agreement between calculated and measured data. Some discrepancies in the system pressure do not distort a picture of the transient.

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1. INTRODUCTION.

An International Thermal-Hydraulic Code Assessment and Application Program (ICAP) is at present being conducted by several countries under the auspices of USNRC. The goal of the program is to make quantitative statements regarding the prediction capabilities of the current best-estimate thermal-hydraulic computer codes. Such codes have been used for many years as state-of-the art instruments to study and verify numerical and correlative computational models with experimental results. Some of these codes have reached a high degree sophistication. So far, however, these codes have not achieved status as reactor licensing tools. The present ICAP aims to quantify uncertainties in the codes so that the codes may be used for licensing purposes.

The SCDAP/RELAP5/MOD3.1 code has been chosen by RRC KI as tool for performing Nuclear Reactor Safety Analysis.

Before undertaking the formal plant calculations, the code is being tested in a wide range of experiments. This exercise is necessary to help identify and quantify any code shortcoming, in particular for the Russian types of reactors.

The LOFT L3-6 experiment has been chosen as a part of the Russian Thermal-Hydraulic best-estimate codes Verification Program.

The LOFT-experiment series L-3 was designed to provide large-scale blowdown system data for PWR small break transients. As part of the Russian ICAP contribution one experiment out of the L3 series was assigned. In the experiment treated in this report, the LOFT L3-6, the main circulation pumps were allowed to operate at normal speed throughout the test.

This calculation is to form part of assessment matrix for the RELAP5 code. This matrix seeks to cover the range of conditions likely to be found when calculating full scale plant transients, and this test, in particular, contains many features that are typical for small break accidents.

2. FACILITY AND TEST DESCRIPTION.

2.1. The LOFT for the L3-6 Experiment.

The LOFT (Loss-of-Fluid-Test) facility is a 50-MW(t) PWR with instrumentation to measure and provide data on the thermal-hydraulic conditions throughout the system. Operation of the LOFT system is typical of large [~ 1000 MW(e)] commercial PWR operations. The LOFT is a scaled down on a volume and a flow area of components and power representation of a PWR. The elevations were not preserved with several components. The LOFT facility consists of:

- A reactor vessel with an annular downcomer, a lower plenum, an upper plenum, and a nuclear core (5.5-ft length) with lower and support structure.
- An active intact loop with a steam generator, a pressurizer, and two parallel primary coolant pumps.
- A passive broken loop with a simulated steam generator and pump, and two pipelines (dead-ended or connected to blowdown assemblies for large breaks);
- A blowdown suppression system consisting of a header, suppression tank and a spray system.
- An emergency core coolant (ECC) injection system consisting of a low head safety injection pump, a high head safety injection pump, and an accumulator, and the associated pipework.

The Experiment L3-6 is one of Small Break Experiments Series L3 that was designed to provide large-scale blowdown system data for a PWR small break transient. In the L3-6 a small break is an offtake pipe, 34 mm in diameter, connected at right angles to the 14-in. cold leg of the active loop. This pipe contains a break orifice and leads to a valve and further to a blowdown suppression tank. The valve is opened to initiate a break. The flow out of the cold leg is choked at the break orifice that has an area (205.9 mm^2) corresponding to the flow area of a 4-in. diameter break (2.5%) in a commercial PWR.

In the L3-6 the accumulator and Low Pressure Injection System (LPIS) were not actuated, and the Pressure Injection System (HPIS) flow was directed to the reactor Downcomer.

The broken loop recirculation lines were isolated.

The primary coolant pumps were operated during the experiment. Cooling water was injected to the bearings of the pumps.

The Experiment L3-6 principal objective was to determine the primary system mass inventory and distribution as a function of time during the small break depressurization. The specific goal was to compare with similar Experiment L3-5 to see an influence of the pump run on a core uncover.

The LOFT main components and small break configuration are shown in Fig. 1 (Appendix C).

2.2. The L3-6 Experiment.

In the Experiment L3-6:

- The Pressurizer heaters were turned off prior to blowdown.
- The reactor with the power level 50 MW was scrammed ~ 6 s before blowdown initiation.
- When the control rods were fully inserted, blowdown was initiated from the cold leg.
- In secondary side termination of main feed water and MSCV (Main Steam Control Valve) closure were started at Scram signal.
- Auxiliary feed water was initiated at 73 s and terminated at 1856 s.
- The HPIS of the ECC injection system was initiated at 3.6 s after break on.
- The primary coolant pumps were automatically tripped at 2371.4 s, when the lowest indicated primary coolant hot leg pressure reached 2.15 MPa.

The Pump stop indicates the L3-6 finishing and beginning of another Experiment (L8-1).

3. THE CODE.

The code used in calculations is the latest version .8d0 of the SCDAP/RELAP5/MOD3.1. The version was received from INEL in the May 1994 according to the Agreement between RRC KI and US NRC. Code has been installed on the IBM PC486/DX2 with reducing of the main dynamic dimension (lfsize = 450000).

4. INPUT DECK DEVELOPMENT.

4.1. Noding.

As we only started to simulate the LOFT Experiments with the code RELAP5, and there is collected large experience of modelling and analysing of these transients transferred in many reports, so we used in this L3-6 calculation the traditional model as a basis of input data set. Hydrodynamic components and heat structures geometry data were taken from Input Dataset Reference Document /5/ prepared in Winfrith Centre. Initial conditions cards were added. Total configuration and numbering of components were preserved as in reference. Our corrected noding scheme is in Fig. 2.

The main modifications put in the developed input model are as follows:

In secondary side the component *separatr* was replaced with *branch*. Our experience shows that similar change permits to receive stable and rather realistic physical conditions in the Steam generator (accounting energy conservation);

In the Primary side the Downcomer and the Filler gap were divided in parallel flow channels feeding from the Intact loop and the Broken loop hot legs. Now the Downcomer is represented as 206 and 216 components, and the Filler gap is 208 and 218. Also, the inlet annulus of the vessel is divided in two parts: 200, 202, 204 and 210, 212, 214;

Cooling water injection to pumps feeds into volume 140;

The break unit is represented as a horizontal volume connecting the cold leg pipe (184 volume) with a crossflow junction and a discharge volume (805) with a valve junction (183). The break valve 183 has a fully opened area in 205.9 mm^2 and a choked flow flag.

4.2. Initial conditions.

The initial state of system before a scram signal was reached in the usual procedure. Preliminary distribution of temperatures and pressures were put down in an input deck, and time dependent volumes were applied as pressure controllers for the Steam Generator and the Pressurizer. In the Secondary side velocities were used in junction initial conditions cards.

The established conditions are compared to experimental magnitudes in Table 1 (Appendix B). The coolant temperatures in the Intact loop and the Steam Generator turned out to be a bit over the upper limit values. This excess was neglected because acceptable heat transfer through the Steam generator tube walls was achieved. The temperatures in the Broken loop and the other parameters were agreed with the L3-6 initial conditions measured values, within experimental uncertainties.

5. TRANSIENT ANALYSIS.

5.1. The Main Course of Transient.

When performing of post-test calculations, one has possibility to face to measured data. To run more successfully an experimental HPIS flow rate set on time was used in the transient. Rates of closure of the main steam valve (MSCV) and terminating of the main feed supply were adjusted to reach correct increase of the Steam Generator Dome pressure during the early stage of the transient (20 to 40 s) through the comparison to experimental pressure. Finally, main feed is terminated in 4 s after blowdown initiation and MSCV is closed in 10 s after blowdown. Information of the MSCV partial opening (14% of a full area) occurred on ~ 88 s after rupture was used in the steam line operation setting.

Useful references were discovered out from a report on the same Experiment analysis /4/. That are:

In the Experiment MSCV control logic incorrectly triggered on a noise at 88 s;

Recommendation of using 0.84 value as a two-phase choking multiplier at a break junction.

Our test runs with a two-phase discharge coefficient (0.82 to 0.88 variety) showed that 0.85 is rather suitable to the developed model. Thereby, the default value 1.0 was set for a subcooled coefficient, 0.85 for a two-phase coefficient. Transiting to single vapour flow regime was occurred in the transient run at ~860 s and the exercises with the restart point at the 800 s were conducted with a superheated coefficient value varied in a wide range: from 0.5 to 1.1. The run with the superheated multiplier equals to 0.6 presents as a base case. Two other runs with 0.76 and 1.0 values will be shown later.

The prepared input data set and restart transient files are enclosed in a full form (Appendix A).

Timings of main events are shown in comparison in Table 2.

5.2. Transient Results.

The results of the LOFT L3-6 RELAP5/MOD3.1.8d0 post-test calculations are shown in Appendix C.

As it was stated above, the substance of the L3-6 is the investigation of the system depressurization. Special attention is paid to the pressure response during the postulated transient.

The early stage of the transient is distinctive with emptying of the Pressurizer. As can be seen from Fig. 3, the liquid level in the Pressurizer was calculated to drop to 0.04 m, which was the uncertainty limit in the experimental measurement about 4 s later than occurred in the experiment. The calculated Pressurizer pressure, as shown in Fig. 4 was calculated to decrease

a little slower than occurred during the experiment. This difference is not enough to do search for whys. Then, the primary side pressure is checked out of the hot leg pressure (Fig. 5). Calculation plot goes close to experimental one until ~ 860 s. In the secondary pressure plot (Fig. 6) the occasional opening of MSCV is reflected into drops in pressure and liquid level (Fig. 7) at 100 s about for all the plots. The calculated value of the Steam Generator collapsed level is a little underestimated. This can be due to the voidage in the riser region or differences in geometric details between the input model and the reference being in the cross sectional area and height. However, divergence between a calculated and measured levels do not oversized 10 cm, that, on our opinion, is not important for the LOFT L3-6 experiment. The liquid level in the Upper plenum of the Reactor vessel (Fig. 8) is shown only for calculation. The HPIS flow rate (Fig. 10) was set in the input deck by table (on the measured data), and so it is presented for calculation only. Calculation temperature plots (Fig. 11 and 12) are not coincident with real plots exactly, in particular, for the reactor Downcomer temperature (Fig. 12). The cause of this distortion could be a slightly incorrect initial temperature state (as seen in Table 1).

Obvious discrepancies with the experiment becomes clear in the run when the second third of the transient starting, concerned to the mass flow rate through break orifice (Fig. 9) and the hot leg pressure (Fig. 5). At the time about 820 s the calculation shows sharp decrease of the primary system pressure. Non-realistic behaviour of the pressure can be explained with not absolutely correct simulation by the RELAP5 code of the critical discharge at transiting from a two-phase flow to a superheated vapour flow. As seen in Fig. S-8, at the time about 820 s calculation shows a instantaneous jump in void fraction of the discharge volume (snglvol 184) from about 0.6 up to 1.0. This leads to a sharp increase of the gas velocity (to 40 m/s) through break (Fig. S-7) and further to a primary system pressure fall (Fig. 5, S-2). At the same moment, the mass rate is perpendicular reduced (Fig. 9, S-1).

After the single vapour discharge began, the code produced a mass error. In Fig. S-5 one may see that *emass* parameter is negative and is increasing by magnitude after 860 s.

The coolant in the Primary side is at the saturation, so temperatures of the fluid (Fig. 11, 12, S-4) and of the cladding (Fig. 13, 14) have the shape which is similar to the primary pressure.

5.3. Sensitivity Calculations.

A few calculations were carried out in order to study sensitivity to variety of the superheated discharge coefficient. Three of them are shown in figures S-1 + S-4.

The main goal of this study is an attempt to avoid the non-realistic primary pressure decreasing, observed after 820 s. The superheated discharge coefficients in sensitivity studies demonstrated as the most interesting are 0.6, 0.76 and 1.0.

The reduction of superheated discharge coefficient from 1.0 up to 0.6 causes some reducing of the rate of pressure decreasing, but does not influences on the transient principle picture. However, for the magnitude of the superheated discharge coefficient in 0.6 some overestimating of the calculated primary system pressure during the last stage of the transient ($\tau > 2000$ s) is observed.

Varying in superheated coefficients is not depicted in the Secondary pressure (Fig. S-3).

6. RUN STATISTICS.

The input model for RELAP5/MOD3.1 calculation for the LOFT L3-6 encompassed:

- 136 Volumes
- 153 Junctions
- 144 Heat Structures
- 670 Total Mesh Points

The volumes include: 2 pump components, 8 time-dependent volumes of which two were used for the steady-state initiating. Among the junctions there are 3 valve components and 4 time dependent junctions.

During the transient calculation the following features were:

- Computer time CPU = 39040.4 sec,
- Number of time steps DT = 81532,
- Number of volumes C = 136

For Transient real time RT = 2400 sec.

Resulting in the following *grind time* (the code efficiency factor):

$$\text{Grind time} = \frac{CPU}{C \times DT} = 0.00352$$

The computer used was IBM PC486/DX2.

7. CONCLUSION.

The LOFT small break experiment L3-6 has been assessed with using the RELAP5/MOD3.1.8d0 code. Three sensitivity calculations were carried out with changes concerning the break junction superheated discharge coefficient.

The code predictions compare reasonably well with the experiment concerning to the first-hand parameters such as the system pressure, fluid temperatures and the Pressurizer and the Steam generator liquid levels.

In the calculated steady state, the experimental initial data were fairly well reproduced.

The predicted voiding start for the hot leg and for the cold leg of the Intact loop was in close agreement with the experiment.

Some discrepancies in the primary system pressure after the cold leg dried out took place. This behaviour of the primary system pressure can be explained as not correct the RELAP5/MOD3.1 code simulation of the vapour discharge flow at transiting from a two-phase flow to a superheated flow.

Two sensitivity calculations with different superheated discharge coefficients showed that changing of the superheated discharge coefficient from 1.0 up to 0.6 leads to some reduction of the rate of pressure decreasing. However, for the magnitude of the superheated discharge coefficient in 0.6 some overestimate of the primary system pressure at the final stage of the transient ($\tau > 2000$ s) is observed.

In general, a whole agreement between the experimental data and the code calculational values in performed simulation of the LOFT Experiment L3-6 was estimated as good. As many times noticed, the code RELAP5/MOD3 is really convenient in qualified simulation and estimating of a wide variety of operational and accident transients.

8. REFERENCES.

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SCDAP/RELAP5/MOD3.1 Code Manual. Volume V: Developmental Assessment (Draft). EG&G Idaho. NUREG/CR-6150.
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Appendix A

INPUT DATA SET

STEADY-STATE RUN

=LOFT Small Break Experiment L3-6

*

*

Assesment of RELAP5/MOD3.1
Against LOFT Small Break Experiment L3-6

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Initial Conditions

*

Power Level 50.00 ± 1.00 MW
Mass Flow Rate 483.30 ± 2.60 kg/s
Hot leg Presssure 14.87 ± 0.14 MPa

*

Intact Loop
Cold leg Temperature 557.90 ± 1.10 K
Hot leg Temperature 577.10 ± 1.80 K

*

Broken Loop
Cold leg Temperature 557.60 ± 2.60 K
Hot leg Temperature 561.40 ± 2.60 K

*

Pressurizer
Pressure 14.90 ± 0.25 MPa
Liquid Level 1.18 ± 0.11 m
Steam Volume 0.29 ± 0.06 m3
Liquid Volume 0.64 ± 0.06 m3
Liquid Temperature 614.70 ± 1.40 K

*

Steam Generator
Pressure 5.57 ± 0.06 MPa
Liquid Level 0.22 ± 0.03 m
(the liquid level is defined as 0.0 at 2.95 m
above the top of the tube sheet)
Liquid Temperature 542.80 ± 0.80 K
Mass Flow Rate 27.80 ± 0.10 kg/s

*

The Input deck is based on the LOFT facility informations,
on the Dataset developed by INEL for use with RELAP5/MOD1
and LOFT Input Dataset Reference Document for RELAP5
Validation Studies prepared by Winfrith Technology Center.

*

Modifications to the standard model:

*

1. The Downcomer model was changed to a split (2 - channel)
downcomer model and was renodalized to allow volume
boundaries to have the same elevation as core volume
boundaries.

*

2. The Break offtake was modelled with a cross-flow junction
from the main loop piping feeding into horizontal volume.
At the end of the horizontal volume a valve was included
discharging directly into a time dependent volume.

*

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*

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*

100 new stdy-st

*

*crdno gas_type
110 nitrogen

*

*crdno mas_fraction
115 1.0

*

*crdno vol_no elev liq_type system_name

120 100010000 0.0 h2o Primary

121 530010000 6.5269 h2o Second

*

*crdno time min_dt max_dt ctrl minor major restart

201 30.0 1.0-7 0.01 14003 10000 10000 10000

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Trip Input Data

401 - Auxiliary trip, always true

402 - Auxiliary trip, always false

403 - SCRAM Reactivity Table no 609

Main Steam Valve no 541 Close

Feed Water Valve no 566 Close

404 - Break time

405 & 601 - PCP off

406 & 602 - HPIS Start (Set Point P ≤ 13.16 MPa)

407 & 603 - Aux. Feed Water Start

604 - on while PRZ pressure set to steady-state

610 - MSCV Open trip (6.98 < P < 7.12)

613 - MSCV Close trip (6.57 < P < 6.50)

Auxiliary Trips :

*no var code rel var code const lin time on

401 time 0 ge null 0 -1.0 1 0.0

*

*no var code rel var code const lin time on

402 time 0 lt null 0 -1.0 1 -1.0

*

SCRAM

*no var code rel var code const lin time on

403 time 0 lt null 0 -1.0 1 -1.0

*

BREAK

*no var code rel var code const lin time on

404 time 0 ge timeof 403 6.0 n -1.0

*

PCP off

*no var code rel var code const lin time on

405 p 100010000 le null 0 2.15+6 n -1.0

*

*no trip_no rel trip_no lin time on

601 404 and 405 n -1.0

*

ECCS Control Logic

*no var code rel var code const lin time on

406 p 610010000 le null 0 13.16+6 n -1.0

*

*no trip_no rel trip_no lin time on

602 404 and 406 1 -1.0

*

Auxiliary Feed Water Logic

*no var code rel var code const lin time on

407 time 0 ge timeof 403 6.0 1 -1.0

*

*no trip_no rel trip_no lin time on

603 404 and 407 1 -1.0

*

Pressurizer Stady state controller

*no trip_no rel trip_no lin time on

604 -403 and -403 n 0.0

*

PCP Injection

*no var code rel var code const lin time on

408 p 100010000 ge null 0 2.15+6 1 -1.0

*

*no trip_no rel trip_no lin time on

605 -408 and -408 1 0.0

*

Main Steam Control Valve

*

```

* no trip_no rel trip_no lin time_on
606 -403 and -403 n 0.0
*
* no trip_no rel trip_no lin time_on
607 -606 and -606 n -1.0
*
* no var code rel var code const lin time_on
409 p 530010000 ge null 0 7.12+6 n -1.0
*
* no var code rel var code const lin time_on
410 p 530010000 ge null 0 6.98+6 n -1.0
*
* no var code rel var code const lin time_on
411 p 530010000 le null 0 6.50+6 n -1.0
*
* no var code rel var code const lin time_on
412 p 530010000 le null 0 6.57+6 n -1.0
*
* no var code rel var code const lin time_on
413 time 0 ge timeof 403 94.0 1 -1.0
*
* no var code rel var code const lin time_on
414 vlvarea 540 ge null 0 0.15 1 -1.0
*
* Open trip
* no trip_no rel trip_no lin time_on
608 609 and 410 n -1.0
*
* no trip_no rel trip_no lin time_on
609 409 or 608 n -1.0
*
* no trip_no rel trip_no lin time_on
*610 403 and 609 n -1.0
610 -414 and 413 n -1.0 * MSCV triggered on the noise
*
* Close trip
* no trip_no rel trip_no lin time_on
611 612 and 412 n -1.0
*
* no trip_no rel trip_no lin time_on
612 411 or 611 n -1.0
*
* no trip_no rel trip_no lin time_on
*613 403 or 612 n -1.0
613 403 and 414 n -1.0
*
*-----
*
* Intact Loop (Primary Side)
*-----
*
* Component no 100
* Reactor Vessel nozzle Intact Loop Hot Leg
*
*crdno name type
1000000 IHL-1 branch
*crdno no.juns. icc
1000001 3 1
*crdno area length volume h-ang v-ang delz
1000101 0.0 1.4458 0.09274 0.0 0.0 0.0
*crdno rough dhy pvbfe
1000102 4.0-5 0. 11000
*crdno ebt pressure temp
1000200 003 14.8816+6 579.371
*crdno from to area floss rloss fvcchs
1001101 252010003 100010001 0.0634 0.1 0.1 010000
* RPV->IHL
1002101 100010002 105010001 0.0634 0.085 0.085 010000
* IHL2->IHL2
1003101 100010001 185010002 0.0634 7200.0 7200.0 000000
* IHL->ICL
*crdno flowf flowg velj
1001201 471.00 0.0 0.0
1002201 482.99 0.0 0.0
1003201 -11.998 0.0 0.0
*-----

```

```

*
* Component no 105
* Intact Loop Hot leg to Pressurizer Tee
*
*crdno name type
1050000 IHL-2 snglvol
*crdno area length volume h-ang v-ang delz
1050101 0.06416 1.0866 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
1050102 4.0e-5 0.0 11000
*crdno ebt pressure temp
1050200 003 14.8742+6 579.368
*-----
*
* Component no 107
* Intact Loop Hot leg Pressurizer Tee
* (V107 = 0.25*F105+0.25*F110)
*
*crdno name type
1070000 IHL-PRZ branch
*crdno no.juns. icc
1070001 3 1
*crdno area length volume h-ang v-ang delz
1070101 0.0 0.5 0.03057 0.0 0.0 0.0
*crdno rough dhy pvbfe
1070102 4.0e-5 0. 11000
*crdno ebt pressure temp
1070200 003 14.8661+6 579.364
*crdno from to area floss rloss fvcchs
1071101 105010002 107010001 0.0 0.06 0.06 010000
1072101 107010002 110010001 0.0 0.06 0.06 010000
1073101 107010003 400010001 1.45-3 0.93 0.93 010000
*crdno flowf flowg velj
1071201 482.99 0.0 0.0
1072201 483.16 0.0 0.0
1073201 0.0 0.0 0.0
*-----
*
* Component no 110
* Intact Loop Hot leg from Pressurizer Tee
*
*crdno name type
1100000 IHL-3 branch
*crdno no.juns. icc
1100001 1 1
*crdno area length volume h-ang v-ang delz
1100101 0.0 0.8561 0.049782 0.0 0.0 0.0
*crdno rough dhy pvbfe
1100102 4.0e-5 0. 11000
*crdno ebt pressure temp
1100200 003 14.8570+6 579.360
*crdno from to area floss rloss fvcchs
1101101 110010002 112010001 0.0 0.15 0.15 010000
*crdno flowf flowg velj
1101201 483.16 0.0 0.0
*-----
*
* Component no 112
* Intact Loop Hot leg elbow and half of Reducer
*
*crdno name type
1120000 IHL-4 pipe
*crdno numb_vol
1120001 2
*crdno area vol.
1120101 0.0 2
*crdno length vol.
1120301 1.3889 1
1120302 0.70769 2
*crdno volume vol.
1120401 0.079697 1
1120402 0.057961 2
*crdno v-ang vol.
1120601 0.0 1
1120602 90.0 2
*crdno elev vol.

```

```

1120701 0.0 1
1120702 0.246 2
*crdno rgh dhy vol.
1120801 4.0-5 0.0 2
*crdno floss rloss jun
1120901 0.2 0.2 1
*crdno pvbfe vol.
1121001 11000 2
*crdno fvcchs jun.
1121101 000000 1
*crdno ebt pressure temp a4 a5 a6 vol.no
1121201 003 14.8456+6 579.355 0.0 0.0 0.0 1
1121202 003 14.8581+6 579.362 0.0 0.0 0.0 2
*crdno cti
1121300 1
*crdno flowf flowg velj jun
1121301 483.15 0.0 0.0 1
*
*
* Component no 114
* Intact Loop SG Inlet Plenum
*
*crdno name type
1140000 IHL-SGIn branch
*crdno no.juns. icc
1140001 2 1
*crdno area length volume h-ang v-ang delz
1140101 0.0 0.63 0.3227 0.0 90.0 0.513
*crdno rough dhy pvbfe
1140102 4.0-5 1.022-2 11000
*crdno ebt pressure temp
1140200 003 14.7721+6 579.334
*crdno from to area floss rloss fvcchs
1141101 112020002 114010001 0.0512 0.0 0.0 000100
1142101 114010002 115010001 0.0 0.0 0.0 000100
*crdno flowf flowg velj
1141201 483.15 0.0 0.0
1142201 483.12 0.0 0.0
*
*
* Component no 115
* Intact Loop SG Tubes
*
*crdno name type
1150000 SG-Tubes pipe
*crdno numb_vol
1150001 10
*crdno area vol.
1150101 0.1513 10
*crdno length vol.
1150301 0.5972 1
1150302 0.3048 2
1150303 0.6096 4
1150304 0.4612 6
1150305 0.6096 8
1150306 0.3048 9
1150307 0.5972 10
*crdno volume vol.
1150401 0.0 10
*crdno v-ang vol.
1150601 90.0 5
1150602 -90.0 10
*crdno elev vol.
1150701 0.5972 1
1150702 0.3048 2
1150703 0.6096 4
1150704 0.4612 5
1150705 -0.4612 6
1150706 -0.6096 8
1150707 -0.3048 9
1150708 -0.5972 10
*crdno rgh dhy vol.
1150801 2.50-6 1.022-2 10
*crdno floss rloss jun
1150901 0.0 0.0 9
*crdno pvbfe vol.

```

```

1151001 00000 10
*crdno fvcchs jun.
1151101 000000 9
*crdno ebt pressure temp a4 a5 a6 vol.no
1151201 003 14.7552+6 577.375 0.0 0.0 0.0 1
1151202 003 14.7470+6 575.605 0.0 0.0 0.0 2
1151203 003 14.7387+6 572.561 0.0 0.0 0.0 3
1151204 003 14.7276+6 569.922 0.0 0.0 0.0 4
1151205 003 14.7179+6 568.018 0.0 0.0 0.0 5
1151206 003 14.7128+6 566.269 0.0 0.0 0.0 6
1151207 003 14.7109+6 564.198 0.0 0.0 0.0 7
1151208 003 14.7087+6 562.288 0.0 0.0 0.0 8
1151209 003 14.7071+6 561.321 0.0 0.0 0.0 9
1151210 003 14.7055+6 560.282 0.0 0.0 0.0 10
*crdno cti
1151300 1
*crdno flowf flowg velj jun
1151301 483.11 0.0 0.0 1
1151302 483.11 0.0 0.0 2
1151303 483.11 0.0 0.0 3
1151304 483.10 0.0 0.0 4
1151305 483.10 0.0 0.0 5
1151306 483.10 0.0 0.0 6
1151307 483.10 0.0 0.0 7
1151308 483.09 0.0 0.0 8
1151309 483.09 0.0 0.0 9
*
*
* Component no 116
* Intact Loop SG outlet Plenum
*
*crdno name type
1160000 IHL-SGOu branch
*crdno no.juns. icc
1160001 2 1
*crdno area length volume h-ang v-ang delz
1160101 0.0 0.63 0.335 0.0 -90.0 -0.513
*crdno rough dhy pvbfe
1160102 4.0-5 1.022-2 11000
*crdno ebt pressure temp
1160200 003 14.7087+6 560.281
*crdno from to area floss rloss fvcchs
1161101 115100002 116010001 0.0 0.0 0.0 000100
1162101 116010002 118010001 0.0 0.0 0.0 000100
*crdno flowf flowg velj
1161201 483.09 0.0 0.0
1162201 483.09 0.0 0.0
*
*
* Component no 118
* Intact Seal Loop #1
* 52 degree elbow, half of Reducer, 90 degree elbow
*
*crdno name type
1180000 ISL-1 pipe
*crdno numb_vol
1180001 3
*crdno area vol.
1180101 0.0 2
1180102 0.0634 3
*crdno length vol.
1180301 0.547 1
1180302 0.689 2
1180303 0.550 3
*crdno volume vol.
1180401 0.0437 1
1180402 0.0462 2
1180403 0.0 3
*crdno v-ang vol.
1180601 -90.0 3
*crdno elev vol.
1180701 -0.498 1
1180702 -0.689 2
1180703 -0.356 3
*crdno rgh dhy vol.
1180801 4.0-5 0.0 3

```

```

*
*crdno floss rloss jun
1180901 0.083 0.083 1
1180902 0.104 0.104 2
*crdno pvbfe vol.
1181001 11000 3
*crdno fvcchs jun.
1181101 000000 2
*crdno ebt pressure temp a4 a5 a6 vol.no
1181201 003 14.6787+6 560.269 0.0 0.0 0.0 1
1181202 003 14.6692+6 560.264 0.0 0.0 0.0 2
1181203 003 14.6640+6 560.261 0.0 0.0 0.0 3
*crdno ctl
1181300 1
*crdno flowf flowg velj jun
1181301 483.09 0.0 0.0 2
*
*
* Component no 120
* Intact Seal Loop #2: Pipe, Inlet to pump suction
*
*crdno name type
1200000 ISL-2 branch
*crdno no.juns. icc
1200001 3 1
*crdno area length volume h-ang v-ang delz
1200101 6.34-2 0.76 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
1200102 4.0-5 0.0 11000
*crdno ebt pressure temp
1200200 003 14.6602+6 560.257
*crdno from to area floss rloss fvcchs
1201101 118030002 120010001 0.0 0.1 0.1 000000
1202101 120010002 125010001 0.0317 0.4 0.4 000000
*PCP #1
1203101 120010002 155010001 0.0317 0.4 0.4 000000
*PCP #2
*crdno flowf flowg velj
1201201 483.09 0.0 0.0
1202201 232.15 0.0 0.0
1203201 250.94 0.0 0.0
*
*
* Component no 125
* Intact Loop : Half of Pump Suction, elbow
*
*crdno name type
1250000 PCP1_Suc branch
*crdno no.juns. icc
1250001 1 1
*crdno area length volume h-ang v-ang delz
1250101 0.0 1.003 0.0613 0.0 90.0 0.521
*crdno rough dhy pvbfe
1250102 4.0-5 0. 11000
*crdno ebt pressure temp
1250200 003 14.6725+6 560.257
*crdno from to area floss rloss fvcchs
1251101 125010002 130010001 0.0 0.13 0.13 000000
*crdno flowf flowg velj
1251201 232.15 0.0 0.0
*
*
* Component no 130
* Intact Loop : Half of Reducer, PCP 1 inlet
*
*crdno name type
1300000 PCP1-In singvol
*crdno area length volume h-ang v-ang delz
1300101 0.0 0.457 0.0189 0.0 90.0 0.457
*crdno rough dhy pvbfe
1300102 4.0e-5 0.0 11000
*crdno ebt pressure temp
1300200 003 14.6543+6 560.249
*
*
* Component no 135

```

```

*PCP #1
*
*crdno name type
1350000 PCP-1 pump
*crdno area length volume h-ang v-ang delz pvbfe
1350101 0.0366 0.0 0.099 0.0 90.0 0.319 00000
*crdno from area floss rloss fvcchs
1350108 130010002 0.0 0.017 0.017 000000
*crdno to area floss rloss fvcchs
1350109 140010001 0.0 0.05 0.05 000000
*crdno ebt pressure temp
1350200 003 14.8996+6 560.383
*crdno flag flowf flowg velj
1350201 1 232.15 0.0 0.0
1350202 1 232.15 0.0 0.0
*crdno id 2faz 2fazd torq pvel ptrip rvrs
1350301 0 0 0 -1 -1 601 0
*crdno rpvel initv rflo rhead rtorg momi
1350302 369. 0.889 0.3155 96. 500.6 1.431
*crdno rdens rpmtrorg tf2 tf0 tf1 tf3
1350303 613.6 0.0 207.433 0.004 19.598 0.0
*crdno rspeed I3 I2 I1 I0
1350308 0.212465 0.0 -25.0 29.5 6.28
*crdno time-stop max_fvel max_rvel
1350310 0.0 0.0 0.0
*
* Pump Data
*
* Single Phase Head Curves
*
* head curve no 1
*
*crdno curve type curve regime
1351100 1 1
* g/gnom h/hnom
1351101 0.00000 1.4036
1351102 0.19061 1.3636
1351103 0.38963 1.3186
1351104 0.59396 1.2328
1351105 0.79020 1.1336
1351106 1.00000 1.0000
*
* head curve no 2
*
*crdno curve type curve regime
1351200 1 2
* g/gnom h/hnom
1351201 0.00000 -0.67000
1351202 0.20000 -0.50000
1351203 0.40000 -0.25000
1351204 0.57554 0.00000
1351205 0.74432 0.25830
1351206 0.77348 0.37780
1351207 0.86313 0.63260
1351208 1.00000 1.00000
*
* head curve no 3
*
*crdno curve type curve regime
1351300 1 3
* g/gnom h/hnom
1351301 -1.00000 2.4722
1351302 -0.80574 2.0474
1351303 -0.60690 1.8310
1351304 -0.40683 1.6240
1351305 -0.20017 1.4705
1351306 0.00000 1.4036
*
* head curve no 4
*
*crdno curve type curve regime
1351400 1 4
* g/gnom h/hnom
1351401 -1.00000 2.472200
1351402 -0.82297 1.996800

```

1351403	-0.63332	1.589700
1351404	-0.45534	1.327900
1351405	-0.27109	1.194900
1351406	-0.17716	1.060500
1351407	-0.090730	1.015600
1351408	0.000000	0.934279

*
* head curve no 5
*

*crdno	curve type	curve regime
1351500	1	5
g/gnom h/hnom		
1351501	0.000000	0.2500
1351502	0.200000	0.2800
1351503	0.400000	0.3400
1351504	0.411800	0.2768
1351505	0.597630	0.4584
1351506	0.793467	0.6992
1351507	0.000000	1.0000

*
* head curve no 6
*

*crdno	curve type	curve regime
1351600	1	6
g/gnom h/hnom		
1351601	0.000000	0.934279
1351602	0.091099	0.922900
1351603	0.186509	0.896300
1351604	0.271762	0.875000
1351605	0.455872	0.843300
1351606	0.574406	0.835000
1351607	0.740576	0.846600
1351608	0.766619	0.846900
1351609	0.871471	0.883800
1351610	1.000000	1.000000

*
* head curve no 7
*

*crdno	curve type	curve regime
1351700	1	7
g/gnom h/hnom		
1351701	-1.0000	-1.0000
1351702	-0.8000	-0.6300
1351703	-0.6000	-0.3000
1351704	-0.4000	-0.0500
1351705	-0.2000	0.1500
1351706	0.0000	0.2500

*
* head curve no 8
*

*crdno	curve type	curve regime
1351800	1	8
g/gnom h/hnom		
1351801	-1.00000	-1.00000
1351802	-0.80000	-0.97000
1351803	-0.60000	-0.95000
1351804	-0.40000	-0.88000
1351805	-0.20000	-0.80000
1351806	0.00000	-0.67000

*-----+
*! Single Phase Torque Data !
*-----+
*

* torque curve no 1
*

*crdno	curve type	curve regime
1351900	2	1
g/gnom h/hnom		
1351901	0.00000	0.60320
1351902	0.19300	0.63250
1351903	0.39300	0.73690
1351904	0.59552	0.83310
1351905	0.79782	0.92290
1351906	1.00000	1.00000

*

* torque curve no 2

*

*crdno	curve type	curve regime
1352000	2	2
g/gnom h/hnom		
1352001	0.00000	-0.670000
1352002	0.40000	-0.250000
1352003	0.50000	0.150000
1352004	0.73725	0.526586
1352005	0.76804	0.606594
1352006	0.86723	0.743660
1352007	1.00000	1.000000

*

* torque curve no 3

*

*crdno	curve type	curve regime
1352100	2	3
g/gnom h/hnom		
1352101	-1.00000	1.98430
1352102	-0.80096	1.39400
1352103	-0.60638	1.09750
1352104	-0.40686	0.82200
1352105	-0.19928	0.66480
1352106	0.00000	0.60320

*

* torque curve no 4

*

*crdno	curve type	curve regime
1352200	2	4
g/gnom h/hnom		
1352201	-1.000000	1.98430
1352202	-0.822340	1.83080
1352203	-0.633710	1.68240
1352204	-0.458530	1.55700
1352205	-0.267023	1.43620
1352206	-0.176107	1.38790
1352207	-0.089310	1.34810
1352208	0.000000	1.23361

*

* torque curve no 5

*

*crdno	curve type	curve regime
1352300	2	5
g/gnom h/hnom		
1352301	0.00000	-0.45000
1352302	0.40000	-0.25000
1352303	0.50000	0.00000
1352304	1.00000	0.35690

*

* torque curve no 6

*

*crdno	curve type	curve regime
1352400	2	6
g/gnom h/hnom		
1352401	0.000000	1.23361
1352402	0.090643	1.19650
1352403	0.188569	1.10960
1352404	0.273470	1.04160
1352405	0.458669	0.89580
1352406	0.574480	0.78070
1352407	0.738160	0.61340
1352408	0.768520	0.58490
1352409	0.870057	0.48770
1352410	1.000000	0.35690

*

* torque curve no 7

*

*crdno	curve type	curve regime
1352500	2	7
g/gnom h/hnom		
1352501	-1.00000	-1.00000
1352502	-0.30000	-0.90000
1352503	-0.10000	-0.50000
1352504	0.00000	-0.45000

*

* torque curve no 8


```

*
*crdno curve type curve regime
1352600 2 8
*
g/gnom h/hnom
1352601 -1.00000 -1.00000
1352602 -0.25000 -0.90000
1352603 -0.08000 -0.80000
1352604 0.00000 -0.67000

```

Two - Phase Multiplier Data
Head Curve

```

*crdno extr.ind
1353000 0
*
voidg head_mult
1353001 0.000 0.000000
1353002 0.020 0.020000
1353003 0.060 0.050000
1353004 0.100 0.100000
1353005 0.200 0.460000
1353006 0.240 0.800000
1353007 0.300 0.960000
1353008 0.400 0.980000
1353009 0.600 0.970000
1353010 0.800 0.900000
1353011 0.900 0.800000
1353012 0.960 5.000000
1353013 1.000 0.000000

```

Torque Curve

```

*crdno extr.ind
1353100 0
*
voidg torq_mult
1353101 0.00000 0.00000
1353102 0.12500 0.07000
1353103 0.16500 0.12500
1353104 0.24000 0.56000
1353105 0.80000 0.56000
1353106 0.96000 0.45000
1353107 1.00000 0.00000

```

Pump 2-Phase Difference Data

head curve no 1

```

*crdno curve type curve regime
1354100 1 1
*
g/gnom h/hnom
1354101 0.00000 0.00000
1354102 0.10000 0.83000
1354103 0.20000 1.09000
1354104 0.50000 1.02000
1354105 0.70000 1.01000
1354106 0.90000 0.94000
1354107 1.00000 1.00000

```

head curve no 2

```

*crdno curve type curve regime
1354200 1 2
*
g/gnom h/hnom
1354201 0.00000 0.00000
1354202 0.10000 -0.04000
1354203 0.20000 0.00000
1354204 0.30000 0.10000
1354205 0.40000 0.21000
1354206 0.80000 0.67000
1354207 0.90000 0.80000
1354208 1.00000 1.00000

```

head curve no 3

```

*crdno curve type curve regime
1354300 1 3
*
g/gnom h/hnom

```

```

1354301 -1.00000 -1.16000
1354302 -0.90000 -1.24000
1354303 -0.80000 -1.77000
1354304 -0.70000 -2.36000
1354305 -0.60000 -2.79000
1354306 -0.50000 -2.91000
1354307 -0.40000 -2.67000
1354308 -0.25000 -1.69000
1354309 -0.10000 -0.50000
1354310 0.00000 0.00000

```

head curve no 4

```

*crdno curve type curve regime
1354400 1 4
*
g/gnom h/hnom
1354401 -1.00000 -1.16000
1354402 -0.90000 -0.78000
1354403 -0.80000 -0.50000
1354404 -0.70000 -0.31000
1354405 -0.60000 -0.17000
1354406 -0.50000 -0.08000
1354407 -0.35000 0.00000
1354408 -0.20000 0.05000
1354409 -0.10000 0.08000
1354410 0.00000 0.11000

```

head curve no 5

```

*crdno curve type curve regime
1354500 1 5
*
g/gnom h/hnom
1354501 0.00000 0.00000
1354502 0.20000 -0.34000
1354503 0.40000 -0.65000
1354504 0.60000 -0.93000
1354505 0.80000 -1.19000
1354506 1.00000 -1.47000

```

head curve no 6

```

*crdno curve type curve regime
1354600 1 6
*
g/gnom h/hnom
1354601 0.00000 0.110000
1354602 0.10000 0.130000
1354603 0.25000 0.150000
1354604 0.40000 0.130000
1354605 0.50000 0.070000
1354606 0.60000 -0.040000
1354607 0.70000 -0.230000
1354608 0.80000 -0.510000
1354609 0.90000 -0.910000
1354610 1.00000 -1.470000

```

head curve no 7

```

*crdno curve type curve regime
1354700 1 7
*
g/gnom h/hnom
1354701 -1.00000 0.0000
1354702 0.00000 0.0000

```

head curve no 8

```

*crdno curve type curve regime
1354800 1 8
*
g/gnom h/hnom
1354801 -1.00000 0.0000
1354802 0.00000 0.0000

```

torque curve no 1

```

*crdno curve type curve regime
1354900 2 1
*
g/gnom h/hnom

```

1354901 0.00000 0.60320
 1354902 0.19300 0.63250
 1354903 0.39300 0.73690
 1354904 0.59552 0.83310
 1354905 0.79782 0.92290
 1354906 1.00000 1.00000

*
 * torque curve no 2
 *

*crdno curve type curve regime
 1355000 2 2
 * g/gnom h/hnom
 1355001 0.000000 -0.670000
 1355002 0.400000 -0.250000
 1355003 0.500000 0.150000
 1355004 0.737255 0.526586
 1355005 0.768049 0.606594
 1355006 0.867230 0.743660
 1355007 1.000000 1.000000

*
 * torque curve no 3
 *

*crdno curve type curve regime
 1355100 2 3
 * g/gnom h/hnom
 1355101 -1.00000 1.98430
 1355102 -0.80096 1.39400
 1355103 -0.60638 1.09750
 1355104 -0.40686 0.82200
 1355105 -0.19928 0.66480
 1355106 0.00000 0.60320

*
 * torque curve no 4
 *

*crdno curve type curve regime
 1355200 2 4
 * g/gnom h/hnom
 1355201 -1.000000 1.98430
 1355202 -0.822340 1.83080
 1355203 -0.633710 1.68240
 1355204 -0.458530 1.55700
 1355205 -0.267023 1.43620
 1355206 -0.176107 1.38790
 1355207 -0.089310 1.34810
 1355208 0.000000 1.23361

*
 * torque curve no 5
 *

*crdno curve type curve regime
 1355300 2 5
 * g/gnom h/hnom
 1355301 0.00000 -0.4500
 1355302 0.40000 -0.2500
 1355303 0.50000 0.0000
 1355304 1.00000 0.3569

*
 * torque curve no 6
 *

*crdno curve type curve regime
 1355400 2 6
 * g/gnom h/hnom
 1355401 0.000000 1.23361
 1355402 0.090643 1.19650
 1355403 0.188569 1.10960
 1355404 0.273470 1.04160
 1355405 0.458669 0.89580
 1355406 0.574480 0.78070
 1355407 0.738160 0.61340
 1355408 0.768520 0.58490
 1355409 0.870057 0.48770
 1355410 1.000000 0.35690

*
 * torque curve no 7
 *

*crdno curve type curve regime
 1355500 2 7

* g/gnom h/hnom
 1355501 -1.00000 -1.00000
 1355502 -0.30000 -0.90000
 1355503 -0.10000 -0.50000
 1355504 0.00000 -0.45000

*
 * torque curve no 8
 *

*crdno curve type curve regime
 1355600 2 8
 * g/gnom h/hnom
 1355601 -1.00000 -1.00000
 1355602 -0.25000 -0.90000
 1355603 -0.08000 -0.80000
 1355604 0.00000 -0.67000

*
 * Component no 140
 * Intact Loop: Pump 1 outlet pipe, elbow
 *

*crdno name type
 1400000 PCP1-dsh snglvol
 *crdno area length volume h-ang v-ang delz
 1400101 0.0366 0.502 0.0 0.0 0.0 0.0
 *crdno rough dhy pvbfe
 1400102 4.0-5 0.0 11000
 *crdno ebt pressure temp
 1400200 003 15.1535+6 560.384

*
 * Component no 145
 * Intact Loop: Pipe, Reducer, PCP1 outlet
 *

*crdno name type
 1450000 PCP1-out branch
 *crdno no.juns. icc
 1450001 2 1
 *crdno area length volume h-ang v-ang delz
 1450101 0.0 1.4084 0.0633 0.0 0.0 0.0
 *crdno rough dhy pvbfe
 1450102 4.0e-5 0.0102 11000
 *crdno ebt pressure temp
 1450200 003 15.1251+6 560.384
 *crdno from to area floss rloss fvcchs
 1451101 140010002 145010001 0.0 0.0 0.0 000000
 1452101 145010002 150010001 0.0 0.1 0.1 000000
 *crdno flowf flowg velj
 1451201 232.24 0.0 0.0
 1452201 232.24 0.0 0.0

*
 * Component no 150
 * Intact Loop: PCP outlet tee
 *

*crdno name type
 1500000 PCP-out branch
 *crdno no.juns. icc
 1500001 2 1
 *crdno area length volume h-ang v-ang delz
 1500101 0.0634 0.4966 0.0 0.0 0.0 0.0
 *crdno rough dhy pvbfe
 1500102 4.0-5 0.0 11000
 *crdno ebt pressure temp
 1500200 003 15.0673+6 560.403
 *crdno from to area floss rloss fvcchs
 1501101 170010002 150010001 0.0183 0.1 0.1 000000
 1502101 150010002 175010001 0.0000 0.0 0.0 000000
 *crdno flowf flowg velj
 1501201 250.94 0.0 0.0
 1502201 483.18 0.0 0.0

*
 * Component no 155
 * Intact Loop: Hulf of PCP2 Suction, elbow
 *

```

*crdno  name  type
1550000  PCP1_Suc  branch
*crdno  no.juns.  icc
1550001  1  1
*crdno  area length volume h-ang v-ang delz
1550101  0.0 1.003 0.0613 0.0 90.0 0.521
*crdno  rough dhy pvbfe
1550102  4.0-5 0.0 11000
*crdno  ebt pressure temp
1550200  003 14.6685+6 560.261
*crdno  from to area floss rloss fvcchs
1551101  155010002 160010001 0.0 0.13 0.13 000000
*crdno  flowf flowg velj
1551201  250.94 0.0 0.0

```

```

*
* Component no 160
* Intact Loop : Half of Reducer, PCP 2 inlet
*

```

```

*crdno  name  type
1600000  PCP2-in  singvol
*crdno  area length volume h-ang v-ang delz
1600101  0.0 0.457 0.0189 0.0 90.0 0.457
*crdno  rough dhy pvbfe
1600102  4.0-5 0.0 11000
*crdno  ebt pressure temp
1600200  003 14.6478+6 560.252

```

```

*
* Component no 165
* PCP #2
*

```

```

*crdno  name  type
1650000  PCP-2  pump
*crdno  area length volume h-ang v-ang delz pvbfe
1650101  0.0366 0.0 0.099 0.0 90.0 0.319 00000
*crdno  from area floss rloss fvcchs
1650108  160010002 0.0 0.017 0.017 000000
*crdno  to area floss rloss fvcchs
1650109  170010001 0.0 0.05 0.05 000000
*crdno  ebt pressure temp
1650200  003 14.8642+6 560.379
*crdno  flag flowf flowg velj
1650201  1 250.94 0.0 0.0
1650202  1 250.94 0.0 0.0
*crdno  id 2faz 2fzdz torq pvel ptrip rvrs
1650301  135 135 135 -1 -1 601 0
*crdno  rpvel initv rflo rhead rtorg momi
1650302  369. 0.892 0.3155 96. 500.6 1.431
*crdno  rdens rpmtrorg tf2 tf0 tf1 tf3
1650303  613.6 0.0 207.433 0.0444 19.5987 0.0
*crdno  rspeed l3 l2 l1 l0
1650308  0.212465 0.0 -25.0 29.5 6.28
*crdno  time-stop max_fvel max_rvel
1650310  0.0 0.0 0.0

```

```

*
* Component no 170
* Intact Loop: Pump 2 elbow, inlet of PCP outlet
*

```

```

*crdno  name  type
1700000  PCP2-out  branch
*crdno  no.juns.  icc
1700001  0 1
*crdno  area length volume h-ang v-ang delz
1700101  0.0366 0.514 0.0 0.0 0.0 0.0
*crdno  rough dhy pvbfe
1700102  4.0-5 0.0 11000
*crdno  ebt pressure temp
1700200  003 15.0879+6 560.455

```

```

*
* Component no 175
* Intact Loop: 90 degree elbow, Pipe section, elbow
*
*crdno  name  type

```

```

1750000  ICL-1  pipe
*crdno  numb_vol
1750001  2
*crdno  area vol.
1750101  0.0634 2
*crdno  length vol.
1750301  0.559 1
1750302  0.613 2
*crdno  v-ang vol.
1750601  0.0 2
*crdno  rgh dhy vol.
1750801  4.0-5 0.0 2
*crdno  floss rloss jun
1750901  0.0 0.0 1
*crdno  pvbfe vol.
1751001  11000 2
*crdno  fvcchs jun.
1751101  000000 1
*crdno  ebt pressure temp a4 a5 a6 vol.
1751201  003 15.0664+6 560.402 0.0 0.0 0.0 1
1751202  003 15.0654+6 560.400 0.0 0.0 0.0 2
*crdno  ctl
1751300  1
*crdno  flowf flowg velj jun
1751301  483.18 0.0 0.0 1

```

```

*
* Component no 180
* Intact Loop: Pipe to ECC Line
*

```

```

*crdno  name  type
1800000  ECC-Tee  branch
*crdno  no.juns.  icc
1800001  2 1
*crdno  area length volume h-ang v-ang delz
1800101  0.0 1.01 0.06406 0.0 0.0 0.0
*crdno  rough dhy pvbfe
1800102  4.0-5 0.0 11000
*crdno  ebt pressure temp
1800200  003 15.0640+6 560.396
*crdno  from to area floss rloss fvcchs
1801101  175020002 180010001 0.0 0.0 0.0 000000
1802101  180010002 184010001 0.0 0.0 0.0 000000
*crdno  flowf flowg velj
1801201  483.18 0.0 0.0
1802201  483.18 0.0 0.0

```

```

*
* Component no 182
* Break line ID=0.034m (1.3 in) from Break tee to Break orifice
*

```

```

*crdno  name  type
1820000  BRK-line  pipe
*crdno  numb_vol
1820001  1
*crdno  area vol.
1820101  9.0792-4 1
*crdno  length vol.
1820301  0.544 1
*crdno  v-ang vol.
1820601  0.0 1
*crdno  rgh dhy vol.
1820801  4.0-5 3.4-2 1
*crdno  pvbfe vol.
1821001  10000 1
*crdno  ebt pressure temp a4 a5 a6 vol.
1821201  003 15.0630+6 477.030 0.0 0.0 0.0 1

```

```

*
* Component no 183
* Break orifice - Simulated 4 in break of PWR (F = 205.6 mm2)
*

```

```

*crdno  name  type
1830000  brkvlv  valve
*crdno  from to area floss rloss fvcchs
1830101  182010002 805000000 205.6-6 0.4 0.4 000100

```

*crdno sub-dsh 2ph-dsh

1830102 1.0 0.85 0.6

*crdno ctl flowf flowg velj

1830201 1 0.0 0.0 0.0

*crdno name

1830300 mtrvlv

*crdno open_trip close_trip vlv_ch.r. in.pos

1830301 404 402 5.0 0.0

*

* Component no 805

* Break Discharge volume

*

*crdno name type

8050000 BRK-DSH tmdpvol

*crdno area length volume h-ang v-ang delz

8050101 3.5-3 1.0 0.0 0.0 0.0 0.0

*crdno rough dhy pvbfe

8050102 0.0 0.0 00000

*crdno ebt

8050200 002

*crdno time pressure quals

8050201 0.0 1.0+5 1.0

*

* Component no 184

* Intact Loop: Cold leg break Tee

*

*crdno name type

1840000 ICL-BTee branch

*crdno no.juns. icc

1840001 1 1

*crdno area length volume h-ang v-ang delz

1840101 0.0 0.284 0.01805 0.0 0.0 0.0

*crdno rough dhy pvbfe

1840102 4.0-5 0.0 11000

*crdno ebt pressure temp

1840200 003 15.0630+6 560.395

*crdno from to area floss rloss fvcchs

1841101 184010003 182010001 9.0792-4 0.5 0.5 000100

*crdno flowf flowg velj

1841201 0.0 0.0 0.0

*

* Component no 185

* Intact Loop: Pipe from ECC line, nozzle

*

*crdno name type

1850000 ICL-Vin branch

*crdno no.juns. icc

1850001 3 1

*crdno area length volume h-ang v-ang delz

1850101 0.0 1.152 0.07349 0.0 0.0 0.0

*crdno rough dhy pvbfe

1850102 4.0-5 0.0 11000

*crdno ebt pressure temp

1850200 003 15.0621+6 560.392

*crdno from to area floss rloss fvcchs

1851101 184010002 185010001 0.0 0.0 0.0 000000

1852101 185010002 202010003 0.0634 2.8 2.8 000000

1853101 185010002 208010001 0.0 52.0 52.0 000000

*crdno flowf flowg velj

1851201 483.18 0.0 0.0

1852201 426.45 0.0 0.0

1853201 44.736 0.0 0.0

*

* PCP Injection

*

* Component no 910

* PCP Injection Tank

*

*crdno name type

9100000 PCP-WAT tmdpvol

*crdno area length volume h-ang v-ang delz

9100101 7-3 1.0 0.0 0.0 0.0 0.0

*crdno rough dhy pvbfe

9100102 4.0-5 0.0 00000

*crdno ebt

9100200 001

*crdno time temp quals

9100201 0.0 305.0 0.0

*

* Component no 911

* PCP Injection Pump

*

*crdno name type

9110000 PCP-INJ tmdpjun

*crdno from to area

9110101 910000000 140010001 0.0

*crdno ctl trip

9110200 1 605

*crdno time flowf flowg velj

9110201 -1. 0.0 0.0 0.0

9110202 0.0 0.094 0.0 0.0

*

* Reactor Vessel

*

* Component no 200

* Reactor Vessel: Inlet Annulus, Upper (from intact loop (3/4))

*

*crdno name type

2000000 RV-In3-1 annulus

*crdno no.vol

2000001 1

*crdno area vol.

2000101 0.00 1

*crdno lenght vol.

2000301 0.1874 1

*crdno volume vol.

2000401 0.03766 1

*crdno angle vol.

2000601 90.0 1

*crdno rgh dhy vol.

2000801 4.0-5 0.172 1

*crdno pvbfe vol.

2001001 11000 1

*crdno ebt pressure temp a4 a5 a6 vol.

2001201 003 15.0132+6 558.966 0.0 0.0 0.0 1

*

* Component no 202

* Reactor Vessel: Inlet Annulus, middle (from intact loop (3/4))

*

*crdno name type

2020000 RV-In3-2 branch

*crdno no.juns. icc

2020001 2 1

*crdno area length volume h-ang v-ang delz

2020101 0.0 0.2852 0.05733 0.0 -90.0 -0.2852

*crdno rough dhy pvbfe

2020102 4.0-5 0.178 11000

*crdno ebt pressure temp

2020200 003 15.0149+6 560.372

*crdno from to area floss rloss fvcchs

2021101 202010001 200010001 0.0 0.0 0.0 000000

2022101 202010002 204010001 0.0 0.0 0.0 000000

*crdno flowf flowg velj

2021201 0.13167 0.0 0.0

2022201 319.80 0.0 0.0

*

* Component no 204

* Reactor Vessel: Inlet Annulus, lower (from intact loop (3/4))

*

*crdno name type

2040000 RV-In3-3 annulus

*crdno no.vol

```

2040001 1
*crdno area vol.
2040101 0.0 1
*crdno lenght vol.
2040301 0.2814 1
*crdno volume vol.
2040401 0.05656 1
*crdno angle vol.
2040601 -90.0 1
*crdno rgh dhy vol.
2040801 4.0-5 0.172 1
*crdno pvbfe vol.
2041001 11000 1
*crdno ebt pressure temp a4 a5 a6 vol.
2041201 003 15.0153+6 560.370 0.0 0.0 0.0 1
*
*
* Component no 205
* Reactor Vessel: Inlet Unnulus to Downcomer junction
*
*crdno name type
2050000 In-Dw snljun
*crdno from to area floss rloss fvcchs
2050101 204010002 206010001 0.0 0.0 0.0 000000
*crdno ctl flowf flowg velj
2050201 1 319.82 0.0 0.0
*
*
* Component no 206
* Reactor Vessel: Downcomer (from intact loop (3/4))
*
*crdno name type
2060000 DWC-3/4 annulus
*crdno no.vol
2060001 6
*crdno area vol.
2060101 0.1065 6
*crdno lenght vol.
2060301 0.958 1
2060302 0.579 2
2060303 0.657 3
2060304 0.559 5
2060305 0.520 6
*crdno vol vol.
2060401 0.0 6
*crdno angle vol.
2060601 -90. 6
*crdno rgh dhy vol.
2060801 4.0-5 0.102 6
*crdno floss rloss jun
2060901 0.0 0.0 5
*crdno pvbfe vol.
2061001 11000 6
*crdno fvcchs jun.
2061101 000000 5
*crdno ebt pressure temp a4 a5 a6 vol.
2061201 003 15.0151+6 560.363 0.0 0.0 0.0 1
2061202 003 15.0200+6 560.361 0.0 0.0 0.0 2
2061203 003 15.0240+6 560.359 0.0 0.0 0.0 3
2061204 003 15.0279+6 560.357 0.0 0.0 0.0 4
2061205 003 15.0315+6 560.355 0.0 0.0 0.0 5
2061206 003 15.0349+6 560.354 0.0 0.0 0.0 6
*crdno ctl
2061300 1
*crdno flowf flowg velj jun
2061301 319.82 0.0 0.0 1
2061302 319.82 0.0 0.0 2
2061303 319.81 0.0 0.0 3
2061304 319.81 0.0 0.0 4
2061305 319.81 0.0 0.0 5
*
*
* Component no 208
* Reactor Vessel: Vessel Filler Gap (from intact loop (3/4))
*
*crdno name type

```

```

2080000 FilG-3/4 annulus
*crdno no.vol
2080001 4
*crdno area vol.
2080101 0.02911 4
*crdno lenght vol.
2080301 1.382 1
2080302 1.236 2
2080303 1.118 3
2080304 1.250 4
*crdno volume vol.
2080401 0.0 4
*crdno angle vol.
2080601 -90. 4
*crdno rgh dhy vol.
2080801 4.0-5 0.0 4
*crdno floss rloss jun
2080901 0.0 0.0 3
*crdno pvbfe vol.
2081001 11000 4
*crdno fvcchs jun.
2081101 000000 3
*crdno ebt pressure temp a4 a5 a6 vo
2081201 003 15.0216+6 560.215 0.0 0.0 0.0 1
2081202 003 15.0312+6 560.070 0.0 0.0 0.0 2
2081203 003 15.0399+6 559.894 0.0 0.0 0.0 3
2081204 003 15.0486+6 559.758 0.0 0.0 0.0 4
*crdno ctl
2081300 1
*crdno flowf flowg velj jun
2081301 42.063 0.0 0.0 1
2081302 38.500 0.0 0.0 2
2081303 43.233 0.0 0.0 3
*
*
* Component no 210
* Reactor Vessel: Inlet Annulus, Upper (from broken loop (1/4))
*
*crdno name type
2100000 RV-In1-1 annulus
*crdno no.vol
2100001 1
*crdno area vol.
2100101 0.00 1
*crdno lenght vol.
2100301 0.1874 1
*crdno volume vol.
2100401 0.01255 1
*crdno angle vol.
2100601 90.0 1
*crdno rgh dhy vol.
2100801 4.0-5 0.172 1
*crdno pvbfe vol.
2101001 11000 1
*crdno ebt pressure temp a4 a5 a6 vol.
2101201 003 15.0132+6 558.160 0.0 0.0 0.0 1
*
*
* Component no 212
* Reactor Vessel: Inlet Annulus, middle (from broken loop (1/4))
*
*crdno name type
2120000 RV-In1-2 branch
*crdno no.juns. icc
2120001 2 1
*crdno area length volume h-ang v-ang delz
2120101 0.0 0.2852 0.01911 0.0 -90.0 -0.2852
*crdno rough dhy pvbfe
2120102 4.0-5 0.178 11000
*crdno ebt pressure temp
2120200 003 15.0149+6 560.364
*crdno from to area floss rloss fvcchs
2121101 212010001 210010001 0.0 0.0 0.0 000000
2122101 212010002 214010001 0.0 0.0 0.0 000000
*crdno flowf flowg velj
2121201 -0.12890 0.0 0.0

```

2122201 106.63 0.0 0.0

*

* Component no 214

* Reactor Vessel: Inlet Annulus, lower (from broken loop (3/4))

*

*crdno name type
2140000 RV-In1-3 annulus

*crdno no.vol

2140001 1

*crdno area vol.

2140101 0.0 1

*crdno lenght vol.

2140301 0.2814 1

*crdno volume vol.

2140401 0.01885 1

*crdno angle vol.

2140601 -90.0 1

*crdno rgh dhy vol.

2140801 4.0-5 0.172 1

*crdno pvbfe vol.

2141001 11000 1

*crdno ebt pressure temp a4 a5 a6 vol.

2141201 003 15.0153+6 560.362 0.0 0.0 0.0 1

*

* Component no 215

* Reactor Vessel: Inlet Unnulus to Downcomer junction

*

*crdno name type
2150000 In-Dw sngljun

*crdno from to area floss rloss fvcchs

2150101 214010002 216010001 0.0 0.0 0.0 000000

*crdno ctl flowf flowg velj

2150201 1 106.62 0.0 0.0

*

* Component no 216

* Reactor Vessel: Downcomer (from broken loop (1/4))

*

*crdno name type
2160000 DWC-1/4 annulus

*crdno no.vol

2160001 6

*crdno area vol.

2160101 3.55-2 6

*crdno lenght vol.

2160301 0.958 1

2160302 0.579 2

2160303 0.657 3

2160304 0.559 5

2160305 0.520 6

*crdno vol vol.

2160401 0.0 6

*crdno angle vol.

2160601 -90. 6

*crdno rgh dhy vol.

2160801 4.0-5 0.102 6

*crdno floss rloss jun

2160901 0.0 0.0 5

*crdno pvbfe vol.

2161001 11000 6

*crdno fvcchs jun.

2161101 000000 5

*crdno ebt pressure temp a4 a5 a6 vol.

2161201 003 15.0151+6 560.356 0.0 0.0 0.0 1

2161202 003 15.0200+6 560.354 0.0 0.0 0.0 2

2161203 003 15.0240+6 560.352 0.0 0.0 0.0 3

2161204 003 15.0279+6 560.351 0.0 0.0 0.0 4

2161205 003 15.0315+6 560.349 0.0 0.0 0.0 5

2161206 003 15.0349+6 560.348 0.0 0.0 0.0 6

*crdno ctl

2161300 1

*crdno flowf flowg velj jun

2161301 106.62 0.0 0.0 5

*

*

* Component no 218

* Reactor Vessel: Vessel Filler Gap (from intact loop (1/4))

*

*crdno name type
2180000 FilG-1/4 annulus

*crdno no.vol

2180001 4

*crdno area vol.

2180101 0.02911 4

*crdno lenght vol.

2180301 1.382 1

2180302 1.236 2

2180303 1.118 3

2180304 1.250 4

*

*crdno volume vol.

2180401 0.0 4

*crdno angle vol.

2180601 -90. 4

*crdno rgh dhy vol.

2180801 4.0-5 0.0 4

*crdno floss rloss jun

2180901 0.0 0.0 3

*crdno pvbfe vol.

2181001 11000 4

*crdno fvcchs jun.

2181101 000000 3

*crdno ebt pressure temp a4 a5 a6 vo

2181201 003 15.0216+6 559.742 0.0 0.0 0.0 1

2181202 003 15.0312+6 559.746 0.0 0.0 0.0 2

2181203 003 15.0399+6 559.590 0.0 0.0 0.0 3

2181204 003 15.0486+6 559.685 0.0 0.0 0.0 4

*crdno ctl

2181300 1

*crdno flowf flowg velj jun

2181301 2.6695 0.0 0.0 1

2181302 6.2288 0.0 0.0 2

2181303 1.4931 0.0 0.0 3

*

* Component no 219

* Reactor Vessel: Downcomer cross junction

*

*crdno name type
2190000 dc-junc mtpljun

*crdno jun.no ctrlw

2190001 13 0

*crdno from to area floss rloss fvcchs

2190011 200010003 210010003 0.0 0.0 0.0 000000

2190021 202010003 212010003 0.0 0.0 0.0 000000

2190031 204010003 214010003 0.0 0.0 0.0 000000

2190041 206010003 216010003 0.0 0.0 0.0 000000

2190051 208010003 218010003 0.0 0.0 0.0 000000

*crdno subc.d.c. 2ph.d.c. suph.d.c. from_incr to_incr zero jun.no

2190012 1.0 1.0 1.0 0 0 0 1

2190022 1.0 1.0 1.0 0 0 0 2

2190032 1.0 1.0 1.0 0 0 0 3

2190042 1.0 1.0 1.0 10000 10000 0 9

2190052 1.0 1.0 1.0 10000 10000 0 13

*crdno flowf flowg jun.no

2191011 0.12951 0.0 1

2191021 106.51 0.0 2

2191031 -1.18969-2 0.0 3

2191041 -4.21396-4 0.0 4

2191051 2.6724 0.0 5

2191061 -3.70813-4 0.0 6

2191071 3.5619 0.0 7

2191081 -1.94251-4 0.0 8

2191091 -4.7333 0.0 9

2191101 -6.78366-4 0.0 10

2191111 20.528 0.0 11

2191121 9.98058-4 0.0 12

2191131 -4.27175-3 0.0 13

*

* Component no 220
 * Reactor Vessel: Lower Plenum lower

*crdno name type
 2200000 LWPL-Dw branch
 *crdno no.juns. icc
 2200001 3 1
 *crdno area length volume h-ang v-ang delz
 2200101 0.790 0.370 0.0 0.0 90.0 0.370
 *crdno rough dhy pvbfe
 2200102 4.0-5 0.0 11000
 *crdno ebt pressure temp
 2200200 003 15.0346+6 559.842
 *crdno from to area floss rloss fvcchs
 2201101 208040002 220010001 0.0 45.0 45.0 000000
 2202101 218040002 220010001 0.0 45.0 45.0 000000
 2203101 220010002 222010001 0.0 0.0 0.0 000000
 *crdno flowf flowg velj
 2201201 22.702 0.0 0.0
 2202201 22.019 0.0 0.0
 2203201 44.703 0.0 0.0

* Component no 222
 * Reactor Vessel: Lower Plenum upper

*crdno name type
 2220000 LWPL-Dw branch
 *crdno no.juns. icc
 2220001 3 1
 *crdno area length volume h-ang v-ang delz
 2220101 0.740 0.360 0.0 0.0 90.0 0.360
 *crdno rough dhy pvbfe
 2220102 4.0-5 0.0 11000
 *crdno ebt pressure temp
 2220200 003 15.0319+6 560.311
 *crdno from to area floss rloss fvcchs
 2221101 206060002 222010002 0.0 2.0 2.0 000000
 2222101 216060002 222010002 0.0 2.0 2.0 000000
 2223101 222010002 225010001 0.15 1.5 1.5 000000
 *crdno flowf flowg velj
 2221201 319.82 0.0 0.0
 2222201 106.61 0.0 0.0
 2223201 471.12 0.0 0.0

* Component no 225
 * Reactor Vessel: Lower Core Support

*crdno name type
 2250000 Core_Sup branch
 *crdno no.juns. icc
 2250001 2 1
 *crdno area length volume h-ang v-ang delz
 2250101 0.250 0.520 0.0 0.0 90.0 0.520
 *crdno rough dhy pvbfe
 2250102 4.0-5 0.095 11000
 *crdno ebt pressure temp
 2250200 003 15.0163+6 560.304
 *crdno from to area floss rloss fvcchs
 2251101 225010002 230010001 0.0975 1.5 1.5 000000
 2252101 225010002 235010001 0.0 21.0 21.0 000000
 *crdno flowf flowg velj
 2251201 453.46 0.0 0.0
 2252201 17.655 0.0 0.0

* Component no 230
 * Reactor Vessel: Active Core

*crdno name type
 2300000 Core pipe
 *crdno no.vol
 2300001 6
 *crdno area vol.
 2300101 0.1705 6

*crdno length vol.
 2300301 0.2795 5
 2300302 0.3775 6
 *crdno volume vol.
 2300401 0.0 6
 *crdno v-ang vol.
 2300601 90.0 6
 *crdno rgh dhy vol.
 2300801 4.0-5 0.012 6
 *crdno floss rloss jun
 2300901 0.0 0.0 1
 2300902 0.66 0.66 2
 2300903 0.0 0.0 3
 2300904 0.66 0.66 4
 2300905 0.0 0.0 5
 *crdno pvbfe vol.
 2301001 00100 6
 *crdno fvcchs jun.
 2301101 000000 5
 *crdno ebt pressure temp a4 a5 a6 vol
 2301201 003 14.9878+6 560.859 0.0 0.0 0.0 1
 2301202 003 14.9827+6 563.736 0.0 0.0 0.0 2
 2301203 003 14.9745+6 568.584 0.0 0.0 0.0 3
 2301204 003 14.9693+6 574.042 0.0 0.0 0.0 4
 2301205 003 14.9609+6 578.573 0.0 0.0 0.0 5
 2301206 003 14.9548+6 580.588 0.0 0.0 0.0 6
 *crdno ctl
 2301300 1
 *crdno flowf flowg velj jun
 2301301 453.46 0.0 0.0 5

* Component no 235
 * Reactor Vessel: Core Bypass

*crdno name type
 2350000 Core_byp pipe
 *crdno no.vol
 2350001 3
 *crdno area vol.
 2350101 0.015 3
 *crdno length vol.
 2350301 0.559 2
 2350302 0.657 3
 *crdno volume vol.
 2350401 0.0 3
 *crdno v-ang vol.
 2350601 90.0 3
 *crdno rgh dhy vol.
 2350801 4.-5 0.003 3
 *crdno floss rloss jun
 2350901 0.0 0.0 2
 *crdno pvbfe vol.
 2351001 00000 3
 *crdno fvcchs jun.
 2351101 000000 2
 *crdno ebt pressure temp a4 a5 a6 vo
 2351201 003 14.9906+6 560.305 0.0 0.0 0.0 1
 2351202 003 14.9790+6 560.313 0.0 0.0 0.0 2
 2351203 003 14.9665+6 560.324 0.0 0.0 0.0 3
 *crdno ctl
 2351300 1
 *crdno flowf flowg velj jun
 2351301 17.654 0.0 0.0 2

* Component no 240
 * Reactor Vessel: Upper end Box center/support

*crdno name type
 2400000 core_low branch
 *crdno no.juns. icc
 2400001 2 1
 *crdno area length volume h-ang v-ang delz
 2400101 0.297 0.559 0.0 0.0 90.0 0.559

```

*crdno rough dhy pvbfe
2400102 4.0-5 0.145 00000
*crdno ebt pressure temp
2400200 003 14.9374+6 579.869
*crdno from to area floss rloss fvcchs
2401101 230060002 240010001 0.120 1.5 1.5 000000
2402101 235030002 240010001 0.0 21.0 21.0 000000
*crdno flowf flowg velj
2401201 453.45 0.0 0.0
2402201 17.653 0.0 0.0

```

```

*
*
* Component no 245
* Reactor Vessel: Upper Support X-flow

```

```

*crdno name type
2450000 Core_SUP branch
*crdno no.juns. icc
2450001 2 1
*crdno area length volume h-ang v-ang delz
2450101 0.297 0.559 0.0 0.0 90.0 0.559
*crdno rough dhy pvbfe
2450102 4.0-5 0.145 00000
*crdno ebt pressure temp
2450200 003 14.9334+6 579.869
*crdno from to area floss rloss fvcchs
2451101 240010002 245010001 0.0 0.0 0.0 000000
2452101 245010002 251010001 0.0 0.0 0.0 000000
*crdno flowf flowg velj
2451201 471.09 0.0 0.0
2452201 -1.38548-3 0.0 0.0

```

```

*
*
* Component no 250
* Reactor Vessel: Upper flow skirt vol

```

```

*crdno name type
2500000 Up-Skirt branch
*crdno no.juns. icc
2500001 1 1
*crdno area length volume h-ang v-ang delz
2500101 0.114 0.7004 0.0 0.0 90.0 0.7004
*crdno rough dhy pvbfe
2500102 4.0-5 0.131 00000
*crdno ebt pressure temp
2500200 003 14.9182+6 579.859
*crdno from to area floss rloss fvcchs
2501101 245010002 250010001 0.0 0.0 0.0 000000
*crdno flowf flowg velj
2501201 471.08 0.0 0.0

```

```

*
*
* Component no 251
* Reactor Vessel: Dead End Fuel Modules

```

```

*crdno name type
2510000 Dead_End snglvol
*crdno area length volume h-ang v-ang delz
2510101 0.183 0.700 0.0 0.0 90.0 0.700
*crdno rough dhy pvbfe
2510102 4.0-5 0.214 00000
*crdno ebt pressure temp
2510200 003 14.9307+6 577.402

```

```

*
*
* Component no 252
* Reactor Vessel: Upper Plenum lower

```

```

*crdno name type
2520000 UpPl-low branch
*crdno no.juns. icc
2520001 2 1
*crdno area length volume h-ang v-ang delz
2520101 0.201 0.2852 0.0 0.0 90.0 0.2852
*crdno rough dhy pvbfe
2520102 4.0-5 0.0 11000

```

```

*crdno ebt pressure temp
2520200 003 14.9249+6 579.864
*crdno from to area floss rloss fvcchs
2521101 252010002 255010001 0.0 0.006 0.006 000000
2522101 250010002 252010001 0.0 0.003 0.003 000000
*crdno flowf flowg velj
2521201 2.85066-2 0.0 0.0
2522201 471.07 0.0 0.0

```

```

*
*
* Component no 255
* Reactor Vessel: Upper plenum bottom

```

```

*crdno name type
2550000 UpPl-bot branch
*crdno no.juns. icc
2550001 1 1
*crdno area length volume h-ang v-ang delz
2550101 0.288 0.7114 0.0 0.0 90.0 0.7114
*crdno rough dhy pvbfe
2550102 4.0-5 0.0 11000
*crdno ebt pressure temp
2550200 003 14.9227+6 573.761
*crdno from to area floss rloss fvcchs
2551101 255010002 260010001 0.0 0.03 0.03 000000
*crdno flowf flowg velj
2551201 1.63408-2 0.0 0.0

```

```

*
*
* Component no 260
* Reactor Vessel: Upper plenum top

```

```

*crdno name type
2600000 UpPl-top snglvol
*crdno area length volume h-ang v-ang delz
2600101 0.244 0.712 0.0 0.0 90.0 0.712
*crdno rough dhy pvbfe
2600102 4.0-5 0.0 11000
*crdno ebt pressure temp
2600200 003 14.9177+6 572.721

```

```

*
* Broken Loop

```

```

*
*
* Component no 300
* Broken Loop: Vessel nozzle, Hot leg

```

```

*crdno name type
3000000 BHL-1 branch
*crdno no.juns. icc
3000001 2 1
*crdno area length volume h-ang v-ang delz
3000101 0.0634 0.876 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
3000102 4.0-5 0.0 11000
*crdno ebt pressure temp
3000200 003 14.9249+6 561.738
*crdno from to area floss rloss fvcchs
3001101 252010003 300010001 0.0634 0.0 0.0 000000
3002101 300010002 305010001 0.0 0.1 0.1 000000
*crdno flowf flowg velj
3001201 3.95983-2 0.0 0.0
3002201 3.81269-2 0.0 0.0

```

```

*
*
* Component no 305
* Broken Loop: BLHL to RABS Tee

```

```

*crdno name type
3050000 BHL-Tee branch
*crdno no.juns. icc
3050001 1 1
*crdno area length volume h-ang v-ang delz
3050101 0.0634 0.698 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe

```



```

3050102 4.0-5 0.0 11000
*crdno ebt pressure temp
3050200 003 14.9249+6 561.373
*crdno from to area floss rloss fvcchs
3051101 305010002 310010001 0.0 0.1 0.1 000000
*crdno flowf flowg velj
3051201 3.55093-2 0.0 0.0
*
*
* Component no 310
* Broken Loop: BLHL contraction
*
*crdno name type
3100000 BHL-Con branch
*crdno no.juns. icc
3100001 2 0
*crdno area length volume h-ang v-ang delz
3100101 0.0 1.5001 0.06785 0.0 0.0 0.0
*crdno rough dhy pvbfe
3100102 4.0-5 0.0 11000
*crdno ebt pressure temp
3100200 003 14.9249+6 561.158
*crdno from to area floss rloss fvcchs
3101101 380030002 310010003 0.0388 0.84 0.84 000000
3102101 310010002 315010001 8.365-3 0.0 0.0 000100
*crdno flowf flowg velj
3101201 -2.48442-2 0.0 0.0
3102201 5.27375-3 0.0 0.0
*
*
* Component no 315
* Broken Loop: Pipe to Isolation Valve
*
*crdno name type
3150000 BHL-end pipe
*crdno numb_vol
3150001 2
*crdno area vol.
3150101 0.0 2
*crdno j_area vol.
3150201 0.011086 1
*crdno length vol.
3150301 0.488 1
3150302 1.6085 2
*crdno volume vol.
3150401 0.00541 1
3150402 0.0777 2
*crdno v-ang vol.
3150601 0.0 2
*crdno rgh dhy vol.
3150801 4.0-5 0.0 2
*crdno floss rloss jun
3150901 0.0 0.0 1
*crdno pvbfe vol.
3151001 11000 2
*crdno fvcchs jun.
3151101 000100 1
*crdno ebt pressure temp a4 a5 a6 vol
3151201 003 14.9249+6 559.178 0.0 0.0 0.0 1
3151202 003 14.9249+6 561.476 0.0 0.0 0.0 2
*crdno ctl
3151300 1
*crdno flowf flowg velj jun
3151301 3.87772-3 0.0 0.0 1
*
*
* Component no 335
* Broken Loop: Vessel nozzle, Cold leg
*
*crdno name type
3350000 BCL-1 branch
*crdno no.juns. icc
3350001 2 1
*crdno area length volume h-ang v-ang delz
3350101 0.0634 0.7495 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe

```

```

3350102 4.0-5 0.0 11000
*crdno ebt pressure temp
3350200 003 15.0149+6 555.401
*crdno from to area floss rloss fvcchs
3351101 212010003 335010001 0.0634 1.0 1.0 000000
3352101 335010002 340010001 0.0 0.1 0.1 000000
*crdno flowf flowg velj
3351201 9.33549-3 0.0 0.0
3352201 6.78439-3 0.0 0.0
*
*
* Component no 340
* Broken Loop: BCL to RABS Tee
*
*crdno name type
3400000 BCL-Tee branch
*crdno no.juns. icc
3400001 1 1
*crdno area length volume h-ang v-ang delz
3400101 0.0634 0.698 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
3400102 4.0-5 0.0 11000
*crdno ebt pressure temp
3400200 003 15.0149+6 556.004
*crdno from to area floss rloss fvcchs
3401101 340010002 345010001 0.0 0.1 0.1 000000
*crdno flowf flowg velj
3401201 6.79018-3 0.0 0.0
*
*
* Component no 345
* Broken Loop: BCL Contraction
*
*crdno name type
3450000 BCL-Con branch
*crdno no.juns. icc
3450001 2 1
*crdno area length volume h-ang v-ang delz
3450101 0.0634 0.974 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
3450102 4.0-5 0.0 11000
*crdno ebt pressure temp
3450200 003 15.0149+6 556.005
*crdno from to area floss rloss fvcchs
3451101 345010003 370010001 0.0388 0.84 0.84 010000
3452101 345010002 350010001 0.0000 0.0 0.0 000000
*crdno flowf flowg velj
3451201 1.89770-3 0.0 0.0
3452201 4.91399-3 0.0 0.0
*
*
* Component no 350
* Broken Loop: BCL Pipe to Isolation Valve
*
*crdno name type
3500000 BCL-end pipe
*crdno numb_vol
3500001 2
*crdno area vol.
3500101 0.0 2
*crdno j_area vol.
3500201 0.011086 1
*crdno length vol.
3500301 0.488 1
3500302 1.6085 2
*crdno volume vol.
3500401 0.00541 1
3500402 0.0777 2
*crdno v-ang vol.
3500601 0.0 2
*crdno rgh dhy vol.
3500801 4.0-5 0.0 2
*crdno floss rloss jun
3500901 0.0 0.0 1
*crdno pvbfe vol.
3501001 11000 2

```

```

*crdno fvcchs jun.
3501101 000100 1
*crdno ebt pressure temp a4 a5 a6 vol
3501201 003 15.0149+6 553.227 0.0 0.0 0.0 1
3501202 003 15.0149+6 555.479 0.0 0.0 0.0 2
*crdno ctl
3501300 1
*crdno flowf flowg velj jun
3501301 3.61834-3 0.0 0.0 1
*
*
* Component no 370
* Broken Loop: RABS - BCL side
*
*crdno name type
3700000 RABS-BCL pipe
*crdno numb_vol
3700001 3
*crdno area vol.
3700101 0.0388 2
3700103 0.0776 3
*crdno j_area vol.
3700201 0.0388 2
*crdno length vol.
3700301 0.0 3
*crdno volume vol.
3700401 0.0279 1
3700402 0.0700 2
3700403 0.1165 3
*crdno v-ang vol.
3700601 90.0 1
3700602 0.0 3
*crdno elev vol.
3700701 0.64 1
3700702 0.0 3
*crdno rgh dhy vol.
3700801 4.0-5 0.0 3
*crdno floss rloss jun
3700901 0.28 0.28 1
3700902 0.84 0.84 2
*crdno pvtbf vol.
3701001 11000 3
*crdno fvcchs jun.
3701101 000000 2
*crdno ebt pressure temp a4 a5 a6 vol
3701201 003 15.0126+6 555.207 0.0 0.0 0.0 1
3701202 003 15.0102+6 556.003 0.0 0.0 0.0 2
3701203 003 15.0102+6 556.004 0.0 0.0 0.0 3
*crdno ctl
3701300 1
*crdno flowf flowg velj jun
3701301 -6.51096-5 0.0 0.0 1
3701302 -4.06750-5 0.0 0.0 2
*
*
* Component no 380
* Broken Loop: RABS - HCL side
*
*crdno name type
3800000 RABS-HCL pipe
*crdno numb_vol
3800001 3
*crdno area vol.
3800101 0.0776 1
3800102 0.0388 3
*crdno j_area jun.
3800201 0.0388 2
*crdno length vol.
3800301 0.0 3
*crdno volume vol.
3800401 0.0915 1
3800402 0.0480 2
3800403 0.0489 3
*crdno v-ang vol.
3800601 0.0 1
3800602 -90.0 2

```

```

3800603 0.0 3
*crdno elev vol.
3800701 0.0 1
3800702 -0.64 2
3800703 0.0 3
*crdno rgh dhy vol.
3800801 4.0-5 0.0 3
*crdno floss rloss jun
3800901 0.84 0.84 1
3800902 0.28 0.28 2
*crdno pvtbf vol.
3801001 11000 3
*crdno fvcchs jun.
3801101 000000 2
*crdno ebt pressure temp a4 a5 a6 vol
3801201 003 14.9201+6 552.801 0.0 0.0 0.0 1
3801202 003 14.9225+6 555.974 0.0 0.0 0.0 2
3801203 003 14.9249+6 556.052 0.0 0.0 0.0 3
*crdno ctl
3801300 1
*crdno flowf flowg velj jun
3801301 -2.51837-2 0.0 0.0 2
*
*
* Pressurizer
*
*
* Component no 400
* Pressurizer: PRZ Surge line - PCS side
*
*crdno name type
4000000 SURGE-1 snglvol
*crdno area length volume h-ang v-ang delz
4000101 0.00145 2.300 0.0 0.0 90.0 0.54
*crdno rough dhy pvtbf
4000102 4.0-5 0.0 01000
*crdno ebt pressure temp
4000200 003 14.8642+6 578.246
*
*
* Component no 401
* Pressurizer: Surge line pipe junction
*
*crdno name type
4010000 PRZ-J1 sngljun
*crdno from to area floss rloss fvcchs
4010101 400010002 405010001 0.0 0.93 0.93 000000
*crdno ctl flowf flowg velj
4010201 1 0.0 0.0 0.0
*
*
* Component no 405
* Pressurizer: Surge line
*
*crdno name type
4050000 SRG-Lin pipe
*crdno numb_vol
4050001 2
*crdno area vol.
4050101 0.0145 2
*crdno j_area jun.
4050201 0.00145 1
*crdno length vol.
4050301 2.30 2
*crdno volume vol.
4050401 0.0 2
*crdno v-ang vol.
4050601 90.0 2
*crdno elev vol.
4050701 0.30 2
*crdno rgh dhy vol.
4050801 4.00-5 0.0 2
*crdno floss rloss jun
4050901 0.00 0.00 1
*crdno pvtbf vol.
4051001 11000 2

```

```

*crdno fvcchs jun.
4051101 000000 1
*crdno ebt pressure temp a4 a5 a6 vol
4051201 003 14.8613+6 578.216 0.0 0.0 0.0 1
4051202 003 14.8592+6 578.320 0.0 0.0 0.0 2
*crdno ctl
4051300 1
*crdno flowf flowg velj jun
4051301 0.0 0.0 0.0 1
*
*
* Component no 410
* Pressurizer: Surge line Vessel junction
*
*crdno name type
4100000 SRG-PRZ sngljun
*crdno from to area floss rloss fvcchs
4100101 405010000 415000000 0.0 0.93 0.93 000000
*crdno ctl flowf flowg velj
4100201 1 0.0 0.0 0.0
*
*
* Component no 415
* Pressurizer: Vessel
*
*crdno name type
4150000 PRZ pipe
*crdno numb_vol
4150001 7
*crdno area vol.
4150101 0.0 2
4150102 0.5653 5
4150103 0.0 7
*crdno length vol.
4150301 0.1815 1
4150302 0.1524 2
4150303 0.3967 3
4150304 0.5289 4
4150305 0.3967 5
4150306 0.1943 6
4150307 0.1029 7
*crdno volume vol.
4150401 0.0684 1
4150402 0.0838 2
4150403 0.0 5
4150404 0.0732 6
4150405 0.0142 7
*crdno v-ang vol.
4150601 90.0 7
*crdno rgh dhy vol.
4150801 4.0-5 0.0 7
*crdno floss rloss jun
4150901 0.0 0.0 6
*crdno pvbfe vol.
4151001 00000 7
*crdno fvcchs jun.
4151101 000000 6
*crdno ebt pressure U-liq U-vap voidg a6 vol
4151201 000 14.8575+6 1.35929+6 2.46300+6 0.00000 0.0 1
4151202 000 14.8564+6 1.41666+6 2.46303+6 0.00000 0.0 2
4151203 000 14.8547+6 1.51541+6 2.46307+6 0.00000 0.0 3
4151204 000 14.8521+6 1.56096+6 2.46339+6 0.19875 0.0 4
4151205 000 14.8506+6 1.58069+6 2.46315+6 0.99976 0.0 5
4151206 000 14.8503+6 1.58068+6 2.46316+6 0.99984 0.0 6
4151207 000 14.8501+6 1.58067+6 2.46316+6 0.99983 0.0 7
*crdno ctl
4151300 1
*crdno flowf flowg velj jun
4151301 0.0 0.0 0.0 6
*
*
* Component no 420
* Pressurizer: PRZ-Top
*
*crdno name type
4200000 PRZ-Top branch

```

```

*crdno no.juns. icc
4200001 1 1
*crdno area length volume h-ang v-ang delz
4200101 0.0 0.1029 0.0142 0.0 90.0 0.1029
*crdno rough dhy pvbfe
4200102 4.5-5 0.0 00000
*crdno ebt pressure quals
4200200 002 14.8500+6 1.0
*crdno from to area floss rloss fvcchs
4201101 415070002 420010001 0.0 0.0 0.0 000000
*crdno flowf flowg velj
4201201 0.0 0.0 0.0
*
*
* Component no 421
* Pressurizer Pressure steady state controller
*
*crdno name type
4210000 PRZ-SS valve
*crdno from to area floss rloss fvcchs
4210101 420010002 422000000 0.0 0.0 0.0 000100
*crdno ctl flowf flowg velj
4210201 1 0.0 0.0 0.0
*crdno name
4210300 trpvlv
*crdno trip no
4210301 604
*
*
* Component no 422
* Pressurizer Pressure steady state controller
*
*crdno name type
4220000 PRZ-SS tmdpvvl
*crdno area length volume h-ang v-ang delz
4220101 0.0 0.1029 0.0142 0.0 0.0 0.0
*crdno rough dhy pvbfe
4220102 0.0 0.0 00000
*crdno ebt
4220200 002
*crdno time pressure quals
4220201 0.0 14.85+6 1.0
*
*
* Steam Generator Secondary Side
*
*
* Component no 500
* Steam Generator: Separator
*
*crdno name type
5000000 SG-SPR branch
*crdno no.juns. icc
5000001 3 0
*crdno area length volume h-ang v-ang delz
5000101 0.3063 0.4445 0.0 0.0 90.0 0.444
*crdno rough dhy pvbfe
5000102 1.0-5 0.0 00000
*crdno ebt pressure U-liq U-vap voidg
5000200 000 5.58347+6 1.18269+6 2.59302+6 0.94546
*crdno from to area floss rloss fvcchs
5001101 500010000 520000000 0.30630 0.000 0.000 001000
5002101 500000000 505000000 0.14024 0.000 0.000 001000
5003101 515010000 500000000 0.29187 2.404 2.404 001000
*crdno flowf flowg velj
5001201 -0.26663 3.4015 0.0
5002201 14.446 -9.44287-3 0.0
5003201 0.81508 6.2977 0.0
*
*
* Component no 502
* Steam Generator: Separator Bypass
*
*crdno name type
5020000 SG-SByp snglvvl
*crdno area length volume h-ang v-ang delz
5020101 2.212 0.4445 0.0 0.0 90.0 0.444

```

```

*crdno rough dhy pvbfe
5020102 1.0-5 0.0 11000
*crdno ebt pressure U-liq U-vap voidg
5020200 000 5.58411+6 1.18266+6 2.59323+6 1.00000
*
*
* Component no 505
* Steam Generator: Separator Outlet
*
*crdno name type
5050000 SG-SpOut branch
*crdno no.juns. icc
5050001 2 0
*crdno area length volume h-ang v-ang delz
5050101 0.0 1.2131 1.4850 0.0 -90.0 -1.2131
*crdno rough dhy pvbfe
5050102 1.0-5 1.9048 10000
*crdno ebt pressure U-liq U-vap voidg
5050200 000 5.58563+6 1.18200+6 2.59378+6 0.41630
*5050200 000 5.58563+6 1.18200+6 2.59378+6 0.38630
*crdno from to area floss rloss fvcchs
5051101 505010002 508010001 0.0 0.0 0.0 000100
5052101 505010001 502010001 0.0 0.0 0.0 000100
*crdno flowf flowg velj
5051201 0.34413 -0.34696 0.0
5052201 -0.19447 2.50132-5 0.0
*
*
* Component no 508
* Steam Generator: Feed Water Inlet
*crdno name type
5080000 SG-FWin branch
*crdno no.juns. icc
5080001 1 0
*crdno area length volume h-ang v-ang delz
5080101 0.0 0.6096 0.22107 0.0 -90.0 -0.6096
*crdno rough dhy pvbfe
5080102 1.0-5 0.163697 10000
*crdno ebt pressure U-liq U-vap voidg
5080200 000 5.59452+6 1.14526+6 2.59311+6 0.0000000
*crdno from to area floss rloss fvcchs
5081101 508010002 510010001 0.0 0.0 0.0 000100
*crdno flowf flowg velj
5081201 0.48538 0.61006 0.0
*
*
* Component no 510
* Steam Generator: Downcomer
*
*crdno name type
5100000 SG-DwCom annulus
*crdno no.vol
5100001 3
*crdno area vol.
5100101 0.297 3
*crdno length vol.
5100301 0.6096 3
*crdno volume vol.
5100401 0.0 3
*crdno v-ang vol.
5100601 -90. 3
*crdno elev. vol.
5100701 -0.6096 3
*crdno rgh dhy vol.
5100801 4.0-5 0.10793 3
*crdno floss rloss jun
5100901 0.0 0.0 2
*crdno pvbfe vol.
5101001 10000 3
*crdno fvcchs jun.
5101101 000000 2
*crdno ebt pressure U-liq U-vap voidg a6 vol
5101201 000 5.59914+6 1.14575+6 2.59308+6 0.00000 0.0 1
5101202 000 5.60379+6 1.14548+6 2.59305+6 0.00000 0.0 2
5101203 000 5.60844+6 1.14518+6 2.59301+6 0.00000 0.0 3
*crdno ctl

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```

5101300 0
*crdno flowf flowg velj jun
5101301 0.48549 0.61037 0.0 1
5101302 0.48544 0.61030 0.0 2
*
*
* Component no 513
* Steam Generator: Junction - Downcomer to Boiler
*
*crdno name type
5130000 J510-515 sngljun
*crdno from to area floss rloss fvcchs
5130101 510030002 515010001 0.258 17.5 17.5 000100
*crdno ctl flowf flowg velj
5130201 0 0.51857 0.88711 0.0
*
*
* Component no 515
* Steam Generator: Boiler
*
*crdno name type
5150000 SG-Boil pipe
*crdno numb_vol
5150001 6
*crdno area vol.
5150101 0.278 5
5150102 0.306294 6
*crdno jun.area jun.
5150201 0.258 5
*
*crdno length vol.
5150301 0.9144 2
5150302 1.8288 5
5150303 1.2131 6
*crdno volume vol.
5150401 0.0 6
*crdno v-ang vol.
5150601 60.0 5
5150602 90.0 6
*crdno elev. vol.
5150701 0.3048 2
5150702 0.6096 5
5150703 1.2131 6
*crdno rgh dhy vol.
5150801 1.0-5 0.0234 5
5150802 1.0-5 0.5962 6
*crdno floss rloss jun
5150901 2.0 2.0 2
5150902 4.05 4.05 5
*crdno pvbfe vol.
5151001 10000 6
*crdno fvcchs jun.
5151101 000100 5
*crdno ebt pressure U-liq U-vap voidg a6 vol
5151201 000 5.60791+6 1.17157+6 2.59302+6 0.23792 0.0 1
5151202 000 5.60575+6 1.18170+6 2.59295+6 0.39791 0.0 2
5151203 000 5.60293+6 1.18368+6 2.59297+6 0.54839 0.0 3
5151204 000 5.59822+6 1.18348+6 2.59294+6 0.53026 0.0 4
5151205 000 5.59291+6 1.18318+6 2.59299+6 0.59106 0.0 5
5151206 000 5.58687+6 1.18285+6 2.59302+6 0.53561 0.0 6
*crdno ctl
5151300 0
*crdno flowf flowg velj jun
5151301 0.67248 1.4019 0.0 1
5151302 0.82720 1.9798 0.0 2
5151303 1.0221 3.2469 0.0 3
5151304 0.90457 5.2295 0.0 4
5151305 0.97083 5.9829 0.0 5
*
*
* Component no 520
* Steam Generator: Lower portion of Steam Dome
*
*crdno name type
5200000 SG-StDlw branch
*crdno no.juns. icc

```

```

5200001 1 0
*crdno area length volume h-ang v-ang delz
5200101 0.27871 0.7180 0.0 0.0 90.0 0.718
*crdno rough dhy pvbfe
5200102 1.0-5 1.0827 10000
*crdno ebt pressure U-liq U-vap voidg
5200200 000 5.58361+6 1.18263+6 2.59306+6 0.99997
*crdno from to area floss rloss fvcchs
5201101 520010002 525010001 0.0 0.0 0.0 000100
*crdno flowf flowg velj
5201201 3.3231 3.5319 0.0
*-----
*
* Component no 525
* Steam Generator: Upper portion of Steam Dome
*
*crdno name type
5250000 SG-StDup branch
*crdno no.juns. icc
5250001 1 0
*crdno area length volume h-ang v-ang delz
5250101 1.5886 0.7620 0.0 0.0 90.0 0.762
*crdno rough dhy pvbfe
5250102 4.0-5 0.64417 11000
*crdno ebt pressure U-liq U-vap voidg
5250200 000 5.58346+6 1.18262+6 2.59312+6 0.99993
*crdno from to area floss rloss fvcchs
5251101 525010002 530010001 0.0 0.0 0.0 000000
*crdno flowf flowg velj
5251201 17.095 21.224 0.0
*-----
*
* Component no 530
* Steam Line: from SG to Control valve
*
*crdno name type
5300000 St-lin1 snglvol
*crdno area length volume h-ang v-ang delz
5300101 0.04635 25.074 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
5300102 4.0-5 0.0 00000
*crdno ebt pressure U-liq U-vap voidg
5300200 000 5.57198+6 1.18203+6 2.59312+6 0.99988
*-----
*
* Component no 540
* Steam Line: Main Steam Control Valve
* In the L3-6 transient valve opens at 88 sec after SCRAM to 15%
*crdno name type
5400000 St-MSCV valve
*crdno from to area floss rloss fvcchs
5400101 530010002 542000000 3.37-3 0.0 0.0 001100
*crdno ctl flowf flowg velj
5400201 1 0.0 0.0 0.0
*crdno name
5400300 mtrvlv
*crdno open_trip close_trip vlv_ch.r. init.pos
5400301 610 613 0.023333 0.0
*-----
*
* Component no 542
* Air Cooled Condenser
*
*crdno name type
5420000 Condens branch
*crdno no.juns. icc
*5420001 2 1
5420001 1 1
*crdno area length volume h-ang v-ang delz
5420101 3.37-3 17.67 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
5420102 4.0e-5 0. 00000
*crdno ebt pressure quals
5420200 002 2.0+6 1.0
*crdno from to area floss rloss fvcchs
5421101 542010002 544000000 0.0 0.0 0.0 001000

```

```

*crdno flowf flowg velj
5421201 0.0 0.0 0.0
*-----
*
* Component no 544
* Air Cooled Condenser
*
*crdno name type
5440000 Condens tmdpvol
*crdno area length volume h-ang v-ang delz
5440101 0.21677 17.67 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
5440102 4.0-5 0.02 00000
*crdno ebt
5440200 002
*crdno time pressure quals
5440201 0.0 2.00+6 1.0
*-----
*
* Component no 545
* Steam Line: Main Steam Control Valve
*
*crdno name type
5450000 St-MSCV valve
*crdno from to area floss rloss fvcchs
5450101 530010002 546000000 3.50-2 0.0 0.0 000100
*crdno ctl flowf flowg velj
5450201 0 10.753 21.268 0.0
*crdno name
5450300 mtrvlv
*crdno open_trip close_trip vlv_ch.r. init.pos
5450301 606 607 0.10 1.0
*-----
*
* Component no 546
* Air Cooled Condenser
*
*crdno name type
5460000 Condens tmdpvol
*crdno area length volume h-ang v-ang delz
5460101 0.21677 17.67 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
5460102 4.0-5 0.02 00000
*crdno ebt
5460200 002
*crdno time pressure quals
5460201 0.0 5.56+6 1.0
*-----
*
* Simplified Feed Water System
*-----
*
* Component no 565
* Feed Water Tank
*
*crdno name type
5650000 FW-Tank tmdpvol
*crdno area length volume h-ang v-ang delz
5650101 29.81 3.048 0.0 0.0 0.0 0.0
*crdno rough dhy pvbfe
5650102 4.0-5 0.0 00000
*crdno ebt
5650200 003
*crdno time pressure temp
5650201 0.0 7.0+6 510.00
*-----
*
* Component no 566
* Feed Water: Inlet flow
*
*crdno name type
5660000 FW-PUMP tmdpjwn
*crdno from to area
5660101 565000000 508010001 0.05
*crdno ctl trip
5660200 1 403

```

*crdno	time	flowf	flowg	velj
5660201	-1.	27.800	0.0	0.0
5660202	0.0	27.800	0.0	0.0
5660203	4.0	0.000	0.0	0.0

*
*
* Component no 568
* Feed Water: Auxiliary Feed Water Storage Tank
*

*crdno	name	type
5680000	FW-AUX	tmdpvcl

*crdno	area	length	volume	h-ang	v-ang	delz
5680101	29.81	3.048	0.0	0.0	0.0	0.0

*crdno	rough	dhy	pvbfe
5680102	4.0e-5	0.0	00000

*crdno	ebt
5680200	003

*crdno	time	pressure	temp
5680201	0.0	8.0+6	315.00

*
* Component no 569
* Feed Water: Auxiliary Feed Water Inlet Flow
*

*crdno	name	type
5690000	FW-AuxIn	tmdpjvn

*crdno	from	to	area
5690101	568000000	508010001	0.10

*crdno	ctl	trip no
5690200	1	603

*crdno	time	flowf	flowg	velj
5690201	-1.	0.0	0.0	0.0
5690202	73.0	0.0	0.0	0.0
5690203	73.4	0.50364	0.0	0.0
5690204	1856.0	0.50364	0.0	0.0
5690205	1857.0	0.0	0.0	0.0
5690206	2500.0	0.0	0.0	0.0

*
* ECC System (ECCS)
*

*
* Component no 605
* ECCS: ECC Check Valve
*

*crdno	name	type
6050000	ECC-CHKV	sngljvn

*crdno	from	to	area	floss	rioss	fvcahs
6050101	610010002	206010001	5.9896-3	0.935	0.935	001100

*crdno	ctl	flowf	flowg	velj
6050201	1	0.0	0.0	0.0

*
* Component no 610
* ECCS: ECC Header to PCS
*

*crdno	name	type
6100000	ECC-Head	snglvcl

*crdno	area	length	volume	h-ang	v-ang	delz
6100101	5.9896-3	5.0148	0.0	0.0	90.0	3.3071202

*crdno	rough	dhy	pvbfe
6100102	4.0-5	0.0	11000

*crdno	ebt	pressure	temp.
6100200	003	14.870+6	560.

*
* Component no 615
* HPIS: System A (HPIS A & B)
*

*crdno	name	type
6150000	HPIS	tmdpjvn

*crdno	from	to	area
6150101	620000000	610010001	0.009099

*crdno	ctl	trip
6150200	1	602

*crdno	time	flowf	flowg	velj
--------	------	-------	-------	------

6150201	-1.00	0.00	0.0	0.0
6150202	0.00	0.00	0.0	0.0
6150203	36.40	0.26	0.0	0.0
6150204	54.50	0.44	0.0	0.0
6150205	236.36	0.41	0.0	0.0
6150206	709.09	0.41	0.0	0.0
6150208	712.70	0.44	0.0	0.0
6150209	872.70	0.44	0.0	0.0
6150210	876.36	0.47	0.0	0.0
6150211	1049.17	0.47	0.0	0.0
6150212	1054.00	0.50	0.0	0.0
6150213	1218.00	0.50	0.0	0.0
6150214	1227.00	0.54	0.0	0.0
6150215	1554.00	0.54	0.0	0.0
6150216	1559.00	0.575	0.0	0.0
6150217	1759.00	0.575	0.0	0.0
6150218	1763.00	0.600	0.0	0.0
6150219	2036.00	0.600	0.0	0.0
6150220	2054.54	0.640	0.0	0.0
6150221	2135.80	0.640	0.0	0.0
6150222	2140.00	0.670	0.0	0.0
6150223	2500.00	0.670	0.0	0.0

*
* Component no 620
* HPIS: Borated Water Storage Tank
*

*crdno	name	type
6200000	BWST	tmdpvcl

*crdno	area	length	volume	h-ang	v-ang	delz
6200101	20.44	5.0	0.0	0.0	90.0	5.0

*crdno	rough	dhy	pvbfe
6200102	4.0-5	0.0	00000

*crdno	ebt
6200200	003

*crdno	time	pressure	temp
6200201	0.0	1.0+5	305.0

*
* Heat Structures
*

*
* Intact Loop
*

*
* Heat Structure no 100-1
* Intact loop Piping
*crdno no.h.s no.m.p geo s.s.flg left
11001000 14 3 2 1 0.142
*crdno mesh flg frnt
11001100 0 1
*crdno intvl rt.cor
11001101 2 0.1780
*crdno comp intvl
11001201 4 2
*crdno source intvl
11001301 0.0 2
*crdno tempflag
11001400 -1
*crdno t(1) t(2) t(3)
11001401 579.09 569.46 560.80
11001402 579.08 569.46 560.80
11001403 579.09 569.47 560.81
11001404 579.10 569.48 560.82
11001405 579.10 569.47 560.81
11001406 559.98 550.90 542.74
11001407 559.99 550.91 542.75
11001408 559.99 550.91 542.75
11001409 560.13 551.05 542.88
11001410 560.13 551.05 542.88
11001411 560.13 551.05 542.88
11001412 560.13 551.05 542.88
11001413 560.12 551.04 542.87
11001414 560.12 551.04 542.87

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*crdno left vol incr b.c sacode safac h.s.no
11001501 100010000 0 1 1 1.44580 1
11001502 105010000 0 1 1 1.08660 2
11001503 107010000 0 1 1 0.50000 3
11001504 110010000 0 1 1 0.85610 4
11001505 112010000 0 1 1 1.38893 5
11001506 118020000 0 1 1 0.68900 6
11001507 118030000 0 1 1 0.55900 7
11001508 120010000 0 1 1 0.76000 8
11001509 150010000 0 1 1 0.49660 9
11001510 175010000 0 1 1 0.55900 10
11001511 175020000 0 1 1 0.61300 11
11001512 180010000 0 1 1 1.01000 12
11001513 185010000 0 1 1 1.15200 13
11001514 184010000 0 1 1 0.28400 14
*crdno rt vol incr b.c sacode safac h.s.no
11001601 -939 0 3949 1 1.44580 1
11001602 -939 0 3949 1 1.08660 2
11001603 -939 0 3949 1 0.50000 3
11001604 -939 0 3949 1 0.85610 4
11001605 -939 0 3949 1 1.38893 5
11001606 -939 0 3949 1 0.68900 6
11001607 -939 0 3949 1 0.55900 7
11001608 -939 0 3949 1 0.76000 8
11001609 -939 0 3949 1 0.49660 9
11001610 -939 0 3949 1 0.55900 10
11001611 -939 0 3949 1 0.61300 11
11001612 -939 0 3949 1 1.01000 12
11001613 -939 0 3949 1 1.15200 13
11001614 -939 0 3949 1 0.28400 14
*crdno s.type mult dir.left dir.rt h.s.no
11001701 0 0.0 0.0 0.0 14
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11001801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 14
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11001901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 14
*
* Heat Structure no 100-2
* Steam Generator Connections
*
*crdno no.h.s no.m.p geo s.s.flg left
11002000 2 5 2 1 0.1625
*crdno mesh flg fmt
11002100 0 1
*crdno intvl rt.cor
11002101 4 0.20300
*crdno comp intvl
11002201 4 4
*crdno source intvl
11002301 0.0 4
*crdno tempflag
11002400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
11002401 579.01 573.51 568.29 563.34 558.62
11002402 559.94 554.75 549.83 545.16 540.71
*crdno left vol incr b.c sacode safac h.s.no
11002501 112020000 0 1 1 0.70769 1
11002502 118010000 0 1 1 0.54700 2
*crdno rt vol incr b.c sacode safac h.s.no
11002601 -939 0 3949 1 0.70769 1
11002602 -939 0 3949 1 0.54700 2
*crdno s.type mult dir.left dir.rt h.s.no
11002701 0 0.0 0.0 0.0 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11002801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11002901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2
*
* Heat Structure no 100-3
* Intact Loop: 0.216 m dia Piping
*
*crdno no.h.s no.m.p geo s.s.flg left
11003000 7 3 2 1 0.108
*crdno mesh flg fmt

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11003100 0 1
*crdno intvl rt.cor
11003101 2 0.1365
*crdno comp intvl
11003201 5 2
*crdno source intvl
11003301 0.0 2
*crdno tempflag
11003400 -1
*crdno t(1) t(2) t(3)
11003401 559.76 557.01 554.57
11003402 559.90 557.15 554.71
11003403 560.07 557.32 554.87
11003404 560.30 557.55 555.10
11003405 560.12 557.37 554.92
11003406 559.92 557.17 554.73
11003407 560.16 557.41 554.96
*crdno left vol incr b.c sacode safac h.s.no
11003501 125010000 0 1 1 1.00000 1
11003502 130010000 0 1 1 0.45700 2
11003503 140010000 0 1 1 0.50200 3
11003504 145010000 0 1 1 1.40840 4
11003505 150010000 0 1 1 1.00300 5
11003506 160010000 0 1 1 0.45700 6
11003507 170010000 0 1 1 0.51400 7
*crdno rt vol incr b.c sacode safac h.s.no
11003601 -939 0 3949 1 1.00000 1
11003602 -939 0 3949 1 0.45700 2
11003603 -939 0 3949 1 0.50200 3
11003604 -939 0 3949 1 1.40840 4
11003605 -939 0 3949 1 1.00300 5
11003606 -939 0 3949 1 0.45700 6
11003607 -939 0 3949 1 0.51400 7
*crdno s.type mult dir.left dir.rt h.s.no
11003701 0 0.0 0.0 0.0 7
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11003801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 7
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11003901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 7
*
* Heat Structure no 100-4
* Steam Generator: Plena
*
*crdno no.h.s no.m.p geo s.s.flg left
11004000 2 5 3 1 0.6858
*crdno mesh flg fmt
11004100 0 1
*crdno intvl rt.cor
11004101 4 0.7747
*crdno comp intvl
11004201 5 4
*crdno source intvl
11004301 0.0 4
*crdno tempflag
11004400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
11004401 578.55 573.96 569.64 565.59 561.76
11004402 559.50 555.23 551.22 547.44 543.88
*crdno left vol incr b.c sacode safac h.s.no
11004501 114010000 0 1 1 0.25 1
11004502 116010000 0 1 1 0.25 2
*crdno rt vol incr b.c sacode safac h.s.no
11004601 -939 0 3949 1 0.25 1
11004602 -939 0 3949 1 0.25 2
*crdno s.type mult dir.left dir.rt h.s.no
11004701 0 0.0 0.0 0.0 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11004801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11004901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2
*
* Heat Structure no 115-0
* Steam Generator Tubing
*

```



```

*crdno no.h.s no.m.p geo s.s.flg left
11150000 10 5 2 1 5.1054-3
*crdno mesh flg fmt
11150100 0 1
*crdno intvl rt.cor
11150101 4 6.34898-3
*crdno comp intvl
11150201 6 4
*crdno source intvl
11150301 0.0 4
*crdno tempflag
11150400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
11150401 568.55 563.60 558.89 554.41 550.13
11150402 567.61 563.13 558.87 554.83 550.97
11150403 565.64 561.78 558.12 554.64 551.32
11150404 563.91 560.56 557.39 554.37 551.50
11150405 562.50 559.43 556.52 553.75 551.12
11150406 561.18 558.36 555.68 553.14 550.71
11150407 559.64 557.11 554.71 552.43 550.26
11150408 558.07 555.73 553.52 551.42 549.41
11150409 557.05 554.68 552.44 550.31 548.29
11150410 555.68 553.13 550.71 548.41 546.23
*crdno left vol incr b.c sacode safac h.s.no
11150501 1115010000 0 1 1 562.360 1
11150502 1115020000 0 1 1 562.360 2
11150503 1115030000 0 1 1 1124.710 3
11150504 1115040000 0 1 1 1124.710 4
11150505 1115050000 0 1 1 849.063 5
11150506 1115060000 0 1 1 849.063 6
11150507 1115070000 0 1 1 1124.710 7
11150508 1115080000 0 1 1 1124.710 8
11150509 1115090000 0 1 1 562.360 9
11150510 1115100000 0 1 1 562.360 10
*crdno rt vol incr b.c sacode safac h.s.no
11150601 515010000 0 1 1 562.360 1
11150602 515020000 0 1 1 562.360 2
11150603 515030000 0 1 1 1124.710 3
11150604 515040000 0 1 1 1124.710 4
11150605 515050000 0 1 1 849.063 5
11150606 515050000 0 1 1 849.063 6
11150607 515040000 0 1 1 1124.710 7
11150608 515030000 0 1 1 1124.710 8
11150609 515020000 0 1 1 562.360 9
11150610 515010000 0 1 1 562.360 10
*crdno s.type mult dir.left dir.rt h.s.no
11150701 0 0.0 0.0 0.0 10
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11150801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 10
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
11150901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 10
*
*-----
* Reactor Vessel
*-----
*
* Heat Structure no 230-0
* Active Core
*
*crdno no.h.s no.m.p geo s.s.flg left refl b.ind ax.int
12300000 6 11 2 1 0.0 2 1 16
*crdno mesh flg fmt
12300100 0 1
*crdno intvl rt.cor
12300101 6 4.647-3
12300102 1 4.742-3
12300103 3 5.359-3
*crdno comp intvl
12300201 1 6
12300202 -2 7
12300203 -3 10
*crdno source intvl
12300301 1.0 6
12300302 0.0 10
*crdno tempflag
12300400 -1

```

```

*crdno t(1) t(2) t(3) t(4) t(5)
12300401 678.6 676.88 671.74 663.25 651.54
+ 636.75 619.07 569.78 568.18 566.64
+ 565.15
*
12300402 1281.8 1267.1 1223.6 1153.6 1059.5
+ 949.73 828.33 608.57 600.63 592.95
+ 585.53
*
12300403 1934.7 1904.1 1812.9 1663.8 1464.9
+ 1232.1 982.62 643.08 630.04 617.40
+ 605.12
*
12300404 2199.7 2163.9 2056.2 1876.6 1633.3
+ 1344.9 1042.0 659.71 644.75 630.21
+ 616.08
*
12300405 1907.2 1877.3 1788.7 1643.6 1450.4
+ 1224.4 981.26 650.49 637.84 625.57
+ 613.66
*
12300406 939.48 933.15 914.35 883.66 841.99
+ 791.15 732.54 604.99 600.60 596.37
+ 592.29
*
*crdno left vol incr b.c sacode safac h.s.no
12300501 0 0 0 1 363.35 5
12300502 0 0 0 1 490.75 6
*crdno rt vol incr b.c sacode safac h.s.no
12300601 230010000 10000 1 1 363.35 5
12300602 230060000 0 1 1 490.75 6
*crdno s.type mult dir.left dir.rt h.s.no
12300701 1000 0.027100270 0.0 0.0 1
12300702 1000 0.138211380 0.0 0.0 2
12300703 1000 0.233062330 0.0 0.0 3
12300704 1000 0.271002710 0.0 0.0 4
12300705 1000 0.227642280 0.0 0.0 5
12300706 1000 0.102981030 0.0 0.0 6
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12300901 1.25-2 30.0 30.0 0.0 0.0 0.0 0.0 1. 6
*-----
*
* Heat Structure no 200-0
* Filler Blocks Inlet Annulus Top Volumes
*
*crdno no.h.s no.m.p geo s.s.flg left
12000000 4 5 2 1 0.508
*crdno mesh flg fmt
12000100 0 1
*crdno intvl rt.cor
12000101 4 0.7264
*crdno comp intvl
12000201 4 4
*crdno source intvl
12000301 0.0 4
*crdno tempflag
12000400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12000401 553.06 530.53 509.72 490.36 472.23
12000402 552.26 529.79 509.04 489.74 471.66
12000403 559.14 536.12 514.87 495.09 476.56
12000404 559.13 536.12 514.86 495.08 476.56
*crdno left vol incr b.c sacode safac h.s.no
12000501 200010000 0 1 1 0.14055 1
12000502 210010000 0 1 1 0.04685 2
12000503 202010000 0 1 1 0.2139 3
12000504 212010000 0 1 1 0.0713 4
*crdno rt vol incr b.c sacode safac h.s.no
12000601 -939 0 3949 1 0.14055 1
12000602 -939 0 3949 1 0.04685 2
12000603 -939 0 3949 1 0.2139 3
12000604 -939 0 3949 1 0.0713 4
*crdno s.type mult dir.left dir.rt h.s.no
12000701 0 0.0 0.0 0.0 4
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12000801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 4

```



```
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12000901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 4
```

*

* Heat Structure no 200-1

* Filler Blocks Inlet Annulus middles Volumes

*

```
*crdno no.h.s no.m.p geo s.s.flg left
12001000 18 5 2 1 0.381
```

```
*crdno mesh flg fmt
12001100 0 1
```

```
*crdno intvl rt.cor
12001101 4 0.419
```

```
*crdno comp intvl
12001201 4 4
```

```
*crdno source intvl
12001301 0.0 4
```

```
*crdno tempflag
12001400 -1
```

```
*crdno t(1) t(2) t(3) t(4) t(5)
12001401 538.26 542.24 546.12 549.90 553.57
12001402 537.50 541.47 545.34 549.10 552.77
12001403 543.68 547.74 551.69 555.53 559.28
12001404 543.67 547.73 551.68 555.53 559.27
12001405 544.12 548.19 552.14 555.99 559.75
12001406 544.11 548.18 552.14 555.99 559.74
12001407 544.38 548.45 552.41 556.27 560.03
12001408 544.38 548.45 552.41 556.26 560.02
12001409 544.38 548.45 552.41 556.27 560.02
12001410 544.38 548.45 552.41 556.26 560.02
12001411 544.38 548.45 552.41 556.27 560.02
12001412 544.37 548.44 552.40 556.26 560.01
12001413 544.38 548.45 552.41 556.26 560.02
12001414 544.37 548.44 552.40 556.26 560.01
12001415 544.38 548.45 552.41 556.26 560.02
12001416 544.37 548.44 552.40 556.26 560.01
12001417 544.38 548.45 552.41 556.26 560.02
12001418 544.37 548.44 552.40 556.26 560.01
```

```
*crdno left vol incr b.c sacode safac h.s.no
12001501 -939 0 3949 1 0.14025 1
12001502 -939 0 3949 1 0.04675 2
12001503 -939 0 3949 1 0.21375 3
12001504 -939 0 3949 1 0.07125 4
12001505 -939 0 3949 1 0.21075 5
12001506 -939 0 3949 1 0.07025 6
12001507 -939 0 3949 1 0.7185 7
12001508 -939 0 3949 1 0.2395 8
12001509 -939 0 3949 1 0.43525 9
12001510 -939 0 3949 1 0.14475 10
12001511 -939 0 3949 1 0.49275 11
12001512 -939 0 3949 1 0.16425 12
12001513 -939 0 3949 1 0.41925 13
12001514 -939 0 3949 1 0.13975 14
12001515 -939 0 3949 1 0.41925 15
12001516 -939 0 3949 1 0.13975 16
12001517 -939 0 3949 1 0.39000 17
12001518 -939 0 3949 1 0.13000 18
```

```
*crdno rt vol incr b.c sacode safac h.s.no
12001601 200010000 0 1 1 0.14025 1
12001602 210010000 0 1 1 0.04675 2
12001603 202010000 0 1 1 0.21375 3
12001604 212010000 0 1 1 0.07125 4
12001605 204010000 0 1 1 0.21075 5
12001606 214010000 0 1 1 0.07025 6
12001607 206010000 0 1 1 0.7185 7
12001608 216010000 0 1 1 0.2395 8
12001609 206020000 0 1 1 0.43525 9
12001610 216020000 0 1 1 0.14475 10
12001611 206030000 0 1 1 0.49275 11
12001612 216030000 0 1 1 0.16425 12
12001613 206040000 0 1 1 0.41925 13
12001614 216040000 0 1 1 0.13975 14
12001615 206050000 0 1 1 0.41925 15
12001616 216050000 0 1 1 0.13975 16
12001617 206060000 0 1 1 0.39000 17
12001618 216060000 0 1 1 0.13000 18
```

```
*crdno s.type mult dir.left dir.rt h.s.no
12001701 0 0.0 0.0 0.0 18
```

```
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12001801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 18
```

```
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12001901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 18
```

*

* Heat Structure no 210-0

* Interactive

*

```
*crdno no.h.s no.m.p geo s.s.flg left
12100000 16 5 2 1 0.470
```

```
*crdno mesh flg fmt
12100100 0 1
```

```
*crdno intvl rt.cor
12100101 4 0.7264
```

```
*crdno comp intvl
12100201 4 4
```

```
*crdno source intvl
12100301 0.0 4
```

```
*crdno tempflag
12100400 -1
```

```
*crdno t(1) t(2) t(3) t(4) t(5)
12100401 560.36 560.32 560.28 560.25 560.22
12100402 560.35 560.19 560.04 559.91 559.79
12100403 560.36 560.28 560.20 560.13 560.07
12100404 560.35 560.18 560.03 559.89 559.77
12100405 560.36 560.27 560.20 560.13 560.07
12100406 560.35 560.18 560.03 559.89 559.77
12100407 560.36 560.22 560.10 559.99 559.90
12100408 560.35 560.13 559.94 559.83 559.62
12100409 560.35 560.22 560.10 559.99 559.90
12100410 560.35 560.13 559.94 559.77 559.62
12100411 560.35 560.18 560.03 559.89 559.76
12100412 560.35 560.16 559.99 559.83 559.70
12100413 560.24 560.10 559.98 559.86 559.76
12100414 560.23 560.07 559.93 559.81 559.69
12100415 559.83 559.81 559.79 559.77 559.76
12100416 559.82 559.78 559.75 559.72 559.69
```

```
*crdno left vol incr b.c sacode safac h.s.no
12100501 206010000 0 1 1 0.7185 1
12100502 216010000 0 1 1 0.2395 2
12100503 206020000 0 1 1 0.43425 3
12100504 216020000 0 1 1 0.14475 4
12100505 206030000 0 1 1 0.49275 5
12100506 216030000 0 1 1 0.16425 6
12100507 206040000 0 1 1 0.41925 7
12100508 216040000 0 1 1 0.13975 8
12100509 206050000 0 1 1 0.41925 9
12100510 216050000 0 1 1 0.13975 10
12100511 206060000 0 1 1 0.360 11
12100512 216060000 0 1 1 0.130 12
12100513 222010000 0 1 1 0.270 13
12100514 222010000 0 1 1 0.090 14
12100515 220010000 0 1 1 0.2775 15
12100516 220010000 0 1 1 0.0925 16
```

```
*crdno rt vol incr b.c sacode safac h.s.no
12100601 208010000 0 1 1 0.7185 1
12100602 218010000 0 1 1 0.2395 2
12100603 208020000 0 1 1 0.43425 3
12100604 218020000 0 1 1 0.14475 4
12100605 208020000 0 1 1 0.49275 5
12100606 218020000 0 1 1 0.16425 6
12100607 208030000 0 1 1 0.41925 7
12100608 218030000 0 1 1 0.13975 8
12100609 208030000 0 1 1 0.41925 9
12100610 218030000 0 1 1 0.13975 10
12100611 208040000 0 1 1 0.360 11
12100612 218040000 0 1 1 0.130 12
12100613 208040000 0 1 1 0.270 13
12100614 218040000 0 1 1 0.090 14
12100615 208040000 0 1 1 0.2775 15
12100616 218040000 0 1 1 0.0925 16
```

```
*crdno s.type mult dir.left dir.rt h.s.no
12100701 0 0.0 0.0 0.0 16
```

```

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12100801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 16
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12100901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 16
*-----
*
*      Heat Structure no 204-0
* Interactive
*
*crdno no.h.s no.m.p geo s.s.flg left
12040000 2 5 2 1 0.5010
*crdno mesh flg fmt
12040100 0 1
*crdno intvl rt.cor
12040101 4 0.7264
*crdno comp intvl
12040201 4 4
*crdno source intvl
12040301 0.0 4
*crdno tempflag
12040400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12040401 560.37 560.32 560.29 560.25 560.22
12040402 560.36 560.20 560.05 559.92 559.80
*crdno left vol incr b.c sacode safac h.s.no
12040501 204010000 0 1 1 0.21105 1
12040502 214010000 0 1 1 0.07035 2
*crdno rt vol incr b.c sacode safac h.s.no
12040601 208010000 0 1 1 0.21105 1
12040602 218010000 0 1 1 0.07035 2
*crdno s.type mult dir.left dir.rt h.s.no
12040701 0 0.0 0.0 0.0 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12040801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12040901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2
*-----
*
*      Heat Structure no 220-0
* Interactive
*crdno no.h.s no.m.p geo s.s.flg left
12200000 1 5 1 1 0.0
*crdno mesh flg fmt
12200100 0 1
*crdno intvl rt.cor
12200101 4 0.092
*crdno comp intvl
12200201 5 4
*crdno source intvl
12200301 0.0 4
*crdno tempflag
12200400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12200401 554.03 550.51 546.99 543.47 539.95
*crdno left vol incr b.c sacode safac h.s.no
12200501 220010000 0 1 1 1.68 1
*crdno rt vol incr b.c sacode safac h.s.no
12200601 -939 0 3949 1 1.68 1
*crdno s.type mult dir.left dir.rt h.s.no
12200701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12200801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12200901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*-----
*
*      Heat Structure no 223-1
* Interactive
*
*crdno no.h.s no.m.p geo s.s.flg left
12231000 4 5 2 1 0.7328
*crdno mesh flg fmt
12231100 0 1
*crdno intvl rt.cor
12231101 4 0.8725
*crdno comp intvl

```

```

12231201 5 4
*crdno source intvl
12231301 0.0 4
*crdno tempflag
12231400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12231401 559.36 553.24 547.39 541.79 536.42
12231402 553.30 547.33 541.62 536.15 530.91
12231403 559.17 553.05 547.20 541.61 536.24
12231404 554.56 548.54 542.79 537.29 532.02
*crdno left vol incr b.c sacode safac h.s.no
12231501 208010000 0 1 1 1.0365 1
12231502 218010000 0 1 1 0.3455 2
12231503 208020000 0 1 1 0.6015 3
12231504 218020000 0 1 1 0.2005 4
*crdno rt vol incr b.c sacode safac h.s.no
12231601 -939 0 3949 1 1.0365 1
12231602 -939 0 3949 1 0.3455 2
12231603 -939 0 3949 1 0.6015 3
12231604 -939 0 3949 1 0.2005 4
*crdno s.type mult dir.left dir.rt h.s.no
12231701 0 0.0 0.0 0.0 4
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12231801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 4
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12231901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 4
*-----
*
*      Heat Structure no 223-2
* Interactive
*
*crdno no.h.s no.m.p geo s.s.flg left
12232000 6 5 2 1 0.7328
*crdno mesh flg fmt
12232100 0 1
*crdno intvl rt.cor
12232101 4 0.8247
*crdno comp intvl
12232201 5 4
*crdno source intvl
12232301 0.0 4
*crdno tempflag
12232400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12232401 559.19 555.23 551.38 547.65 544.02
12232402 554.67 550.77 546.99 543.32 539.75
12232403 559.02 555.06 551.22 547.49 543.87
12232404 553.95 550.07 546.30 542.65 539.09
12232405 558.72 554.77 550.93 547.21 543.59
12232406 557.34 553.41 549.59 545.89 542.28
*crdno left vol incr b.c sacode safac h.s.no
12232501 208020000 0 1 1 0.3255 1
12232502 218020000 0 1 1 0.1085 2
12232503 208030000 0 1 1 0.8385 3
12232504 218030000 0 1 1 0.2795 4
12232505 208040000 0 1 1 0.9375 5
12232506 218040000 0 1 1 0.3125 6
*crdno rt vol incr b.c sacode safac h.s.no
12232601 -939 0 3949 1 0.3255 1
12232602 -939 0 3949 1 0.1085 2
12232603 -939 0 3949 1 0.8385 3
12232604 -939 0 3949 1 0.2795 4
12232605 -939 0 3949 1 0.9375 5
12232606 -939 0 3949 1 0.3125 6
*crdno s.type mult dir.left dir.rt h.s.no
12232701 0 0.0 0.0 0.0 6
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12232801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 6
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12232901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 6
*-----
*
*      Heat Structure no 225-0
* Interactive
*
*crdno no.h.s no.m.p geo s.s.flg left

```

12250000 10 5 2 1 0.300

*crdno mesh flg fmt

12250100 0 1

*crdno intvl rt.cor

12250101 4 0.380

*crdno comp intvl

12250201 4 4

*crdno source intvl

12250301 0.0 4

*crdno tempflag

12250400 -1

*crdno t(1) t(2) t(3) t(4) t(5)

12250401 559.69 550.03 540.88 532.20 523.93

12250402 560.55 550.86 541.69 532.99 524.69

12250403 563.42 553.65 544.39 535.60 527.23

12250404 568.27 558.34 548.94 540.01 531.51

12250405 573.72 563.62 554.06 544.98 536.33

12250406 578.25 568.01 558.32 549.11 540.34

12250407 580.26 569.96 560.21 550.95 542.12

12250408 579.06 568.80 559.08 549.86 541.06

12250409 579.06 568.80 559.08 549.85 541.06

12250410 579.49 569.22 559.49 550.25 541.44

*crdno left vol incr b.c sacode safac h.s.no

12250501 225010000 0 1 1 0.5200 1

12250502 230010000 0 1 1 0.2795 2

12250503 230020000 0 1 1 0.2795 3

12250504 230030000 0 1 1 0.2795 4

12250505 230040000 0 1 1 0.2795 5

12250506 230050000 0 1 1 0.2795 6

12250507 230060000 0 1 1 0.3775 7

12250508 240010000 0 1 1 0.5590 8

12250509 245010000 0 1 1 0.5590 9

12250510 250010000 0 1 1 0.8430 10

*crdno rt vol incr b.c sacode safac h.s.no

12250601 -939 0 3949 1 0.5200 1

12250602 -939 0 3949 1 0.2795 2

12250603 -939 0 3949 1 0.2795 3

12250604 -939 0 3949 1 0.2795 4

12250605 -939 0 3949 1 0.2795 5

12250606 -939 0 3949 1 0.2795 6

12250607 -939 0 3949 1 0.3775 7

12250608 -939 0 3949 1 0.5590 8

12250609 -939 0 3949 1 0.5590 9

12250610 -939 0 3949 1 0.8430 10

*crdno s.type mult dir.left dir.rt h.s.no

12250701 0 0.0 0.0 0.0 10

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no

12250801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 10

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no

12250901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 10

*

*

*

Heat Structure no 225-1

* Interactive

*

*crdno no.h.s no.m.p geo s.s.flg left

12251000 1 5 2 1 0.282

*crdno mesh flg fmt

12251100 0 1

*crdno intvl rt.cor

12251101 4 0.300

*crdno comp intvl

12251201 4 4

*crdno source intvl

12251301 0.0 4

*crdno tempflag

12251400 -1

*crdno t(1) t(2) t(3) t(4) t(5)

12251401 559.72 557.62 555.55 553.51 551.49

*crdno left vol incr b.c sacode safac h.s.no

12251501 225010000 0 1 1 0.520 1

*crdno rt vol incr b.c sacode safac h.s.no

12251601 -939 0 3949 1 0.520 1

*crdno s.type mult dir.left dir.rt h.s.no

12251701 0 0.0 0.0 0.0 1

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no

12251801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no

12251901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1

*

*

*

Heat Structure no 240-0

* Interactive

*

*crdno no.h.s no.m.p geo s.s.flg left

12400000 2 5 2 1 0.282

*crdno mesh flg fmt

12400100 0 1

*crdno intvl rt.cor

12400101 4 0.310

*crdno comp intvl

12400201 4 4

*crdno source intvl

12400301 0.0 4

*crdno tempflag

12400400 -1

*crdno t(1) t(2) t(3) t(4) t(5)

12400401 579.10 575.60 572.17 568.81 565.53

12400402 579.10 575.60 572.17 568.81 565.53

*crdno left vol incr b.c sacode safac h.s.no

12400501 240010000 0 1 1 0.559 1

12400502 245010000 0 1 1 0.559 2

*crdno rt vol incr b.c sacode safac h.s.no

12400601 -939 0 3949 1 0.559 1

12400602 -939 0 3949 1 0.559 2

*crdno s.type mult dir.left dir.rt h.s.no

12400701 0 0.0 0.0 0.0 2

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no

12400801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no

12400901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2

*

*

*

Heat Structure no 251-0

* Interactive

*

*crdno no.h.s no.m.p geo s.s.flg left

12510000 1 5 1 1 0.0

*crdno mesh flg fmt

12510100 0 1

*crdno intvl rt.cor

12510101 4 0.010

*crdno comp intvl

12510201 4 4

*crdno source intvl

12510301 0.0 4

*crdno tempflag

12510400 -1

*crdno t(1) t(2) t(3) t(4) t(5)

12510401 579.80 579.61 579.41 579.21 579.01

*crdno left vol incr b.c sacode safac h.s.no

12510501 250010000 0 1 1 1.80 1

*crdno rt vol incr b.c sacode safac h.s.no

12510601 251010000 0 1 1 1.80 1

*crdno s.type mult dir.left dir.rt h.s.no

12510701 0 0.0 0.0 0.0 1

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no

12510801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no

12510901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1

*

*

*

Heat Structure no 255-1

* Interactive

*

*crdno no.h.s no.m.p geo s.s.flg left

12551000 3 5 1 1 0.0

*crdno mesh flg fmt

12551100 0 1

*crdno intvl rt.cor

12551101 4 0.005

*crdno comp intvl

```

12551201 4 4
*crdno source intvl
12551301 0.0 4
*crdno tempflag
12551400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12551401 578.67 578.08 577.48 576.88 576.28
12551402 567.71 567.13 566.55 565.97 565.39
12551403 566.68 566.11 565.53 564.95 564.37
*crdno left vol incr b.c sacode safac h.s.no
12551501 252010000 0 1 1 0.30 1
12551502 255010000 0 1 1 0.70 2
12551503 260010000 0 1 1 1.00 3
*crdno rt vol incr b.c sacode safac h.s.no
12551601 -939 0 3949 1 0.30 1
12551602 -939 0 3949 1 0.70 2
12551603 -939 0 3949 1 1.00 3
*crdno s.type mult dir.left dir.rt h.s.no
12551701 0 0.0 0.0 0.0 3
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12551801 0.0 30.0 30.0 0.0 0.0 0.0 1. 3
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12551901 0.0 30.0 30.0 0.0 0.0 0.0 1. 3
*
* Heat Structure no 255-2
* Interactive
*
*crdno no.h.s no.m.p geo s.s.flg left
12552000 1 5 2 1 0.381
*crdno mesh flg fmt
12552100 0 1
*crdno intvl rt.cor
12552101 4 0.474
*crdno comp intvl
12552201 5 4
*crdno source intvl
12552301 0.0 4
*crdno tempflag
12552400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12552401 566.93 562.44 558.21 554.20 550.39
*crdno left vol incr b.c sacode safac h.s.no
12552501 255010000 0 1 1 0.854 1
*crdno rt vol incr b.c sacode safac h.s.no
12552601 -939 0 3949 1 0.854 1
*crdno s.type mult dir.left dir.rt h.s.no
12552701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12552801 0.0 30.0 30.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12552901 0.0 30.0 30.0 0.0 0.0 0.0 1. 1
*
* Heat Structure no 260-1
* Interactive
*crdno no.h.s no.m.p geo s.s.flg left
12601000 1 5 2 1 0.381
*crdno mesh flg fmt
12601100 0 1
*crdno intvl rt.cor
12601101 4 0.728
*crdno comp intvl
12601201 5 4
*crdno source intvl
12601301 0.0 4
*crdno tempflag
12601400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12601401 564.64 545.38 529.38 515.70 503.76
*crdno left vol incr b.c sacode safac h.s.no
12601501 260010000 0 1 1 0.712 1
*crdno rt vol incr b.c sacode safac h.s.no
12601601 -939 0 3949 1 0.712 1
*crdno s.type mult dir.left dir.rt h.s.no
12601701 0 0.0 0.0 0.0 1

```

```

*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12601801 0.0 30.0 30.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12601901 0.0 30.0 30.0 0.0 0.0 0.0 1. 1
*
* Heat Structure no 260-2
* Interactive
*
*crdno no.h.s no.m.p geo s.s.flg left
12602000 1 5 1 1 0.0
*crdno mesh flg fmt
12602100 0 1
*crdno intvl rt.cor
12602101 4 0.474
*crdno comp intvl
12602201 5 4
*crdno source intvl
12602301 0.0 4
*crdno tempflag
12602400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
12602401 567.72 552.22 536.73 521.23 505.74
*crdno left vol incr b.c sacode safac h.s.no
12602501 260010000 0 1 1 0.712 1
*crdno rt vol incr b.c sacode safac h.s.no
12602601 -939 0 3949 1 0.712 1
*crdno s.type mult dir.left dir.rt h.s.no
12602701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12602801 0.0 30.0 30.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
12602901 0.0 30.0 30.0 0.0 0.0 0.0 1. 1
*
* Broken Loop
*
* Heat Structure no 300-0
* Broken Loop: Hot leg
*
*crdno no.h.s no.m.p geo s.s.flg left
13000000 3 3 2 1 0.142
*crdno mesh flg fmt
13000100 0 1
*crdno intvl rt.cor
13000101 2 0.178
*crdno comp intvl
13000201 4 2
*crdno source intvl
13000301 0.0 2
*crdno tempflag
13000400 -1
*crdno t(1) t(2) t(3)
13000401 560.57 551.47 543.29
13000402 560.20 551.12 542.95
13000403 560.14 551.06 542.89
*crdno left vol incr b.c sacode safac h.s.no
13000501 300010000 0 1 1 0.876 1
13000502 305010000 0 1 1 0.698 2
13000503 310010000 0 1 1 1.424 3
*crdno rt vol incr b.c sacode safac h.s.no
13000601 -939 0 3949 1 0.876 1
13000602 -939 0 3949 1 0.698 2
13000603 -939 0 3949 1 1.424 3
*crdno s.type mult dir.left dir.rt h.s.no
13000701 0 0.0 0.0 0.0 3
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13000801 0.0 30.0 30.0 0.0 0.0 0.0 1. 3
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13000901 0.0 30.0 30.0 0.0 0.0 0.0 1. 3
*
* Heat Structure no 315-1
* Broken Loop: Hot leg
*

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```

*crdno no.h.s no.m.p geo s.s.flg left
13151000 1 3 2 1 0.055
*crdno mesh flg fmt
13151100 0 1
*crdno intvl rt.cor
13151101 2 0.178
*crdno comp intvl
13151201 4 2
*crdno source intvl
13151301 0.0 2
*crdno tempflag
13151400 -1
*crdno t(1) t(2) t(3)
13151401 558.16 515.17 489.43
*crdno left vol incr b.c sacode safac h.s.no
13151501 315010000 0 1 1 0.488 1
*crdno rt vol incr b.c sacode safac h.s.no
13151601 -939 0 3949 1 0.488 1
*crdno s.type mult dir.left dir.rt h.s.no
13151701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13151801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13151901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*
*
* Heat Structure no 315-2
* Broken Loop: Hot leg
*
*crdno no.h.s no.m.p geo s.s.flg left
13152000 1 3 2 1 0.0865
*crdno mesh flg fmt
13152100 0 1
*crdno intvl rt.cor
13152101 2 0.1095
*crdno comp intvl
13152201 4 2
*crdno source intvl
13152301 0.0 2
*crdno tempflag
13152400 -1
*crdno t(1) t(2) t(3)
13152401 560.40 554.41 549.07
*crdno left vol incr b.c sacode safac h.s.no
13152501 315020000 0 1 1 1.6085 1
*crdno rt vol incr b.c sacode safac h.s.no
13152601 -939 0 3949 1 1.6085 1
*crdno s.type mult dir.left dir.rt h.s.no
13152701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13152801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13152901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*
*
* Heat Structure no 335-0
* Broken Loop: Cold leg
*
*crdno no.h.s no.m.p geo s.s.flg left
13350000 1 3 2 1 0.142
*crdno mesh flg fmt
13350100 0 1
*crdno intvl rt.cor
13350101 2 0.178
*crdno comp intvl
13350201 4 2
*crdno source intvl
13350301 0.0 2
*crdno tempflag
13350400 -1
*crdno t(1) t(2) t(3)
13350401 554.25 545.34 537.32
*crdno left vol incr b.c sacode safac h.s.no
13350501 335010000 0 1 1 0.7495 1
*crdno rt vol incr b.c sacode safac h.s.no
13350601 -939 0 3949 1 0.7495 1

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*crdno s.type mult dir.left dir.rt h.s.no
13350701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13350801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13350901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*
*
* Heat Structure no 350-0
* Broken Loop: Cold leg
*
*crdno no.h.s no.m.p geo s.s.flg left
13500000 1 3 2 1 0.055
*crdno mesh flg fmt
13500100 0 1
*crdno intvl rt.cor
13500101 2 0.178
*crdno comp intvl
13500201 4 2
*crdno source intvl
13500301 0.0 2
*crdno tempflag
13500400 -1
*crdno t(1) t(2) t(3)
13500401 552.23 510.10 484.89
*crdno left vol incr b.c sacode safac h.s.no
13500501 350010000 0 1 1 0.488 1
*crdno rt vol incr b.c sacode safac h.s.no
13500601 -939 0 3949 1 0.488 1
*crdno s.type mult dir.left dir.rt h.s.no
13500701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13500801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13500901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*
*
* Heat Structure no 350-2
* Broken Loop: Cold leg
*
*crdno no.h.s no.m.p geo s.s.flg left
13502000 1 3 2 1 0.0865
*
*crdno
13502100 0 1
*crdno intvl rt.cor
13502101 2 0.1095
*crdno comp intvl
13502201 4 2
*crdno source intvl
13502301 0.0 2
*crdno tempflag
13502400 -1
*crdno t(1) t(2) t(3)
13502401 554.69 548.82 543.57
*crdno left vol incr b.c sacode safac h.s.no
13502501 350020000 0 1 1 1.6085 1
*crdno rt vol incr b.c sacode safac h.s.no
13502601 -939 0 3949 1 1.6085 1
*crdno s.type mult dir.left dir.rt h.s.no
13502701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13502801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13502901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 1
*
*
* Heat Structure no 370-0
* Broken Loop: Cold leg
*
*crdno no.h.s no.m.p geo s.s.flg left
13700000 2 3 2 1 0.111
*crdno mesh flg fmt
13700100 0 1
*crdno intvl rt.cor
13700101 2 0.1365

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*crdno comp intvl
13700201 4 2
*crdno source intvl
13700301 0.0 2
*crdno tempflag
13700400 -1
*crdno t(1) t(2) t(3)
13700401 548.43 542.20 536.56
13700402 551.56 545.27 539.57
*crdno left vol incr b.c sacode safac h.s.no
13700501 370010000 0 1 1 0.7251 1
13700502 380010000 0 1 1 9.3549 2
*crdno rt vol incr b.c sacode safac h.s.no
13700601 -939 0 3949 1 0.7251 1
13700602 -939 0 3949 1 9.3549 2
*crdno s.type mult dir.left dir.rt h.s.no
13700701 0 0.0 0.0 0.0 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13700801 0.0 30.0 30.0 0.0 0.0 0.0 1. 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
13700901 0.0 30.0 30.0 0.0 0.0 0.0 1. 2
*
* Pressurizer heat structures
*
*
* Heat Structure no 415-2
* Pressurizer: Vessel
*
*crdno no.h.s no.m.p geo s.s.flg left
14152000 6 3 2 1 0.42291
*crdno mesh flg fmt
14152100 0 1
*crdno intvl rt.cor
14152101 2 0.49911
*crdno comp intvl
14152201 5 2
*crdno source intvl
14152301 0.0 2
*crdno tempflag
14152400 -1
*crdno t(1) t(2) t(3)
14152401 574.00 566.84 560.26
14152402 583.96 576.54 569.71
14152403 599.59 591.75 584.54
14152404 611.29 602.98 595.48
14152405 613.55 605.34 597.79
14152406 613.67 605.47 597.91
*crdno left vol incr b.c sacode safac h.s.no
14152501 415010000 0 1 1 0.1815 1
14152502 415020000 0 1 1 0.1524 2
14152503 415030000 0 1 1 0.3967 3
14152504 415040000 0 1 1 0.5289 4
14152505 415050000 0 1 1 0.3967 5
14152506 415060000 0 1 1 0.1943 6
*crdno rt vol incr b.c sacode safac h.s.no
14152601 -939 0 3949 1 0.1815 1
14152602 -939 0 3949 1 0.1524 2
14152603 -939 0 3949 1 0.3967 3
14152604 -939 0 3949 1 0.5289 4
14152605 -939 0 3949 1 0.3967 5
14152606 -939 0 3949 1 0.1943 6
*crdno s.type mult dir.left dir.rt h.s.no
14152701 0 0.0 0.0 0.0 6
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
14152801 0.0 30.0 30.0 0.0 0.0 0.0 1. 6
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
14152901 0.0 30.0 30.0 0.0 0.0 0.0 1. 6
*
*
* Heat Structure no 415-3
* Pressurizer: Vessel
*
*crdno no.h.s no.m.p geo s.s.flg left
14153000 2 3 2 1 0.2032
*crdno mesh flg fmt
14153100 0 1

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*crdno intvl rt.cor
14153101 2 0.3683
*crdno comp intvl
14153201 5 2
*crdno source intvl
14153301 0.0 2
*crdno tempflag
14153400 -1
*crdno t(1) t(2) t(3)
14153401 613.68 591.80 575.42
14153402 613.68 591.81 575.43
*crdno left vol incr b.c sacode safac h.s.no
14153501 415070000 0 1 1 0.1029 1
14153502 420010000 0 1 1 0.1029 2
*crdno rt vol incr b.c sacode safac h.s.no
14153601 -939 0 3949 1 0.1029 1
14153602 -939 0 3949 1 0.1029 2
*crdno s.type mult dir.left dir.rt h.s.no
14153701 0 0.0 0.0 0.0 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
14153801 0.0 30.0 30.0 0.0 0.0 0.0 1. 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
14153901 0.0 30.0 30.0 0.0 0.0 0.0 1. 2
*
*
* Heat Structure no 420-1
* Pressurizer: Vessel
*
*crdno no.h.s no.m.p geo s.s.flg left
14201000 1 3 1 1 0.0
*crdno mesh flg fmt
14201100 0 1
*crdno intvl rt.cor
14201101 2 0.18415
*crdno comp intvl
14201201 5 2
*crdno source intvl
14201301 0.0 2
*crdno tempflag
14201400 -1
*crdno t(1) t(2) t(3)
14201401 613.89 597.36 580.82
*crdno left vol incr b.c sacode safac h.s.no
14201501 420010000 0 1 1 0.130 1
*crdno rt vol incr b.c sacode safac h.s.no
14201601 -939 0 3949 1 0.130 1
*crdno s.type mult dir.left dir.rt h.s.no
14201701 0 0.0 0.0 0.0 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
14201801 0.0 30.0 30.0 0.0 0.0 0.0 1. 1
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
14201901 0.0 30.0 30.0 0.0 0.0 0.0 1. 1
*
*
* Secondary Side
*
*
* Heat Structure no 500-0
* Secondary Side: Shroud Upper Plenum
*
*crdno no.h.s no.m.p geo s.s.flg left
15000000 2 5 2 1 0.3048
*crdno mesh flg fmt
15000100 0 1
*crdno intvl rt.cor
15000101 4 0.3143
*crdno comp intvl
15000201 5 4
*crdno source intvl
15000301 0.0 4
*crdno tempflag
15000400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
15000401 543.88 543.88 543.88 543.88 543.87
15000402 543.91 543.91 543.91 543.91 543.91
*crdno left vol incr b.c sacode safac h.s.no

```

```

15000501 502010000 0 1 0 0.85127 1
15000502 515060000 0 1 0 2.51199 2
*crdno rt vol incr b.c sacode safac h.s.no
15000601 500010000 0 1 0 0.87780 1
15000602 505010000 0 1 0 2.59028 2
*crdno s.type mult dir.left dir.rt h.s.no
15000701 0 0.0 0.0 0.0 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
15000801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
15000901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 2
*
* Heat Structure no 510-0
* Secondary Side: Shroud Lower Section
*
*crdno no.h.s no.m.p geo s.s.flg left
15100000 5 5 2 1 0.6445
*crdno mesh flg fmt
15100100 0 1
*crdno intvl rt.cor
15100101 4 0.6572
*crdno comp intvl
15100201 5 4
*crdno source intvl
15100301 0.0 4
*crdno tempflag
15100400 -1
*crdno t(1) t(2) t(3) t(4) t(5)
15100401 539.18 535.98 532.79 529.61 526.45
15100402 538.60 535.09 531.59 528.10 524.63
15100403 538.66 535.13 531.63 528.14 524.66
15100404 529.32 526.93 524.55 522.18 519.83
15100405 520.68 519.33 518.00 516.68 515.36
*crdno left vol incr b.c sacode safac h.s.no
15100501 515050000 0 1 1 0.646354 1
15100502 515040000 0 1 0 2.46858 2
15100503 515030000 0 1 0 2.46858 3
15100504 515020000 0 1 0 1.23429 4
15100505 515010000 0 1 0 1.23429 5
*crdno rt vol incr b.c sacode safac h.s.no
15100601 508010000 0 1 1 0.646354 1
15100602 510010000 0 1 0 2.51723 2
15100603 510010000 0 1 0 2.51723 3
15100604 510010000 0 1 0 1.25862 4
15100605 510010000 0 1 0 1.25862 5
*crdno s.type mult dir.left dir.rt h.s.no
15100701 0 0.0 0.0 0.0 5
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
15100801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 5
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
15100901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 5
*
* Heat Structure no 525-0
* Secondary Side: Vessel Wall
*
*crdno no.h.s no.m.p geo s.s.flg left
15250000 8 3 2 1 0.7112
*crdno mesh flg fmt
15250100 0 1
*crdno intvl rt.cor
15250101 2 0.76397
*crdno comp intvl
15250201 5 2
*crdno source intvl
15250301 0.0 2
*crdno tempflag
15250400 -1
*crdno t(1) t(2) t(3)
15250401 543.26 537.76 532.46
15250402 543.25 537.76 532.45
15250403 543.28 537.79 532.48
15250404 542.75 537.26 531.97
15250405 505.94 501.29 496.82
15250406 507.22 502.55 498.05

```

```

15250407 507.21 502.55 498.04
15250408 507.05 502.38 497.88
*crdno left vol incr b.c sacode safac h.s.no
15250501 525010000 0 1 1 0.76238 1
15250502 520010000 0 1 1 0.7520 2
15250503 500010000 0 1 1 0.4445 3
15250504 505010000 0 1 1 1.2131 4
15250505 508010000 0 1 1 0.6096 5
15250506 510010000 0 1 1 0.6096 6
15250507 510020000 0 1 1 0.6096 7
15250508 510030000 0 1 1 0.6096 8
*crdno rt vol incr b.c sacode safac h.s.no
15250601 -938 0 3948 1 0.76238 1
15250602 -938 0 3948 1 0.7520 2
15250603 -938 0 3948 1 0.4445 3
15250604 -938 0 3948 1 1.2131 4
15250605 -938 0 3948 1 0.6096 5
15250606 -938 0 3948 1 0.6096 6
15250607 -938 0 3948 1 0.6096 7
15250608 -938 0 3948 1 0.6096 8
*crdno s.type mult dir.left dir.rt h.s.no
15250701 0 0.0 0.0 0.0 8
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
15250801 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 8
*crdno dth hl-f hl-r gs-lf gs-lr floss rloss boil-f h.s.no
15250901 0.0 30.0 30.0 0.0 0.0 0.0 0.0 1. 8
*
* Environmental Heat Loss Boundary Conditions
*
* Table no 939
* Environmental temperature
*
*crdno table_type
20293900 temp
*
*crdno time temp
20293901 0.0 305.0
*
* Table no 949
* Environmental Loss Heat XFER Coefficient
*
*crdno table_type
20294900 htc-t
*
*crdno time htc
20294901 0.0 30.0
*
* Table no 938
* Environmental Heat Loss boundary temperature
*
*crdno table_type
20293800 temp
*
*crdno time temp
20293801 0.0 305.0
*
* Table no 948
* Environmental Loss Heat XFER Coefficient
*
*crdno table_type
20294800 htc-t
*
*crdno time htc
20294801 0.0 40.0
*
*
*+-----+
*! Reactor kinetics !
*+-----+
*
* Point kinetics

```



```

*
*crdno  type ftype
30000000 point separabl
*
*crdno  decay power in.reac.del.n.fract.fis.f. U239
30000001 gamma-ac 50.+6 0. 371.875 1. 1.
*
* delayed neutron constants
*crdno  yield ratio decay const.
30000101 0.0420 3.01
30000102 0.1150 1.14
30000103 0.3950 3.301
30000104 0.1960 0.301
30000105 0.2190 0.305
30000106 0.0330 0.0124
*
*crdno  power time dimens.
30000401 25.+6 9. hr
30000402 50.+6 66. hr
*
*crdno  react.curve
30000011 609
*
* Reactivity curve table
*
*crdno  type trip-no |
20260900 reac-t 403 *|
*
*crdno  time reactiv. |
20260901 -1.0 0.0 *|
20260902 0.1 -2.1 *|
20260903 0.2 -4.3 *|
20260904 0.3 -6.8 *|
20260905 0.4 -9.2 *|
20260906 0.5 -11.1 *|
20260907 0.6 -12.2 *|
20260908 0.7 -12.9 *|
20260909 0.8 -13.3 *|
20260910 0.9 -13.6 *|
20260911 1.0 -13.7 *|
20260912 1.1 -13.8 *|
20260913 1.2 -13.9 *|
20260914 1.8 -14.0 *|
20260915 2500. -14.0 *|
*
* Moderator density reactivity table
*
*crdno  density react. react.
30000501 626.26 0.0 * -4.4769
30000502 663.96 0.0 * -3.2923
30000503 716.17 0.0 * -1.5692
30000504 761.12 0.0 * -0.1692
30000505 768.37 0.0 * 0.04615
30000506 791.57 0.0 * 0.6923
30000507 811.88 0.0 * 1.2398
30000508 862.63 0.0 * 2.2415
30000509 938.04 0.0 * 3.9231
30000510 997.49 0.0 * 5.1077
*
* Doppler reactivity table
*
*crdno  temper react. react.
30000601 255.0 0.0 * 1.5
30000602 500.0 0.0 * 0.3
30000603 750.0 0.0 * -0.7
30000604 1000.0 0.0 * -1.6
30000605 1250.0 0.0 * -2.3
30000606 1500.0 0.0 * -3.0
30000607 1750.0 0.0 * -3.7
30000608 2000.0 0.0 * -4.3
30000609 2250.0 0.0 * -4.9
30000610 2500.0 0.0 * -5.4
30000611 2750.0 0.0 * -5.9
30000612 3000.0 0.0 * -6.3

```

```

*crdno  vol_no incr weight_f Water_temp_coef
30000701 230010000 0 0.15746 0.0
30000702 230020000 0 0.15746 0.0
30000703 230030000 0 0.15746 0.0
30000704 230040000 0 0.15746 0.0
30000705 230050000 0 0.15746 0.0
30000706 230060000 0 0.21270 0.0
*
*crdno  heat_no incr weight_f fuel_temp_coef
30000801 2300001 0 0.0170 0.0
30000802 2300002 0 0.3639 0.0
30000803 2300003 0 0.2747 0.0
30000804 2300004 0 0.2379 0.0
30000805 2300005 0 0.0976 0.0
30000806 2300006 0 0.0089 0.0
*
*-----+
*+-----+
*| Material properties |
*+-----+
*
*crdno  mater_type thc_flg cap_flg
20100100 tbl/fctn 1 1 * 1 - UO2
20100200 tbl/fctn 3 1 * 2 - Gap
20100300 tbl/fctn 1 1 * 3 - Zircaloy-4
20100400 tbl/fctn 1 1 * 4 - S-Steel
20100500 c-steel * 5 - C-steel
20100600 tbl/fctn 1 1 * 6 - Inconel-600
*
*-----+
* UO2 Thermal Conductivity
*
*crdno  temp. thc
20100101 273.150 8.440000
20100102 416.670 6.450000
20100103 533.150 5.782385
20100104 699.817 4.633177
20100105 866.483 3.880307
20100106 1033.150 3.357625
20100107 1088.710 3.155129
20100108 1199.820 2.983787
20100109 1283.150 2.836674
20100110 1366.480 2.713792
20100111 1533.150 2.521680
20100112 1616.480 2.448990
20100113 1699.820 2.391875
20100114 1977.590 2.289762
20100115 2255.370 2.307069
20100116 2533.150 2.433413
20100117 2810.930 2.661870
20100118 3088.710 2.994171
*
*-----+
* UO2 Volume Heat Capacity
*
*crdno  temp. vol.hcap
20100151 273.15 2.310427+6
20100152 323.15 2.571985+6
20100153 373.15 2.746357+6
20100154 673.15 3.138694+6
20100155 1373.15 3.443844+6
20100156 1773.15 3.531030+6
20100157 1973.15 3.792588+6
20100158 2173.15 4.228518+6
20100159 2373.15 4.882412+6
20100160 2673.15 6.015829+6
20100161 2773.15 6.320980+6
20100162 2873.15 6.582538+6
20100163 2973.15 6.713317+6
20100164 3113.15 6.800503+6
20100165 4699.82 6.800503+6
*
*-----+

```


* Gap Thermal Conductivity

*
*
*crdno gaz-type mole-frac.
20100201 helium 1.00
*

* Gap Volume Heat Capacity

*
*crdno temp. vol.hcap
20100251 273.15 5.4
20100252 5000.00 5.4
*

* Zircoloy-4 Thermal Conductivity

*
*crdno temp. thc
20100301 380.4 13.6
20100302 469.3 14.6
20100303 577.6 15.8
20100304 685.9 17.3
20100305 774.8 18.4
20100306 872.0 19.8
20100307 973.2 21.8
20100308 1073.2 23.2
20100309 1123.2 25.4
20100310 1152.3 24.2
20100311 1232.2 25.5
20100312 1331.2 26.6
20100313 1404.2 28.2
20100314 1576.2 33.0
20100315 1625.2 36.7
20100316 1755.2 41.2
20100317 2273.2 55.0
*

* Zircoloy-4 Volume Heat Capacity

*
*crdno temp. vol.hcap
20100351 300.00 1.841+6
20100352 400.00 1.978+6
20100353 640.00 2.168+6
20100354 1090.00 2.456+6
20100355 1093.00 3.288+6
20100356 1113.00 3.865+6
20100357 1133.00 4.028+6
20100358 1153.00 4.709+6
20100359 1173.00 5.345+6
20100360 1193.00 5.044+6
20100361 1213.00 4.054+6
20100362 1233.00 3.072+6
20100363 1243.00 2.332+6
20100364 1477.00 2.332+6
*

* S-Steel Thermal Conductivity

*
*crdno temp. thc
20100401 273.15 12.98
20100402 1199.82 25.10
*

* S-Steel Volume Heat Capacity

*
*crdno temp. vol.hcap
20100451 273.15 3.830+6
20100452 366.50 3.830+6
20100453 477.59 4.190+6
20100454 588.59 4.336+6
*

20100455 699.82 4.504+6
20100456 810.93 4.639+6
20100457 922.04 4.773+6
20100458 1144.26 5.076+6
20100459 1366.50 5.376+6
20100460 1477.59 5.546+6
*

* Inconel-600 Thermal Conductivity

*
*crdno temp. thc
20100601 366.5 13.85
20100602 477.6 15.92
20100603 588.7 18.17
20100604 700.0 20.42
20100605 810.9 22.50
20100606 922.0 24.92
20100607 1033.2 26.83
20100608 1144.3 29.42
20100609 1477.6 36.06
*

* Inconel-600 Volume Heat Capacity

*
*crdno temp. vol.hcap
20100651 366.5 3.908+6
20100652 477.6 4.084+6
20100653 588.7 4.260+6
20100654 700.0 4.436+6
20100656 810.9 4.665+6
20100657 922.0 4.929+6
20100658 1033.2 5.105+6
20100659 1477.6 5.727+6
*

* ICAP Assessment Parameters

* Levels

*
* Cntrlvar No 1 - Downcomer Liquid Level - LE-1ST-1
* Cntrlvar No 2 - Upper Plenum Liquid Level - LE-3UP-1
* Cntrlvar No 3 - SG Liquid Level - LD-P004-008B
* Cntrlvar No 4 - Pressurizer Liquid Level - LT-P139-007
*

* Pressure

*
* P 420010000 - PRZ Vapor Space - PE-PC-004
* P 105010000 - Intact Loop Hot leg - PE-PC-002
* P 525010000 - SG Dome - PE-SGS-001
*

* Mass Flow Rate

* mflowj 183000000 - Break Orifice - FR-PC-SBRK
*

* Coolant Temperature

* tempf 105010000 - Intact Loop Hot Leg - TE-PC-002A
* tempf 206030000 - Downcomer 1 Stalk - TE-1ST-005
*

* Fluid Density

*
* Fluid Density in Intact Loop Hot leg:
* DE-PC-002A - Beam A (Bottom)
* DE-PC-002C - Beam C (Upper)
* rho 105010000 - Fluid Density in the hot leg
*

* Lliquid Levels Calculations

* Control Variable No 1

* Downcomer Liquid Level - LE-1ST-1 - Computed variable

```

*
*crdno  name  type  s.fac. in.v in.flg l.cnt min max
20500100 LE-1ST-1 sum 1.0 5.316 0
*crdno  a0    al    var    code
20500101 0.0  0.1874 voidf 210010000
20500102      0.2852 voidf 212010000
20500103      0.2814 voidf 214010000
20500104      0.9580 voidf 216010000
20500105      0.5790 voidf 216020000
20500106      0.6570 voidf 216030000
20500107      0.5590 voidf 216040000
20500108      0.5590 voidf 216050000
20500109      0.5200 voidf 216060000
20500110      0.3600 voidf 222010000
20500111      0.3700 voidf 220010000

```

*

*

* Control Variable No 2

* Upper Plenum Liquid Level - LE-3UP-1 - Computed variable

*

```

*crdno  name  type  s.fac. in.v in.flg l.cnt min max
20500200 LE-3UP-1 sum 1. 1.7086 0
*crdno  a0    al    var    code
20500201 0.0  0.2852 voidf 252010000
20500202      0.7114 voidf 255010000
20500203      0.7120 voidf 260010000

```

*

* Control Variable No 3

* Steam Generator: Density Compensated

* Liquid Level LD-P004-008B Computed variable

*

```

*crdno  name  type  s.fac. in.v in.flg l.cnt min max
20500300 LD-P004 sum 1. 0.0 1
*crdno  a0    al    var    code
20500301 -2.95 0.6096 voidf 510010000
20500302      0.6096 voidf 510020000
20500303      0.6096 voidf 510030000
20500304      0.6096 voidf 508010000
20500305      1.2131 voidf 505010000
20500306      0.4440 voidf 502010000
20500307      0.7180 voidf 520010000

```

*

* Control Variable No 4

* Pressurizer Liquid Level on the South-West Side LT-P139-007

*

```

*crdno  name  type  s.fac. in.v in.flg l.cnt min max
20500400 LT-P139 sum 1. 0.0 1
*crdno  a0    al    var    code
20500401 0.0  0.1815 voidf 415010000
20500402      0.1524 voidf 415020000
20500403      0.3967 voidf 415030000
20500404      0.5289 voidf 415040000
20500405      0.3967 voidf 415050000
20500406      0.1943 voidf 415060000
20500407      0.1029 voidf 415070000

```

*

* Core Average Coolant Density and Fuel Temperature:

*

* Control Variable no 5

* Core Coolant average density

*

```

*crdno  name  type  s.fac. in.v in.flg l.cnt min max
20500500 Core-RHO sum 0.5633802 0.0 1
*crdno  a0    al    var    code
20500501 0.0  0.2795 rho 230010000
20500502      0.2795 rho 230020000
20500503      0.2795 rho 230030000
20500504      0.2795 rho 230040000
20500505      0.2795 rho 230050000
20500506      0.3775 rho 230060000

```

*

*

* Control Variable no 6

* Fuel average Temperature

*

```

*crdno  name  type  s.fac. in.v in.flg l.cnt min max
20500600 Core-TEM sum 0.5633802 0.0 1

```

*crdno a0 al var code

```

20500601 0.0  0.2795 htvat 2300001
20500602      0.2795 htvat 2300002
20500603      0.2795 htvat 2300003
20500604      0.2795 htvat 2300004
20500605      0.2795 htvat 2300005
20500606      0.3775 htvat 2300006

```

*

* End of input data file

RESTART FILE

TRANSIENT RUN

=LOFT Small Break Experiment L3-6

```

*
100 restart transnt
103 934
*
*crdno time min_dt max_dt ctrl minor major restart
201 600.0 1.0-7 0.04 14003 50 15000 15000
202 810.0 1.0-7 0.04 14003 50 5250 5250
203 1500.0 1.0-7 0.04 14003 50 17250 17250
204 2400.0 1.0-7 0.04 14003 75 22500 22500
*
* Component no 183
* Break orifice - Simulated 4 in break of PWR (F = 205.9 mm2)
*
1830000 brkvlv valve
1830101 182010002 805000000 205.9-6 0.4 0.4 000100
1830102 1.0 0.85 0.60
1830201 1 0.0 0.0 0.0
1830300 mtrvlv
1830301 404 402 5.0 0.0
*
*
208000001 florgj 183000000
*
* Auxiliary Trips
*no var code rel var code const lin time on
401 time 0 ge null 0 -1.0 1 0.0
402 time 0 lt null 0 -1.0 1 -1.0
*
* SCRAM
403 time 0 gt null 0 0.0 1 -1.0
*
* BREAK
404 time 0 ge timeof 403 6.0 n -1.0
*
* PCP off
405 p 100010000 le null 0 2.15+6 n -1.0
*no trip_no rel trip_no lin time_on
601 404 and 405 n -1.0
*
* ECCS Control Logic
*no var code rel var code const lin time_on
406 p 610010000 le null 0 13.16+6 n -1.0
*
*no trip_no rel trip_no lin time_on
602 404 and 406 1 -1.0
*
* Auxiliary Feed Water Logic
*no var code rel var code const lin time_on
407 time 0 ge timeof 403 6.0 1 -1.0
*
*no trip_no rel trip_no lin time_on
603 404 and 407 1 -1.0
*
* Pressurizer Stady state controller
*no trip_no rel trip_no lin time_on
604 -403 and -403 n 0.0
*
* PCP Injection
*no var code rel var code const lin time_on

```

```

408 p 100010000 ge null 0 2.15+6 1 -1.0
*
*no trip_no rel trip_no lin time_on
605 -408 and -408 1 0.0
*
* Main Steam Control Valve
*no trip_no rel trip_no lin time_on
606 -403 and -403 n 0.0
*no trip_no rel trip_no lin time_on
607 -606 and -606 n -1.0
*no var code rel var code const lin time_on
409 p 530010000 ge null 0 7.12+6 n -1.0
*no var code rel var code const lin time_on
410 p 530010000 ge null 0 6.98+6 n -1.0
*no var code rel var code const lin time_on
411 p 530010000 le null 0 6.50+6 n -1.0
*no var code rel var code const lin time_on
412 p 530010000 le null 0 6.57+6 n -1.0
*no var code rel var code const lin time_on
413 time 0 ge timeof 403 94.0 1 -1.0
*no var code rel var code const lin time_on
414 vlvarea 540 ge null 0 0.15 1 -1.0
*
* Open trip
*no trip_no rel trip_no lin time_on
608 609 and 410 n -1.0
*no trip_no rel trip_no lin time_on
609 409 or 608 n -1.0
*no trip_no rel trip_no lin time_on
610 -414 and 413 n -1.0
* MSCV triggered on the noise
*
* Close trip
*no trip_no rel trip_no lin time_on
611 612 and 412 n -1.0
*no trip_no rel trip_no lin time_on
612 411 or 611 n -1.0
*no trip_no rel trip_no lin time_on
613 403 and 414 n -1.0
*
* Reactor kinetics
*
* Point kinetics
30000000 point separabl
30000001 gamma-ac 50.+6 0. 371.875 1. 1.
* delayed neutron constants
30000101 0.0420 3.01
30000102 0.1150 1.14
30000103 0.3950 3.301
30000104 0.1960 0.301
30000105 0.2190 0.305
30000106 0.0330 0.0124
30000401 25.+6 9. hr
30000402 50.+6 66. hr
30000011 609
*
* Reactivity curve table
*
20260900 reac-t 403
20260901 -1.0 0.0
20260902 0.1 -2.1
20260903 0.2 -4.3
20260904 0.3 -6.8
20260905 0.4 -9.2
20260906 0.5 -11.1
20260907 0.6 -12.2
20260908 0.7 -12.9
20260909 0.8 -13.3
20260910 0.9 -13.6
20260911 1.0 -13.7
20260912 1.1 -13.8
20260913 1.2 -13.9
20260914 1.8 -14.0
20260915 2500. -14.0

```

*

* Moderator density reactivity table

30000501	626.26	-4.4769
30000502	663.96	-3.2923
30000503	716.17	-1.5692
30000504	761.12	-0.1692
30000505	768.37	0.04615
30000506	791.57	0.6923
30000507	811.88	1.2398
30000508	862.63	2.2415
30000509	938.04	3.9231
30000510	997.49	5.1077

*

* Doppler reactivity table

30000601	255.0	1.5		
30000602	500.0	0.3		
30000603	750.0	-0.7		
30000604	1000.0	-1.6		
30000605	1250.0	-2.3		
30000606	1500.0	-3.0		
30000607	1750.0	-3.7		
30000608	2000.0	-4.3		
30000609	2250.0	-4.9		
30000610	2500.0	-5.4		
30000611	2750.0	-5.9		
30000612	3000.0	-6.3		
30000701	230010000	0	0.15746	0.0
30000702	230020000	0	0.15746	0.0
30000703	230030000	0	0.15746	0.0
30000704	230040000	0	0.15746	0.0
30000705	230050000	0	0.15746	0.0
30000706	230060000	0	0.21270	0.0
30000801	2300001	0	0.0170	0.0
30000802	2300002	0	0.3639	0.0
30000803	2300003	0	0.2747	0.0
30000804	2300004	0	0.2379	0.0
30000805	2300005	0	0.0976	0.0
30000806	2300006	0	0.0089	0.0

*

*

* End of restart file

Appendix B

Table 1. Initial conditions of the Experiment L3-6.

Parameters	Measured values	Calculated values
Primary Coolant System:		
Mass flow rate (kg/s)	483.3 ± 2.6	482.42
Hot leg pressure (MPa)	14.87 ± 0.14	14.87
Cold leg temperature (K)	557.9 ± 1.1	560.9
Hot leg temperature (K)	577.1 ± 1.8	579.7
Pressure vessel:		
Power level (MW)	$50. \pm 1$	50.
Pressurizer:		
Liquid temperature (K)	614.7 ± 1.4	614.5
Pressure (MPa)	14.90 ± 0.25	14.85
Liquid Level (m)	1.18 ± 0.11	1.17
Broken Loop:		
Cold Leg Temperature near Reactor Vessel (K)	557.6 ± 2.6	555.2
Hot Leg Temperature near Reactor Vessel (K)	561.4 ± 2.6	561.6
Primary Coolant Pump Injection (kg/s)		
	0.098 ± 0.016	0.094 (to one pump)
Steam Generator Secondary Side:		
Liquid Level* (m)	0.22 ± 0.03	0.2
Liquid Temperature (K)	542.8 ± 0.8	544.1
Pressure (MPa)	5.57 ± 0.06	5.58
Mass flow rate (kg/s)	27.8 ± 0.1	27.76

* Level is defined as 0.0 at 2.95 m above the tube sheet.

Table 2. Sequence of events in the Experiment L3-6.

Events	Experiment, s	RELAP5/MOD3, s
Reactor scrammed	-5.8 ± 0.2	-6.0
Break initiated	0.0	0.0
HPIS injection initiated	3.6 ± 0.2	3.6
Pressurizer emptied	20.2 ± 0.2	24.
Upper plenum reached saturation pressure	28.5 ± 0.2	25.
Intact loop hot leg voiding begun	29.4 ± 5.0	27.
Intact loop cold leg voiding begun	31.4 ± 5.0	27.
Subcooled break flow ended	44.2 ± 0.2	34.
Secondary system Pressure exceeded		
Primary side Pressure	930.0 ± 30.0	830.
Primary Coolant Pumps tripped (End of Transient)	2371.4 ± 0.2	not tripped (2400.)

Appendix C

Fig.1. LOFT System and the cold leg break configuration.

Fig. 2. RELAP5/MOD3 Noding for the LOFT L3-6 calculations

Fig. 3. Liquid Level in the Pressurizer.

Fig. 4. Pressure in the Pressurizer.

Fig. 5. Pressure in the Intact loop hot leg.

Fig. 6. Pressure in the Steam generator dome.

Fig. 7. Liquid level in the Steam generator.

Fig. 8. Liquid level in the Upper plenum.

Fig. 9. Break mass flow rate.

Fig. 10. HPIS mass flow rate.

Fig. 11. Fluid temperature in the Intact loop hot leg.

Fig. 12. Fluid temperature in the reactor vessel Downcomer.

Fig. 13. Cladding temperature at 0.81 m above the core bottom.

Fig. 14. Cladding temperature at 1.14 m above the core bottom.

Fig. S-1. Break mass flow rate (for 3 values of superheated coef.)

Fig. S-2. Pressure in the hot leg (for 3 values of superheated coef.).

Fig. S-3. Pressure in the SG dome (for 3 values of superheated coef.)

Fig. S-4. Fluid temperature in the reactor vessel Downcomer.

Fig. S-5. Mass error.

Fig. S-6. Density at the break tee.

Fig. S-7. Velocity at the break tee.

Fig. S-8. Void fraction upstream the break.

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

A calculation of LOFT Experiment L3-6, a small-break equivalent to a 4-inch diameter rupture in the cold leg of a four-loop commercial pressurized water reactor, has been performed to help validate RELAP5/MOD3.1 for this application. The version of the code to be used is SCDAP/RELAP5/MOD3.1.8d0. Three calculations were carried out in order to study the sensitivity to change of the break nozzle superheated discharge coefficient. Conducted comparative analysis of the LOFT L3-6 experiment shows on the whole a reasonable agreement between calculated and measured data. Some discrepancies in the system pressure do not distort a picture of the transient.

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