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International Agreement Report

ICAP Assessment of RELAP5/MOD2, Cycle 36.05 Against LOFT Small Break Experiment L3-7

Prepared by
Euy-Joon Lee, Bud-Dong Chung, Hho-Jung Kim

Nuclear Safety Center
Korea Advanced Energy Research Institute

Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555

April 1990

Prepared as part of
The Agreement on Research Participation and Technical Exchange
under the International Thermal-Hydraulic Code Assessment
and Application Program (ICAP)

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ICAP

ASSESSMENT OF RELAP5/MOD2, Cycle 36.05

AGAINST LOFT SMALL BREAK EXPERIMENT

L3-7

ABSTRACT

The LOFT small break (1 in-dia) experiment L3-7 has been analyzed using the reactor thermal hydraulic analysis code RELAP5/MOD2, Cycle 36.05.

The base calculation (Case A) was completed and compared with the experimental data. Three types of sensitivity studies (Cases B, C, and D) were carried out to investigate the effects of (1) break discharge coefficient Cd ,(2) pump two-phase difference multiplier and (3) High Pressure Injection System (HPIS) capacity on major thermal and hydraulic (T/H) parameters. A nodalization study (Case E) was conducted to assess the phenomena with a simplified nodalization.

The results indicate that Cd of 0.9 and 0.1 fit to the single discharge flow rate of Test L3-7 best among the tried cases. The pump two-phase multiplier has little effects on the T/H parameters because of the low discharge flow rate and the early pump coast down in this smaller size SBLOCA. But HPIS capacity has a very strong influence on parameters such as pressure, flow and temperature. It is also shown that a simplified nodalization could accomodate the dominant T/H phenomena with the same degree of code accuracy and efficiency.

Executive Summary

This report presents the assessment calculations using RELAP5/MOD2 Cycle 36.05, a frozen version of code, to predict the thermal/hydraulic behavior under the conditions of Loss of Fluid Test (LOFT) SBLOCA Experiment L3-7. The purpose of this assessment calculation is to determine whether the code can predict the major phenomena of LOFT L3-7 and to contribute to the generation of the body of information needed to determine the code uncertainty. This calculation also represents a part of KAERI's contribution to the USNRC international Code Assessment and Application Program (ICAP).

The key phenomena of SBLOCA, which depend upon the size and location of the break, are (1) RCS hydraulics, (2) reactor vessel hydraulics, (3) effect of RCP operation, (4) core status and heat transfer, and (5) steam generator (S/G) heat transfer. The LOFT L3-7 [50 MWt] simulated 1 inch diameter cold leg break of a typical 4-loop 1,000 MWe [3,000 MWt] commercial PWR, which belongs to a relatively small SBLOCA group and represents the smallest break experiment conducted in INEL. With respect to the hydraulic aspect in the experiment, RCP coastdown was completed at 85 s ,and reflux boiling and loop seal-clearing were not observed experimentally although natural circulation started at 35 s. The core remained unexposed and not much depressurized. With respect to the thermal aspect, the core transient decay heat curve was based on the proposed 79 ANS standard. S/G feed was initiated at 75 s and terminated at 1,800 s while S/G steam valve was closed at 40 s ,and later a bleeding was initiated at 3,603 s.

The base calculation (Case A) was completed and compared with the experimental data. The code predicted the dominant phenomena of the L3-7 transient fairly well, except two-phase break flow and depressurization during the period from 2,000 s to 6,000 s. This period of post-pump coast -down belongs to the period of two-phase discharge and the transient without HPIS operation. Thus, it was motivated to investigate the effect of the following items on the major T/H parameters including the two-phase discharge flow and the others. Three types of input sensitivity studies (Cases B,C and D) were carried out to see the effect of (1) break discharge coefficient Cd, (2) pump two-phase difference multiplier, and (3) HPIS capacities on the major thermal and hydraulic parameters. A nodalization study (Case E) was conducted to see if a simplified nodalizationcan catch the phenomena.

Results indicated that single phase Cd of 0.9 and 1.0 fit the test L3-7 best, which also lead to a careful implementation of two-phase critical flow model. The pump two-phase multiplier has little effects on the T/H parameters because of the low discharge flow and the early pump coastdown in this smaller size SBLOCA. But, the primary system pressure, flow and temperature were very sensitive to HPIS characteristics. For instance, the changes in primary pressure of 1 MPa and the cladding temperature of about 5 K were resulted by a 0.3 L/s change in HPIS flow. Besides the simpler nodalization was able to catch the dominant T/H phenomena but did not reduce the computer time, i.e. same grind time of 1.67. This assessment report concludes that RELAP5/MOD2 Cycle 36.05 can predict the major phenomena and T/H parameters of LOFT SBLOCA Test L3-7 failry well.

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1. INTRODUCTION

The International Code Assessment and Applications Program (ICAP) has been conducted by fourteen nations and multinational organizations under the auspices of the USNRC[1]. For the PWR analysis, the USNRC selected two Best Estimate (BE) codes: RELAP5/MOD2 and TRAC/PF1/MOD1[2]. The goal of the program is to assess the prediction capabilities of the current BE thermal hydraulic(T/H) codes utilizing the available facility test and plant data. At present the ICAP activities in Korea help to quantify uncertainties in the codes so that the codes may be used for licensing purposes.

Korean contributions to ICAP have been made through the RELAP5/MOD2 calculations against ten experiments and five plant data. Six of the assessments will be performed with LOFT Integral Effect Test (IET) data and two with Semiscale IET data. Two Separate Effect Test (SET) data for critical flow and condensation will also be used to assess the code RELAP5/MOD2.

The RELAP5/MOD2/cycle 36.04 [3] was implemented in 1986 on KAERI CDC 170-875 computer. The code was updated to cycle 36.05 based on the update file obtained from Idaho National Engineering Laboratory (INEL) in November 1987. The objective was to assess the RELAP5/MOD2/Cycle 36.05 against the LOFT small break experiment L3-7. The assessment was performed by comparing the major calculated parameters with the experimental data as was done in the previous developmental assessment [4]. Thus, this study addressed to the prediction capability of the code for the LOFT SBLOCA test L3-7. The capability and user guidelines of the specific code was decided based on the following steps:

(1) Base calculation, (2) Sensitivity study (Input and Model), (3) Nodalization (modelling) study.

A brief description of the LOFT facility and L3-7 test is contained in Section 2, and Section 3 presents the features of the RELAP5/MOD2 to be assessed. Section 4 discusses the results of the base calculation; and, the motivation for the sensitivity and nodalization study and results are included in Section 5. The code efficiency is evaluated in Section 6 through run statistics. The conclusions drawn from this study are given in Section 7.

2. FACILITY AND TEST

2.1 LOFT

The LOFT Integral Effect Test (IET) facility has been designed to simulate the major components and system responses of a commercial, four-loop PWR [1000 MWe] [5]. The LOFT facility as in Figure 1 consists of:(1) a reactor vessel with a nuclear core, (2) an intact loop (a steam generator and two primary pumps parallel), (3) a broken loop (simulated pump and steam generator and two quick opening valves), (4) the blow down suppression system and (5) the emergency core coolant (ECC) system (two LPIS, two HPIS pumps and two accumulators). To relate LOFT to a PWR, the test facility is designed as follows:

(1) the same linear heat generation rate of a large reactor is used, (2) LOFT powers are scaled according to component volumes (1:60), (3) flow areas are scaled to provide the identical volume ratio to large reactor values, (4) pipe break areas are set based on the ratio of core volume, and (5) pressure, temperature, and mass flux are attempted to be identical to large reactor values.

2.2 L3-7

For Experiment L3-7, the LOFT system was configured to represent a postulated small break, equivalent to one inch-diameter rupture, in the cold leg of a commercial PWR. One classifies as SBLOCA if the relevant break diameter is less than 10 inch and the break belongs to the lower end of the SBLOCA range when the diameter is less than 1 inch which represents a leakage from a valve or joint [6].

The objective of Experiment L3-7 is to investigate how the HPIS and the primary system behave against such a small break accident(1 in-dia). C.E. McCreery summarized the test L3-7 in the quick look report[7]. Based on this report, at the time of experiment initiation, the LOFT reactor was operating; (1) at a maximum linear heat generation rate 52.8 KW/m and a power of 49 MW, which is about 98% of the LOFT rated power of 50 MW; and (2) at temperatures in the RCS intact loop of 576 K and 556 K in the hot and cold legs, respectively, and a pressure of 14.9 MPa in the hot leg. These measurement initial conditions of the experiment are in Table 1 along with the calculated values of steady-state calclulation. The sequence of events is summarized in Table 2, where the measured and calculated times are compared.

3. CODE AND MODELING

3.1 CODE

The RELAP5/MOD2 code [3] has been developed for best-estimate transient simulation of PWR's and associated systems. The code is based on a non-homogeneous and non-equilibrium model for one dimensional, two phase system that is solved by a fast, partially implicit numerical scheme to permit economical evaluation of system transients. ICAP RELAP5 newsletter [8], October 1987, summarized the key features of RELAP5/MOD2 Cycle 36.05 and the changes from the previous Cycles 36.04.

3.2 MODELLING

3.2.1 Break

In the experiment, small break orifice of 4 mm-diameter simulates 25.4 mm (1 in-dia) SBLOCA of a commercial PWR. Critical flow models calculate the break mass flow rate based on the enthalpy and other necessary information of the front volume[9]. The break is represented by junction 365 (quick opening valve) in the code,which is modelled with a trip valve. The valve is coded as centrally located (V = 0), abrupt area change (a = 1), non-homogeneous option(h = 0), and choking option (c = 0) with both single- and two-phase discharge coefficients of 1.0 respectively as the base case.

3.2.2 Pump

The pump model of RELAP5 is based on RELAP4/MOD6 model. The pump related subroutines such as PUMP and PUMP2 basically calculate the head and torque of the new time step using the speed and the information of the previous time step. The pumps are normally degraded in two-phase flow conditions. The pump performance in two-phase flow conditions are explained in the following equations:

$$H = H1 - MH(A)(H1-H2)$$

$$T = T1 - MT(A)(T1-T2)$$

where H1 and H2 are single- and two-phase head difference data from homologous curves ,respectively, MH(A) void dependent two-phase head multiplier, T1 and T2 are single- and two-phase torque difference data from homologous curves, respectively, and MT(A) void dependent two-phase torque multiplier.

The input required for pump modeling are (1) static geometric data, (2) initial conditions, (3) two-phase torque and head data and (4) pump dynamic data. One of the issue here is whether the system relevant to Test L3-7 will be degraded due to the pump degradation in two-phase.

3.2.3 HPIS

The HPIS in the LOFT is composed of serially connected two pumps. The HPIS is instated by a low pressure signal and the flow is injected through the cold leg into the vessel according to the characteristic curve of head and flow in the combined system. The head and flow diagram is estimated from the pump data and validated from the experiment. The HPIS is modelled as a time-dependent junction and instated when primary loop pressure is lower than the set point, 13.159 MPa. HPIS flow characteristics also affect the primary loop pressure and the discharge flow.

3.2.4 Nodalization

The RELAP5/MOD2 nodalization diagram of the base case is shown in Figure 2. The nodalization has 130 volumes, 136 junctions, and 137 heat structures. This includes 1 more control volume and 1 more flow junction than the one used for the MOD2 Cycle 7 developmental assessment during 1983 as indicated in Reference [4]. E. J. Kee initially developed the base LOFT input deck for RELAP5/MOD2[10]. He also used RELAP5/MOD1 to predict the L3-7 behavior as a pre-test simulation[11]. W. H. Grush did post-test calculation in 1981 [12]. The decks L37SS and L37TRAN were provided by the INEL in 1986. The pump relative speed, word 1 of case CCC0308, was corrected and the accumulator was modelled as a component instead of a volume.

4. THE BASE CASE CALCULATION (Case A)

The input listing for the base calclulation, Case A, is attached in Appendix A. L37SS of steady state and L37BASE of transient calculation ran successfully on the KAERI CDC 170-875. The major parameters of concern are break flow rate, HPIS flow rate, upper plenum pressure, velocity and density of intact loop hot leg (ILHL), density of broken loop cold leg (BLCL), steam dome pressure, cladding temperature, and accumulator level. The numerical performance of the code is evaluated in terms of CPU and DT vs. simulated time and grind time. The assessment parameters and their measurement uncertainties are summarized in Table 3.

Figure B.I.1 of Appendix B shows the break mass flow rate. The mass flow rate at the break orifice was compared with the measured flow at FR-BL-111 [4]. The code underpredicted the initial peak by 0.5 kg/s. Just after the initiation of break, the experimental peak was about 1.9 kg/s while the code still underpredicted as 1.4 kg/s although there was the uncertainty of measurement (about 0.2 kg/s). Single-phase Cd 1.0 and two-phase Cd 1.0 gave higher mean single-phase break flow and lower two-phase discharge flow. After 350 s, two-phase discharge flow started and the code underpredicted the flow by 0.2 kg/s. A sensitivity study with Cd has been performed to match the L3-7 measured discharge flow.

Figure B.I.2 shows the volumetric flow rate of the HPIS. The flow rate was compared with the measured at FT-P128-104, intact loop cold leg to vessel. The time dependent flow and pressure provided feedback to the boundary condition for modeling the HPIS. Figure B.I.2 indicated that the code closely followed the sequence and data of the experiment. The HPIS was injected at 70 s and terminated at 1820 s. The HPIS was reinstated at 6000 s. The measured and calculated sequences are summarized in Table 2.

Figure B.I.3 shows the upper plenum pressure in the reactor vessel. The upper plenum pressure, affected by the combined action of break and HPIS flow, was compared with the pressure measured at PE-1UP-001A. The code showed earlier two-phase depressurization than the test and underpredicted the pressure by 1 MPa (0.2 MPa measurement uncertainty) at 4000 s. The code predicted that depressurization occurred faster. A sensitivity study with higher and lower HPIS flows was performed to see its effect on key T/H parameters including the primary pressure.

Figure B.I.4 shows the liquid and vapor velocities in the ILHL. The calculated velocity at volume 112 was compared with the measured at PE-PC-002A. The result indicated that the two-phase natural circulation started at 85 s and terminated after repressurized. The code predicted the velocities little higher but within the acceptable range of the measurement uncertainty (0.63 m/s). The effect of pump two-phase multiplier changes on this primary loop velocities was studied.

Figure B.I.5 shows the density in the ILHL, which was compared with the measured at DE-PC-002B (100 kg/m3 uncertainty). The code followed the experiment fairly well but underpredicted the density upto 100 kg/m3 when the HPIS is off. The code again closely followed the experimental data after the HPIS was reinstated at 6000 s.

Figure B.I.6 shows the density in the BLCL. The code experienced the low density as in the experiment when the HPIS is not on line. The density variation surely can affect the break flow strongly after 2000 s; and, thus, the discharge flow is supposed to be drastically changed. However, no experimental data of the break flow after 1800 s is available for LOFT Test L3-7.

Figure B.I.7 shows the steam dome pressure of the steam generator. The calculated pressure was compared with the measured at PE-SGS-001 (0.012 MPa uncertainty). The predicted peak pressure at 35 s was 6.8 MPa. The code also showed the repressurization phenomena after the secondary coolant system (SCS) auxiliary feed was terminated at 1800 s and the depressurization when the SCS steam bleed was initiated at 3600 s.

Figure B.I.8 shows the cladding temperature in the core. The calculated temperature at fuel assembly 5 row F column 9 at 1.14 m above the bottom of the fuel rod (TE-5F9-045) and the measured temperature HTTEMP 23003 were compared. The measurement was made with an uncertainty of 3.0 K. The code underpredicted the temperature upto 10 K at 4000 s, which was probably caused by the overestimated flow through the primary loop and the core. It should be noted that no later core heat-up was shown for this small size (1 in-dia) SBLOCA since no core uncovery had occurred.

Figure B.I.9 shows the level in the accumulator, which is added as an additional component in this calculation. The accumulator water level of control variable 4 was compared with LIT-P120-044. The code predicted that the accumulator was turned on about 1000 s earlier than measurement because the code underpredicted the primary system pressure which activated the accumulator. A code problem was observed when the accumulator became empty. The problem was resolved by adding a trip to turn the accumulator off when it became empty.

5. SENSITIVITY AND NODALIZATION STUDY

The base code fairly well predicted the dominant phenomena of the L3-7 transient except for two-phase discharge flow and the system depressurization during the period from 2000s to 6000s. This period belongs to post-pump coast-down, two-phase discharge, and the transient without HPIS operation. Thus, it was motivated to investigate the effect of the following items on major T/H parameters including the primary system pressure. The items used for the sensitivity study are: break discharge coefficients (single- and two-phase), pump two-phase head and torque multiplier, HPIS flow and head characteristics, and simpler nodalization. The scope of the sensitivity and nodalization study is explicitly summarized in Table 4.

5.1 BREAK DISCHARGE COEFFICIENT (Case B)

As in the scope of sensitivity and nodalization study of Table 4, six different combinations of break discharge coefficients were used to see the effects of Cd on especially discharge flow. Results from three cases, which are (1) 1.0 and 1.0, (2) 1.2 and 1.0 and (3) 0.9 and 0.9 in single- and two-phase break discharge coefficents, are shown in Figure B.II.2 to B.II.9.

Figure B.II.1 shows the effect of Cd on discharge flow. The variation of single-phase Cd's strongly affects the peak flow rate. Cd 1.2 (Case B.1) gave 1.7Kg/s while Cd 1.0 allowed 1.4Kg/s for the peak value. All Cases B.3 through B.5 with several two-phase Cd's underestimated the flows. Case B.2 gave water property error at 61.2 s because of the artificially high pressure generated by the code when Cd is 0.8.

Several cases with single-phase and two-phase Cd's were tested. Among them, Cd of 0.9 (Case B.6) is recommended to fit the mean values of the single phase flows. The results indicated that tuning of two phase Cd's (0.8, 1.0, 1.2 and 1.4) was not successful for predicting the two-phase discharge flow because of the lower flow rate (<0.8 kg/s). The code underestimated the two-phase discharge flow till 1,800 s. This study shows that the effect on the single-phase flow propagates into the two-phase discharge flow. It is suggested that a SET study on two phase discharge flow be conducted. The effects of Cd's on the other key T/H parameters are illustrated in Figure B.II series.

5.2 PUMP TWO-PHASE T/H MULTIPLIER (Case C)

Two-phase torque and head multiplier data for the base case (Case A.0) came from LOFT test L3-6 and a suggestion was made to use a greater two-phase degradation factor (Case C.0) [13]. Figure B.III.1 shows the input changes in two-phase head multiplier and two-phase torque. Results from this change were obtained and compared with the base case in Figure B.III.2 to 9. Figure B.III.1 shows the changes of two phase head multipliers and the major change occurs at the mid range of void fraction. The head multiplier of the base case at void fraction 0.5 is 0.6 while the one for Case C is about 0.95 assuming about 40 % more two-phase degradation.

Results showed that basically no major differences were shown because the pump coast-down was completed early at 56.2 s ;and, therefore, the two-phase degradation had little effect on the major T/H parameters.

5.3 HPIS (Case D)

Figure B.IV.1 shows the higher and lower flow cases than the nominal base case. Figure B.IV.3 shows the calculated and measured HPIS flow rates as a function of time. A lower HPIS gave less discharge flowrate as shown in Figure B.IV.2. As in Figure B.I.3, the pressure became below 7 MPa after 1,300 sec and the was activated at 6,000 sec because of the set pressure 4 MPa. As far as HPSI flow sensitivity concerned, a higher and a lower flow rates of HPSI were assumed as in Figure B.IV.1. It shows that the higher flow case gives 5.8 kg/s and the lower case does 0.1 kg/s at 7 MPa while the base case gives 3.8 kg/s.

A higher HPIS flow lead to a more rapid depressurization in steam generator secondary side (Figure B.IV.8) and cooled fuel rods more quickly (Figure B.IV.9). From this comparative study, the T/H parameter changes due to HPIS flow changes could be estimated for LOFT Test L3-7. Figure B.IV.9 shows that, when the HPIS flow is reduced by 0.3 L/s at 1000 sec, the cladding temperature becomes higher by 5 K at most. Therefore, a lower ECCS HPIS flow seems to be still acceptable for this L3-7 type SBLOCA.

5.4 NODALIZATION (Case E)

The objective of this nodalization study was to ensure the code capability to capture the key L3-7 phenomena with a simplified nodalization as in Table 4. The break flow was predicted well as in the case A.0 (Figure B.V.1). The pressure (Figure B.V.3) and the velocity (Figure B.V.4) of the primary loop were fairly well predicted. As in Figure B.V.5 and 6, the densities started to decrease about 1000 s earlier than the base case. Figure B.V.7, 8 and 9 show that the code with a simplified noding can predict the key T/H parameters well as the base code. And the same numeric efficiency was also obtained.

6. RUN STATISTICS

The input models for the base case (Case A) and the simpler nodalization (Case E) of LOFT L3-7 contained the following number of nodes:

	Case A	Case E
Volumes	130	123
Junctions	136	132
Heat Structures	137	129

Figure B.VI.10 compares CPU vs Simulated time. Figure B.VI.11 compares DT vs simulated time. The ratio of CPU vs simulated time came out to be about 5000/10000 (0.5) for both cases A and E. During the transient calculation the following computing resources were used:

	Case A	Case E
Computer time CPU (s)	5521	5295
Number of time step DT (s)	25519	25689
Number of Volumes C	130	123
Transient real time RT	10000	9489

The calculated grind time (code efficiency factor) for 9000 s is

$$\frac{CPU * 1000}{C * DT} = \frac{(5521) \times 1000}{(130)\ (24801)} = 1.64 \quad \text{for case A}$$

$$= \frac{(5086) \times 1000}{(123)\ (24833)} = 1.67 \quad \text{for case E}$$

CPU benefit as expected with a simpler nodalization was not obtained.

The computer used was a cyber 170-815

7. CONCLUSION

REALP5/MOD2 Cycle 36.05 has been assessed using the LOFT small break experiment L3-7. Five major calculations were carried out: one base calculation (Case A) and four sensitivity calculations with changes on break discharge coefficient (Case B), pump two-phase multiplier (Case C), HPIS capacities (Case D), and simpler nodalization (Case E).

The key phenomena any assessor must consider in SBLOCA over the duration of the transient are (1) RCS hydraulics, (2) reactor vessel hydraulics, (3) effect of RCP operation, (4) core status and heat transfer ,and (5) S/G heat transfer. The assessor also should consider the size and location of the break. The type of SBLOCA should be catagorized first based on the principle in Section 2.2. SBLOCA Test L3-7 belongs to a relatively small size SBLOCA because the break diameter is just one inch. Thus, the primary pressure varied very slowly ,and reflux boiling and loop seal/clearing were not observed although two-phase natural circulation started at 35 s. The core remained unexposed over the transient. RCP pump coast-down was completed at early 85 s;therefore, it could not affect the system T/H parameters much in such a long transient. The core decay heat was digitized from experimental data. S/G feed was terminated at 1,800 s whereas steam bleeding was initiated at 3,603 s. A reversed heat transfer to primary side in S/G was not observed.

In the steady-state calculation, the initial experimental data could be fairly well reproduced as in Table I. But there exist a relatively large discrepancies in initial steam dome pressure.

The measured data with uncertainty band were compared with the calculated values from the base case A. The plots for this case are shown in

plot I's of Appendix B. According to the plot B.I.1, two-phase discharge flow after 400 s were not properly predicted probably due to poor imlementation of two-phase critical flow model. The primary system pressure was underestimated by 1 MPa when HPIS was off, which would not be readily explained. A earlier study showed that the deficiency was related to existing four assumptions to calculate two-phase sound speeds [14]. R. R. Schultz found that a big transition in the sound speed occurred between void fractions of 0.0 and approximately 0.1, which is very relevant to Test L3-7. The current MOD2 did not include the high sound speed upto 1,830 m/s at the void close to 0.0. However, the other major T/H parameters were still predicted fairly well except the mid-range depressurization and the two-phase discharge flow.

Plot II's in Appendix B include the results for the Case B: break discharge coefficient sensitivity study. Several break discharge coefficients (Cd) were tested in the range between 0.8 and 1.2. And 0.9 was found to be the most suitable for both single- and two-phase discharge flows. The code consistently tends consistently to underestimate the two-phase discharge flow, which was actually demonstrated in the test cases with 0.8,1.0,1.2 and 1.4. Thus, it is desirable to conduct a two-phase choked flow model assessment with a SET to investigate this underestimation.

Plot III's in Appendix B include the results for the Case C: pump two-phase multiplier sensitivity study. The change of the pump two-phase torque and head multiplier did not affect the major T/H parameters because the complete pump coast down occurred very early in time at 85 s and no other effects were present afterwards in such a long transient.

Plot IV's in Appendix C include the results for the Case D: HPIS curve sensitivity study. The flow capacity of the HPIS showed strong influence on certain T/H parameters such as pressures, flowrates and PCT. The higher the HPIS flow is, the higher loop flow rate, and thus, the less the PCT is obtained, even though the discharge flow increases. For this size of small breaks, the designed HPIS capacity is more than needed.

Plot V's in Appendix D include the results for the Case E: nodalization sensitivity study. The simplified nodalization was almost as good as the base case in predicting the major T/H phenomena. The numeric efficiency, i.e., grind time was found to be 1.66, which was the same in both cases. Additional simplification study is recommended to find the minimum required volumes and junctions which simulate the LOFT Test L3-7.

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Table 1. Initial Conditions for Experiment L3-7 and Calculation

Parameter	Measured	Calculated
Primary Coolant System		
Mass flow rate (Kg/s)	481.30	481.26
Hot leg pressure (MPa)	14.90	14.95
Cold leg temperature (K)	556.00	555.81
Hot leg temperature (K)	576.10	574.74
Reactor Vessel		
Power level (MW)	49.00	48.91
Pressurizer		
Water temperature (K)	615.00	612.33
Pressure (MPa)	14.90	14.89
Liquid level (m)	1.10	1.09
Broken Loop		
Cold leg temperature near reactor vessel (K)	557.70	554.82
Hot leg temperature Near reactor vessel (K)	561.40	555.63
Steam Generator Secondary Side		
Water level (m)	0.25	0.25
Water temperature (K)	544.0	540.1
Pressure (MPs)	5.576	5.246
Mass flow rate (Kg/s)	28.000	24.982
Accumulator A		
Pressure (MPa)	4.31	4.31
Temperature (K)	306.60	300.25

Table 2. Sequence of Events for Experiment L3-7 and Calculation

Event	Time (sec)	
	Measured	Calculated
LOCE initiated	0	
Reactor scrammed	36.0	
Control rods reached bottom	38.1	33.5
Primary coolant pumps tripped	39.3	33.79
Primary coolant pumps coastdown completed	56.2	70.0
Core natural circulation first indicated	60.8	85.0
HPIS injection initiated	65.6	70.625
SCS auxiliary feed initiated	75	100.0
Pressurizer emptied	264	182.187
Upper plenum reached saturation pressure	382	350
End of subcooled break flow	1037	1550
SCS auxiliary initial feed terminated	1800	
HPIS flow terminated	1805.3	1820
SCS steam bleed initiated	3603	
HPIS flow reinstated	5974.2	5974.063
Accumulator injection initiated	6028	5581.187
Break isolated	7302.0	
Primary system fluid became subcooled	7915	
Pressurizer refill initiated	8680	
pressurizer refill terminated	19900	
Experiment Completed	29500	

Table 3. Assessment Data and Measurement Uncertainties

Component	Parameter	Prediction	Measurement Identifier	Uncertainty	EDR [5] Figure
BREAK	Mass Flow Rate	MFLOWJ 36500	FR-BL-111	±10% of Reading	5U-1
ECC	Volume Flow Rate	MFLOWJ 64000	FT-P128-104	±0.02 L/S	5U-6
VESSEL	Upper Plenum pressure	P25001	PE-1UP-1A1	±0.2 Mpa	5M-43
Primary Loop					
I.L.H.L	Velocity	VELFJ11201	FE-PC-002	±0.63 M/S	5U-5
	Density	RH010001	DE-PC-002	±100 Kg/m	5U-4
B.L.C.L	Density	RH034501	DE-BL-001	±76 Kg/m3	5U-2
Secondary Loop	Pressure (steam Dome)	P53001	PE-SGS-001	±0.012 Mpa	5U-16
CORE	Cladding Temp	HTTEMP 230000310	TE-5E8-34.5 -5F9-45	±3 K	5U-18
ACCUMULATOR	Level	CNTRLVAR 4	LIT-P120-044	±5%	5L-4
RELAP5	CPU				
	DT				

I.L.H.L. Intact Loop Hot Leg
B.L.C.L. Broken Loop Cold Leg
EDR Experiment Data Report [5]

Table 4. Scope of Sensitivity and Nodalization Study

	Break Cd 1-&2-Phase	Pump 2-phase Factor	HPIS Flow	Nodalization
Base (Case A)	1.0 1.0	L3-6 [12] Test	nominal [12]	Used in INEL 83 MOD2 Developmental Assessment [4]
Case B.1	1.20 1.00	"	"	"
2	0.80 1.00	"	"	"
3	1.00 1.40	"	"	"
4	1.00 1.20	"	"	"
5	1.00 0.80	"	"	"
6	0.90 0.90	"	"	"
Case C	1.00 1.00	Chen [13]	"	"
Case D.1	1.00 1.00		Higher	
D.2	1.00 1.00		Lower	
Case E	1.00 1.00	L3-6	Nominal	Simpler Nodalization Volumes 100&105→100(ILHL) 172&175→172(ILCL) 140&145→145 (Pump Outlet) 240&245→240 (Upper Core) 300&305→300(BLHL) 335&340→335(BLCL)

[ ] Reference number
ILHL Intact loop hot leg
ILCL Intact loop cold leg
BLHL Broken loop hot leg
BLCL Broken loop cold leg

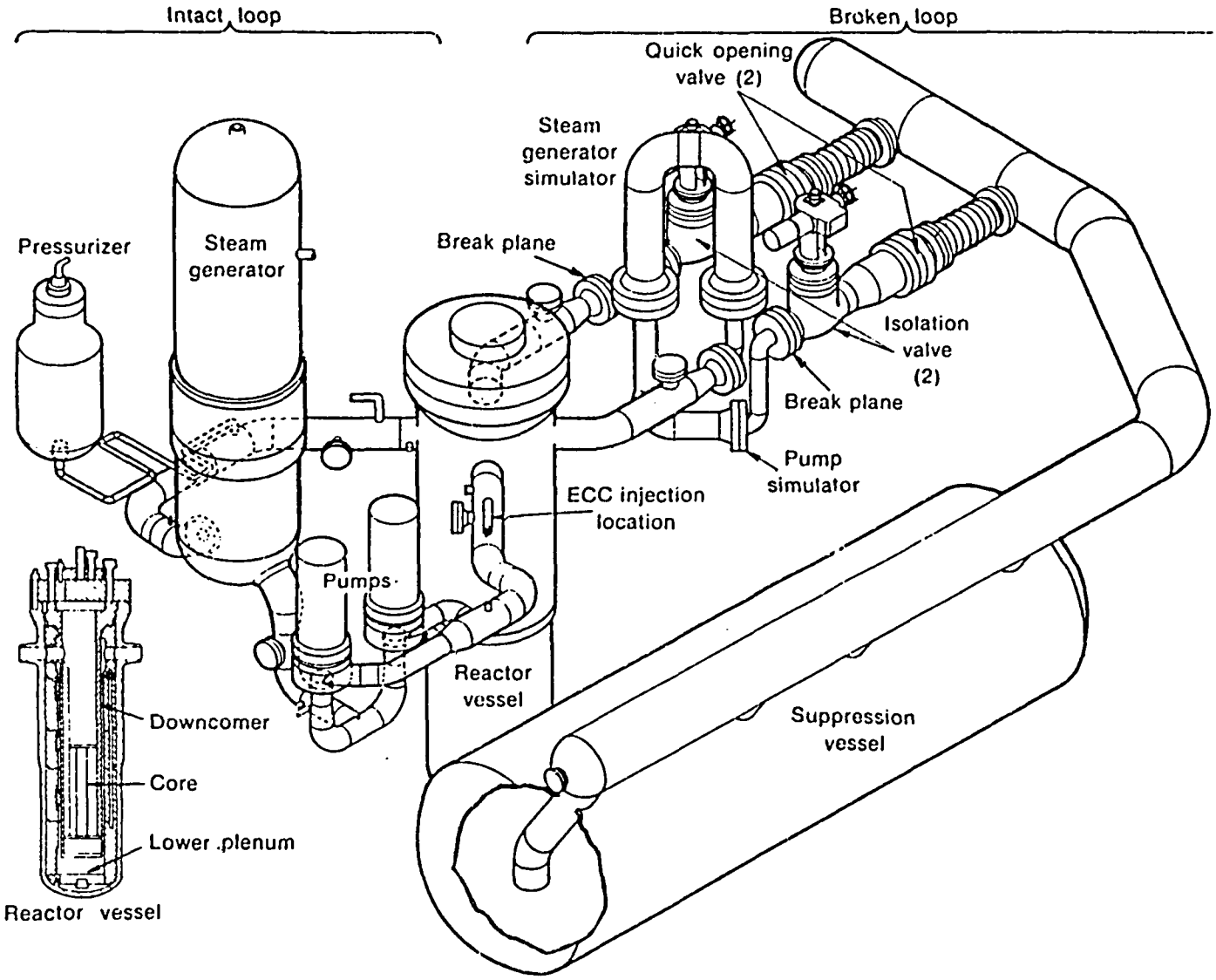
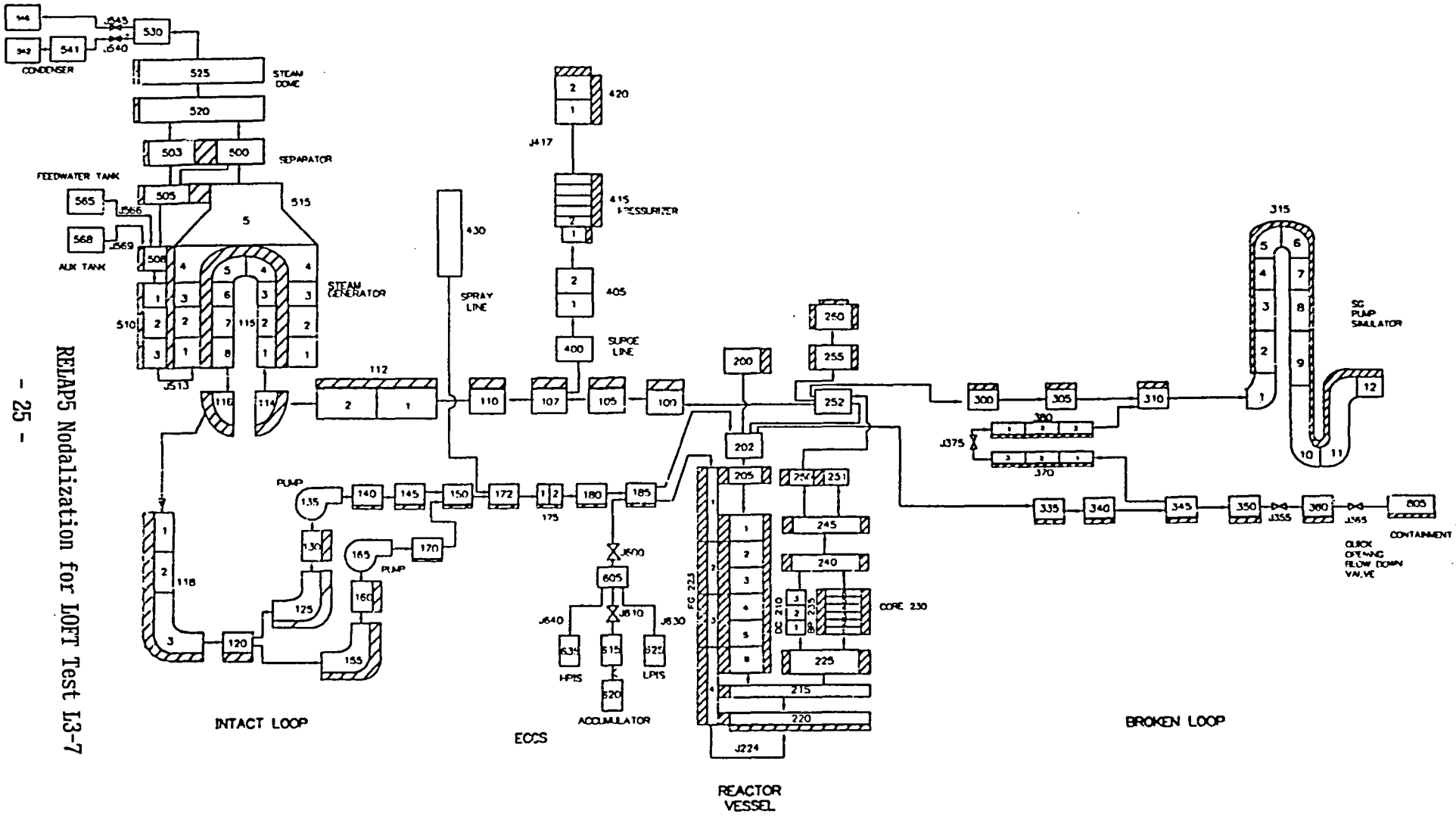


Fig. 1 LOFT major components.

LOFT System Configuration



Nodalization for LOFT L3-7

JEN00562

Appendix A Input Listings

- Steady-state deck (L37SS)
- Transient deck (L37BASE)

```
/JOB
L37SR1,T2000.
/USER
ATTACH,STH2XT,REL36KX.
PURGE,L3SRP1/NA.
DEFINE,RSTPLT=L3SRP1.
FILE,RSTPLT,SBF=NO.
RFL,CM=350000,EC=200.
REDUCE(-)
REL36KX,,*PL=50000.
/EOR
=LOFT L3-7 POST TEST ANALYSIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*              INITIAL CONDITIONS
*
*              CORE POWER = 48.9 MW
*              PCS FLOW = 481.3 KG/S
*              THOT = 576.1 K
*              TCOLD = 556.0 K
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000100   NEW    STDY-ST
0000101   RUN
0000105   5.0     10.0
0000110   NITROGEN
*   TIME STEP CONTROL CARDS
*         END TIME  MIN DT    MAX DT    OPTN MNR  MJR  RST
0000201   100.0     1.E-6     0.25      11   4    100  100
*CARD ABOVE IS A REPLACEMENT CARD OF THE ONE BELOW
* 0000201   200.0     1.E-6     0.25      2    4    100  100
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   MINOR EDIT VARIABLES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEADY STATE PLOT REQUESTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000301   P         250010000
0000302   P         530010000
0000303   TEMPF     250010000
0000304   TEMPF     185010000
0000305   TEMPF     515010000
0000306   MFLOWJ    540000000
0000307   MFLOWJ    985000000
0000308   MFLOWJ    995000000
0000309   CNTRLVAR  1
0000310   CNTRLVAR  2
0000311   MFLOWJ    566000000
0000312   CNTRLVAR  910
0000313   MFLOWJ    100010000
0000314   P         420010000
0000315   VOIDG     500010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TEMPERATURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000316   SATTEMP   345010000          * TE-BL-1A,1B,1C
0000317   SATTEMP   310010000          * TE-BL-2A,2B,2C
0000318   SATTEMP   100010000          * TE-PC-2A,2B,2C
0000319   SATTEMP   180010000          * TE-PC-1
```

```
0000320   SATTEMP   114010000          * TE-SG-1
0000321   SATTEMP   116010000          * TE-SG-2
0000322   SATTEMP   510030000          * TE-SG-3
0000323   SATTEMP   415040000          * TE-139-19
0000324   SATTEMP   415030000          * TE-139-20
0000325   SATTEMP   205010000          * TE-1ST-1 / TE-2ST-1
0000326   SATTEMP   210010000          * TE-1ST-2 / TE-2ST-2
0000327   SATTEMP   210050000          * TE-1ST-6 / TE-2ST-6
0000328   SATTEMP   210060000          * TE-1ST-7 / TE-2ST-7
0000329   SATTEMP   215010000          * TE-1ST-10 / TE-2ST-10
0000330   SATTEMP   220010000          * TE-1ST-13 / TE-2ST-13
0000331   SATTEMP   250010000          * TE-1UP-6
0000332   SATTEMP   251010000          * TE-2UP-4
0000333   SATTEMP   255010000          * TE-1UP-3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DENSITIES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000334   RHO       345010000          * DE-BL-1
0000335   RHO       310010000          * DE-BL-2
0000336   RHO       180010000          * DE-PC-1
0000337   RHO       100010000          * DE-PC-2
0000338   RHO       118020000          * DE-PC-3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VELOCITIES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000339   VELF      345010000          * FE-BL-1
0000340   VELF      310010000          * FE-BL-2
0000341   VELF      180010000          * FE-PC-1
0000342   VELF      100010000          * FE-PC-2
0000343   VELG      345010000          * FE-BL-1
0000344   VELG      310010000          * FE-BL-2
0000345   VELG      180010000          * FE-PC-1
0000346   VELG      100010000          * FE-PC-2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* MASS FLOW RATES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000347   MFLOWJ    350010000          * BREAK PLANE BLCL
0000348   MFLOWJ    315110000          * BREAK PLANE BLHL
0000349   MFLOWJ    345020000          * DTT-RAKE BLCL
0000350   MFLOWJ    310020000          * DTT-RAKE BLHL
0000351   MFLOWJ    180010000          * DTT-RAKE ILCL
0000352   MFLOWJ    100020000          * DTT-RAKE ILHL
0000353   MFLOWJ    400010000          * PRES. SURGE LINE FLOW
0000354   MFLOWJ    541010000          * FE-P4-12
0000355   MFLOWJ    566000000          * FE-P4-72-1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CLADDING TEMPERATURES CONTROL MODULE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000356   HTTEMP    230000110          *
0000357   HTTEMP    230000210          *
0000358   HTTEMP    230000310          *
0000359   HTTEMP    230000410          *
0000360   HTTEMP    230000510          *
0000361   HTTEMP    230000610          *
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LIQUID FRACTIONS IN THE PRESSURIZER                              *
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000362   VOIDF     415010000
0000363   VOIDF     415020000
```

```
0000364   VOIDF     415030000
0000365   VOIDF     415040000
0000366   VOIDF     415050000
0000367   VOIDF     415060000
0000368   VOIDF     420010000
0000369   VOIDF     420020000
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*     TRIPS
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     501-509  GENERAL TRIPS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     ALWAYS TRUE
0000501   TIME      0         GE   NULL      0         -1.0     L
*     ALWAYS FALSE
0000502   TIME      0         LT   NULL      0         -1.0     N
*     PRESSURIZER LOW LEVEL ALARM
0000503   CNTRLVAR  002       LE   NULL      0         0.3810   L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     510-519  TEST SPECIFIC TRIPS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     SCRAM
0000510   P         100010000 LE   NULL      0         1.4193+7 L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LT  677  COLD LEG QOBV           CARD 3650301
0000511   TIME      0         LT   NULL      0         7302.    N
0000512   TIME      0         GE   NULL      0         0.0      L
0000677   511       AND       512       N
*---- ----1---- ----1---- ----1----
* LT  678  COLD LEG ISOL VALVE     CARD 3550301
0000678   501       OR        501       N
*---- ----1---- ----1---- ----1----
* LT  681  ECC CHECK VALVE         CARD 6000301
0000577   MFLOWJ    600000000 GE   NULL      0         0.0      N
0000578   P         605010000 GE   P         185010000 0.0      N
0000681   577       AND       578       N
*---- ----1---- ----1---- ----1----
* LT  682  ACCUMULATOR VALVE       CARD 6100301
0000579   TIME      0         GE   NULL      0         1.0+9    L
0000682   579       OR        579       L
*---- ----1---- ----1---- ----1----
* LT  683  HPIS JUNCTION           CARD 6400200
0000513   P         100010000 LE   NULL      0         13.159+6 L
0000514   TIME      0         LT   NULL      0         1800.    N
0000515   TIME      0         GT   NULL      0         5974.    L
0000610   514       OR        515       N
0000683   610       AND       513       N
*---- ----1---- ----1---- ----1----
* LT  684  LPIS JUNCTION           CARD 6350200
0000684   510       AND       510       L
*---- ----1---- ----1---- ----1----
* LT  685-686  STEAM VALVE         CARD 5400301
* OPEN TRIP
0000589   P         530010000 GT   NULL      0         7.1125+6 N
0000590   P         530010000 LT   NULL      0         6.9747+6 N
0000670   685       OR        589       N
0000671   -590      AND       -686      N
0000685   671       AND       670       N
```

```
* CLOSE TRIP
0000591   P         530010000 GT   NULL      0         6.5613+6 N
0000592   P         530010000 LT   NULL      0         6.4924+6 N
0000672   686       OR        592       N
0000673   -591      AND       672       N
0000674   -685      AND       699       N
0000686   673       AND       674       N
*---- ----1---- ----1---- ----1----
* LT  687  STEAM BYPASS VALVE      CARD 5450301
0000516   TIME      0         GE   NULL      0         3574.    L
0000517   P         530010000 GT   P         546010000 0.       N
0000687   516       AND       517       N
*---- ----1---- ----1---- ----1----
* LT  688  FEED JUNCTION           CARD 5660200
0000688   510       AND       510       L
*---- ----1---- ----1---- ----1----
* LT  689  FEED VOLUME             CARD 5650200
0000689   510       AND       510       L
*---- ----1---- ----1---- ----1----
* LT  690  AUX FEED JUNCTION       CARD 5690200
0000690   516       AND       516       L
*---- ----1---- ----1---- ----1----
* LT  692  PZR SPRAY VALVE         CARD 4350301
0000583   P         420010000 GT   NULL      0       1.533874+7 N
0000584   P         420010000 LT   NULL      0       1.516637+7 N
0000665   583       OR        692       N
0000692   -584      AND       665       N
*---- ----1---- ----1---- ----1----
* LT  695  PCP 1 TRIP              CARD 1350301
0000695   510       AND       510       N
*---- ----1---- ----1---- ----1----
* LT  696  PCP 1 VELOCITY TABLE    CARD 1356100
0000696   502       AND       502       N
*---- ----1---- ----1---- ----1----
* LT  697  PCP 2 TRIP              CARD 1650301
0000697   510       AND       510       N
*---- ----1---- ----1---- ----1----
* LT  698  PCP 2 VELOCITY TABLE    CARD 1656100
0000698   502       AND       502       N
*---- ----1---- ----1---- ----1----
* LT  699  SCRAM                   CARD 20269900 OR 20290000
0000699   510       OR        510       L
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   INTACT LOOP
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - INTACT LOOP HOT LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1000000   "RVN ILHL  "      BRANCH
1000001   2         0
1000101   0.0       1.58878   0.102752  0.0       0.0       0.0
1000102   4.0E-5    0.0       00
1000200   0         14913500. 1328990.0 2461830.0 0.0
1001101   252010000 100000000 0.0634    0.1       0.1       0002
1002101   100010000 105000000 0.0       0.1       0.1       0000
1001201   10.523000 10.523000 0.0
1002201   10.517000 10.517000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
```

```
* PRESSURIZER CONNECTION TEE REACTOR VESSEL SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1050000   "PZR T RVS "        BRANCH
1050001   1         0
1050101   0.0634444 1.0531192 0.0       0.0       0.0       0.0
1050102   4.0E-5    0.0       00
1050200   0         14905700. 1328990.  2461990.  0.0
1051101   105010000 107000000 0.0       0.12      0.12      0000
1051201   10.757000 10.757000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER CONNECTION TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1070000   "PZR T     "        BRANCH
1070001   1         0
1070101   0.0620253 0.2810215 0.0       0.0       0.0       0.0
1070102   4.0E-5    0.0       00
1070200   0         14897600. 1328990.  2462160.  0.0
1071101   107010000 110000000 0.0       0.135     0.135     0000
1071201   11.009    11.009    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER CONNECTION TEE STEAM GENERATOR SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1100000   "PZR T SGS "        BRANCH
1100001   1         0
1100101   0.0606063 0.9207292 0.0       0.0       0.0       0.0
1100102   4.0E-5    0.0       00
1100200   0         14888500. 1328980.  2462350.  0.0
1101101   110010000 112000000 0.0       0.15      0.15      0000
1101201   11.628000 11.628000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HOT LEG PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1120000   "HOT LEG PP"        PIPE
1120001   2
1120101   0.0       2
1120201   0.0       1
1120301   1.38893   1
1120302   0.707687  2
1120401   0.0796973 1
1120402   0.0579614 2
1120501   0.0       2
1120601   0.0       1
1120602   90.0      2
1120701   0.0       1
1120702   0.246447  2
1120801   4.0E-5    0.0       2
1120901   0.20      0.20      1
1121001   00        2
1121101   0000      1
1121201   0         14873600. 1328970.  2462670.  0.0  0.0  01
1121202   0         14885900. 1328970.  2462410.  0.0  0.0  02
1121300   0
1121301   11.628000 11.628000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG INLET PLENUM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1140000   "SG IN PLNM"        BRANCH
1140001   2         0
1140101   0.0       0.629795  0.33532   0.0       90.0      0.512756
```

```
1140102   4.E-5     0.0102    00
1140200   0         14801000. 1328950.  2464200.  0.0
1141101   112010000 114000000 0.0512    0.0       0.0       0100
1142101   114010000 115000000 0.0       0.0       0.0       0100
1141201   8.1466000 8.1466000 0.0
1142201   4.4143000 4.4143000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG U-TUBES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1150000   "SG TUBES  "       PIPE
1150001   8
1150101   0.0       8
1150201   0.151171  7
1150301   0.902     1
1150302   0.6096    3
1150303   0.462908  5
1150304   0.6096    7
1150305   0.902     8
1150401   0.136356  1
1150402   0.0921538 3
1150403   0.0699783 5
1150404   0.0921538 7
1150405   0.136356  8
1150501   0.0       8
1150601   90.0      4
1150602   -90.0     8
1150701   0.902     1
1150702   0.6096    3
1150703   0.299572  4
1150704   -0.299572 5
1150705   -0.6096   7
1150706   -0.902    8
1150801   1.27-7    0.01022   8
1150901   0.0       0.0       7
1151001   00        8
1151101   0000      7
1151201   0         14781200. 1308850.  2464620.  0.0  0.0  01
1151202   0         14767100. 1292040.  2464910.  0.0  0.0  02
1151203   0         14755800. 1277830.  2465150.  0.0  0.0  03
1151204   0         14746400. 1267890.  2465350.  0.0  0.0  04
1151205   0         14741200. 1258740.  2465460.  0.0  0.0  05
1151206   0         14738500. 1247990.  2465520.  0.0  0.0  06
1151207   0         14736200. 1237950.  2465570.  0.0  0.0  07
1151208   0         14733400. 1228440.  2465630.  0.0  0.0  08
1151300   0
1151301   4.3678000 4.3678000 0.0       01
1151302   4.3300000 4.3300000 0.0       02
1151303   4.2988000 4.2988000 0.0       03
1151304   4.2777000 4.2777000 0.0       04
1151305   4.2587000 4.2587000 0.0       05
1151306   4.2370000 4.2370000 0.0       06
1151307   4.2166000 4.2166000 0.0       07
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG OUTLET PLENUM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1160000   "SG OUT PLN"       BRANCH
1160001   2         0
1160101   0.0       0.629795  0.33532   0.0       -90.0     -0.512756
1160102   4.E-5     0.0102    00
```

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1160200   0         14735800. 1228440.  2465580.  0.0
1161101   115010000 116000000 0.0       0.0       0.0       0100
1162101   116010000 118000000 0.0512    0.0       0.0       0100
1161201   4.1997000 4.1997000 0.0
1162201   7.7841000 7.7841000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SUCTION PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1180000   "PMP SUC PP"       PIPE
1180001   3
1180101   0.0       3
1180201   0.0       2
1180301   0.546638  1
1180302   0.688596  2
1180303   0.558577  3
1180401   0.0445625 1
1180402   0.0445137 2
1180403   0.0354278 3
1180501   0.0       3
1180601   -90.0     3
1180701   -0.498052 1
1180702   -0.688596 2
1180703   -0.355604 3
1180801   4.E-5     0.0       3
1180901   0.083     0.083     1
1180902   0.104     0.104     2
1181001   00        3
1181101   0000      2
1181201   0         14659900. 1228430.  2467190.  0.0  0.0  01
1181202   0         14646900. 1228430.  2467470.  0.0  0.0  02
1181203   0         14644400. 1228430.  2467520.  0.0  0.0  03
1181300   0
1181301   9.8172000 9.8172000 0.0       01
1181302   10.006000 10.006000 0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SUCTION TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1200000   "PMP SCT T "       BRANCH
1200001   3         0
1200101   0.0       0.759614  0.0487901 0.0       0.0       0.0
1200102   4.0E-5    0.0       00
1200200   0         14641700. 1228420.  2467580.  0.0
1201101   118010000 120000000 0.0       0.1       0.1       0000
1202101   120010000 125000000 0.0317    0.4       0.4       0100
1203101   120010000 155000000 0.0317    0.4       0.4       0100
1201201   10.006000 10.006000 0.0
1202201   5.2047000 5.2047000 0.0
1203201   4.7736000 4.7736000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP1 SUCTION TEE OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1250000   "PMP1 SCT T"       BRANCH
1250001   1         0
1250101   0.0       1.00308   0.0640548 0.0       90.0      0.520704
1250102   4.0E-5    0.0       00
1250200   0         14619800. 1228410.  2468040.  0.0
1251101   125010000 130000000 0.0       0.13      0.13      0000
1251201   8.5638000 8.5638000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
```

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* PUMP 1 INLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1300000   "PMP1 INLET"       SNGLVOL
1300101   0.0       0.457201  0.0177444 0.0       90.0      0.457201
1300102   4.0E-5    0.0       00
1300200   0         14594400. 1228410.  2468590.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1350000   "PCPUMP1   "       PUMP
1350101   0.0       0.4572    0.0991    0.0       90.0      0.317900
1350102   0
1350108   130010000 0.0       0.017     0.017     0000
1350109   140000000 0.0       0.05      0.05      0000
1350200   0         14870800. 1228670.  2462730.  0.0
1350201   0         8.5640000 8.5640000 0.0
1350202   0         9.0771000 9.0771000 0.0
1350301   0    0    0         -1        -1        695       0
1350302   369.00000 .91178862 .31550000 96.000000 500.60000 1.4310000
1350303   613.6     0.0       207.433   0.0444    19.5987   0.0
1350308   78.53982  0.0       -22.86511 27.16043  5.74589
1350310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 1 OUTLET PUMP SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1400000   "PMP1 OUT P"       SNGLVOL
1400101   0.0       0.502185  0.0183849 0.0       0.0       0.0
1400102   4.0E-5    0.0       00
1400200   0         15090400. 1228670.  2457720.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP1 OUTLET PIPE TEE SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1450000   "PMP1 OUT T"       BRANCH
1450001   2         0
1450101   0.0       1.4084    0.0633    0.0       0.0       0.0
1450102   4.0E-5    0.0       00
1450200   0         15099600. 1228660.  2457500.  0.0
1451101   140010000 145000000 0.0       0.0       0.0       0000
1452101   145010000 150000000 0.0       0.1       0.1       0100
1451201   9.0747000 9.0747000 0.0
1452201   7.3917000 7.3917000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP OUTLET TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1500000   "PMP OUT T "       BRANCH
1500001   2         0
1500101   0.0636463 0.3542995 0.0       0.0       0.0       0.0
1500102   4.0E-5    0.0       00
1500200   0         15079600. 1228680.  2457980.  0.0
1501101   170010000 150000000 0.0183    0.1       0.1       0100
1502101   150010000 172000000 0.0       0.0       0.0       0000
1501201   8.0488000 8.0488000 0.0
1502201   9.9847000 9.9847000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 SUCTION TEE OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1550000   "PMP2 SCT T"       BRANCH
1550001   1         0
1550101   0.0       1.00308   0.0640548 0.0       90.0      0.520704
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1550102   4.0E-5    0.0       00
1550200   0         14629600. 1228410.  2467830.  0.0
1551101   155010000 160000000 0.0       0.13      0.13      0000
1551201   7.7885000 7.7885000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 INLET PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1600000   "PMP2 INLET"       SNGLVOL
1600101   0.0       0.457201  0.0177444 0.0       90.0      0.457201
1600102   4.0E-5    0.0       00
1600200   0         14608000. 1228410.  2468300.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1650000   "PCPUMP2   "       PUMP
1650101   0.0       0.514     0.0991    0.0       90.0      0.317900
1650102   0
1650108   160010000 0.0       0.017     0.017     0000
1650109   170000000 0.0       0.1       0.1       0000
1650200   0         14928600. 1228710.  2461510.  0.0
1650201   0         7.7887000 7.7887000 0.0
1650202   0         8.0515000 8.0515000 0.0
1650301   135  135  135       -1        -1        697       0
1650302   369.00000 .93018970 .31550000 96.000000 500.60000 1.4310000
1650303   613.6     0.0       207.433   0.0444    19.5987   0.0
1650308   78.53982  0.0       -22.86511 27.16403  5.74589
1650310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1700000   "PMP2 OUT T"       BRANCH
1700001   0         0
1700101   0.0       0.514071  0.0192958 0.0       0.0       0.0
1700102   4.0E-5    0.0       00
1700200   0         15203100. 1228710.  2454990.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SPRAY TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1720000   "PZR SPR T "       BRANCH
1720001   1         0
1720101   0.0635359 0.2844229 0.0       0.0       0.0       0.0
1720102   4.0E-5    0.0       00
1720200   0         15078900. 1228680.  2458000.  0.0
1721101   172010000 175000000 0.0       0.0       0.0       0000
1721201   10.002    10.002    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INTACT LOOP COLD LEG PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1750000   "ILCL PIPE "       PIPE
1750001   2
1750101   0.0       2
1750201   0.0       1
1750301   0.4163655 1
1750302   0.613244  2
1750401   0.0264082 1
1750402   0.038895  2
1750501   0.0       2
1750601   0.0       2
1750701   0.0       2
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1750801   4.0E-5    0.0       2
1750901   0.0       0.0       1
1751001   00        2
1751101   0000      1
1751201   0         15078200. 1228680.  2458020.  0.0  0.0  01
1751202   0         15077300. 1228680.  2458040.  0.0  0.0  02
1751300   0
1751301   10.002000 10.002000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CONNECTION TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1800000   "ECC T     "        BRANCH
1800001   1         0
1800101   0.0       1.15189   0.0730598 0.0       0.0       0.0
1800102   4.0E-5    0.0       00
1800200   0         15075800. 1228670.  2458080.  0.0
1801101   175010000 180000000 0.0       0.0       0.0       0000
1801201   10.002000 10.002000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - INTACT LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1850000   "RVN ILCL  "        BRANCH
1850001   2         0
1850101   0.0       1.00965   0.0644920 0.0       0.0       0.0
1850102   4.0E-5    0.0       00
1850200   0         15075200. 1228670.  2458090.  0.0
1851101   185010000 202000000 0.0634    2.8       2.8       0101
1852101   180010000 185000000 0.0       0.0       0.0       0100
1851201   8.6438000 8.6438000 0.0
1852201   10.002000 10.002000 0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   REACTOR VESSEL
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS TOP VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2000000   "IN AN TOP "        BRANCH
2000001   1         0
2000101   0.2617061 0.1876129 0.0       0.0       90.0      0.1876129
2000102   3.81-6    0.178     00
2000200   0         15030000. 1232640.  2459190.  0.0
2001101   200000000 202000000 0.0       0.0       0.0       0000
2001201   1.59691-7 1.59691-7 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2020000   "IN AN     "        BRANCH
2020001   2         0
2020101   0.2617061 0.2851822 0.0       0.0       -90.0     -0.2851822
2020102   3.81-6    0.175     00
2020200   0         15031700. 1228660.  2459150.  0.0
2021101   202010000 205000000 0.0       0.0       0.0       0000
2022101   202000000 252000000 0.0       4.5+4     4.5+4     0003
2021201   2.2804    2.2804    0.0
2022201   6.12444-2 6.12444-2 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS BOTTOM VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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2050000   "IN AN BOT "        BRANCH
2050001   1         0
2050101   0.2296374 0.2525361 0.0       0.0       -90.0     -0.2525361
2050102   3.81-6    0.172     00
2050200   0         15031700. 1228660.  2459150.  0.0
2051101   205010000 210000000 0.0       0.0       0.0       0000
2051201   3.5613000 3.5613000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2100000   "DOWNCOMER "        ANNULUS
2100001   6
2100101   0.0       6
2100201   0.0       5
2100301   1.0267313 1
2100302   0.4933248 2
2100303   0.7028265 3
2100304   0.5588068 4
2100305   0.6522799 5
2100306   0.4269792 6
2100401   0.1509710 1
2100402   0.0706690 2
2100403   0.1060015 3
2100404   0.0795138 4
2100405   0.0998947 5
2100406   0.06252   6
2100501   0.0       6
2100601   -90.0     6
2100801   3.81-6    0.102     6
2100901   0.0       0.0       5
2101001   00        6
2101101   0000      5
2101201   0         15033300. 1228660.  2459110.  0.0  0.0  01
2101202   0         15038200. 1228660.  2458990.  0.0  0.0  02
2101203   0         15042800. 1228660.  2458880.  0.0  0.0  03
2101204   0         15046500. 1228660.  2458790.  0.0  0.0  04
2101205   0         15051300. 1228660.  2458670.  0.0  0.0  05
2101206   0         15054600. 1228660.  2458590.  0.0  0.0  06
2101300   0
2101301   3.6556000 3.6556000 0.0       01
2101302   3.6555000 3.6555000 0.0       02
2101303   3.6801000 3.6801000 0.0       03
2101304   3.6801000 3.6801000 0.0       04
2101305   3.5763000 3.5763000 0.0       05
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER PLENUM TOP VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2150000   "LWR PL TOP"        BRANCH
2150001   3         0
2150101   0.0       0.3533183 0.24520   0.0       -90.0     -0.3533183
2150102   3.81-6    0.0       00
2150200   0         15052500. 1228660.  2458640.  0.0
2151101   210010000 215000000 0.0       2.00      2.00      0000
2152101   215010000 220000000 0.0       0.005     0.005     0000
2153101   215000000 225000000 0.1499    1.5       1.5       0000
2151201   3.5762000 3.5762000 0.0
2152201   -.1243900 -.1243900 0.0
2153201   4.0692000 4.0692000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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* LOWER PLENUM BOTTOM VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2200000   "LWR PL BOT"        SNGLVOL
2200101   0.0       0.3741720 0.29656   0.0       -90.0     -0.3741720
2200102   4.0E-5    0.0       00
2200200   0         15055200. 1227510.  2458580.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION FROM COLD LEG TO FILLER GAP
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2220000   "CL-FLLRGAP"       SNGLJUN
2220101   185010000 223000000 0.0       15.000    15.000    0100
2220201   0         1.3659000 1.3659000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL FILLER GAP
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2230000   "FILLER GAP"        ANNULUS
2230001   4
2230101   0.0       4
2230201   0.0       3
2230301   1.4218585 1
2230302   1.1961513 2
2230303   1.2110867 3
2230304   0.7802975 4
2230401   0.0899085 1
2230402   0.0722790 2
2230403   0.0334096 3
2230404   0.0309800 4
2230501   0.0       4
2230601   -90.0     4
2230801   3.81-6    0.0       4
2230901   0.0       0.0       3
2231001   00        4
2231101   0000      3
2231201   0         15105600. 1228360.  2457350.  0.0  0.0  01
2231202   0         15115300. 1228100.  2457120.  0.0  0.0  02
2231203   0         15121100. 1227850.  2456970.  0.0  0.0  03
2231204   0         15130300. 1227690.  2456750.  0.0  0.0  04
2231300   0
2231301   1.4291000 1.4291000 0.0       01
2231302   1.3129900 1.3129900 0.0       02
2231303   3.1295000 3.1295000 0.0       03
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION FROM FILLER GAP TO LOWER PLENUM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2240000   "FLLRGAP-LP"       SNGLJUN
2240101   223010000 220000000 0.0       15.       15.       0000
2240101   223010000 220000000 0.0       45.       45.       0000
2240201   0         2.1743000 2.1743000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER CORE SUPPORT STRUCTURE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2250000   "L CORE SUP"        BRANCH
2250001   2         0
2250101   0.0       0.4269792 0.12094   0.0       90.0      0.4269792
2250102   3.81-6    0.095     00
2250200   0         15038300. 1228490.  2458990.  0.0
2251101   225010000 230000000 0.1134    1.5       1.5       0100
2252101   225010000 235000000 0.0       12.       12.       0100
2251201   3.2020000 3.2020000 0.0
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2252201   1.6570000 1.6570000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACTIVE CORE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2300000   "CORE      "        PIPE
2300001   6
2300101   0.0       6
2300201   0.1705    1
2300202   0.144     2
2300203   0.1705    3
2300204   0.144     4
2300205   0.1705    5
2300301   0.3728765 1
2300302   0.2794034 5
2300303   0.4234231 6
2300401   0.0683340 1
2300402   0.0478582 2
2300403   0.0483329 3
2300404   0.0479138 4
2300405   0.0479052 5
2300406   0.0750459 6
2300501   0.0       6
2300601   90.0      6
2300801   1.27-7    0.012     6
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
2301001   00        6
2301101   0000      5
2301201   0         15017600. 1243280.  2459490.  0.0  0.0  01
2301202   0         15012600. 1267710.  2459620.  0.0  0.0  02
2301203   0         15004500. 1294130.  2459810.  0.0  0.0  03
2301204   0         15000500. 1317510.  2459910.  0.0  0.0  04
2301205   0         14992300. 1332930.  2460100.  0.0  0.0  05
2301206   0         14987800. 1337240.  2460200.  0.0  0.0  06
2301300   0
2301301   3.4659000 3.4659000 0.0       01
2301302   4.1523000 4.1523000 0.0       02
2301303   3.5540000 3.5540000 0.0       03
2301304   4.2594000 4.2594000 0.0       04
2301305   3.6273000 3.6273000 0.0       05
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE BYPASS VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2350000   "CORE BYPSS"       PIPE
2350001   3
2350101   0.0       3
2350201   0.0       2
2350301   0.6522799 1
2350302   0.5588068 2
2350303   0.7028265 3
2350401   0.0091280 1
2350402   0.0072325 2
2350403   0.0088095 3
2350501   0.0       3
2350601   90.0      3
2350801   3.81-6    0.003     3
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2350901   0.0        0.0        2
2351001   00         3
2351101   0000       2
2351201   0          15001900. 1228490.  2459460.  0.0  0.0  01
2351202   0          15007600. 1228490.  2459740.  0.0  0.0  02
2351203   0          14994900. 1228500.  2460040.  0.0  0.0  03
2351300   0
2351301   1.7916000 1.7916000 0.0        01
2351302   1.8500000 1.8500000 0.0        02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER END BOXES AND SUPPORT STRUCTURE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2400000   "UPR END BX"        BRANCH
2400001   2          0
2400101   0.0        0.4933248 0.1195494 0.0       90.0      0.4933248
2400102   3.81-6     0.145     00
2400200   0          14969100. 1333110.  2460620.  0.0
2401101   230010000 240000000 0.1118    1.5       1.5       0100
2402101   235010000 240000000 0.0       12.       12.       0100
2401201   3.4977000 3.4977000 0.0
2402201   1.8501000 1.8501000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER CORE SUPPORT STRUCTURE - CROSS FLOW REGION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2450000   "UPR CR SUP"        BRANCH
2450001   2          0
2450101   0.0        0.4933248 0.1280806 0.0       90.0      0.4933248
2450102   3.81-6     0.145     00
2450200   0          15420100. 1407960.  2449770.  0.0
2451101   240010000 245000000 0.0       0.0       0.0       0000
2452101   245010000 251000000 0.0       0.0       0.0       0100
2451201   2.1756000 2.1756000 0.0
2452201   -.24832-4 -.24832-4 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER FLOW SKIRT REGION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2500000   "U FLW SKRT"        BRANCH
2500001   1          0
2500101   0.1547532 0.7850547 0.0       0.0       90.0      0.7850547
2500102   3.81-6     0.131     00
2500200   0          14955900. 1333110.  2460920.  0.0
2501101   245010000 250000000 0.0       0.0       0.0       0100
2501201   4.1549000 4.1549000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DEAD END OF FUEL MODULES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2510000   "DE FL MODS"        SNGLVOL
2510101   0.0        0.7844123 0.1154214 0.0       90.0      0.7844123
2510102   3.81-6     0.214     00
2510200   0          14963500. 1329710.  2460750.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER HEAD
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2520000   "UPR HEAD  "        BRANCH
2520001   1          0
2520101   0.2622585 0.2869580 0.0       0.0       90.0      0.2869580
2520102   3.81-6     0.0       00
2520200   0          14957200. 1329000.  2460890.  0.0
2521101   250010000 252000000 0.0       0.006     0.006     0000
```

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2521201   4.1549000 4.1549000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PLENUM BOTTOM VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2550000   "UPR PL BOT"       BRANCH
2550001   2         0
2550101   0.2622585 0.6312304 0.0       0.0       90.0      0.6312304
2550102   3.81-6    0.0       00
2550200   0         14954800. 1328590.  2460950.  0.0
2551101   252010000 255000000 0.0       0.006     0.006     0000
2552101   255010000 260000000 0.0       0.03      0.03      0000
2551201   3.56869-6 3.56869-6 0.0
2552201   4.52212-6 4.52212-6 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PLENUM TOP VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2600000   "UPR PL TOP"       SNGLVOL
2600101   0.0       0.7747094 0.1914909 0.0       90.0      0.7747094
2600102   3.81-6    0.0       00
2600200   0         14949800. 1326010.  2461060.  0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*    BROKEN LOOP
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP HOT LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3000000   "RVN BLHL  "       BRANCH
3000001   2         0
3000101   0.0       0.876303  0.0575410 0.0       0.0       0.0
3000102   4.0E-5    0.0       00
3000200   0         14957200. 1221360.  2460890.  0.0
3001101   252010000 300000000 0.067014  0.0       0.0       0002
3002101   300010000 305000000 0.063426  0.1       0.1       0000
3001201   -.1240600 -.1240600 0.0
3002201   -.1311000 -.1311000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HOT LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3050000   "HLP-RABS T"       BRANCH
3050001   1         0
3050101   0.0       0.698336  0.0442927 0.0       0.0       0.0
3050102   4.0E-5    0.0       00
3050200   0         14957200. 1221770.  2460890.  0.0
3051101   305010000 310000000 0.0       0.1       0.1       0100
3051201   -.1838800 -.1838800 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP HOT LEG CONTRACTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3100000   "BLHL CONTR"       BRANCH
3100001   2         0
3100101   0.0       1.50013   0.0678467 0.0       0.0       0.0
3100102   4.0E-5    0.0       00
3100200   0         14957200. 1222120.  2460890.  0.0
3101101   380010000 310000000 0.0388    0.84      0.84      0100
3102101   310010000 315000000 0.0083647 0.0       0.0       0100
3101201   .21484000 .21484000 0.0
3102201   2.07725-3 2.07725-3 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
```

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* STEAM GENERATOR AND PUMP SIMULATIOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3150000   "SG+PMP SIM"       PIPE
3150001   12
3150101   0.0        12
3150201   0.0083647 2
3150202   0.032603  4
3150203   0.105626  5
3150204   0.032603  7
3150205   0.0083647 9
3150206   0.008364  10
3150207   0.0046398 11
3150301   0.367768  1
3150302   0.552201  2
3150303   0.993978  4
3150304   0.849744  6
3150305   0.993978  8
3150306   1.371350  9
3150307   1.365029  10
3150308   1.674812  11
3150309   0.545209  12
3150401   3.0767-3  1
3150402   4.67621-3 2
3150403   8.60554-2 4
3150404   8.97552-2 6
3150405   8.60554-2 8
3150406   1.82303-2 9
3150407   5.46687-2 10
3150408   1.82489-2 11
3150409   2.83241-2 12
3150601   90.0      5
3150602   -90.0     10
3150603   90.0      11
3150604   0.0       12
3150701   0.127000  1
3150702   0.552201  2
3150703   0.993978  4
3150704   0.457202  5
3150705   -0.457202 6
3150706   -0.993978 8
3150707   -1.371350 9
3150708   -0.520701 10
3150709   1.212851  11
3150710   0.0       12
3150801   4.0E-5    0.0       3
3150802   4.0E-5    0.124     4
3150803   4.0E-5    0.0       6
3150804   4.0E-5    0.124     7
3150805   4.0E-5    0.0       12
3150901   0.2       0.2       1
3150902   0.0       0.0       2
3150903   93.9      93.9      4
3150904   0.4       0.4       5
3150905   93.9      93.9      7
3150906   0.0       0.0       8
3150907   0.2       0.2       9
3150908   4.1       4.1       10
3150909   0.4       0.4       11
3151001   00        12
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3151101   0000      1
3151102   0100      2
3151103   0000      7
3151104   0100      8
3151105   0000      10
3151106   0100      11
3151201   0         14956800. 1204970.  2460900.  0.0  0.0  01
3151202   0         14954200. 1196960.  2460960.  0.0  0.0  02
3151203   0         14948400. 1216750.  2461090.  0.0  0.0  03
3151204   0         14941000. 1217220.  2461250.  0.0  0.0  04
3151205   0         14935500. 1219110.  2461370.  0.0  0.0  05
3151206   0         14935500. 1219140.  2461370.  0.0  0.0  06
3151207   0         14941000. 1217240.  2461250.  0.0  0.0  07
3151208   0         14948400. 1217200.  2461090.  0.0  0.0  08
3151209   0         14957300. 1206410.  2460890.  0.0  0.0  09
3151210   0         14964400. 1209760.  2460730.  0.0  0.0  10
3151211   0         14961800. 1196570.  2460790.  0.0  0.0  11
3151212   0         14957200. 1215100.  2460890.  0.0  0.0  12
3151300   0
3151301   -.14625-4 -.14625-4 0.0       01
3151302   -.35422-4 -.35422-4 0.0       02
3151303   -.13114-4 -.13114-4 0.0       03
3151304   -.72833-5 -.72833-5 0.0       04
3151305   -.24333-5 -.24333-5 0.0       05
3151306   -.88365-5 -.88365-5 0.0       06
3151307   -.29947-5 -.29947-5 0.0       07
3151308   -.19321-4 -.19321-4 0.0       08
3151309   -.16785-4 -.16785-4 0.0       09
3151310   -.16628-4 -.16628-4 0.0       10
3151311   -.12497-4 -.12497-4 0.0       11
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3350000   "RVN BLCL  "        BRANCH
3350001   2         0
3350101   0.0       0.749305  0.047979  0.0       0.0       0.0
3350102   4.0E-5    0.0       00
3350200   0         15031700. 1228270.  2459150.  0.0
3351101   202000000 335000000 0.064130  1.0       1.0       0002
3352101   335010000 340000000 0.063426  0.1       0.1       0000
3351201   .13028000 .13028000 0.0
3352201   .13170000 .13170000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3400000   "CLP-RABS T"        BRANCH
3400001   1         0
3400101   0.0       0.698336  0.0443927 0.0       0.0       0.0
3400102   4.0E-5    0.0       00
3400200   0         15031700. 1227890.  2459150.  0.0
3401101   340010000 345000000 0.0       0.1       0.1       0100
3401201   .18613000 .18613000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP COLD LEG CONTRACTION TO BREAK PLANE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3450000   "BLCL CONTR"        BRANCH
3450001   2         0
3450101   0.0       1.50013   0.0673163 0.0       0.0       0.0
3450102   4.0E-5    0.0       00
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3450200   0         15424700. 1228050.  2449660.  0.0
3451101   345000000 370000000 0.0388    0.84      0.84      0100
3452101   345010000 350000000 0.0046367 0.0       0.0       0100
3451201   .21516000 .21516000 0.0
3452201   6.55835-5 6.55835-5 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPOOL PIECE AND PIPE TO ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3500000   "BRK SP+PPE"       PIPE
3500001   2
3500101   0.0       2
3500201   0.023520  1
3500301   0.453394  1
3500302   1.074803  2
3500401   0.0106640 1
3500402   0.0407801 2
3500601   0.0       2
3500801   4.0E-5    0.0       1
3500802   4.0E-5    0.0       2
3500901   0.0       0.0       1
3501001   00        2
3501101   0100      1
3501201   0         15031700. 1218930.  2459150.  0.0  0.0  01
3501202   0         15031700. 1226360.  2459150.  0.0  0.0  02
3501300   0
3501301   4.59331-5 4.59331-5 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3550000   "CL ISO VLV"       VALVE
3550101   350010000 360000000 0.0       0.0       0.0       0100
3550201   0         -6.7943-7 -6.7943-7 0.0
3550300   TRPVLV
3550301   678
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG PIPE BETWEEN ISOLATION VALVE AND QOBV
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3600000   "CL IS-QOBV"       SNGLVOL
3600101   0.0       0.569219  0.0297722 0.0       0.0       0.0
3600102   4.0E-5    0.0       00
3600200   0         15031700. 1241690.  2459150.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG QUICK OPENING BLOWDOWN VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3650000   "CL QOBV   "       VALVE
3650101   360010000 805000000 0.0466    0.0       0.0       0000
3650201   0         .00000000 .00000000 0.0
3650300   TRPVLV
3650301   677
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - COLD LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3700000   "RABS C L  "       PIPE
3700001   3
3700101   0.0388    2
3700102   0.0776    3
3700201   0.0388    2
3700301   0.0       3
3700401   0.0279    1
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3700402   0.070      2
3700403   0.1165     3
3700601   90.0       1
3700602   0.0        3
3700701   0.64       1
3700702   0.0        3
3700801   4.0-5      0.0        3
3700901   0.28       0.28       1
3700902   0.84       0.84       2
3701001   00         3
3701101   0000       2
3701201   0          15029300. 1226830.  2459210.  0.0  0.0  01
3701202   0          15026900. 1226050.  2459270.  0.0  0.0  02
3701203   0          15026900. 1224760.  2459270.  0.0  0.0  03
3701300   0
3701301   .21514000 .21514000 0.0        01
3701302   .21508000 .21508000 0.0        02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS VALVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3750000   "RABS VALVS"        SNGLJUN
3750101   370010000 380000000 0.0        1.55+4    1.55+4    0000
3750201   0         .10749000 .10749000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - HOT LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3800000   "RABS H L  "        PIPE
3800001   3
3800101   0.0776     1
3800102   0.0388     3
3800201   0.0388     2
3800301   0.0        3
3800401   0.0915     1
3800402   0.048      2
3800403   0.0489     3
3800601   0.0        1
3800602   -90.0      2
3800603   0.0        3
3800701   0.0        1
3800702   -0.64      2
3800703   0.0        3
3800801   4.0-5      0.0        3
3800901   0.84       0.84       1
3800902   0.28       0.28       2
3801001   00         3
3801101   0000       2
3801201   0          14952500. 1223750.  2469100.  0.0  0.0  01
3801202   0          14954900. 1223220.  2469090.  0.0  0.0  02
3801203   0          14957200. 1222740.  2460890.  0.0  0.0  03
3801300   0
3801301   .21492000 .21492000 0.0        01
3801302   .21488000 .21488000 0.0        02
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PRESSURIZER
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SURGE LINE PCS SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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4000000   "SRG LN PCS"        BRANCH
4000001   2         0
4000101   1.44561-3 2.30      0.0       0.0       90.0      0.54
4000102   2.3622-5  0.0       00
4000200   0         14895700. 1345680.  2462200.  0.0
4001101   107000000 400000000 1.44561-3 3.9       3.9       0002
4002101   400010000 405000000 1.44561-3 2.85      2.85      1000
4001201   1.16231-2 1.16231-2 0.0
4002201   1.16247-2 1.16247-2 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SURGE LINE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4050000   "SRG LN PZR"        PIPE
4050001   2
4050101   1.44561-3 2
4050201   1.44561-3 1
4050301   2.30      2
4050401   0.0       2
4050601   90.0      2
4050701   0.30      2
4050801   2.3622-5  0.0       2
4050901   2.85      2.85      1
4051001   00        2
4051101   1000      1
4051201   0         14892800. 1383720.  2462200.  0.0  0.0  01
4051202   0         14890800. 1435980.  2462300.  0.0  0.0  02
4051300   0
4051301   1.16231-2 1.16231-2 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SURGE LINE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4100000   "SRG LINE  "        SNGLJUN
4100101   405010000 415000000 1.44561-3 0.42      1.00      1000
4100201   0         -.0608789 -.0608789 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4150000   "PZR VESSEL"        PIPE
4150001   6
4150101   0.0       2
4150102   0.5653    5
4150103   0.0       6
4150201   0.0       5
4150301   0.1815    1
4150302   0.1524    2
4150303   0.3967    3
4150304   0.5289    4
4150305   0.3967    5
4150306   0.1943    6
4150401   0.0684    1
4150402   0.0838    2
4150403   0.0       5
4150404   0.0732    6
4150501   0.0       6
4150601   90.0      6
4150801   4.0E-5    0.0       6
4151001   00        6
4151101   0000      5
4151201   0         14889200. 1551340.  2462340.  0.0       0.0  01
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4151202   0          14888200. 1576890.  2462360.  0.0        0.0  02
4151203   0          14888600. 1578210.  2462390.  0.0        0.0  03
4151204   0          14884300. 1579040.  2463380.  .31381     0.0  04
4151205   0          14882900. 1581860.  2462380.  1.0        0.0  05
4151206   0          14882600. 1581850.  2462350.  1.0        0.0  06
4151300   0
4151301   4.13174-5 4.13174-5 0.0       01
4151302   2.75755-5 2.75755-5 0.0       02
4151303   2.50280-5  .50049   0.0       03
4151304   -.37026   5.25011-5 0.0       04
4151305   -.13472   1.81309-5 0.0       05
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER VESSEL TO TOP HAT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4170000   "VSSL-TPHAT"        SNGLJUN
4170101   415010000 420000000 0.0       0.0       0.0       0000
4170201   0         -.19776   3.46367-5 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER TOP HAT AND RELIEF CONNECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4200000   "PZR TOPHAT"        PIPE
4200001   2
4200101   0.0       2
4200201   0.0       1
4200301   0.1104915 2
4200401   0.0139870 2
4200601   90.0      2
4200801   4.E-5     0.346066  2
4201001   00        2
4201101   0000      1
4201201   0         14882500. 1581850.  2462380.  1.0  0.0  01
4201202   0         14882400. 1581840.  2462380.  1.0  0.0  02
4201300   0
4201301   -.10996   2.21137-5 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPRAY LINE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4300000   "SPRAY     "        BRANCH
4300001   1         0
4300101   0.0003363 6.322     0.0       0.0       90.0      2.9905
4300102   4.0-5     0.0       00
4300200   0         15067800. 1227770.  2458270.  0.0
4301101   172000000 430000000 0.0       0.0       0.0       0002
4301201   -5.3194-6 -5.3194-6 0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   STEAM GENERATOR SECONDARY SIDE
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY SEPARATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5000000   "SEPARATOR "        SEPARATR
5000001   3         0
5000101   0.0       0.4445    0.2425    0.0       90.0      0.4445
5000102   4.E-5     0.2840    00
5000200   0         5222780.0 1161490.  2595710.  .89049
5001101   500010000 520000000 0.087745  0.0       0.0       0100
5002101   500000000 505000000 0.087745  0.0       0.0       0100     0.3
5003101   515010000 500000000 0.29187   0.4       0.4       0100
```

```
5001201   1.3751    1.4411    0.0
5002201   .53770    .50887    0.0
5003201   2.7804    3.5935    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SEPARATOR BYPASS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5030000   "SEPBYPASS "        BRANCH
5030001   2         0
5030101   0.0       0.4445    0.4384    0.0       90.0      0.4445
5030102   4.E-5     0.3678    00
5030200   0         5222780.0 1611330.  2595720.  .99999
5031101   505000000 503000000 0.98627   0.0       0.0       0100
5032101   503010000 520000000 0.98627   0.8       0.0       0100
5031201   -.16063   .48006    0.0
5032201   2.38241-2 .17866    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SEPARATOR OUTLET REGION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5050000   "LWR SEPAR "        BRANCH
5050001   1         0
5050101   0.0       1.2131    1.4850    0.0       -90.0     -1.2131
5050102   4.E-5     1.9048    00
5050200   0         5222770.0 1161410.  2595720.  .37208
5051101   505010000 508000000 0.0       0.0       0.0       0100
5051201   .47026    -.47917   0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FEED INLET VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5080000   "UPR DWNCMR"        BRANCH
5080001   1         0
5080101   0.0       0.6096    0.22107   0.0       -90.0     -0.6096
5080102   4.E-5     0.163697  00
5080200   0         5228350.0 1094450.  2595690.  0.0
5081101   508010000 510000000 0.0       0.0       0.0       0100
5081201   .58694    .58694    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR DOWNCOMER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5100000   "DWNCMR    "        ANNULUS
5100001   3
5100101   0.232     3
5100201   0.0       2
5100301   0.6096    3
5100401   0.0       3
5100601   -90.0     3
5100701   -0.6096   3
5100801   4.E-5     0.10793   3
5100901   0.0       0.0       2
5101001   00        3
5101101   0000      2
5101201   0         5233030.0 1094480.  2595670.  0.0       0.0  01
5101202   0         5237770.0 1095280.  2595640.  0.0       0.0  02
5101203   0         5242510.0 1095650.  2595610.  0.0       0.0  03
5101300   0
5101301   .58704    .58704    0.0       01
5101302   .58714    .58714    0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION FROM DOWNCOMER TO BOILER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
```

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5130000   "DNCMR-BLR "        SNGLJUN
5130101   510010000 515000000 0.0       17.5      17.5      0100
5130201   0         .58722    .83849    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR BOILER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5150000   "BOILER    "        PIPE
5150001   5
5150101   0.2776    4
5150102   0.306294  5
5150201   0.0       4
5150301   1.8288    4
5150302   1.2131    5
5150401   0.0       5
5150601   60.0      4
5150602   90.0      5
5150701   0.6096    4
5150702   1.2131    5
5150801   4.E-5     0.0234    4
5150802   4.E-5     0.5962    5
5150901   4.05      4.05      4
5151001   00        5
5151101   0100      4
5151201   0         5241030.0 1154980.  2595580.  .49316    0.0  01
5151202   0         5237440.0 1161810.  2595610.  .71327    0.0  02
5151203   0         5233350.0 1162120.  2595650.  .80605    0.0  03
5151204   0         5232841.0 1161820.  2595680.  .85407    0.0  04
5151205   0         5237361.0 1161540.  2595700.  .87426    0.0  05
5151300   0
5151301    .94859   1.3289    0.0       01
5151302   1.5589    2.3557    0.0       02
5151303   2.1266    3.3332    0.0       03
5151304   2.6440    4.0529    0.0       04
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER PORTION OF STEAM DOME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5200000   "LWR STM DM"        BRANCH
5200001   1         0
5200101   0.0       0.46956   0.705312  0.0       90.0      0.46956
5200102   4.E-5     1.383     00
5200200   0         5219990.0 1161320.  2595680.  1.0
5201101   520010000 525000000 0.0       0.0       0.0       0100
5201201    .50120    .64094   0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PORTION OF STEAM DOME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5250000   "UPR STM DM"        BRANCH
5250001   1         0
5250101   0.0       0.46956   0.705312  0.0       90.0      0.46956
5250102   4.E-5     1.383     00
5250200   0         5219870.0 1161310.  2595700.  1.0
5251101   525010000 530000000 0.0       0.8       0.8       0100
5251201   15.687    20.771    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM PIPE FROM GENERATOR TO CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5300000   "STEAM PIPE"        SNGLVOL
5300101   0.04635   25.074    0.0       0.0       0.0       0.0
5300102   4.E-5     0.0       00
```

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5300200   0         5203370.0 1160330.  2595740.  .99998
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM FLOW CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5400000   "CV-P4-10  "       VALVE
5400101   530010000 541000000 0.0047772 0.0       0.0       1100
5400201   0         16.933    36.097    0.0
5400300   MTRVLV
5400301   685       686       0.05      0.645229  540
20254000  NORMAREA
20254001  0.0       9.25-4
20254002  9.25-4    9.25-4
20254003  1.0       1.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPE DOWNSTREAM OF STEAM CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5410000   "COND INLET"       BRANCH
5410001   1         0
5410101   0.06557   54.44     0.0       0.0       0.0       0.0
5410102   4.E-5     0.0       00
5410200   0         2009650.0  907346. 2597920.   .99820
5411101   541010000 542000000 0.0       0.0       0.0       0100
5411201   16.933    36.097    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AIR COOLED CONDENSER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5420000   "CONDENSER "       TMDPVOL
5420101   0.21677   17.67     0.0       0.0       0.0       0.0
5420102   4.E-5     0.02      00
5420200   2
5420207   0.0       2.00E6   1.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM BYPASS VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5450000   "STM BYPSS "       VALVE
5450101   530010000 546000000 3.2-4     0.0       0.0       0100
5450201   0         .00000000 .00000000 0.0
5450300   TRPVLV
5450301   687
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AIR COOLED CONDENSER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5460000   "CONDENSER "       TMDPVOL
5460101   0.21677   17.67     0.0       0.0       0.0       0.0
5460102   4.E-5     0.02      00
5460200   1         516
5460201   0.0       554.8     0.999
5460202   18000.    332.5     0.999
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FEED STORAGE TANK
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5650000   "FEED TANK "       TMDPVOL
5650101   29.81     3.048     0.0       0.0       0.0       0.0
5650102   4.E-5     0.0       00
5650200   1         689
5650201   -1.0      478.706   0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FEED WATER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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5660000   "FEED      "        TMDPJUN
5660101   565000000 508000000 0.05
5660200   1         688
5660201   0.0       25.553    0.0       0.0
5660202   0.7       0.0       0.0       0.0
5660203   59.5      0.0       0.0       0.0
5660204   60.0      0.50364   0.0       0.0
5660205   1860.0    0.50364   0.0       0.0
5660206   1861.0    0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AUX FEED STORAGE TANK
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5680000   "AUX FD TNK"       TMDPVOL
5680101   29.81     3.048     0.0       0.0       0.0       0.0
5680102   4.E-5     0.0       00
5680200   1
5680201   0.0       305.0     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AUX FEED WATER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5690000   "AUX FEED  "       TMDPJUN
5690101   568000000 508000000 0.05
5690200   1         690
5690201   -1.0      0.00      0.0       0.0
5690202   0.0       0.50364   0.0       0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   ECC SYSTEM
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CHECK VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6000000   "ECC CHKVLV"       VALVE
6000101   605010000 185000000 5.9896-3  0.935     0.935     1120
6000201   0         .00000000 .00000000 0.0
6000300   TRPVLV
6000301   681
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECCS HEADER TO PCS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6050000   "ECCS HEADR"       SNGLVOL
6050101   5.9896-3  5.0148    0.0       0.0       90.0      3.3071202
6050102   4.0-5     0.0       01
6050200   0         13595900. 172410.  2489140.   0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6100000   "ACCUM VLV "       VALVE
6100101   615010000 605000000 5.9896-3  6.278     6.278     1000
6100201   0         0.0       0.0       0.0
6100300   TRPVLV
6100301   682
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6150000   "ACC PIPE  "       SNGLVOL
6150101   0.0       25.997165 0.4074774 0.0       0.0       0.0
6150102   4.0-5     0.0       01
6150200   0         13580200. 112409.  2489450.   0.0
```

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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*6200000   "ACCUMULATR"        ACCUM
*6200101   0.0       1.8103    2.3422    0.0       90.0      1.8103
*6200102   4.0-5     0.0       01
*6200200   4.31+6    306.6
*6201101   615000000 8.2132-3  13.3      13.3      0
*6202200   0.0       1.0662    2.4509    1.6927    0.04445   0 0 0 0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BWST LPIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6250000   "BWST LPIS "        TMDPVOL
6250101   20.44     5.0       0.0       0.0       90.0      5.0
6250102   4.0E-5    0.0       00
6250200   3
6250201   0.0       1.0+5     300.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOW PRESSURE INJECTION SYSTEM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6300000   "LPIS      "        TMDPJUN
6300101   625000000 605000000 5.9896-3
6300200   1         684       P         605010000
6300201   -1.0      0.0       0.0       0.0
6300202   0.0       0.0       0.0       0.0
6300203   8.483+4   7.045     0.0       0.0
6300204   4.297+5   6.091     0.0       0.0
6300205   7.745+5   5.045     0.0       0.0
6300206   9.448+5   4.313     0.0       0.0
6300207   1.119+6   3.454     0.0       0.0
6300208   1.186+6   3.173     0.0       0.0
6300209   1.257+6   2.673     0.0       0.0
6300210   1.326+6   2.159     0.0       0.0
6300211   1.395+6   1.536     0.0       0.0
6300212   1.464+6   0.7182    0.0       0.0
6300213   1.517+6   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BWST HPIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6350000   "BWST HPIS "        TMDPVOL
6350101   20.44     5.0       0.0       0.0       90.0      5.0
6350102   4.0E-5    0.0       00
6350200   3
6350201   0.0       1.0+5     300.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HIGH PRESSURE INJECTION SYSTEM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6400000   "HPIS      "        TMDPJUN
6400101   635000000 185000000 5.9896-3
6400200   1         683       P         185010000
6400201   -1.0      0.0       0.0       0.0
6400202   0.0       .75687272 0.0       0.0
6400203   7.72514+6 .75687272 0.0       0.0
6400204   8.3597+6  .31536281 0.0       0.0
6400205   17.2436+6 .31536281 0.0       0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   CONTAINMENT
*
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CONTAINMENT BROKEN LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
8050000   "CONT BLCL "       TMDPVOL
8050101   0.0       1.0       0.1       0.0       0.0       0.0
8050102   0.0       0.0       00
8050200   2
8050201   0.0       1.0+5     1.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   REACTOR VESSEL HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL WALL HEAT STRUCTURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* THE REACTOR VESSEL WALL IS NOT MODELLED ABOVE THE NOZZLES.
* THE VESSEL TO FILLER GAP IS ASSUMED TO INSULATE THE VESSEL
* FROM THE FILLERS.  THE VESSEL TO FILLER GAP IS NOT MODELLED
* AT THIS ELEVATION.
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL WALL ABOVE STATION 178 - 5.50 INCHES THICK
* STATION 178 TO 258
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12231000  2         5         2         1         0.7328
12231100  0         1
12231101  4         0.8725
12231201  5         4
12231301  0.0       4
12231401  551.0     5
12231501  223010000 0         1         1         1.4218585  1
12231502  223020000 0         1         1         0.7621415  2
12231601  -939      0         3949      1         1.4218585  1
12231602  -939      0         3949      1         0.7621415  2
12231701  0         0.0       0.0       0.0       2
12231801  0         0.0127    0.1922    1.4218585 1
12231802  0         0.0127    0.1922    0.7621415 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL WALL BELOW STATION 178 - 3.62 INCHES THICK
* STATION 67.7 TO 178
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12232000  4         5         2         1         0.7328
12232100  0         1
12232101  4         0.8247
12232201  5         4
12232301  0.0       4
12232401  553.0     5
12232501  223020000 0         1         1         0.4340098  1
12232502  223030000 0         1         1         1.2110867  2
12232503  223040000 0         1         1         0.7802975  3
12232504  220010000 0         1         1         0.3741720  4
12232601  -939      0         3949      1         0.4340098  1
12232602  -939      0         3949      1         1.2110867  2
12232603  -939      0         3949      1         0.7802975  3
12232604  -939      0         3949      1         0.3741720  4
12232701  0         0.0       0.0       0.0       4
12232801  0         0.0127    0.1922    0.4340098 1
12232802  0         0.0127    0.1922    1.2110867 2
12232803  0         0.0127    0.1922    0.7802975 3
12232804  0         0.0127    0.1922    0.3741720 4
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL BOTTOM
* STATION 67.7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12200000  1         5         1         1         0.0
12200100  0         1
12200101  4         0.092
12200201  5         4
12200301  0.0       4
12200401  551.0     5
12200501  220010000 0         1         0         1.68      1
12200601  -939      0         3949      0         1.68      1
12200701  0         0.0       0.0       0.0       1
12200801  0         0.0       0.0       5.00      1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL FILLER BLOCKS HEAT STRUCTURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS TOP VOLUME
* STATION 264 TO 277
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12000000  2         5         2         1         0.508
12000100  0         1
12000101  4         0.7264
12000201  4         4
12000301  0.0       4
12000401  556.0     5
12000501  200010000 0         1         1         0.1876129 1
12000502  202010000 0         1         1         0.2851823 2
12000601  0         0         0         1         0.1876129 1
12000602  0         0         0         1         0.2851823 2
12000701  0         0.0       0.0       0.0       2
12000801  0         0.1524    0.3245    0.1876129 1
12000802  0         0.1524    0.3245    0.2851823 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS LOWER VOLUME
* STATION 247.3 TO 264.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12050000  1         5         2         1         0.501
12050100  0         1
12050101  4         0.7264
12050201  4         4
12050301  0.0       4
12050401  556.0     5
12050501  205010000 0         1         1         0.2525361 1
12050601  223010000 0         1         1         0.2525361 1
12050701  0         0.0       0.0       0.0       1
12050801  0         0.1524    0.3245    0.2525361 1
12050901  0         0.0127    0.0253    0.2525361 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER AND LOWER PLENUM
* STATION 67.7 TO 247.3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12100000  7         5         2         1         0.47
12100100  0         1
12100101  4         0.7264
12100201  4         4
12100301  0.0       4
12100401  556.0     5
12100501  210010000 0         1         1         1.0267313  1
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12100502  210020000 0         1         1         0.4933248  2
12100503  210030000 0         1         1         0.7028265  3
12100504  210040000 0         1         1         0.5588068  4
12100505  210050000 0         1         1         0.6522799  5
12100506  210060000 0         1         1         0.4269792  6
12100507  215010000 0         1         1         0.3533183  7
12100601  223010000 0         1         1         1.0267313  1
12100602  223020000 0         1         1         0.4933248  2
12100603  223020000 0         1         1         0.7028265  3
12100604  223030000 0         1         1         0.5588068  4
12100605  223030000 0         1         1         0.6522799  5
12100606  223040000 0         1         1         0.4269792  6
12100607  223040000 0         1         1         0.3533183  7
12100701  0         0.0       0.0       0.0       7
12100801  0         0.1016    0.2155    1.0267313 1
12100802  0         0.1016    0.2155    0.4933248 2
12100803  0         0.1016    0.2155    0.7028265 3
12100804  0         0.1016    0.2155    0.5588068 4
12100805  0         0.1016    0.2155    0.6522799 5
12100806  0         0.1016    0.2155    0.4269792 6
12100807  0         0.1016    0.2155    0.3533183 7
12100901  0         0.0127    0.0253    1.0267313 1
12100902  0         0.0127    0.0253    0.4933248 2
12100903  0         0.0127    0.0253    0.7028265 3
12100904  0         0.0127    0.0253    0.5588068 4
12100905  0         0.0127    0.0253    0.6522799 5
12100906  0         0.0127    0.0253    0.4269792 6
12100907  0         0.0127    0.0253    0.3533183 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE SUPPORT BARREL
* STATION 96.44 TO 277
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12001000  9         5         2         1         0.381
12001100  0         1
12001101  4         0.419
12001201  4         4
12001301  0.0       4
12001401  556.0     5
12001501  0         0         0         1         0.1876129  1
12001502  0         0         0         1         0.2851823  2
12001503  0         0         0         1         0.2525361  3
12001504  0         0         0         1         1.0267313  4
12001505  0         0         0         1         0.4933248  5
12001506  0         0         0         1         0.7028265  6
12001507  0         0         0         1         0.5588068  7
12001508  0         0         0         1         0.6522799  8
12001509  0         0         0         1         0.4269792  9
12001601  200010000 0         1         1         0.1876129  1
12001602  202010000 0         1         1         0.2851823  2
12001603  205010000 0         1         1         0.2525361  3
12001604  210010000 0         1         1         1.0267313  4
12001605  210020000 0         1         1         0.4933248  5
12001606  210030000 0         1         1         0.7028265  6
12001607  210040000 0         1         1         0.5588068  7
12001608  210050000 0         1         1         0.6522799  8
12001609  210060000 0         1         1         0.4269792  9
12001701  0         0.0       0.0       0.0       9
12001901  0         0.1016    0.2155    0.1876129 1
12001902  0         0.1016    0.2155    0.2851823 2
```

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12001903  0         0.1016    0.2155    0.2525361 3
12001904  0         0.1016    0.2155    1.0267313 4
12001905  0         0.1016    0.2155    0.4933248 5
12001906  0         0.1016    0.2155    0.7028265 6
12001907  0         0.1016    0.2155    0.5588068 7
12001908  0         0.1016    0.2155    0.6522799 8
12001909  0         0.1016    0.2155    0.4369792 9
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FLOW SKIRT - CORE FILLER ASSEMBLY
* STATION 96.44 TO 261.13
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12250000  10        5         2         1         0.3
12250100  0         1
12250101  4         0.38
12250201  4         4
12250301  0.0       4
12250401  575.0     5
12250501  225010000 0         1         1         0.4269792 1
12250502  230010000 0         1         1         0.3728765 2
12250503  230020000 10000     1         1         0.2794034 6
12250504  230060000 0         1         1         0.4234231 7
12250505  240010000 5000000   1         1         0.4933248 9
12250506  250010000 0         1         1         0.7850547 10
12250601  0         0         0         1         0.4269792 1
12250602  0         0         0         1         0.3728765 2
12250603  0         0         0         1         0.2794034 6
12250604  0         0         0         1         0.4234231 7
12250605  0         0         0         1         0.4933248 9
12250606  0         0         0         1         0.7850547 10
12250701  0         0.0       0.0       0.0       10
12250801  0         0.095     0.095     0.4269792 1
12250802  0         0.0124    0.5713    0.3728765 2
12250803  0         0.0124    0.5713    0.2794034 6
12250804  0         0.0124    0.5713    0.4234231 7
12250805  0         0.145     0.5713    0.4933248 9
12250806  0         0.131     0.5713    0.7850547 10
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER CORE SUPPORT STRUCTURE
* STATION 96.44 TO 116.91
* INCLUDES CORE SUPPORT BARREL LIP , LOWER CORE SUPPORT
* STRUCTURE , AND FUEL MODULE LOWER END BOXES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12251000  1         5         2         1         0.282
12251100  0         1
12251101  4         0.3
12251201  4         4
12251301  0.0       4
12251401  556.0     5
12251501  225010000 0         1         1         0.4269792 1
12251601  0         0         0         1         0.4269792 1
12251701  0         0.0       0.0       0.0       1
12251801  0         0.095     0.095     0.4269792 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACTIVE CORE
* STATION 116.91 TO 182.94
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12300000  6         10        2         1         0.0
12300100  0         1
12300101  5         4.647E-3
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12300102  1         4.742E-3
12300103  3         5.359E-3
12300201  1         5
12300202  -2        6
12300203  -3        9
12300301  1.0       5
12300302  0.0       9
12300401  575.0     10
12300501  0         0         0         1         363.35    6
12300601  230010000 10000     1         1         363.35    6
12300701  900       0.13599   0.0       0.0       1 * 100% POWER
12300702  900       0.22454   0.0       0.0       2 * 100% POWER
12300703  900       0.24293   0.0       0.0       3 * 100% POWER
12300704  900       0.2152    0.0       0.0       4 * 100% POWER
12300705  900       0.1419    0.0       0.0       5 * 100% POWER
12300706  900       0.0397    0.0       0.0       6 * 100% POWER
12300901  0         0.01240   0.01504   1.775     6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER CORE SUPPORT STRUCTURE
* STATION 190.5 TO 234.5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12400000  2         5         2         1         0.282
12400100  0         1
12400101  4         0.31
12400201  4         4
12400301  0.0       4
12400401  575.0     5
12400501  240010000 5000000   1         1         0.4933248 2
12400601  0         0         0         1         0.4933248 2
12400701  0         0.0       0.0       0.0       2
12400801  0         0.56      0.0       0.9866496 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FUEL MODULES
* STATION 187.6 TO 258.4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12510000  1         5         1         1         0.0
12510100  0         1
12510101  4         0.01
12510201  4         4
12510301  0.0       4
12510401  575.0     5
12510501  250010000 0         1         1         1.8       1
12510601  251010000 0         1         1         1.8       1
12510701  0         0.0       0.0       1.8       1
12510801  0         0.0       0.0       1.8       1
12510901  0         0.0       0.0       1.8       1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PLENUM INTERNALS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12551000  3         5         1         1         0.0
12551100  0         1
12551101  4         0.005
12551201  4         4
12551301  0.0       4
12551401  575.0     5
12551501  252010000 0         1         1         1.0       1
12551502  255010000 0         1         1         1.0       2
12551503  250010000 0         1         1         1.0       3
12551601  0         0         0         1         1.0       3
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12551701  0         0.0       0.0       0.0       3
12551801  0         0.0       0.0       1.0       3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE SUPPORT BARREL - UPPER PLENUM LOWER VOLUME
* STATION 264 TO 297.6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12552000  2         5         2         1         0.381
12552100  0         1
12552101  4         0.474
12552201  5         4
12552301  0.0       4
12552401  575.0     5
12552501  255010000 0         1         1         0.6312304 1
12552502  252010000 0         1         1         0.2869580 2
12552601  0         0         0         1         0.6312304 1
12552602  0         0         0         1         0.2869580 2
12552701  0         0.0       0.0       0.0       2
12552801  0         0.762     0.0       0.6312304 1
12552802  0         0.762     0.0       0.2869580 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE SUPPORT BARREL - UPPER PLENUM TOP VOLUME
* STATION 297.6 TO 325
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12601000  1         5         2         1         0.381
12601100  0         1
12601101  4         0.728
12601201  5         4
12601301  0.0       4
12601401  575.0     5
12601501  260010000 0         1         1         0.7747094 1
12601601  0         0         0         1         0.7747094 1
12601701  0         0.0       0.0       0.0       1
12601801  0         0.762     0.0       0.7747094 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER HEAD TOP PLATE
* STATION 325
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12602000  1         5         1         1         0.0
12602100  0         1
12602101  4         0.474
12602201  5         4
12602301  0.0       4
12602401  560.0     5
12602501  260010000 0         1         1         0.712     1
12602601  -939      0         3949      1         0.712     1
12602701  0         0.0       0.0       0.0       1
12602801  0         0.0       0.0       0.712     1
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   STEAM GENERATOR HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TUBING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
10060000  8         8         2         1         0.0051054
10060100  0         1
10060101  7         0.006348984
10060201  6         7
10060301  0.0       7
```

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10060401  551.0     8
10060501  115010000 10000     1         1         1124.71   3
10060502  115040000 10000     1         1         849.063   5
10060503  115060000 10000     1         1         1124.71   8
10060601  515010000 10000     1         1         1124.71   3
10060602  515040000 0         1         1         849.063   4
10060603  515040000 0         1         1         849.063   5
10060604  515030000 -10000    1         1         1124.71   8
10060701  0         0         0         0         8
10060801  0         0         0         0         8
10060901  0         0         0         0         8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SHROUD - UPPER SECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
15000000  2         4         2         1         0.3048
15000100  0         1
15000101  3         0.3143
15000201  5         3
15000301  0.0       3
15000401  539.0     4
15000501  500010000 0         1         0         0.85127   1
15000502  515050000 0         1         0         2.51199   2
15000601  503010000 0         1         0         0.87780   1
15000602  505010000 0         1         0         2.59028   2
15000701  0         0.0       0.0       0.0       2
15000801  0         0.0       0.0       0.0       2
15000901  0         0.0       0.0       0.0       2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SHROUD - LOWER SECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
15100000  4         4         2         1         0.6445
15100100  0         1
15100101  3         0.6572
15100201  5         3
15100301  0.0       3
15100401  533.0     4
15100501  515040000 0         1         1         0.646354  1
15100502  515030000 -10000    1         0         2.46858   4
15100601  508010000 0         1         1         0.646354  1
15100602  510010000 10000     1         0         2.51723   4
15100701  0         0.0       0.0       0.0       4
15100801  0         0.0       0.0       0.0       4
15100901  0         0.0       0.0       0.0       4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL WALL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
15250000  8         5         2         1         0.7112
15250100  0         1
15250101  4         0.76397
15250201  5         4
15250301  0.0       4
15250401  540.0     5
15250501  525010000 0         1         1         0.46956   1
15250502  520010000 0         1         1         0.46956   2
15250503  503010000 0         1         1         0.4445    3
15250504  505010000 0         1         1         1.2131    4
15250505  508010000 0         1         1         0.6096    5
15250506  510010000 10000     1         1         0.6096    8
15250601  -939      0         3959      1         0.46956   1
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15250602  -939      0         3959      1         0.46956   2
15250603  -939      0         3959      1         0.4445    3
15250604  -939      0         3959      1         1.2131    4
15250605  -939      0         3959      1         0.6096    5
15250606  -939      0         3959      1         0.6096    8
15250701   0        0.0       0.0       0.0       8
15250801   0        0.0       0.0       0.0       8
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
* PIPING HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INTACT LOOP PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* .284 METER DIAMETER PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
11001000  14        5         2         1         0.142
11001100  0         1
11001101  4         0.1780
11001201  4         4
11001301  0.0       4
11001401  560.0     5
11001501  100010000 0         1         1         1.58878   1
11001502  105010000 0         1         1         1.0531192 2
11001503  107010000 0         1         1         0.2810215 3
11001504  110010000 0         1         1         0.9207292 4
11001505  112010000 0         1         1         1.38893   5
11001506  118020000 0         1         1         0.688596  6
11001507  118030000 0         1         1         0.558577  7
11001508  120010000 0         1         1         0.759614  8
11001509  150010000 0         1         1         0.3542995 9
11001510  172010000 0         1         1         0.2844229 10
11001511  175010000 0         1         1         0.4163655 11
11001512  175020000 0         1         1         0.613244  12
11001513  180010000 0         1         1         1.15189   13
11001514  185010000 0         1         1         1.00965   14
11001601  -939      0         3949      1         1.58878   1
11001602  -939      0         3949      1         1.0531192 2
11001603  -939      0         3949      1         0.2810215 3
11001604  -939      0         3949      1         0.9207292 4
11001605  -939      0         3949      1         1.38893   5
11001606  -939      0         3949      1         0.688596  6
11001607  -939      0         3949      1         0.558577  7
11001608  -939      0         3949      1         0.759614  8
11001609  -939      0         3949      1         0.3542995 9
11001610  -939      0         3949      1         0.2844229 10
11001611  -939      0         3949      1         0.4163655 11
11001612  -939      0         3949      1         0.613244  12
11001613  -939      0         3949      1         1.15189   13
11001614  -939      0         3949      1         1.00965   14
11001701  0         0         0         0         14
11001801  0         0         0         1.58878   1
11001802  0         0         0         1.0531192 2
11001803  0         0         0         0.2810215 3
11001804  0         0         0         0.9207292 4
11001805  0         0         0         1.38893   5
11001806  0         0         0         0.688596  6
11001807  0         0         0         0.558577  7
11001808  0         0         0         0.759614  8
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11001809  0         0         0         0.3542995 9
11001810  0         0         0         0.2844229 10
11001811  0         0         0         0.4163655 11
11001812  0         0         0         0.613244  12
11001813  0         0         0         1.15189   13
11001814  0         0         0         1.00965   14
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR CONNECTIONS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
11002000  2         5         2         1         0.1625
11002100  0         1
11002101  4         0.203
11002201  4         4
11002301  0.0       4
11002401  560.0     5
11002501  112020000 0         1         1         0.707687  1
11002502  118010000 0         1         1         0.546638  2
11002601  -939      0         3949      1         0.707687  1
11002602  -939      0         3949      1         0.546638  2
11002701  0         0         0         0         2
11002801  0         0         0         0.707687  1
11002802  0         0         0         0.546638  2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* .216 METER DIAMETER PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
11003000  7         5         2         1         0.108
11003100  0         1
11003101  4         0.1365
11003201  4         4
11003301  0.0       4
11003401  560.0     5
11003501  125010000 0         1         1         1.00308   1
11003502  130010000 0         1         1         0.457201  2
11003503  140010000 0         1         1         0.502185  3
11003504  145010000 0         1         1         1.40843   4
11003505  155010000 0         1         1         1.00308   5
11003506  160010000 0         1         1         0.457201  6
11003507  170010000 0         1         1         0.514071  7
11003601  -939      0         3949      1         1.00308   1
11003602  -939      0         3949      1         0.457201  2
11003603  -939      0         3949      1         0.502185  3
11003604  -939      0         3949      1         1.40843   4
11003605  -939      0         3949      1         1.00308   5
11003606  -939      0         3949      1         0.457201  6
11003607  -939      0         3949      1         0.514071  7
11003701  0         0         0         0         7
11003801  0         0         0         1.00308   1
11003802  0         0         0         0.457201  2
11003803  0         0         0         0.502185  3
11003804  0         0         0         1.40843   4
11003805  0         0         0         1.00308   5
11003806  0         0         0         0.457201  6
11003807  0         0         0         0.514071  7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR PLENA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
11004000  2         5         3         1         0.6858
11004100  0         1
11004101  4         0.7747
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11004201  5         4
11004301  0.0       4
11004401  560.0     5
11004501  114010000 0         1         1         0.25      1
11004502  116010000 0         1         1         0.25      2
11004601  -939      0         3949      1         0.25      1
11004602  -939      0         3949      1         0.25      2
11004701  0         0         0         0         2
11004801  0         0         0         0.630     1
11004802  0         0         0         0.630     2
11004901  0         0         0         0.630     2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP HOT LEG PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* NOZZLE PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13000000  3         5         2         1         0.1420
13000100  0         1
13000101  4         0.1780
13000201  4         4
13000301  0.0       4
13000401  560.0     5
13000501  300010000 0         1         1         0.876303  1
13000502  305010000 0         1         1         0.698336  2
13000503  310010000 0         1         1         0.974349  3
13000601  -939      0         3949      1         0.876303  1
13000602  -939      0         3949      1         0.698336  2
13000603  -939      0         3949      1         0.974349  3
13000701  0         0         0         0         3
13000801  0         0         0         0.876303  1
13000802  0         0         0         0.698336  2
13000803  0         0         0         0.974349  3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET TO STM GEN SIMULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13151000  3         5         2         1         0.0515
13151100  0         1
13151101  4         0.0705
13151201  4         4
13151301  0.0       4
13151401  545.0     5
13151501  310010000 0         1         1         0.525781  1
13151502  315010000 0         1         1         0.367768  2
13151503  315020000 0         1         1         0.552201  3
13151601  -939      0         3949      1         0.525781  1
13151602  -939      0         3949      1         0.367768  2
13151603  -939      0         3949      1         0.552201  3
13151701  0         0         0         0         3
13151801  0         0         0         0.525781  1
13151802  0         0         0         0.36768   2
13151803  0         0         0         0.552201  3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR SIMULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13152000  6         5         2         1         0.1835
13152100  0         1
13152101  4         0.2285
13152201  4         4
13152301  0.0       4
```

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13152401  545.0     5
13152501  315030000 10000     1         1         0.993978  2
13152502  315050000 10000     1         1         0.849744  4
13152503  315070000 10000     1         1         0.993978  6
13152601  -939      0         3949      1         0.993978  2
13152602  -939      0         3949      1         0.849744  4
13152603  -939      0         3949      1         0.993978  6
13152701  0         0         0         0         6
13152801  0         0         0         0.993978  2
13152802  0         0         0         0.849744  4
13152803  0         0         0         0.993978  6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STM GEN SIMULATOR OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13153000  1         5         2         1         0.0550
13153100  0         1
13153101  4         0.0705
13153201  4         4
13153301  0.0       4
13153401  545.0     5
13153501  315090000 0         1         1         1.371350  1
13153601  -939      0         3949      1         1.371350  1
13153701  0         0         0         0         1
13153801  0         0         0         1.371350  1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SIMULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13154000  1         5         2         1         0.1420
13154100  0         1
13154101  4         0.1780
13154201  4         4
13154301  0.0       4
13154401  545.0     5
13154501  315100000 0         1         1         1.365029  1
13154601  -939      0         3949      1         1.365029  1
13154701  0         0         0         0         1
13154801  0         0         0         1.365029  1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SIMULATOR OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13155000  1         5         2         1         0.0660
13155100  0         1
13155101  4         0.0840
13155201  4         4
13155301  0.0       4
13155401  545.0     5
13155501  315110000 0         1         1         1.674812    1
13155601  -939      0         3949      1         1.674812    1
13155701  0         0         0         0         1
13155801  0         0         0         1.674812  1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPING BETWEEN BREAK AND ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13156000  1         5         2         1         0.1285
13156100  0         1
13156101  4         0.1620
13156201  4         4
13156301  0.0       4
13156401  545.0     5
```

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13156501  315120000 0         1         1         0.545209  1
13156601  -939      0         3949      1         0.545209  1
13156701  0         0         0         0         1
13156801  0         0         0         0.545209  1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP COLD LEG PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* NOZZLE PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13350000  3         5         2         1         0.1420
13350100  0         1
13350101  4         0.1780
13350201  4         4
13350301  0.0       4
13350401  550.0     5
13350501  335010000 0         1         1         0.749305  1
13350502  340010000 0         1         1         0.698336  2
13350503  345010000 0         1         1         0.974349  3
13350601  -939      0         3949      1         0.749305  1
13350602  -939      0         3949      1         0.698336  2
13350603  -939      0         3949      1         0.974349  3
13350701  0         0         0         0         3
13350801  0         0         0         0.749305  1
13350802  0         0         0         0.698336  2
13350803  0         0         0         0.974349  3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SMALL PIPING NEAR BREAK
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13501000  1         5         2         1         0.0550
13501100  0         1
13501101  4         0.1780
13501201  4         4
13501301  0.0       4
13501401  545.0     5
13501501  345010000 0         1         1         0.525781  1
13501601  -939      0         3949      1         0.525781  1
13501701  0         0         0         0         1
13501801  0         0         0         0.525781  1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPING BETWEEN BREAK AND ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13502000  2         5         2         1         0.0865
13502100  0         1
13502101  4         0.1095
13502201  4         4
13502301  0.0       4
13502401  545.0     5
13502501  350010000 0         1         1         0.453394  1
13502502  350020000 0         1         1         1.074803  2
13502601  -939      0         3949      1         0.453394  1
13502602  -939      0         3949      1         1.074803  2
13502701  0         0         0         0         2
13502801  0         0         0         0.453394  1
13502802  0         0         0         1.074803  2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST PIPING AND VALVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13700000  6         5         2         1         0.111
13700100  0         1
```

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13700101  4         0.1365
13700201  4         4
13700301  0.0       4
13700401  550.0     5
13700501  370010000 0         1         1         0.7251    1
13700502  370020000 0         1         1         1.8200    2
13700503  370030000 0         1         1         2.9055    3
13700504  380010000 0         1         1         2.2898    4
13700505  380020000 0         1         1         1.2231    5
13700506  380030000 0         1         1         1.1065    6
13700601  -939      0         3949      1         0.7251    1
13700602  -939      0         3949      1         1.8200    2
13700603  -939      0         3949      1         2.9055    3
13700604  -939      0         3949      1         2.2898    4
13700605  -939      0         3949      1         1.2231    5
13700606  -939      0         3949      1         1.1065    6
13700701  0         0         0         0         6
13700801  0         0         0         0.7246    1
13700802  0         0         0         1.820     2
13700803  0         0         0         1.7230    3
13700804  0         0         0         1.144     4
13700805  0         0         0         1.181     5
13700806  0         0         0         1.2586    6
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
* PRESSURIZER HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL BOTTOM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14151000  1         5         1         1         0.0
14151100  0         1
14151101  4         0.0762
14151201  5         4
14151301  0.0       4
14151401  613.0     5
14151501  415010000 0         1         1         0.362     1
14151601  -939      0         3969      1         0.362     1
14151701  0         0         0         0         1
14151801  0         0.0       0.0       0.0       1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL SIDES - LARGE DIAMETER SECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14152000  6         5         2         1         0.42291
14152100  0         1
14152101  4         0.49911
14152201  5         4
14152301  0.0       4
14152401  613.0     5
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
14152601  -939      0         3969      1         0.1815    1
14152602  -939      0         3969      1         0.1524    2
14152603  -939      0         3969      1         0.3967    3
14152604  -939      0         3969      1         0.5289    4
```

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14152605  -939      0         3969      1         0.3967    5
14152606  -939      0         3969      1         0.1943    6
14152701  0         0         0         0         6
14152801  0         0.0       0.0       0.0       6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL SIDES - SMALL DIAMETER SECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14153000  2         5         2         1         0.2032
14153100  0         1
14153101  4         0.3683
14153201  5         4
14153301  0.0       4
14153401  613.0     5
14153501  420010000 10000     1         1         0.1029    2
14153601  -939      0         3969      1         0.1029    2
14153701  0         0         0         0         2
14153801  0         0.0       0.0       0.0       2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL TOP
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14201000  1         5         1         1         0.0
14201100  0         1
14201101  4         0.18415
14201201  5         4
14201301  0.0       4
14201401  613.0     5
14201501  420020000 0         1         1         0.13      1
14201601  -939      0         3969      1         0.13      1
14201701  0         0         0         0         1
14201801  0         0.0       0.0       0.0       1
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   HEAT STRUCTURE THERMAL PROPERTY DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100100  TBL/FCTN  1         1         * UO2
20100200  TBL/FCTN  1         1         * GAP
20100300  TBL/FCTN  1         1         * ZR
20100400  TBL/FCTN  1         1         * S-STEEL
20100500  C-STEEL
20100600  TBL/FCTN  1         1         * INCONEL 600
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UO2 - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100101  2.7315E2  8.44
20100102  4.1667E2  6.46
20100103  5.3315E2  5.782385
20100104  6.99817E2 4.633177
20100105  8.66483E2 3.880307
20100106  1.03315E3 3.357625
20100107  1.08871E3 3.155129
20100108  1.19982E3 2.983787
20100109  1.28315E3 2.836674
20100110  1.36648E3 2.713792
20100111  1.53315E3 2.521680
20100112  1.61648E3 2.448990
20100113  1.69982E3 2.391875
20100114  1.97759E3 2.289762
20100115  2.25537E3 2.307069
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20100116  2.53315E3 2.433413
20100117  2.81093E3 2.661870
20100118  3.08871E3 2.994171
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UO2 - VOLUMETRIC HEAT CAPACITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100151  2.73150E2 2.310427E6
20100152  3.23150E2 2.571985E6
20100153  3.73150E2 2.746357E6
20100154  6.7315E2  3.138694E6
20100155  1.37315E3 3.443844E6
20100156  1.77315E3 3.531030E6
20100157  1.97315E3 3.792588E6
20100158  2.17315E3 4.228518E6
20100159  2.37315E3 4.882412E6
20100160  2.67315E3 6.015829E6
20100161  2.77315E3 6.320980E6
20100162  2.87315E3 6.582538E6
20100163  2.97315E3 6.713317E6
20100164  3.11315E3 6.800503E6
20100165  4.69982E3 6.800503E6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* GAP - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100201  273.15    0.14
20100202  590.0     0.24
20100203  810.0     0.29
20100204  1090.0    0.36
20100205  1370.0    0.42
20100206  3260.0    0.75
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* GAP - VOLUMETRIC HEAT CAPACITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100251  273.15    5.4
20100252  3260.0    5.4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ZIRCALOY-4 - THERMAL CONDUCTIVITY          FROM MATPRO
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ZIRCALOY-4 - VOLUMETRIC HEAT CAPACITY      FROM MATPRO
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100351  300.0     1.841E6
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20100352  400.0     1.978E6
20100353  640.0     2.168E6
20100354  1090.0    2.456E6
20100355  1093.0    3.288E6
20100356  1113.0    3.865E6
20100357  1133.0    4.028E6
20100358  1153.0    4.709E6
20100359  1173.0    5.345E6
20100360  1193.0    5.044E6
20100361  1213.0    4.054E6
20100362  1233.0    3.072E6
20100363  1243.0    2.332E6
20100364  1477.0    2.332E6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* S-STEEL - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100401  273.15    12.98
20100402  1199.82   25.1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* S-STEEL - VOLUMETRIC HEAT CAPACITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100451  273.15    3.83E6
20100452  366.5     3.83E6
20100453  477.59    4.190E6
20100454  588.59    4.336E6
20100455  699.82    4.504E6
20100456  810.93    4.639E6
20100457  922.04    4.773E6
20100458  1144.26   5.076E6
20100459  1366.5    5.376E6
20100460  1477.59   5.546E6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INCONEL-600 - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INCONEL-600 - VOLUMETRIC HEAT CAPACITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*         CONTROL VARIABLES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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*  001-006  LEVEL CALCULATORS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 001 STEAM GENERATOR LEVEL
20500100  SGLVL     SUM       1.0       0.0       1
20500101  0.0       0.4445    VOIDF     503010000
20500102            1.2131    VOIDF     505010000
20500103            0.6096    VOIDF     508010000
20500104            0.6096    VOIDF     510010000
20500105            0.6096    VOIDF     510020000
20500106            0.6096    VOIDF     510030000
* 002 PRESSURIZER LEVEL
20500200  PZRLVL    SUM       1.0       0.0       1
20500201  0.0       0.1815    VOIDF     415010000
20500202            0.1524    VOIDF     415020000
20500203            0.3967    VOIDF     415030000
20500204            0.5289    VOIDF     415040000
20500205            0.3967    VOIDF     415050000
20500206            0.1943    VOIDF     415060000
20500207            0.1029    VOIDF     420010000
20500208            0.1029    VOIDF     420020000
* 004 ACCUMULATOR LEVEL
*20500400  ACCMLVL   INTEGRAL  -6.3480-3 2.0447    0
*20500401  VELFJ     620010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  061-072  PRIMARY SYSTEM MASS CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 061 INTACT LOOP HOT LEG MASS
20506100  ILHLMASS  SUM       1.0       0.0       1
20506101  0.0       0.102752  RHO       100010000
20506102            7.57291-2 RHO       105010000
20506103            6.43178-2 RHO       110010000
20506104            7.96973-2 RHO       112010000
20506105            5.79614-2 RHO       112020000
* 062 STEAM GENERATOR PRIMARY MASS
20506200  SGPRIMASS SUM       1.0       0.0       1
20506201  0.0       0.335320  RHO       114010000
20506202            0.136356  RHO       115010000
20506203            9.21538-2 RHO       115020000
20506204            9.21538-2 RHO       115030000
20506205            6.99783-2 RHO       115040000
20506206            6.99783-2 RHO       115050000
20506207            9.21538-2 RHO       115060000
20506208            9.21538-2 RHO       115070000
20506209            0.136356  RHO       115080000
20506210            0.335320  RHO       116010000
* 063 PUMP SUCTION PIPING MASS
20506300  PMPSUMASS SUM       1.0       0.0       1
20506301  0.0       4.45625-2 RHO       118010000
20506302            4.45137-2 RHO       118020000
20506303            3.54278-2 RHO       118030000
20506304            4.87901-2 RHO       120010000
20506305            6.40548-2 RHO       125010000
20506306            1.77444-2 RHO       130010000
20506307            6.40548-2 RHO       155010000
20506308            1.77444-2 RHO       160010000
* 064 INTACT LOOP COLD LEG MASS
20506400  ILCLMASS  SUM       1.0       0.0       1
20506401  0.0       9.91000-2 RHO       135010000
20506402            1.83849-2 RHO       140010000
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20506403            6.33861-2 RHO       145010000
20506404            3.16011-2 RHO       150010000
20506405            9.91000-2 RHO       165010000
20506406            1.92958-2 RHO       170010000
20506407            3.54280-2 RHO       175010000
20506408            3.88950-2 RHO       175020000
20506409            7.30598-2 RHO       180010000
20506410            6.44920-2 RHO       185010000
* 065 DOWNCOMER/LOWER PLENUM MASS
20506500  DCLPMASS  SUM       1.0       0.0       1
20506501  0.0       0.0864164 RHO       200010000
20506502            0.0907360 RHO       205010000
20506503            0.1509710 RHO       210010000
20506504            0.0706690 RHO       210020000
20506505            0.1060015 RHO       210030000
20506506            0.0795138 RHO       210040000
20506507            0.0998947 RHO       210050000
20506508            0.06252   RHO       210060000
20506509            0.24520   RHO       215010000
20506510            0.29656   RHO       220010000
* 066 REACTOR VESSEL FILLER GAP MASS
20506600  FGAPMASS  SUM       1.0       0.0       1
20506601  0.0       0.0899085 RHO       223010000
20506602            0.0722790 RHO       223020000
20506603            0.0334096 RHO       223030000
20506604            0.03098   RHO       223040000
* 067 CORE/UPPER PLENUM MASS
20506700  CRUPMASS  SUM       1.0       0.0       1
20506701  0.0       0.12094   RHO       225010000
20506702            0.0683340 RHO       230010000
20506703            0.0478582 RHO       230020000
20506704            0.0483329 RHO       230030000
20506705            0.0479138 RHO       230040000
20506706            0.0479052 RHO       230050000
20506707            0.0750459 RHO       230060000
20506708            0.0091280 RHO       235010000
20506709            0.0072325 RHO       235020000
20506710            0.0088095 RHO       235030000
20506711            0.1195494 RHO       240010000
20506712            0.1280806 RHO       245010000
20506713            0.1436936 RHO       250010000
20506714            0.1154214 RHO       251010000
20506715            0.2031741 RHO       255010000
20506716            0.1914909 RHO       260010000
* 068 BROKEN LOOP HOT LEG MASS
20506800  BLHLMASS  SUM       1.0       0.0       1
20506801  0.0       5.75410-2 RHO       300010000
20506802            4.42927-2 RHO       305010000
20506803            6.78467-2 RHO       310010000
20506804            3.07670-3 RHO       315010000
20506805            4.67621-3 RHO       315020000
20506806            8.60554-2 RHO       315030000
20506807            8.60554-2 RHO       315040000
20506808            8.97552-2 RHO       315050000
20506809            8.97552-2 RHO       315060000
20506810            8.60554-2 RHO       315070000
20506811            8.60554-2 RHO       315080000
20506812            1.82303-2 RHO       315090000
20506813            5.46687-2 RHO       315100000
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20506814            1.82489-2 RHO       315110000
20506815            2.83241-2 RHO       315120000
20506816            9.15000-2 RHO       380010000
20506817            4.80000-2 RHO       380020000
20506818            4.89000-2 RHO       380030000
* 069 BROKEN LOOP COLD LEG MASS
20506900  BLCLMASS  SUM       1.0       0.0       1
20506901  0.0       4.79790-2 RHO       335010000
20506902            4.43927-2 RHO       340010000
20506903            6.73163-2 RHO       345010000
20506904            1.06640-2 RHO       350010000
20506905            4.07801-2 RHO       350020000
20506906            2.97722-2 RHO       360010000
20506907            2.79000-2 RHO       370010000
20506908            7.00000-2 RHO       370020000
20506909            1.16500-1 RHO       370030000
* 070 PRESSURIZER MASS
20507000  PZRMASS   SUM       1.0       0.0       1
20507001  0.0       3.33500-3 RHO       400010000
20507002            3.33500-3 RHO       405010000
20507003            3.33500-3 RHO       405020000
20507004            6.84000-2 RHO       415010000
20507005            8.38000-2 RHO       415020000
20507006            2.24255-1 RHO       415030000
20507007            2.98987-1 RHO       415040000
20507008            2.24255-1 RHO       415050000
20507009            7.32000-2 RHO       415060000
20507010            1.42000-2 RHO       420010000
20507011            1.42000-2 RHO       420020000
20507012            2.12609-3 RHO       430010000
* 071 REACTOR VESSEL TOTAL MASS
20507100  RVMASS    SUM       1.0       0.0       1
20507101  0.0       1.0       CNTRLVAR  65
20507102            1.0       CNTRLVAR  66
20507103            1.0       CNTRLVAR  67
* 072 PCS TOTAL MASS
20507200  PCSMASS   SUM       1.0       0.0       1
20507201  0.0       1.0       CNTRLVAR  61
20507202            1.0       CNTRLVAR  62
20507203            1.0       CNTRLVAR  63
20507204            1.0       CNTRLVAR  64
20507205            1.0       CNTRLVAR  68
20507206            1.0       CNTRLVAR  69
20507207            1.0       CNTRLVAR  70
20507208            1.0       CNTRLVAR  71
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  073-076  STEAM GENERATOR MASS CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 073 STEAM GENERATOR DOWNCOMER MASS
20507300  SGDCMASS  SUM       1.0       0.0       1
20507301  0.0       0.4384    RHO       503010000
20507302            1.4850    RHO       505010000
20507303            2.21070-1 RHO       508010000
20507304            1.41427-1 RHO       510010000
20507305            1.41427-1 RHO       510020000
20507306            1.41427-1 RHO       510030000
* 074 STEAM GENERATOR BOILER MASS
20507400  SGBLRMASS SUM       1.0       0.0       1
20507401  0.0       5.07675-1 RHO       515010000
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20507402            5.07675-1 RHO       515020000
20507403            5.07675-1 RHO       515030000
20507404            5.07675-1 RHO       515040000
20507405            3.71565-1 RHO       515050000
20507406            0.2425    RHO       500010000
* 075 STEAM GENERATOR DOME AND PIPE MASS
20507500  SGDMMASS  SUM       1.0       0.0       1
20507501  0.0       0.705312  RHO       520010000
20507502            0.705312  RHO       525010000
20507503            1.162180  RHO       530010000
* 076 STEAM GENERATOR TOTAL MASS
20507600  SGMASS    SUM       1.0       0.0       1
20507601  0.0       1.0       CNTRLVAR  73
20507602            1.0       CNTRLVAR  74
20507603            1.0       CNTRLVAR  75
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   GENERAL TABLE DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*      TABLE
*      NUMBER       DESCRIPTION
*      ------       -----------
*
*       900         REACTOR POWER VS TIME AFTER SCRAM
*       939         ENVIRONMENTAL HEAT LOSS BOUNDARY TEMPERATURE
*       949         PRIMARY SYSTEM ENVR LOSS HEAT XFER COEFFICIENT
*       959         STEAM GENERATOR ENVR LOSS HEAT XFER COEFFICIENT
*       969         PRESSURIZER ENVR LOSS HEAT XFER COEFFICIENT
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20290000  POWER     699       1.0       48.9+6
20290001  0.0       1.0       * FROM RELAP4 L3-1 POSTTEST
20290002  0.15      0.88
20290003  0.3       0.76
20290004  0.6       0.58
20290005  0.85      0.176
20290006  1.0       0.122605
20290007  1.3       0.1
20290008  2.0       0.087420
20290009  4.0       0.075788
20290010  7.0       0.064
20290011  10.       0.060012
20290012  25.       0.046738
20290013  65.       0.035
20290014  100.      0.031546
20290015  250.      0.025210
20290016  650.      0.0188
20290017  1000.     0.0164
20290018  1500.     0.0140
20290019  3000.     0.0110
20290020  5000.     0.0092
20290021  1.+5      0.001460  * FROM LTR LO-08-81-173
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ENVIRONMENTAL HEAT LOSS BOUNDARY TEMPERATURE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20293900  TEMP
20293901  0.0       311.0
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY SYSTEM ENVIRONMENTAL LOSS HEAT XFER COEFFICIENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20294900  HTC-T
20294901  0.0       10.76     * 174 KW FROM PCS (EXCEPT PZR)
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR ENVIRONMENTAL LOSS HEAT XFER COEFFICIENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20295900  HTC-T
20295901  0.0       3.385     *  20 KW FROM STEAM GENERATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER ENVIRONMENTAL LOSS HEAT XFER COEFFICIENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20296900  HTC-T
20296901  0.0       3.019     *   6 KW FROM PRESSURIZER
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PUMP DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE HEAD CURVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351100   1                   1
1351101   0.000000E+00        1.403600E+00
1351102   1.906100E-01        1.363600E+00
1351103   3.896300E-01        1.318600E+00
1351104   5.939600E-01        1.232800E+00
1351105   7.902000E-01        1.133600E+00
1351106   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351200   1                   2
1351201   0.000000E+00        -6.700000E-01
1351202   2.000000E-01        -5.000000E-01
1351203   4.000000E-01        -2.500000E-01
1351204   5.755400E-01        0.000000E+00
1351205   7.443200E-01        2.583000E-01
1351206   7.734800E-01        3.778000E-01
1351207   8.631300E-01        6.326000E-01
1351208   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351300   1                   3
1351301   -1.000000E+00       2.472200E+00
1351302   -8.057400E-01       2.047400E+00
1351303   -6.069000E-01       1.831000E+00
1351304   -4.068300E-01       1.624000E+00
1351305   -2.001710E-01       1.470500E+00
1351306   0.000000E+00        1.403600E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351400   1                   4
1351401   -1.000000E+00       2.472200E+00
1351402   -8.229700E-01       1.996800E+00
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1351403   -6.333200E-01       1.589700E+00
1351404   -4.553400E-01       1.327900E+00
1351405   -2.710900E-01       1.194900E+00
1351406   -1.771600E-01       1.060500E+00
1351407   -9.073000E-02       1.015600E+00
1351408   0.000000E+00        9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351500   1                   5
1351501   0.000000E+00        2.500000E-01
1351502   2.000000E-01        2.800000E-01
1351503   4.000000E-01        3.400000E-01
1351504   4.118000E-01        2.768000E-01
1351505   5.976300E-01        4.584000E-01
1351506   7.934670E-01        6.992000E-01
1351507   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351600   1                   6
1351601   0.000000E+00        9.342790E-01
1351602   9.109900E-02        9.229000E-01
1351603   1.865090E-01        8.963000E-01
1351604   2.717620E-01        8.750000E-01
1351605   4.558720E-01        8.433000E-01
1351606   5.744060E-01        8.355000E-01
1351607   7.405760E-01        8.466000E-01
1351608   7.666190E-01        8.469000E-01
1351609   8.714710E-01        8.838000E-01
1351610   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351700   1                   7
1351701   -1.000000E+00       -1.000000E+00
1351702   -8.000000E-01       -6.300000E-01
1351703   -6.000000E-01       -3.000000E-01
1351704   -4.000000E-01       -5.000000E-02
1351705   -2.000000E-01       1.500000E-01
1351706   0.000000E+00        2.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351800   1                   8
1351801   -1.000000E+00       -1.000000E+00
1351802   -8.000000E-01       -9.700000E-01
1351803   -6.000000E-01       -9.500000E-01
1351804   -4.000000E-01       -8.800000E-01
1351805   -2.000000E-01       -8.000000E-01
1351806   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE TORQUE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351900   2                   1
1351901   0.000000E+00        6.032000E-01
1351902   1.930000E-01        6.325000E-01
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1351903   3.930000E-01        7.369000E-01
1351904   5.955200E-01        8.331000E-01
1351905   7.978200E-01        9.229000E-01
1351906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352000   2                   2
1352001   0.000000E+00        -6.700000E-01
1352002   4.000000E-01        -2.500000E-01
1352003   5.000000E-01        1.500000E-01
1352004   7.372550E-01        5.265860E-01
1352005   7.680490E-01        6.065940E-01
1352006   8.672300E-01        7.436600E-01
1352007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352100   2                   3
1352101   -1.000000E+00       1.984300E+00
1352102   -8.009600E-01       1.394000E+00
1352103   -6.063800E-01       1.097500E+00
1352104   -4.068600E-01       8.220000E-01
1352105   -1.992800E-01       6.648000E-01
1352106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352200   2                   4
1352201   -1.000000E+00       1.984300E+00
1352202   -8.223400E-01       1.830800E+00
1352203   -6.337100E-01       1.682400E+00
1352204   -4.585300E-01       1.557000E+00
1352205   -2.670230E-01       1.436200E+00
1352206   -1.761070E-01       1.387900E+00
1352207   -8.931000E-02       1.348100E+00
1352208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352300   2                   5
1352301   0.000000E+00        -4.500000E-01
1352302   4.000000E-01        -2.500000E-01
1352303   5.000000E-01        0.000000E+00
1352304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352400   2                   6
1352401   0.000000E+00        1.233610E+00
1352402   9.064300E-02        1.196500E+00
1352403   1.885690E-01        1.109600E+00
1352404   2.734700E-01        1.041600E+00
1352405   4.586690E-01        8.958000E-01
1352406   5.744800E-01        7.807000E-01
1352407   7.381600E-01        6.134000E-01
1352408   7.685200E-01        5.849000E-01
1352409   8.700570E-01        4.877000E-01
1352410   1.000000E+00        3.569000E-01
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352500   2                   7
1352501   -1.000000E+00       -1.000000E+00
1352502   -3.000000E-01       -9.000000E-01
1352503   -1.000000E-01       -5.000000E-01
1352504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352600   2                   8
1352601   -1.000000E+00       -1.000000E+00
1352602   -2.500000E-01       -9.000000E-01
1352603   -8.000000E-02       -8.000000E-01
1352604   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353000   0
1353001   0.000000E+00        0.000000E+00
1353002   1.000000E-01        0.000000E+00
1353003   2.000000E-01        1.000000E-01
1353004   3.000000E-01        2.000000E-01
1353005   3.500000E-01        3.000000E-01
1353006   4.000000E-01        6.000000E-01
1353007   5.000000E-01        6.000000E-01
1353008   6.000000E-01        6.000000E-01
1353009   7.000000E-01        6.000000E-01
1353010   8.000000E-01        5.000000E-01
1353011   9.000000E-01        3.000000E-01
1353012   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353100   0
1353101   0.000000E+00        0.000000E+00
1353102   1.000000E-01        0.000000E+00
1353103   2.000000E-01        1.000000E-01
1353104   3.000000E-01        3.000000E-01
1353105   3.500000E-01        5.000000E-01
1353106   4.000000E-01        7.500000E-01
1353107   5.000000E-01        7.500000E-01
1353108   6.000000E-01        7.500000E-01
1353109   7.000000E-01        7.500000E-01
1353110   8.000000E-01        7.500000E-01
1353111   9.000000E-01        5.000000E-01
1353112   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2-PHASE DIFFERENCE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354100   1                   1
1354101   0.000000E+00        1.000000E+00
1354102   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354200   1                   2
1354201   0.000000E+00        1.000000E+00
1354202   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354300   1                   3
1354301   -1.000000E+00       -1.160000E+00
1354302   -9.000000E-01       -1.240000E+00
1354303   -8.000000E-01       -1.770000E+00
1354304   -7.000000E-01       -2.360000E+00
1354305   -6.000000E-01       -2.790000E+00
1354306   -5.000000E-01       -2.910000E+00
1354307   -4.000000E-01       -2.670000E+00
1354308   -2.500000E-01       -1.690000E+00
1354309   -1.000000E-01       -5.000000E-01
1354310   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354400   1                   4
1354401   -1.000000E+00       -1.160000E+00
1354402   -9.000000E-01       -7.800000E-01
1354403   -8.000000E-01       -5.000000E-01
1354404   -7.000000E-01       -3.100000E-01
1354405   -6.000000E-01       -1.700000E-01
1354406   -5.000000E-01       -8.000000E-02
1354407   -3.500000E-01       0.000000E+00
1354408   -2.000000E-01       5.000000E-02
1354409   -1.000000E-01       8.000000E-02
1354410   0.000000E+00        1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354500   1                   5
1354501   0.000000E+00        0.000000E+00
1354502   2.000000E-01        -3.400000E-01
1354503   4.000000E-01        -6.500000E-01
1354504   6.000000E-01        -9.300000E-01
1354505   8.000000E-01        -1.190000E+00
1354506   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354600   1                   6
1354601   0.000000E+00        1.100000E-01
1354602   1.000000E-01        1.300000E-01
1354603   2.500000E-01        1.500000E-01
1354604   4.000000E-01        1.300000E-01
1354605   5.000000E-01        7.000000E-02
1354606   6.000000E-01        -4.000000E-02
1354607   7.000000E-01        -2.300000E-01
1354608   8.000000E-01        -5.100000E-01
1354609   9.000000E-01        -9.100000E-01
1354610   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354700   1                   7
1354701   -1.000000E+00       0.000000E+00
1354702   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354800   1                   8
1354801   -1.000000E+00       0.000000E+00
1354802   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354900   2                   1
1354901   0.000000E+00        1.000000E+00
1354906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355000   2                   2
1355001   0.000000E+00        1.000000E+00
1355007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355100   2                   3
1355101   -1.000000E+00       1.984300E+00
1355102   -8.009600E-01       1.394000E+00
1355103   -6.063800E-01       1.097500E+00
1355104   -4.068600E-01       8.220000E-01
1355105   -1.992800E-01       6.648000E-01
1355106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355200   2                   4
1355201   -1.000000E+00       1.984300E+00
1355202   -8.223400E-01       1.830800E+00
1355203   -6.337100E-01       1.682400E+00
1355204   -4.585300E-01       1.557000E+00
1355205   -2.670230E-01       1.436200E+00
1355206   -1.761070E-01       1.387900E+00
1355207   -8.931000E-02       1.348100E+00
1355208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355300   2                   5
1355301   0.000000E+00        -4.500000E-01
1355302   4.000000E-01        -2.500000E-01
1355303   5.000000E-01        0.000000E+00
1355304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355400   2                   6
1355401   0.000000E+00        1.233610E+00
1355402   9.064300E-02        1.196500E+00
1355403   1.885690E-01        1.109600E+00
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1355404   2.734700E-01        1.041600E+00
1355405   4.586690E-01        8.958000E-01
1355406   5.744800E-01        7.807000E-01
1355407   7.381600E-01        6.134000E-01
1355408   7.685200E-01        5.849000E-01
1355409   8.700570E-01        4.877000E-01
1355410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355500   2                   7
1355501   -1.000000E+00       -1.000000E+00
1355502   -3.000000E-01       -9.000000E-01
1355503   -1.000000E-01       -5.000000E-01
1355504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355600   2                   8
1355601   -1.000000E+00       -1.000000E+00
1355602   -2.500000E-01       -9.000000E-01
1355603   -8.000000E-02       -8.000000E-01
1355604   0.000000E+00        -6.700000E-01
* $$$ REMOVE ALL REMAINING DATA CARDS AFTER ACHIEVING STEADY STATE
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PUMP DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE HEAD CURVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651100   1                   1
1651101   0.000000E+00        1.403600E+00
1651102   1.906100E-01        1.363600E+00
1651103   3.896300E-01        1.318600E+00
1651104   5.939600E-01        1.232800E+00
1651105   7.902000E-01        1.133600E+00
1651106   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651200   1                   2
1651201   0.000000E+00        -6.700000E-01
1651202   2.000000E-01        -5.000000E-01
1651203   4.000000E-01        -2.500000E-01
1651204   5.755400E-01        0.000000E+00
1651205   7.443200E-01        2.583000E-01
1651206   7.734800E-01        3.778000E-01
1651207   8.631300E-01        6.326000E-01
1651208   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651300   1                   3
1651301   -1.000000E+00       2.472200E+00
1651302   -8.057400E-01       2.047400E+00
1651303   -6.069000E-01       1.831000E+00
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1651304   -4.068300E-01       1.624000E+00
1651305   -2.001710E-01       1.470500E+00
1651306   0.000000E+00        1.403600E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651400   1                   4
1651401   -1.000000E+00       2.472200E+00
1651402   -8.229700E-01       1.996800E+00
1651403   -6.333200E-01       1.589700E+00
1651404   -4.553400E-01       1.327900E+00
1651405   -2.710900E-01       1.194900E+00
1651406   -1.771600E-01       1.060500E+00
1651407   -9.073000E-02       1.015600E+00
1651408   0.000000E+00        9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651500   1                   5
1651501   0.000000E+00        2.500000E-01
1651502   2.000000E-01        2.800000E-01
1651503   4.000000E-01        3.400000E-01
1651504   4.118000E-01        2.768000E-01
1651505   5.976300E-01        4.584000E-01
1651506   7.934670E-01        6.992000E-01
1651507   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651600   1                   6
1651601   0.000000E+00        9.342790E-01
1651602   9.109900E-02        9.229000E-01
1651603   1.865090E-01        8.963000E-01
1651604   2.717620E-01        8.750000E-01
1651605   4.558720E-01        8.433000E-01
1651606   5.744060E-01        8.355000E-01
1651607   7.405760E-01        8.466000E-01
1651608   7.666190E-01        8.469000E-01
1651609   8.714710E-01        8.838000E-01
1651610   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651700   1                   7
1651701   -1.000000E+00       -1.000000E+00
1651702   -8.000000E-01       -6.300000E-01
1651703   -6.000000E-01       -3.000000E-01
1651704   -4.000000E-01       -5.000000E-02
1651705   -2.000000E-01       1.500000E-01
1651706   0.000000E+00        2.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651800   1                   8
1651801   -1.000000E+00       -1.000000E+00
1651802   -8.000000E-01       -9.700000E-01
1651803   -6.000000E-01       -9.500000E-01
1651804   -4.000000E-01       -8.800000E-01
1651805   -2.000000E-01       -8.000000E-01
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1651806   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE TORQUE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651900   2                   1
1651901   0.000000E+00        6.032000E-01
1651902   1.930000E-01        6.325000E-01
1651903   3.930000E-01        7.369000E-01
1651904   5.955200E-01        8.331000E-01
1651905   7.978200E-01        9.229000E-01
1651906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652000   2                   2
1652001   0.000000E+00        -6.700000E-01
1652002   4.000000E-01        -2.500000E-01
1652003   5.000000E-01        1.500000E-01
1652004   7.372550E-01        5.265860E-01
1652005   7.680490E-01        6.065940E-01
1652006   8.672300E-01        7.436600E-01
1652007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652100   2                   3
1652101   -1.000000E+00       1.984300E+00
1652102   -8.009600E-01       1.394000E+00
1652103   -6.063800E-01       1.097500E+00
1652104   -4.068600E-01       8.220000E-01
1652105   -1.992800E-01       6.648000E-01
1652106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652200   2                   4
1652201   -1.000000E+00       1.984300E+00
1652202   -8.223400E-01       1.830800E+00
1652203   -6.337100E-01       1.682400E+00
1652204   -4.585300E-01       1.557000E+00
1652205   -2.670230E-01       1.436200E+00
1652206   -1.761070E-01       1.387900E+00
1652207   -8.931000E-02       1.348100E+00
1652208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652300   2                   5
1652301   0.000000E+00        -4.500000E-01
1652302   4.000000E-01        -2.500000E-01
1652303   5.000000E-01        0.000000E+00
1652304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652400   2                   6
1652401   0.000000E+00        1.233610E+00
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1652402   9.064300E-02        1.196500E+00
1652403   1.885690E-01        1.109600E+00
1652404   2.734700E-01        1.041600E+00
1652405   4.586690E-01        8.958000E-01
1652406   5.744800E-01        7.807000E-01
1652407   7.381600E-01        6.134000E-01
1652408   7.685200E-01        5.849000E-01
1652409   8.700570E-01        4.877000E-01
1652410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652500   2                   7
1652501   -1.000000E+00       -1.000000E+00
1652502   -3.000000E-01       -9.000000E-01
1652503   -1.000000E-01       -5.000000E-01
1652504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652600   2                   8
1652601   -1.000000E+00       -1.000000E+00
1652602   -2.500000E-01       -9.000000E-01
1652603   -8.000000E-02       -8.000000E-01
1652604   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1653000   0
1653001   0.000000E+00        0.000000E+00
1653002   1.000000E-01        0.000000E+00
1653003   2.000000E-01        1.000000E-01
1653004   3.000000E-01        2.000000E-01
1653005   3.500000E-01        3.000000E-01
1653006   4.000000E-01        6.000000E-01
1653007   5.000000E-01        6.000000E-01
1653008   6.000000E-01        6.000000E-01
1653009   7.000000E-01        6.000000E-01
1653010   8.000000E-01        5.000000E-01
1653011   9.000000E-01        3.000000E-01
1653012   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1653100   0
1653101   0.000000E+00        0.000000E+00
1653102   1.000000E-01        0.000000E+00
1653103   2.000000E-01        1.000000E-01
1653104   3.000000E-01        3.000000E-01
1653105   3.500000E-01        5.000000E-01
1653106   4.000000E-01        7.500000E-01
1653107   5.000000E-01        7.500000E-01
1653108   6.000000E-01        7.500000E-01
1653109   7.000000E-01        7.500000E-01
1653110   8.000000E-01        7.500000E-01
1653111   9.000000E-01        5.000000E-01
1653112   1.000000E+00        0.000000E+00
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2-PHASE DIFFERENCE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654100   1                 1
1654101   0.000000E+00      1.000000E+00
1654102   1.000000E+00      1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654200   1                 2
1654201   0.000000E+00      1.000000E+00
1654202   1.000000E+00      1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654300   1                 3
1654301   -1.000000E+00     -1.160000E+00
1654302   -9.000000E-01     -1.240000E+00
1654303   -8.000000E-01     -1.770000E+00
1654304   -7.000000E-01     -2.360000E+00
1654305   -6.000000E-01     -2.790000E+00
1654306   -5.000000E-01     -2.910000E+00
1654307   -4.000000E-01     -2.670000E+00
1654308   -2.500000E-01     -1.690000E+00
1654309   -1.000000E-01     -5.000000E-01
1654310   0.000000E+00      0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654400   1                 4
1654401   -1.000000E+00     -1.160000E+00
1654402   -9.000000E-01     -7.800000E-01
1654403   -8.000000E-01     -5.000000E-01
1654404   -7.000000E-01     -3.100000E-01
1654405   -6.000000E-01     -1.700000E-01
1654406   -5.000000E-01     -8.000000E-02
1654407   -3.500000E-01     0.000000E+00
1654408   -2.000000E-01     5.000000E-02
1654409   -1.000000E-01     8.000000E-02
1654410   0.000000E+00      1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654500   1                 5
1654501   0.000000E+00      0.000000E+00
1654502   2.000000E-01      -3.400000E-01
1654503   4.000000E-01      -6.500000E-01
1654504   6.000000E-01      -9.300000E-01
1654505   8.000000E-01      -1.190000E+00
1654506   1.000000E+00      -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654600   1                 6
1654601   0.000000E+00      1.100000E-01
1654602   1.000000E-01      1.300000E-01
1654603   2.500000E-01      1.500000E-01
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1654604   4.000000E-01        1.300000E-01
1654605   5.000000E-01        7.000000E-02
1654606   6.000000E-01        -4.000000E-02
1654607   7.000000E-01        -2.300000E-01
1654608   8.000000E-01        -5.100000E-01
1654609   9.000000E-01        -9.100000E-01
1654610   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654700   1                   7
1654701   -1.000000E+00       0.000000E+00
1654702   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654800   1                   8
1654801   -1.000000E+00       0.000000E+00
1654802   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654900   2                   1
1654901   0.000000E+00        1.000000E+00
1654906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655000   2                   2
1655001   0.000000E+00        1.000000E+00
1655007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655100   2                   3
1655101   -1.000000E+00       1.984300E+00
1655102   -8.009600E-01       1.394000E+00
1655103   -6.063800E-01       1.097500E+00
1655104   -4.068600E-01       8.220000E-01
1655105   -1.992800E-01       6.648000E-01
1655106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655200   2                   4
1655201   -1.000000E+00       1.984300E+00
1655202   -8.223400E-01       1.830800E+00
1655203   -6.337100E-01       1.682400E+00
1655204   -4.585300E-01       1.557000E+00
1655205   -2.670230E-01       1.436200E+00
1655206   -1.761070E-01       1.387900E+00
1655207   -8.931000E-02       1.348100E+00
1655208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655300   2                   5
1655301   0.000000E+00        -4.500000E-01
1655302   4.000000E-01        -2.500000E-01
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1655303   5.000000E-01        0.000000E+00
1655304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655400   2                   6
1655401   0.000000E+00        1.233610E+00
1655402   9.064300E-02        1.196500E+00
1655403   1.885690E-01        1.109600E+00
1655404   2.734700E-01        1.041600E+00
1655405   4.586690E-01        8.958000E-01
1655406   5.744800E-01        7.807000E-01
1655407   7.381600E-01        6.134000E-01
1655408   7.685200E-01        5.849000E-01
1655409   8.700570E-01        4.877000E-01
1655410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655500   2                   7
1655501   -1.000000E+00       -1.000000E+00
1655502   -3.000000E-01       -9.000000E-01
1655503   -1.000000E-01       -5.000000E-01
1655504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655600   2                   8
1655601   -1.000000E+00       -1.000000E+00
1655602   -2.500000E-01       -9.000000E-01
1655603   -8.000000E-02       -8.000000E-01
1655604   0.000000E+00        -6.700000E-01
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*     STEADY STATE CONTROL SYSTEM
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP SPEED CONTROLLERS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CALCULATE MASS FLOW ERROR
*---- ----1---- ----1---- ----1----
20590100  MSSERR    SUM       1.0       0.0       1
20590101  481.30    -1.0      MFLOWJ    100010000
* SP      XXXXXX
* SP - HOT LEG MASS FLOW SETPOINT
*---- ----1---- ----1---- ----1----
* PUMP 1 SPEED
*---- ----1---- ----1---- ----1----
20590200  PCP1SPD   INTEGRAL  0.34482   321.95    1
20590201  CNTRLVAR  901
*---- ----1---- ----1---- ----1----
* PCP1 PUMP VELOCITY TABLE
*---- ----1---- ----1---- ----1----
1356100   501       CNTRLVAR  902
1356101   0.0       0.0
1356102   369.0     369.0
*---- ----1---- ----1---- ----1----
* MODIFY PCP1 PUMP DATA
*---- ----1---- ----1---- ----1----
```

```
1350301   0    0    0         -1        0         695       0
*---- ----1---- ----1---- ----1----
* PUMP 2 SPEED
*---- ----1---- ----1---- ----1----
20590300  PCP2SPD   INTEGRAL  0.34482   328.74    1
20590301  CNTRLVAR  901
*---- ----1---- ----1---- ----1----
* PCP2 PUMP VELOCITY TABLE
*---- ----1---- ----1---- ----1----
1656100   501       CNTRLVAR  903
1656101   0.0       0.0
1656102   369.0     369.0
*---- ----1---- ----1---- ----1----
* MODIFY PCP2 PUMP DATA
*---- ----1---- ----1---- ----1----
1650301   0    0    0         -1        0         697       0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SPRAY VALVE CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPRAY VALVE
*---- ----1---- ----1---- ----1----
4350000   "SPRVLV    "        VALVE
4350101   430010000 415010000 3.3451E-4 1.5432E01 1.5432E01 0100
4350201   0         .00000000 .00000000 0.0
4350300   SRVVLV
4350301   904       999
*---- ----1---- ----1---- ----1----
* SPRAY VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20590400  SPRAY     SUM       -1.0      0.0       1         * CONTIN
+         3         0.0       1.0
20590401  14.90+6   -1.0      P         420010000
* SP      XXXXXXX
* SP - TOP END OF PRESSURE CONTROL BAND ; SPRAY TURNS ON
*---- ----1---- ----1---- ----1----
* POSITION VS AREA TABLE
*---- ----1---- ----1---- ----1----
20299900  NORMAREA
20299901  0.0       0.0
20299902  0.0001    0.0
20299903  1.0       1.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER HEATERS IN INITIALIZATION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TRIP SETPOINTS
*---- ----1---- ----1---- ----1----
* LT  693  CYLCING HEATERS         CARD 20241700
0000585   P         100010000 GT   NULL      0         14.85+6    N
* SP                                                    XXXXXXX
* SP - BOTTOM END OF PRESSURE CONTROL BAND ; HEATERS TURN OFF
0000586   P         100010000 LT   NULL      0         14.8499+6  N
* SP                                                    XXXXXXXXX
* SP - (BOTTOM END . . .) - DELTA ; HEATERS TURN ON
0000666   586       OR        693       N
0000667   -585      AND       666       N
0000693   -503      AND       667       N
*---- ----1---- ----1---- ----1----
* LT  694  BACKUP HEATERS          CARD 20241800
0000587   P         420010000 GT   NULL      0         14.85+6    N
```

```
* SP                                                    XXXXXXX
* SP - BACKUP HEATERS TURN OFF
0000588   P         420010000 LT   NULL      0        14.84+6    N
* SP                                                    XXXXXXX
* SP - BACKUP HEATERS TURN ON
0000668   588       OR        694       N
0000669   -587      AND       668       N
0000694   -503      AND       669       N
*---- ----1---- ----1---- ----1----
* PRESSURIZER HEATERS
*---- ----1---- ----1---- ----1----
14172000  2         9         2         1         0.0
14172100  0         1
14172101  8         8.3820E-3
14172201  4         8
14172301  1.0       8
14172401  615.      9
14172501  0         0         0         1         5.4864    1
14172502  0         0         0         1         1.8288    2
14172601  415040000 0         1         1         5.4864    1
14172602  415040000 0         1         1         1.8288    2
14172701  417       1.0       0.0       0.0       1         * CYCLING
14172702  418       1.0       0.0       0.0       2         * BACKUP
14172901  0         1.6764E-2 1.6764E-2 5.4864    1
14172902  0         1.6764E-2 1.6764E-2 1.8288    2
*---- ----1---- ----1---- ----1----
* PRESSURIZER CYCLING HEATERS
*---- ----1---- ----1---- ----1----
20241700  POWER     693
20241701  -1.0      0.0
20241702  0.0       0.0
20241703  1.0       3.6+4
*---- ----1---- ----1---- ----1----
* PRESSURIZER BACKUP HEATERS
*---- ----1---- ----1---- ----1----
20241800  POWER     694
20241801  -1.0      0.0
20241802  0.0       0.0
20241803  1.0       3.6+4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER LEVEL CONTROL USING CHARGING AND LETDOWN COMPONENTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* MODIFY PZR LEVEL CONTROL VARIABLE
*---- ----1---- ----1---- ----1----
20500206            0.1249    VOIDF     415060000
20500207            0.02477   VOIDF     420010000
20500208            0.02447   VOIDF     420020000
*---- ----1---- ----1---- ----1----
* CHARGING RESERVIOR
*---- ----1---- ----1---- ----1----
9800000   "CHRG RESRV"        TMDPVOL
9800101   1.0       1.0       0.0       0.0       0.0       0.0
9800102   4.0-5     0.0       00
9800200   3
9800201   0.0       2.07+07   559.2
*---- ----1---- ----1---- ----1----
* CHARGING VALVE
*---- ----1---- ----1---- ----1----
9850000   "CHRG VALVE"        VALVE
```

```
9850101   980000000 185000000 3.8E-05   0.0       0.0       0100
9850201   0         .00000000 .00000000 0.0
9850300   SRVVLV
9850301   905       999
*---- ----1---- ----1---- ----1----
* CHARGING VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20590500  CHARGE    SUM       7.7       0.0       1         *CONTIN
+         3         0.0       1.0
20590501  1.09      -1.0      CNTRLVAR  2
* SP      XXXXX
* SP - BOTTOM END OF LEVEL CONTROL BAND ; CHARGING TURNS ON
*---- ----1---- ----1---- ----1----
* LETDOWN SINK
*---- ----1---- ----1---- ----1----
9900000   "LTDWN SINK"       TMDPVOL
9900101   1.0       1.0       0.0       0.0       0.0       0.0
9900102   4.0-5     0.0       00
9900200   3
9900201   0.0       1.4+7     559.2
*---- ----1---- ----1---- ----1----
* LETDOWN VALVE
*---- ----1---- ----1---- ----1----
9950000   "LTDWN VLV "        VALVE
9950101   185000000 990000000  2.5-5    0.0       0.0       0100
9950201   0         .00000000 .00000000 0.0
9950300   SRVVLV
9950301   906       999
*---- ----1---- ----1---- ----1----
* LETDOWN VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20590600  LETDOWN   SUM       -7.7      0.0       1         *CONTIN
+         3         0.0       1.0
20590601  1.11      -1.0      CNTRLVAR  2
* SP      XXXXX
* SP - TOP END OF LEVEL CONTROL BAND ; LETDOWN TURNS ON
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM VALVE CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CHANGES TO STEAM VALVE
*---- ----1---- ----1---- ----1----
5400201   0         16.946000 20.832000 0.0
5400300   SRVVLV
5400301   910       540
20254000  NORMAREA
20254001  0.0       0.0
20254002  0.0001    0.0
20254003  1.0       1.0
*---- ----1---- ----1---- ----1----
* COMPUTE DELTA T ERROR
*---- ----1---- ----1---- ----1----
20590700  "DELTA T" SUM       1.0       0.0       1
20590701  556.00    -1.       TEMPF     185010000
* SP      XXXXXX
* SP - COLD LEG TEMPERATURE SETPOINT
*---- ----1---- ----1---- ----1----
* FILTER DELTA T THRU DEADBAND
*---- ----1---- ----1---- ----1----
20590800  DEADBAND  FUNCTION  1.0       0.0       1
```

```
20590801  CNTRLVAR  907       908
20290800  REAC-T
20290801  -100.     -100.
20290802  -0.25     -0.25
20290803  -0.25     0.0
20290804  0.25      0.0
20290805  0.25      0.25
20290806  100.      100.
*---- ----1---- ----1---- ----1----
* INTEGRATE DELTA T ERROR
*---- ----1---- ----1---- ----1----
20590900  "INT D T" INTEGRAL  1.0       0.0       1
20590901  CNTRLVAR  908
*---- ----1---- ----1---- ----1----
* STEAM VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20591000  TCONTROL  SUM       1.0       0.645229  0         *CONTI
+         3         0.6       0.90
* SP                                   XXXXXXX
* SP - STEAM VALVE INITIAL POSTION
20591001  0.645229  -0.07126  CNTRLVAR  908
* SP      XXXXXXX
* SP - STEAM VALVE INITIAL POSITION
20591002            -0.01492  CNTRLVAR  909
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SIMPLIFIED FEED SYSTEM CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20591100  SGLVLERR  SUM       1.0       0.0       1
20591101  3.20      -1.0      CNTRLVAR  001
* SP      XXXXXX
* SP - STEAM GENERATOR LEVEL SETPOINT
20591200  FEEDFLOW  SUM       1.0       0.0       1
20591201  0.0       1.0       MFLOWJ    540000000
20591202            48.4      CNTRLVAR  911
*---- ----1---- ----1---- ----1----
* REPLACE FEED JUNCTION TABLE
*---- ----1---- ----1---- ----1----
5660200   1         0         CNTRLVAR  912
5660201   -100.0    25.553    0.0       0.0
* SP                XXXXXX
* SP - INITIAL FEED FLOW RATE
5660202   -1.0      0.0       0.0       0.0
5660203   0.0       0.0       0.0       0.0
5660204   50.0      50.0      0.0       0.0
5660205
5660206
5660207
5660208
5660209
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CONSTANT REACTOR POWER TABLE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20290000  POWER
20290001  0.0       48.9+6
20290002  100.      48.9+6
20290003  200.      48.9+6
20290004  1.E+3     48.9+6
20290005
20290006
```

```
20290007
20290008
20290009
20290010
20290011
20290012
20290013
20290014
20290015
20290016
20290017
20290018
20290019
20290020
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REPLACE TRIPS FOR STEADY STATE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     SCRAM
0000510   TIME      0         GE   NULL      0         1.+9     L
*     BREAK OPENS
0000511   TIME      0         GE   NULL      0         1.+9     L
*     HPIS ON
0000513   TIME      0         GE   NULL      0         1.+9     L
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
. . . . . RELAP5 END CARD
```

```
/JOB
L37BASE,T6000.
/USER
ATTACH,REL36KX.
ATTACH,STH2XT=STEAM/UN=KA41202.
*PURGE,L37PRP1/NA.
*DEFINE,RSTPLT=L37PRP1.
PURGE,L37PFB1/NA.
DEFINE,PLOTFL=L37PFB1.
ATTACH,RSTIN=L3SRP1.
FILE,RSTIN,SBF=NO.
FILE,RSTPLT,SBF=NO.
RFL,CM=350000,EC=200.
REDUCE(-)
REL36KX,,*PL=50000.
/EOR
= LOFT L3-7 POST TEST ANALYSIS
0000100   RESTART   TRANSNT
0000101   RUN
0000103   408
0000105   5.0       10.0
0000201   10000.0   1.0-6     5.0       3     2  200  400
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE PUMP SPEED CONTROLLERS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20590100  MSSERR    DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590200  PCP1SPD   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590300  PCP2SPD   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* RENODALIZE PUMP1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1350000   "PCPUMP1   "       PUMP
1350101   0.0       0.4572    0.0991    0.0       90.0      0.317900
1350102   0
1350108   130010000 0.0       0.017     0.017     0000
1350109   140000000 0.0       0.05      0.05      0000
1350200   0         1.48280+7 1.22765+6 2.46363+6 0.
1350201   0         8.5604    8.5604    0.0
1350202   0         9.0732    9.0732    0.0
1350301     0    0    0        -1        -1        595         0
1350302   369.00000 .91140921 .31550000 96.000000 500.60000 1.4310000
1350303   613.6     0.0       207.433   .0444     19.5987   0.0
1350308   0.212845  0.0       -22.86511 27.16043  5.74589
1350310   0.0       0.0       0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PUMP DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE HEAD CURVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351100   1                 1
1351101   0.000000E+00      1.403600E+00
1351102   1.906100E-01      1.363600E+00
1351103   3.896300E-01      1.318600E+00
1351104   5.939600E-01      1.232800E+00
1351105   7.902000E-01      1.133600E+00
```

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1351106   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1----  ---1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351200   1                   2
1351201   0.000000E+00        -6.700000E-01
1351202   2.000000E-01        -5.000000E-01
1351203   4.000000E-01        -2.500000E-01
1351204   5.755400E-01        0.000000E+00
1351205   7.443200E-01        2.583000E-01
1351206   7.734800E-01        3.778000E-01
1351207   8.631300E-01        6.326000E-01
1351208   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351300   1                   3
1351301   -1.000000E+00       2.472200E+00
1351302   -8.057400E-01       2.047400E+00
1351303   -6.069000E-01       1.831000E+00
1351304   -4.068300E-01       1.624000E+00
1351305   -2.001710E-01       1.470500E+00
1351306   0.000000E+00        1.403600E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351400   1                   4
1351401   -1.000000E+00       2.472200E+00
1351402   -8.229700E-01       1.996800E+00
1351403   -6.333200E-01       1.589700E+00
1351404   -4.553400E-01       1.327900E+00
1351405   -2.710900E-01       1.194900E+00
1351406   -1.771600E-01       1.060500E+00
1351407   -9.073000E-02       1.015600E+00
1351408   0.000000E+00        9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351500   1                   5
1351501   0.000000E+00        2.500000E-01
1351502   2.000000E-01        2.800000E-01
1351503   4.000000E-01        3.400000E-01
1351504   4.118000E-01        2.768000E-01
1351505   5.976300E-01        4.584000E-01
1351506   7.934670E-01        6.992000E-01
1351507   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351600   1                   6
1351601   0.000000E+00        9.342790E-01
1351602   9.109900E-02        9.229000E-01
1351603   1.865090E-01        8.963000E-01
1351604   2.717620E-01        8.750000E-01
1351605   4.558720E-01        8.433000E-01
1351606   5.744060E-01        8.355000E-01
1351607   7.405760E-01        8.466000E-01
1351608   7.666190E-01        8.469000E-01
1351609   8.714710E-01        8.838000E-01
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1351610   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351700   1                   7
1351701   -1.000000E+00       -1.000000E+00
1351702   -8.000000E-01       -6.300000E-01
1351703   -6.000000E-01       -3.000000E-01
1351704   -4.000000E-01       -5.000000E-02
1351705   -2.000000E-01       1.500000E-01
1351706   0.000000E+00        2.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351800   1                   8
1351801   -1.000000E+00       -1.000000E+00
1351802   -8.000000E-01       -9.700000E-01
1351803   -6.000000E-01       -9.500000E-01
1351804   -4.000000E-01       -8.800000E-01
1351805   -2.000000E-01       -8.000000E-01
1351806   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE TORQUE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351900   2                   1
1351901   0.000000E+00        6.032000E-01
1351902   1.930000E-01        6.325000E-01
1351903   3.930000E-01        7.369000E-01
1351904   5.955200E-01        8.331000E-01
1351905   7.978200E-01        9.229000E-01
1351906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352000   2                   2
1352001   0.000000E+00        -6.700000E-01
1352002   4.000000E-01        -2.500000E-01
1352003   5.000000E-01        1.500000E-01
1352004   7.372550E-01        5.265860E-01
1352005   7.680490E-01        6.065940E-01
1352006   8.672300E-01        7.436600E-01
1352007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352100   2                   3
1352101   -1.000000E+00       1.984300E+00
1352102   -8.009600E-01       1.394000E+00
1352103   -6.063800E-01       1.097500E+00
1352104   -4.068600E-01       8.220000E-01
1352105   -1.992800E-01       6.648000E-01
1352106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352200   2                   4
1352201   -1.000000E+00       1.984300E+00
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1352202   -8.223400E-01       1.830800E+00
1352203   -6.337100E-01       1.682400E+00
1352204   -4.585300E-01       1.557000E+00
1352205   -2.670230E-01       1.436200E+00
1352206   -1.761070E-01       1.387900E+00
1352207   -8.931000E-02       1.348100E+00
1352208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352300   2                   5
1352301   0.000000E+00        -4.500000E-01
1352302   4.000000E-01        -2.500000E-01
1352303   5.000000E-01        0.000000E+00
1352304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352400   2                   6
1352401   0.000000E+00        1.233610E+00
1352402   9.064300E-02        1.196500E+00
1352403   1.885690E-01        1.109600E+00
1352404   2.734700E-01        1.041600E+00
1352405   4.586690E-01        8.958000E-01
1352406   5.744800E-01        7.807000E-01
1352407   7.381600E-01        6.134000E-01
1352408   7.685200E-01        5.849000E-01
1352409   8.700570E-01        4.877000E-01
1352410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352500   2                   7
1352501   -1.000000E+00       -1.000000E+00
1352502   -3.000000E-01       -9.000000E-01
1352503   -1.000000E-01       -5.000000E-01
1352504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352600   2                   8
1352601   -1.000000E+00       -1.000000E+00
1352602   -2.500000E-01       -9.000000E-01
1352603   -8.000000E-02       -8.000000E-01
1352604   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353000   0
1353001   0.000000E+00        0.000000E+00
1353002   1.000000E-01        0.000000E+00
1353003   2.000000E-01        1.000000E-01
1353004   3.000000E-01        2.000000E-01
1353005   3.500000E-01        3.000000E-01
1353006   4.000000E-01        6.000000E-01
1353007   5.000000E-01        6.000000E-01
1353008   6.000000E-01        6.000000E-01
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1353009   7.000000E-01        6.000000E-01
1353010   8.000000E-01        5.000000E-01
1353011   9.000000E-01        3.000000E-01
1353012   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353100   0
1353101   0.000000E+00        0.000000E+00
1353102   1.000000E-01        0.000000E+00
1353103   2.000000E-01        1.000000E-01
1353104   3.000000E-01        3.000000E-01
1353105   3.500000E-01        5.000000E-01
1353106   4.000000E-01        7.500000E-01
1353107   5.000000E-01        7.500000E-01
1353108   6.000000E-01        7.500000E-01
1353109   7.000000E-01        7.500000E-01
1353110   8.000000E-01        7.500000E-01
1353111   9.000000E-01        5.000000E-01
1353112   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2-PHASE DIFFERENCE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354100   1                   1
1354101   0.000000E+00        1.000000E+00
1354102   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354200   1                   2
1354201   0.000000E+00        1.000000E+00
1354202   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354300   1                   3
1354301   -1.000000E+00       -1.160000E+00
1354302   -9.000000E-01       -1.240000E+00
1354303   -8.000000E-01       -1.770000E+00
1354304   -7.000000E-01       -2.360000E+00
1354305   -6.000000E-01       -2.790000E+00
1354306   -5.000000E-01       -2.910000E+00
1354307   -4.000000E-01       -2.670000E+00
1354308   -2.500000E-01       -1.690000E+00
1354309   -1.000000E-01       -5.000000E-01
1354310   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354400   1                   4
1354401   -1.000000E+00       -1.160000E+00
1354402   -9.000000E-01       -7.800000E-01
1354403   -8.000000E-01       -5.000000E-01
1354404   -7.000000E-01       -3.100000E-01
1354405   -6.000000E-01       -1.700000E-01
1354406   -5.000000E-01       -8.000000E-02
1354407   -3.500000E-01       0.000000E+00
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1354408   -2.000000E-01       5.000000E-02
1354409   -1.000000E-01       8.000000E-02
1354410   0.000000E+00        1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354500   1                   5
1354501   0.000000E+00        0.000000E+00
1354502   2.000000E-01        -3.400000E-01
1354503   4.000000E-01        -6.500000E-01
1354504   6.000000E-01        -9.300000E-01
1354505   8.000000E-01        -1.190000E+00
1354506   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354600   1                   6
1354601   0.000000E+00        1.100000E-01
1354602   1.000000E-01        1.300000E-01
1354603   2.500000E-01        1.500000E-01
1354604   4.000000E-01        1.300000E-01
1354605   5.000000E-01        7.000000E-02
1354606   6.000000E-01        -4.000000E-02
1354607   7.000000E-01        -2.300000E-01
1354608   8.000000E-01        -5.100000E-01
1354609   9.000000E-01        -9.100000E-01
1354610   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354700   1                   7
1354701   -1.000000E+00       0.000000E+00
1354702   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354800   1                   8
1354801   -1.000000E+00       0.000000E+00
1354802   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354900   2                   1
1354901   0.000000E+00        1.000000E+00
1354906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355000   2                   2
1355001   0.000000E+00        1.000000E+00
1355007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355100   2                   3
1355101   -1.000000E+00       1.984300E+00
1355102   -8.009600E-01       1.394000E+00
1355103   -6.063800E-01       1.097500E+00
1355104   -4.068600E-01       8.220000E-01
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1355105   -1.992800E-01       6.648000E-01
1355106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355200   2                   4
1355201   -1.000000E+00       1.984300E+00
1355202   -8.223400E-01       1.830800E+00
1355203   -6.337100E-01       1.682400E+00
1355204   -4.585300E-01       1.557000E+00
1355205   -2.670230E-01       1.436200E+00
1355206   -1.761070E-01       1.387900E+00
1355207   -8.931000E-02       1.348100E+00
1355208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355300   2                   5
1355301   0.000000E+00        -4.500000E-01
1355302   4.000000E-01        -2.500000E-01
1355303   5.000000E-01        0.000000E+00
1355304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355400   2                   6
1355401   0.000000E+00        1.233610E+00
1355402   9.064300E-02        1.196500E+00
1355403   1.885690E-01        1.109600E+00
1355404   2.734700E-01        1.041600E+00
1355405   4.586690E-01        8.958000E-01
1355406   5.744800E-01        7.807000E-01
1355407   7.381600E-01        6.134000E-01
1355408   7.685200E-01        5.849000E-01
1355409   8.700570E-01        4.877000E-01
1355410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355500   2                   7
1355501   -1.000000E+00       -1.000000E+00
1355502   -3.000000E-01       -9.000000E-01
1355503   -1.000000E-01       -5.000000E-01
1355504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355600   2                   8
1355601   -1.000000E+00       -1.000000E+00
1355602   -2.500000E-01       -9.000000E-01
1355603   -8.000000E-02       -8.000000E-01
1355604   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* RENODALIZE PUMP 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1650000   "PCPUMP2   "        PUMP
1650101   0.0       0.514     0.0991    0.0       90.0      0.317900
1650102   0
1650108   160010000 0.0       0.017     0.017     0000
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1650109   170000000 0.0       0.1       0.1       0000
1650200   0         1.48858+7 1.22768+6 2.46241+6 0.
1650201   0         7.7855    7.7855    0.0
1650202   0         8.0481    8.0481    0.0
1650301   135  135  135        -1        -1       597         0
1650302   369.00000 .92981030 .31550000 96.000000 500.60000 1.4310000
1650303   613.60000 .00000000 207.43300 .04440000 19.598700 .00000000
1650308   0.212845  0.0       -22.86511 27.16043  5.74589
1650310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE  SPRAY VALVE AND CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4350000   SPRVLV    DELETE
20590400  SPRAY     DELETE    0.0  0.0  0.0  0.0  0.0  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE PRESSURIZER TRIPS AND HEATERS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000585   DISCARD
0000586   DISCARD
0000666   510       DISCARD
0000667   510       DISCARD
0000693   510       DISCARD
0000587   DISCARD
0000588   DISCARD
0000668   510       DISCARD
0000669   510       DISCARD
0000694   510       DISCARD
14172000  DELETE
20241700  DELETE
20241800  DELETE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE PRESSURIZER LEVEL CONTROLLERS, CHARGING COMPONENT, AND
* LETDOWN COMPONENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20500200  PZRLVL    SUM       1.0       0.0       1
20500201  0.0       0.1815    VOIDF     415010000
20500202            0.1524    VOIDF     415020000
20500203            0.3967    VOIDF     415030000
20500204            0.5289    VOIDF     415040000
20500205            0.3967    VOIDF     415050000
20500206            0.1943    VOIDF     415060000
20500207            0.1029    VOIDF     420010000
20500208            0.1029    VOIDF     420020000
9800000   "CHRG R"  DELETE
9850000   "CHRG V"  DELETE
20590500  CHARGE    DELETE    0.0  0.0  0.0  0.0  0.0  0.0
9900000   "LTDWN S" DELETE
9950000   "LTDWN V" DELETE
20590600  LETDOWN   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE STEAM VALVE CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5400000   "CV-P4-10  "        VALVE
5400101   530010000 541000000 0.0047772 0.0       0.0       1100
5400201   0         16.963    20.945    0.0
5400300   MTRVLV
5400301   685       686       0.05      .649345   540
20254000  NORMAREA
20254001  0.0       7.066-3
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20254002  7.066-3   7.066-3
20254003  1.0       1.0
20590700  "DELTA T" DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590800  DEADBAND  DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590900  "INT D T" DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20591000  TCONTROL  DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20290800  DELETE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE FEED SYSTEM CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20591100  SGLVLERR  DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20591200  FEEDFLOW  DELETE    0.0  0.0  0.0  0.0  0.0  0.0
5660000   "FEED     "         TMDPJUN
5660101   565000000 508000000 0.05
5660200   1         688
5660201   0.0       25.593    0.0       0.0
5660202   0.7       0.0       0.0       0.0
5660203   59.5      0.0       0.0       0.0
5660204   60.0      0.50364   0.0       0.0
5660205   1860.0    0.50364   0.0       0.0
5660206   1861.0    0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REPLACE REACTOR POWER TABLE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20290000  POWER     699       1.0       48.9+6
20290001  0.0       1.0       * FROM RELAP4 L3-1 POSTEST
20290002  0.15      0.88
20290003  0.3       0.76
20290004  0.6       0.58
20290005  0.85      0.176
20290006  1.0       0.122605
20290007  1.3       0.1
20290008  2.0       0.087420
20290009  4.0       0.075788
20290010  7.0       0.064
20290011  10.       0.060012
20290012  25.       0.046738
20290013  65.       0.035
20290014  100.      0.031546
20290015  250.      0.025210
20290016  650.      0.0188
20290017  1000.     0.0164
20290018  1500.     0.0140
20290019  3000.     0.0110
20290020  5000.     0.0092
20290022  1.+5      0.001460  * FROM LTR LO-08-81-173
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REPLACE TRIPS 510,511,513
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     SCRAM
0000510   P         100010000 LT   NULL      0         1.4193+7 L
*     BREAK OPENS
0000511   TIME      0         LT   NULL      0         7302.    N
*     HPIS ON
0000513   P         100010000 LE   NULL      0         13.159+6 L
0000595    TIME   0   GE   NULL  0   39.3    L
0000597    TIME   0   GE   NULL  0   39.3    L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
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*    RENODALIZE DEAD END OF FUEL MODULES AND BROKEN LOOP
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DEAD END OF FUEL MODULES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2510000   "DE FL MODS"        SNGLVOL
2510101   0.0       0.7844123 0.1154214 0.0       90.0      0.7844123
2510102   3.81-6    0.214     00
2510200   0         1.49207+7 1.33213+6 2.46168+6 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP HOT LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3000000   "RVN BLHL  "        BRANCH
3000001   2         0
3000101   0.0       0.876303  0.0575410 0.0       0.0       0.0
3000102   4.0E-5    0.0       00
3000200   0         1.49144+7 1.25750+6 2.46181+6 0.0
3001101   252010000 300000000 0.067014  0.0       0.0       0002
3002101   300010000 305000000 0.063426  0.1       0.1       0000
3001201   0.0       0.0       0.0
3002201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HOT LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3050000   "HLP-RABS T"        BRANCH
3050001   1         0
3050101   0.0       0.698336  0.0442927 0.0       0.0       0.0
3050102   4.0E-5    0.0       00
3050200   0         1.49144+7 1.25750+6 2.46181+6 0.0
3051101   305010000 310000000 0.0       0.1       0.1       0100
3051201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP HOT LEG CONTRACTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3100000   "BLHL CONTR"        BRANCH
3100001   2         0
3100101   0.0       1.50013   0.0678467 0.0       0.0       0.0
3100102   4.0E-5    0.0       00
3100200   0         1.49144+7 1.25750+6 2.46181+6 0.0
3101101   380010000 310000000 0.0388    0.84      0.84      0100
3102101   310010000 315000000 0.0083647 0.0       0.0       0100
3101201   0.0       0.0       0.0
3102201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR AND PUMP SIMULATIOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3150000   "SG+PMP SIM"        PIPE
3150001   12
3150101   0.0       12
3150201   0.0083647 2
3150202   0.032603  4
3150203   0.105626  5
3150204   0.032603  7
3150205   0.0083647 9
3150206   0.008364  10
3150207   0.0046398 11
3150301   0.367768  1
3150302   0.552201  2
3150303   0.993978  4
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3150304	0.849744	6					
3150305	0.993978	8					
3150306	1.371350	9					
3150307	1.365029	10					
3150308	1.674812	11					
3150309	0.545209	12					
3150401	3.0767-3	1					
3150402	4.67621-3	2					
3150403	8.60554-2	4					
3150404	8.97552-2	6					
3150405	8.60554-2	8					
3150406	1.82303-2	9					
3150407	5.46687-2	10					
3150408	1.82489-2	11					
3150409	2.83241-2	12					
3150601	90.0	5					
3150602	-90.0	10					
3150603	90.0	11					
3150604	0.0	12					
3150701	0.127000	1					
3150702	0.552201	2					
3150703	0.993978	4					
3150704	0.457202	5					
3150705	-0.457202	6					
3150706	-0.993978	8					
3150707	-1.371350	9					
3150708	-0.520701	10					
3150709	1.212851	11					
3150710	0.0	12					
3150801	4.0E-5	0.0	3				
3150802	4.0E-5	0.124	4				
3150803	4.0E-5	0.0	6				
3150804	4.0E-5	0.124	7				
3150805	4.0E-5	0.0	12				
3150901	0.2	0.2	1				
3150902	0.0	0.0	2				
3150903	93.9	93.9	4				
3150904	0.4	0.4	5				
3150905	93.9	93.9	7				
3150906	0.0	0.0	8				
3150907	0.2	0.2	9				
3150908	4.1	4.1	10				
3150909	0.4	0.4	11				
3151001	00	12					
3151101	0000	1					
3151102	0100	2					
3151103	0000	7					
3151104	0100	8					
3151105	0000	10					
3151106	0100	11					
3151201	0	14914000.	1257500.	2461820.	0.0	0.0	01
3151202	0	14911400.	1257500.	2461870.	0.0	0.0	02
3151203	0	14905500.	1257500.	2461990.	0.0	0.0	03
3151204	0	14998100.	1257500.	2462150.	0.0	0.0	04
3151205	0	14992600.	1257500.	2462270.	0.0	0.0	05
3151206	0	14992600.	1257500.	2462270.	0.0	0.0	06
3151207	0	14998100.	1257500.	2462150.	0.0	0.0	07
3151208	0	14905500.	1257500.	2461990.	0.0	0.0	08
3151209	0	14914500.	1257500.	2461810.	0.0	0.0	09

```
3151210   0         14921600. 1257500.  2461660.  0.0  0.0  10
3151211   0         14919000. 1257500.  2461710.  0.0  0.0  11
3151212   0         14914300. 1257500.  2461810.  0.0  0.0  12
3151300   0
3151301   0.0       0.0       0.0       11
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3350000   "RVN BLCL  "        BRANCH
3350001   2         0
3350101   0.0       0.749305  0.047979  0.0       0.0       0.0
3350102   4.0E-5    0.0       00
3350200   0         1.49889+7 1.23500+6 2.46018+6 0.0
3351101   202000000 335000000 0.064130  1.0       1.0       0002
3352101   335010000 340000000 0.0       0.1       0.1       0000
3351201   0.0       0.0       0.0
3352201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3400000   "CLP-RABS T"        BRANCH
3400001   1         0
3400101   0.0       0.698336  0.0443927 0.0       0.0       0.0
3400102   4.0E-5    0.0       00
3400200   0         1.49889+7 1.23500+6 2.46018+6 0.0
3401101   340010000 345000000 0.0       0.1       0.1       0100
3401201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP COLD LEG CONTRACTION TO BREAK PLANE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3450000   "BLCL CONTR"        BRANCH
3450001   2         0
3450101   0.0634    0.974     0.0       0.0       0.0       0.0
3450102   4.0E-5    0.0       00
3450200   0         1.49889+7 1.23500+6 2.46018+6 0.0
3451101   345000000 370000000 0.0388    0.84      0.84      0100
3452101   345010000 350000000 0.0       0.0       0.0       0100
3451201   0.0       0.0       0.0
3452201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPOOL PIECE AND PIPE TO ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3500000   "BRK SP+PPE"        SNGLVOL
3500101   0.0525    0.823     0.0       0.0       0.0       0.0
3500102   4.0E-5    0.0       00
3500200   0         1.49889+7 1.23500+6 2.46018+6 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE COLD LEG ISOLATION VALVE AND COLD LEG PIPE BETWEEN
* ISOLATION VALVE AND QOBV
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3550000   "CL ISO VLV"        DELETE
3600000   "CL IS-QOBV"        DELETE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG QUICK OPENING BLOWDOWN VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3650000   "CO QOBV   "        VALVE
3650101   350010000 805000000 1.27778-5 0.0       0.0       0100  1.0 1.0
3650201   0         0.0       0.0       0.0
3650300   TRPVLV
```

```
3650301   677
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - COLD LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3700000   "RABS C L  "        PIPE
3700001   3
3700101   0.0388    2
3700102   0.0776    3
3700201   0.0388    2
3700301   0.0       3
3700401   0.0279    1
3700402   0.070     2
3700403   0.1165    3
3700601   90.0      1
3700602   0.0       3
3700701   0.64      1
3700702   0.0       3
3700801   4.0-5     0.0       3
3700901   0.28      0.28      1
3700902   0.84      0.84      2
3701001   00        3
3701101   0000      2
3701201   0         1.49865+7 1.23500+6 2.46023+6 0.0  0.0  01
3701202   0         1.49841+7 1.23500+6 2.46028+6 0.0  0.0  02
3701203   0         1.49841+7 1.23500+6 2.46028+6 0.0  0.0  03
3701300   0
3701301   0.0       0.0       0.0       01
3701302   0.0       0.0       0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS VALVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3750000   "RABS VALVS"        SNGLJUN
3750101   370010000 380000000 0.0       1.55+2    1.55+2    0000
3750201   0         0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - HOT LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3800000   "RABS H L  "        PIPE
3800001   3
3800101   0.0776    1
3800102   0.0388    3
3800201   0.0388    2
3800301   0.0       3
3800401   0.0915    1
3800402   0.048     2
3800403   0.0489    3
3800601   0.0       1
3800602   -90.0     2
3800603   0.0       3
3800701   0.0       1
3800702   -0.64     2
3800703   0.0       3
3800801   4.0-5     0.0       3
3800901   0.84      0.84      1
3800902   0.28      0.28      2
3801001   00        3
3801101   0000      2
3801201   0         1.49097+7 1.25750+6 2.46191+6 0.0  0.0  01
3801202   0         1.49121+7 1.25750+6 2.46186+6 0.0  0.0  02
```

```
3801203   0          1.49144+7 1.25750+6 2.46181+6 0.0  0.0  03
3801300   0
3801301   0.0        0.0       0.0       01
3801302   0.0        0.0       0.0       02
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   MINOR EDIT VARIABLES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEADY STATE AND TRANSIENT PLOT REQUESTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000301   P          250010000
0000302   P          530010000
0000303   TEMPF      250010000
0000304   TEMPF      185010000
0000305   TEMPF      515010000
0000306   MFLOWJ     540000000
0000309   CNTRLVAR   1
0000310   CNTRLVAR   2
0000311   MFLOWJ     566000000
0000313   MFLOWJ     100010000
0000314   P          420010000
0000315   VOIDG      500010000
0000316   VELFJ      112010000
0000317   VELGJ      112010000
0000318   TEMPF      215010000
0000319   MFLOWJ     365000000
0000320   RHO        100010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TEMPERATURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000321   SATTEMP    345010000          * TE-BL-1A,1B,1C
0000322   SATTEMP    310010000          * TE-BL-2A,2B,2C
0000323   SATTEMP    100010000          * TE-PC-2A,2B,2C
0000324   SATTEMP    180010000          * TE-PC-1
0000325   SATTEMP    114010000          * TE-SG-1
0000326   SATTEMP    116010000          * TE-SG-2
0000327   SATTEMP    510030000          * TE-SG-3
0000328   SATTEMP    415040000          * TE-139-19
0000329   SATTEMP    415030000          * TE-139-20
0000330   SATTEMP    205010000          * TE-1ST-1 / TE-2ST-1
0000331   SATTEMP    210010000          * TE-1ST-2 / TE-2ST-2
0000332   SATTEMP    210050000          * TE-1ST-6 / TE-2ST-6
0000333   SATTEMP    210060000          * TE-1ST-7 / TE-2ST-7
0000334   SATTEMP    215010000          * TE-1ST-10 / TE-2ST-10
0000335   SATTEMP    220010000          * TE-1ST-13 / TE-2ST-13
0000336   SATTEMP    250010000          * TE-1UP-6
0000337   SATTEMP    251010000          * TE-2UP-4
0000338   SATTEMP    255010000          * TE-1UP-3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DENSITIES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000341   RHO        345010000          * DE-BL-1
0000342   RHO        310010000          * DE-BL-2
0000343   RHO        180010000          * DE-PC-1
0000344   RHO        100010000          * DE-PC-2
0000345   RHO        118020000          * DE-PC-3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VELOCITIES
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000351   VELF      345010000          * FE-BL-1
0000352   VELF      310010000          * FE-BL-2
0000353   VELF      180010000          * FE-PC-1
0000354   VELF      100010000          * FE-PC-2
0000355   VELG      345010000          * FE-BL-1
0000356   VELG      310010000          * FE-BL-2
0000357   VELG      180010000          * FE-PC-1
0000358   VELG      100010000          * FE-PC-2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* MASS FLOW RATES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000361   MFLOWJ    345020000          * BREAK PLANE BLCL
0000362   MFLOWJ    315110000          * BREAK PLANE BLHL
0000363   MFLOWJ    345020000          * DTT-RAKE BLCL
0000364   MFLOWJ    310020000          * DTT-RAKE BLHL
0000365   MFLOWJ    180010000          * DTT-RAKE ILCL
0000366   MFLOWJ    100020000          * DTT-RAKE ILHL
0000367   MFLOWJ    400010000          * PRES. SURGE LINE FLOW
0000369   MFLOWJ    541010000          * FE-P4-12
0000370   MFLOWJ    566000000          * FE-P4-72-1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CLADDING TEMPERATURES CONTROL MODULE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000381   HTTEMP    230000110          *
0000382   HTTEMP    230000210          *
0000383   HTTEMP    230000310          *
0000384   HTTEMP    230000410          *
0000385   HTTEMP    230000510          *
0000386   HTTEMP    230000610          *
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LIQUID FRACTIONS IN THE PRESSURIZER                            *
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000391   VOIDF     415010000
0000392   VOIDF     415020000
0000393   VOIDF     415030000
0000394   VOIDF     415040000
0000395   VOIDF     415050000
0000396   VOIDF     415060000
0000397   VOIDF     420010000
0000398   VOIDF     420020000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECCS HEADER TO PCS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6050000   "ECCS HEADR"       SNGLVOL
6050101   5.9896-3  5.0148   0.0       0.0       90.0      3.3071202
6050102   4.0-5     0.0      00
6050200   0         13595900. 172410.   2489140.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6150000   "ACC PIPE  "       SNGLVOL
6150101   0.0       25.997165 0.4074774 0.0       0.0       0.0
6150102   4.0-5     0.0      00
6150200   0         13580200. 112409.   2489450.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPING BETWEEN BREAK AND VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13502000  1         5        2         1         0.0865
```

```
13502100  0         1
13502101  4         0.1095
13502201  4         4
13502301  0.0       4
13502401  551.0     5
13502501  350010000 0         1         1         0.823     1
13502601  -939      0         3949      1         0.823     1
13502701  0         0         0         0         1
13502801  0         0         0         0.823     1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 069 BROKEN LOOP COLD LEG MASS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20506900  BLCLMASS  SUM       1.0       0.0       1
20506901  0.0       4.79790-2 RHO       335010000
20506902            4.43927-2 RHO       340010000
20506903            6.73163-2 RHO       345010000
20506904            4.32075-2 RHO       350010000
20506905            2.79000-2 RHO       370010000
20506906            7.00000-2 RHO       370020000
20506907            1.16500-1 RHO       370030000
*
*  REACTOR VESSEL LIQUID LEVEL CONTROL VARIABLE
*
20501000    RVLVL   SUM   0.2794034   0.0  1
20501001    0.0   1.0   VOIDF  230010000
20501002          1.0   VOIDF  230020000
20501003          1.0   VOIDF  230030000
20501004          1.0   VOIDF  230040000
20501005          1.0   VOIDF  230050000
20501006          1.0   VOIDF  230060000
*---
*  REPLACE HPIS 89.2.13
*---
6400000   "HPIS"       TMDPJUN
6400101   635000000  185000000  5.9896-3
6400200   1          683        P        185010000
6400201  -1.0        0.0        0.0      0.0
6400202   0.0        0.700      0.0      0.0
6400203   3.5+6      0.575      0.0      0.0
6400204   6.6+6      0.460      0.0      0.0
6400205  17.0+6      0.100      0.0      0.0
*---
*  IMPROVE ACCUMULATOR (E J LEE 89.2.28)
*---
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE TRIPS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000579   MFLOWJ    610000000 GE        NULL      0    0.0     N
0000580   CNTRLVAR  4         LT        NULL      0    1.520   L
*  MODIFIED THE LIMIT OF ACCUM EMPTY CASE INTO 1.52 FROM 0.939 (P160 EDR, 89.5.15) EJL
0000682   579       AND       -580      N
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR LEVEL CONTROL VARIABLE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20500400  ACCMLVL   INTEGRAL  -6.549E-3 1.85      0
20500401  VELFJ     620010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CHECK VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
```

```
6000000   "ECC CHKVLV"        VALVE
6000101   605010000 185000000 0.0       1.3869    1.3869    0100
6000201   0         0.0       0.0       0.0
6000300   TRPVLV
6000301   681
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECCS HEADER TO PCS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6050000   "ECCS HEADR"        SNGLVOL
6050101   5.989E-3  4.8247    0.0       0.0       90.0      2.2061
6050102   1.0165-5  0.0       10
6050200   0         4.31E+6    125472.   2600290.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6100000   "ACCUM VLV "        VALVE
6100101   615010000 605000000 0.0       8.1009    8.1009    0000
6100201   0         0.0       0.0       0.0
6100300   TRPVLV
6100301   682
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6150000   "ACC PIPE  "        SNGLVOL
6150101   0.01608   24.5486   0.0       0.0       0.0       0.0
6150102   1.0165-5  0.0       10
6150200   3         4.31E+6   306.6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*  DO'NT ADD ACCUM COMPONENT WITH REFLOOD OPTION IN RESTART CASE
*  MOVE TO S/S COMPONENT BY B. D. CHUNG
*
*
6200000   "ACCUMULATR"        ACCUM
6200101   1.254     1.8261563 0.0       0.0       -90.0     -1.8261563
6200102   2.286-5   0.0       10
6200200   4.31E+6   306.6
6201101   615000000 8.213E-3  6.7582    8.3202    0
6202200   1.10      0.0       4.0251    0.67056   0.04445   0 0 0 0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*
*00   PLOT REQUEST VARIALES  *
*
20300100   P          250010000    * UPPLENUM PRESSURE(PE-1UP-1A1)
20300200   P          530010000    * STEAMDOME PRESSURE(PE-SGS-1)
20301600   VELFJ      112010000    * IL HL LIQUID VEL
20301700   VELGJ      112010000    * IL HL VAPOR VEL
20301800   RHO   100010000     * IL HL DENSITY(DE-PC-2)
20301900   RHO   345010000     * BL CL DENSITY(DE-BL-1)
20302000   MFLOWJ   365000000    *BREAK FLOW(FR-BL-111)
20302100   MFLOWJ   640000000    *HPIS FLOW
20302200   HTTEMP   230000310    *HOTTEST CLAD TEMP(TE-5E8-34.5)
20302300   CPUTIME    0         *CPU TIME
*20302400    ACVLIQ     62000000   *ACCUMU VOL
20302500    MFLOWJ   545000000   * STEAM MASS OUT
20302600    MFLOWJ   540000000   * STAEM MASS OUT
```

```
20302700    MFLOWJ   569000000   * STEAM MASS IN
20302800    MFLOWJ   566000000   * STAEM MASS IN (AUX)
20302900   VOIDF   515010000   * SG2
20303000   VOIDF   515020000   *
20303100   VOIDF   515030000
20303200   VOIDF   515040000
20303300   VOIDF   515050000
20303400   VOIDG   250010000   * UPPER PLENUM
20303500   VOIDF   250010000
20303600   VOIDF   245010000
20303700   VOIDF   240010000
20303800   VOIDF   230060000
20303900   VOIDF   230050000
20304000   VOIDF   230040000
20304100   VOIDF   230030000
20304200   VOIDF   230020000
20304300   VOIDF   230010000
20304400   VOIDF   225010000
20304500   VOIDF   215010000
20304600   MFLOWJ  610000000
20304700   MFLOWJ  630000000   *LPIS
*20304800   RHO   350010000    *DENSITY BEFORE BREAK
*20304900   VOIDG 350010000
*20305000   TEMPF   35001000
20305100  CNTRLVAR   1
20305200  CNTRLVAR   2
20305300  CNTRLVAR   4
20305400  CNTRLVAR   10
20305500  CNTRLVAR   69
20305600   DT  0
20305700   MFLOWJ  100010000
*
.  * END OF INPUT DATA
```

Appendix B Data Comparison Plots

Data Comparison Plots

Case A:

Figure B.I.1 Break mass flow rate (Case A.0 [Base] vs. Experiment L3-7)
Figure B.I.2 HPIS volume flow rate (Case A.0 [Base] vs. Experiment L3-7)
Figure B.I.3 Upper plenum pressure (Case A.0 [Base] vs. Experiment L3-7)
Figure B.I.4 Liquid velocity of ILHL (Case A.0 [Base] vs. Experiment L3-7)
Figure B.I.5 Density of ILHL (Case A.0 [Base] vs. Experiment L3-7)
Figure B.I.6 Density of BLCL (Case A.0 [Base] vs. Experiment L3-7)
Figure B.I.7 Steam doem pressure (Case A.0 [Base] vs. Experiment L3-7)
Figure B.I.8 Peak cladding temperature (Case A.0 [Base] vs. Experiment L3-7)
Figure B.I.9 Accumulator level (Case A.0 [Base] vs. Experiment L3-7)

Case B:

Figure B.II.1 The effect of break discharge coefficient on break flow
Figure B.II.2 The effect of break discharge coefficient on HPIS flow
Figure B.II.3 The effect of break discharge coefficient on upper plenum pressure
Figure B.II.4 The effect of break discharge coefficient on ILHL liquid velocity
Figure B.II.5 The effect of break discharge coefficient on ILHL density
Figure B.II.6 The effect of break discharge coefficient on BLCL density
Figure B.II.7 The effect of break discharge coefficient on steam dome pressure
Figure B.II.8 The effect of break discharge coefficient on peak cladding temperature
Figure B.II.9 The effect of break discharge coefficient on accumulator level

Case C:

Figure B.III.1 The changes of pump two-phase multipliers
Figure B.III.2 The effect of pump 2-phase factor on break flow
Figure B.III.3 The effect of pump 2-phase factor on HPIS flow
Figure B.III.4 The effect of pump 2-phase factor on upper plenum pressure
Figure B.III.5 The effect of pump 2-phase factor on ILHL liquid velocity
Figure B.III.6 The effect of pump 2-phase factor on ILHL density
Figure B.III.7 The effect of pump 2-phase factor on BLCL density
Figure B.III.8 The effect of pump 2-phase factor on steam dome pressure
Figure B.III.9 The effect of pump 2-phase factor on peak cladding temperature
Figure B.III.10 The effect of pump 2-phase factor on accumulator level

Case D:

Figure B.IV.1 The changes of HPIS characteristics
Figure B.IV.2 The effect of HPIS characteristic on break flow
Figure B.IV.3 The effect of HPIS characteristic on HPIS flow
Figure B.IV.4 The effect of HPIS characteristic on upper plenum pressure
Figure B.IV.5 The effect of HPIS characteristic on ILHL liquid velocity
Figure B.IV.6 The effect of HPIS characteristic on ILHL density
Figure B.IV.7 The effect of HPIS characteristic on BLCL density
Figure B.IV.8 The effect of HPIS characteristic on steam dome pressure
Figure B.IV.9 The effect of HPIS characteristic on peak cladding temeprature
Figure B.IV.10 The effect of HPIS characteristic on accumulator level

Case E:

Figure B.V.1 The effect of simpler nodalization on break flow
Figure B.V.2 The effect of simpler nodalization on HPIS flow
Figure B.V.3 The effect of simpler nodalization on upper plenum pressure
Figure B.V.4 The effect of simpler nodalization on ILHL liquid velocity
Figure B.V.5 The effect of simpler nodalization on ILHL density
Figure B.V.6 The effect of simpler nodalization on BLCL density
Figure B.V.7 The effect of simpler nodalization on steam dome pressure
Figure B.V.8 The effect of simpler nodalization on peak cladding temperature
Figure B.V.9 The effect of simpler nodalization on accumulator level
Figure B.V.10 The effect of simpler nodalization on CPU vs. simulated time
Figure B.V.11 The effect of simpler nodalization on DT vs. simulated time

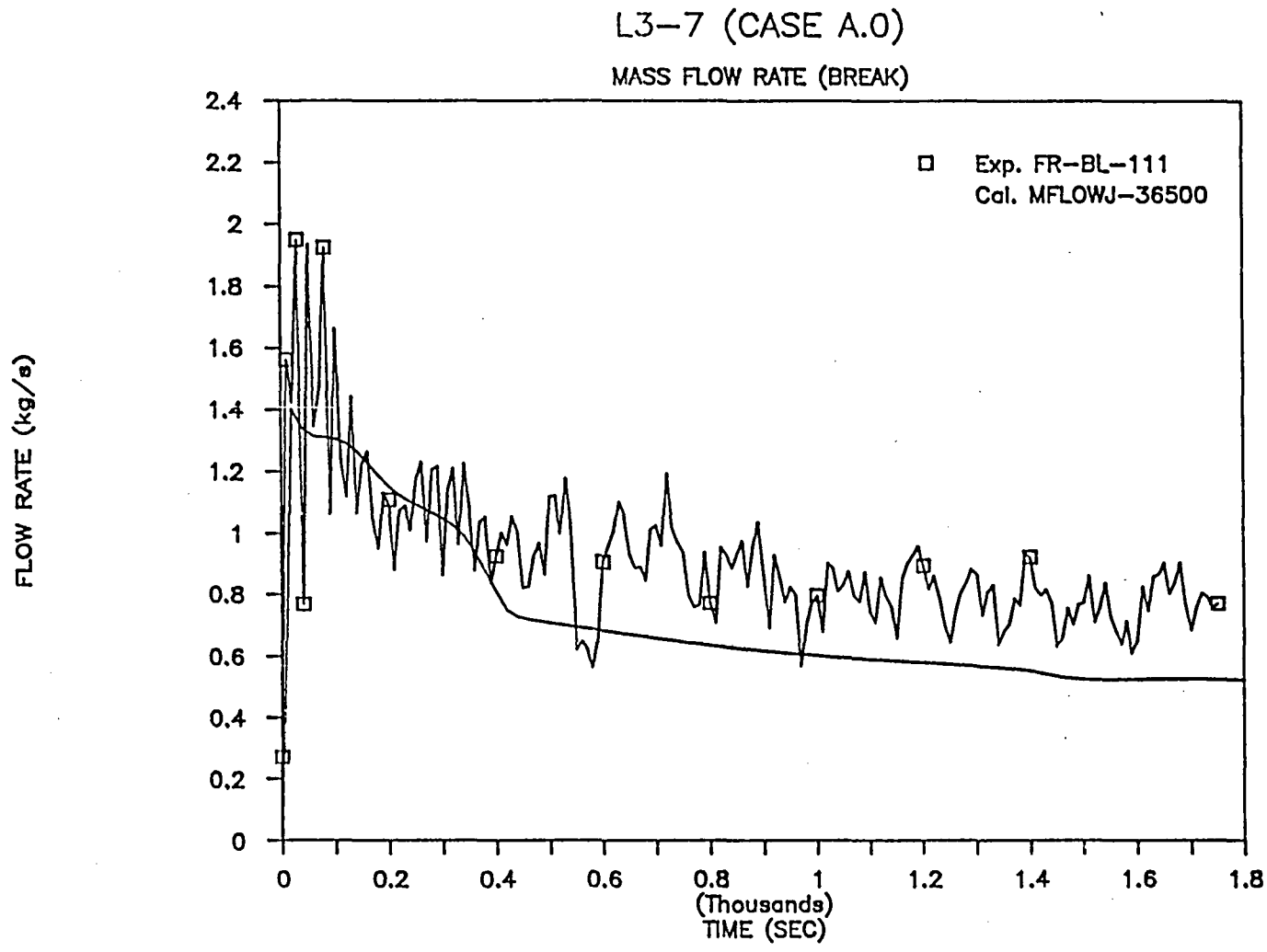

Figure B.I.1 Break mass flow rate (Case A.0 [Base] vs. Experiment L3-7)

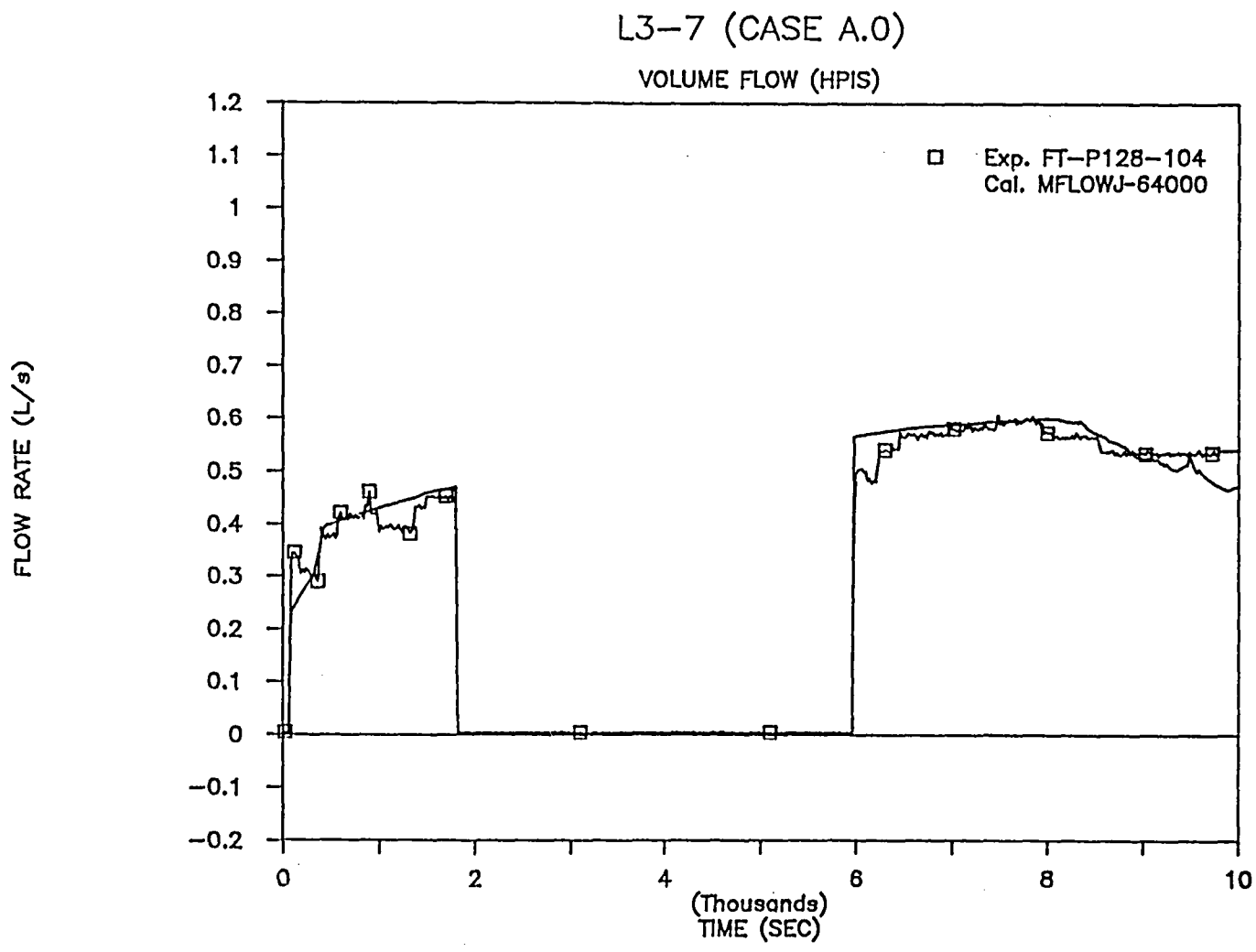

Figure B.I.2 HPIS volume flow rate (Case A.0 [Base] vs. Experiment L3-7)

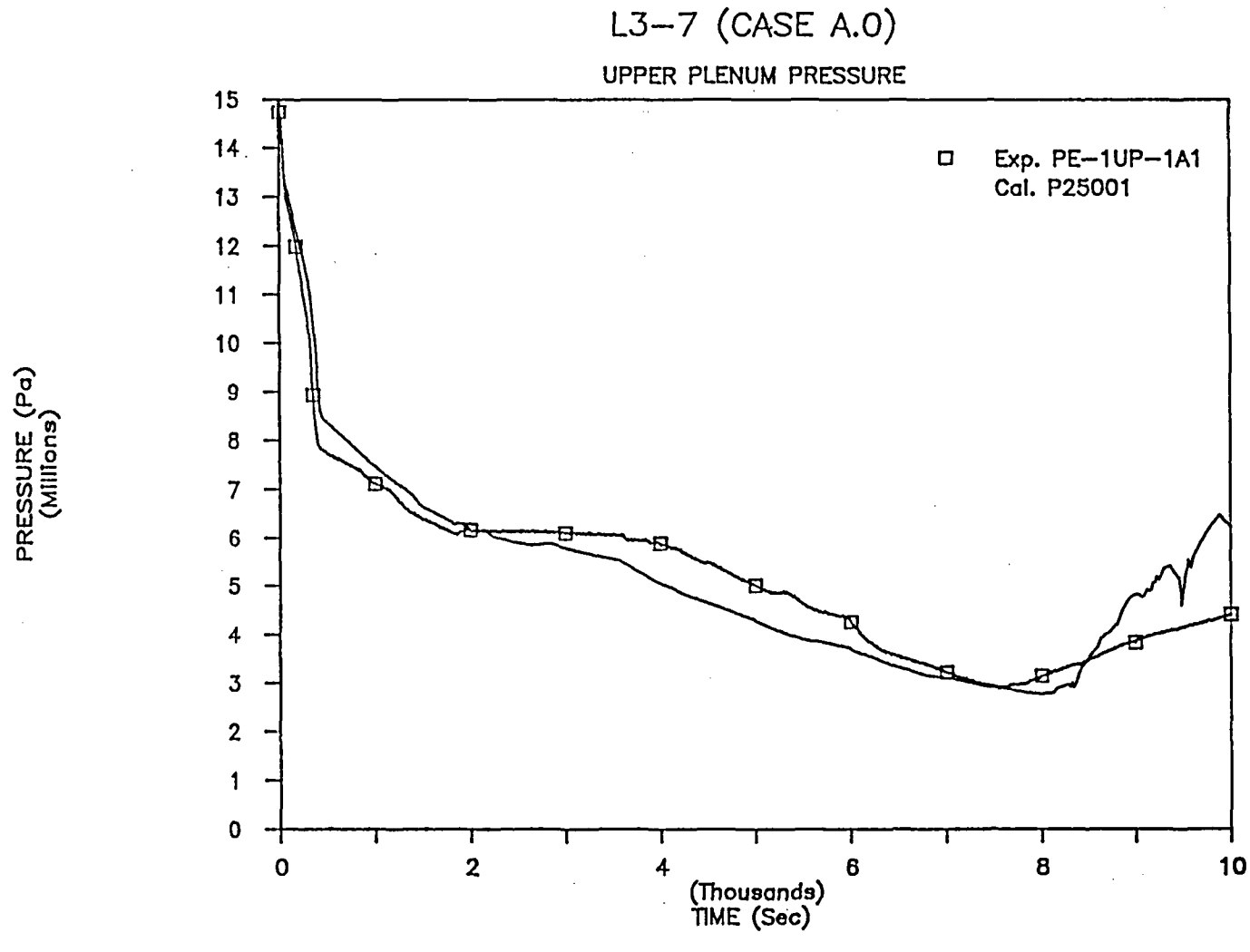

Figure B.I.3 Upper plenum pressure (Case A.0 [Base] vs. Experiment L3-7)

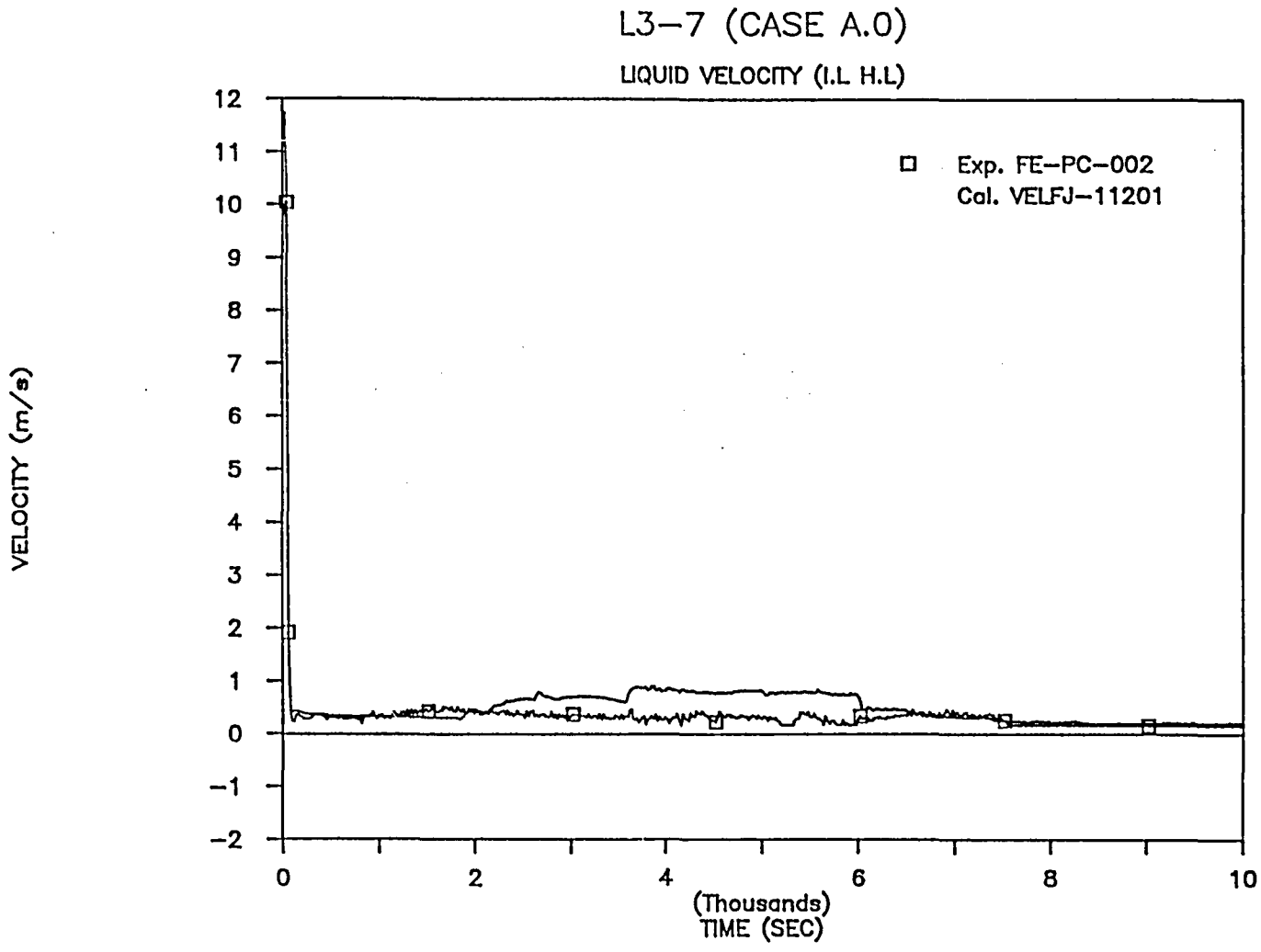

Figure B.I.4 Liquid velocity of ILHL (Case A.0 [Base] vs. Experiment L3-7)

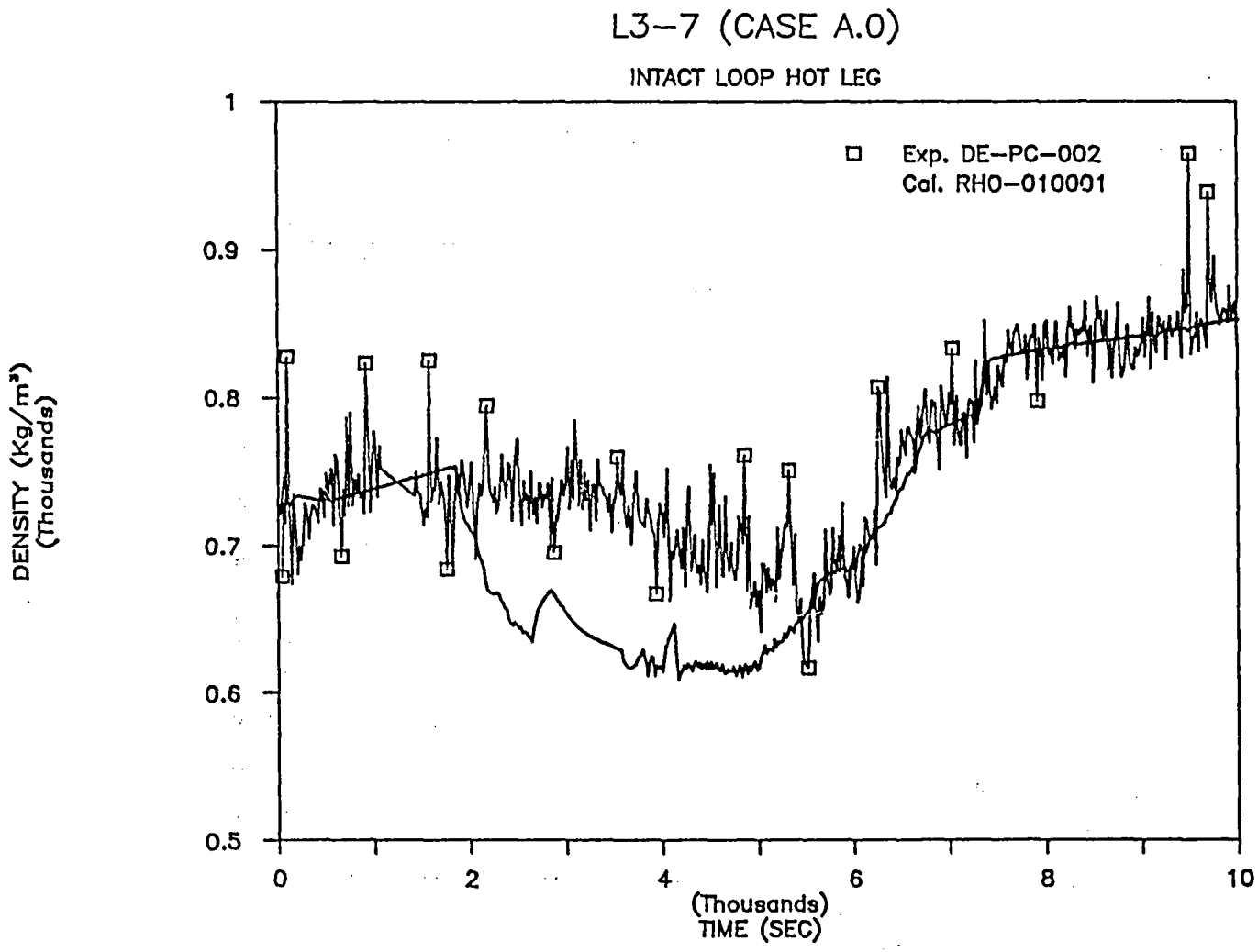

Figure B.I.5 Density of ILHL (Case A.0 [Base] vs. Experiment L3-7)

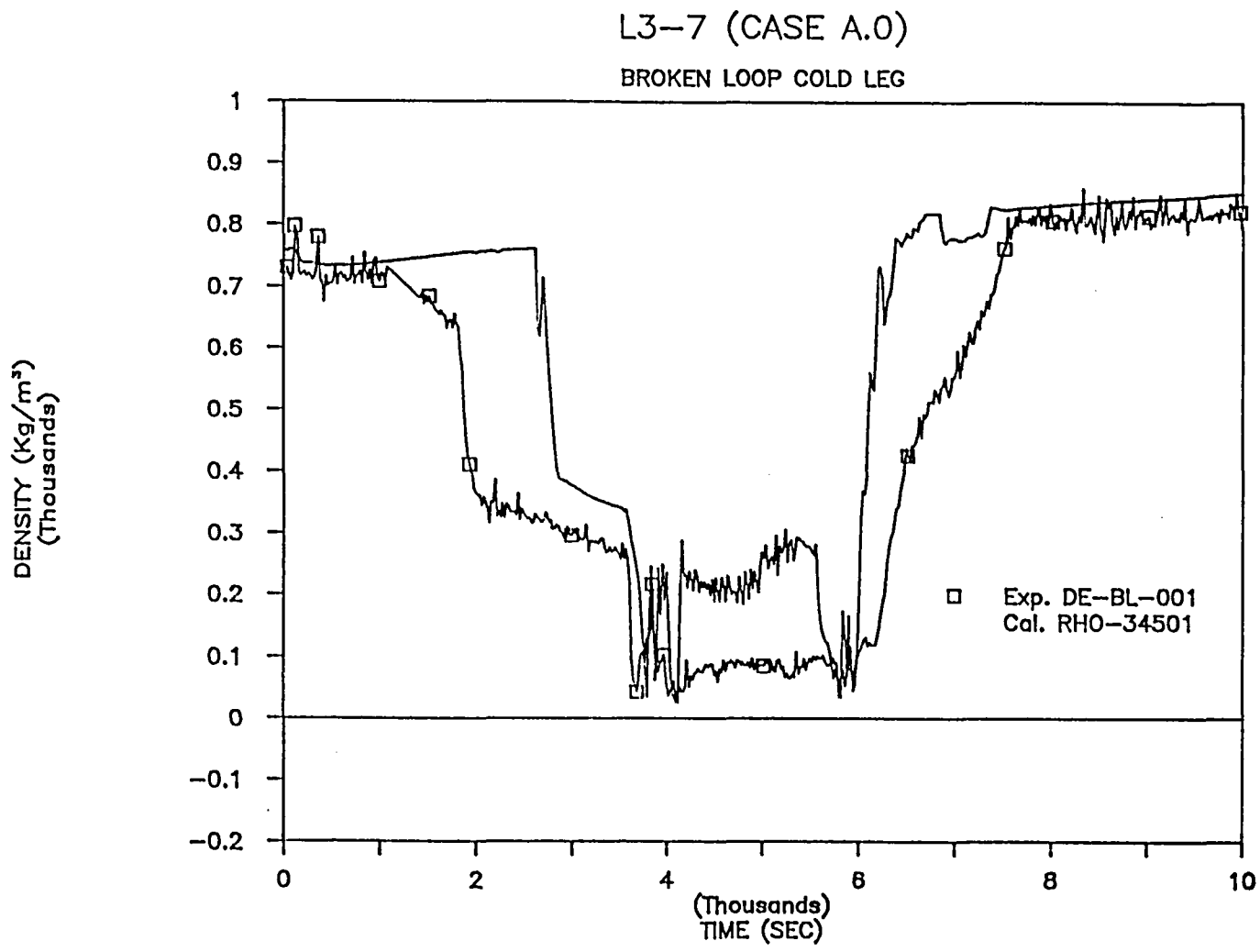

Figure B.I.6 Density of BLCL (Case A.0 [Base] vs. Experiment L3-7)

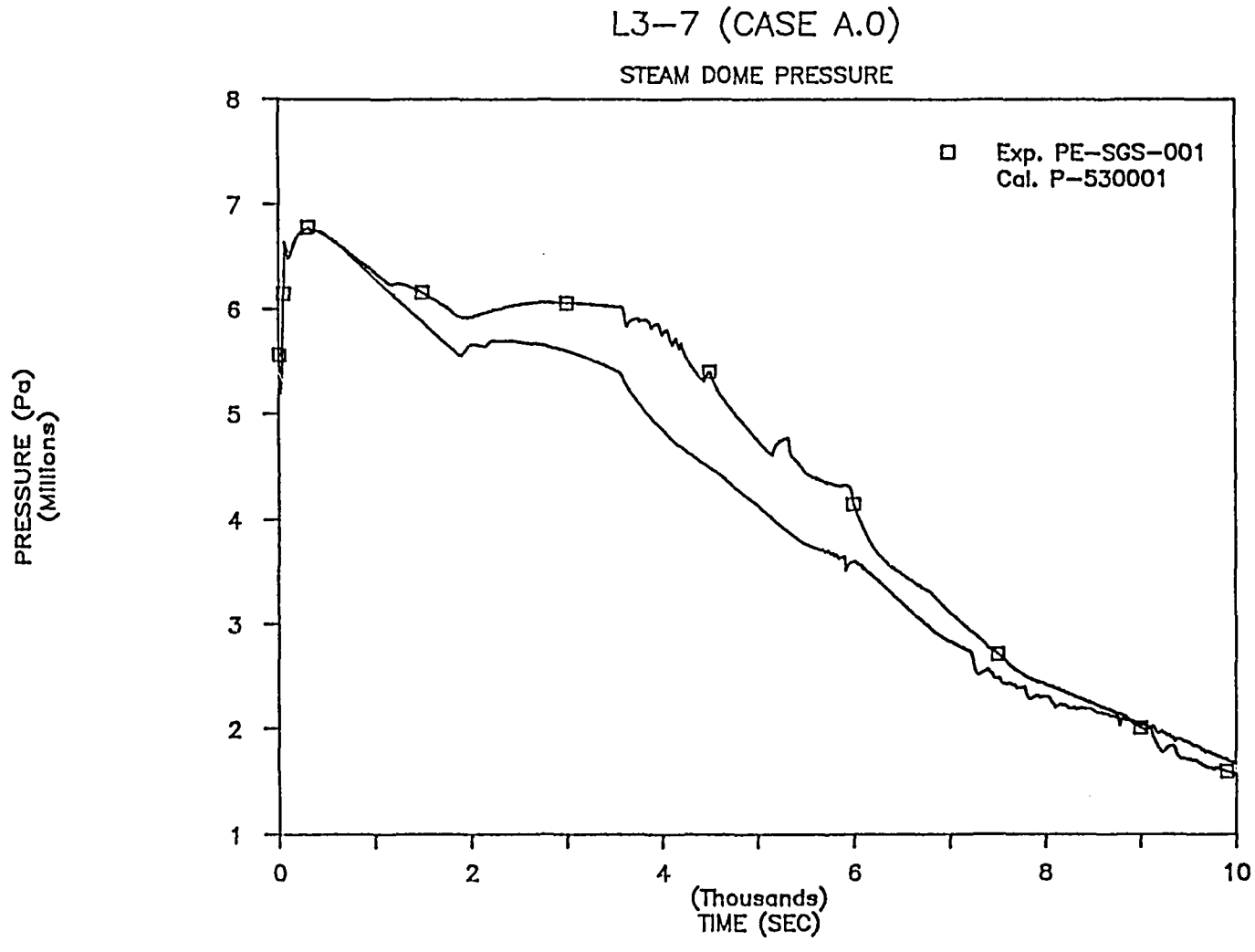

Figure B.I.7 Steam doem pressure (Case A.0 [Base] vs. Experiment L3-7)

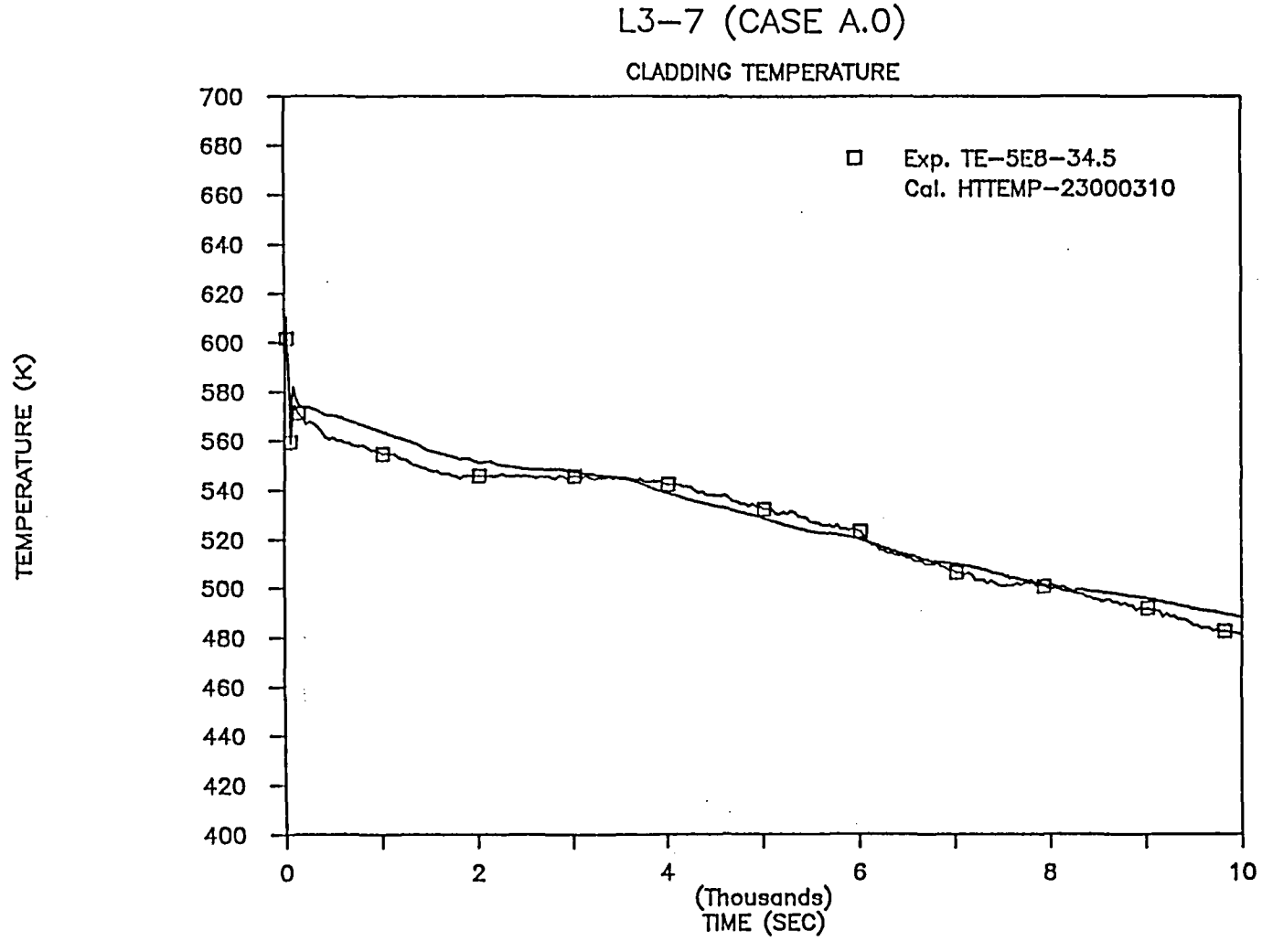

Figure B.I.8 Peak cladding temperature (Case A.0 [Base] vs. Experiment L3-7)

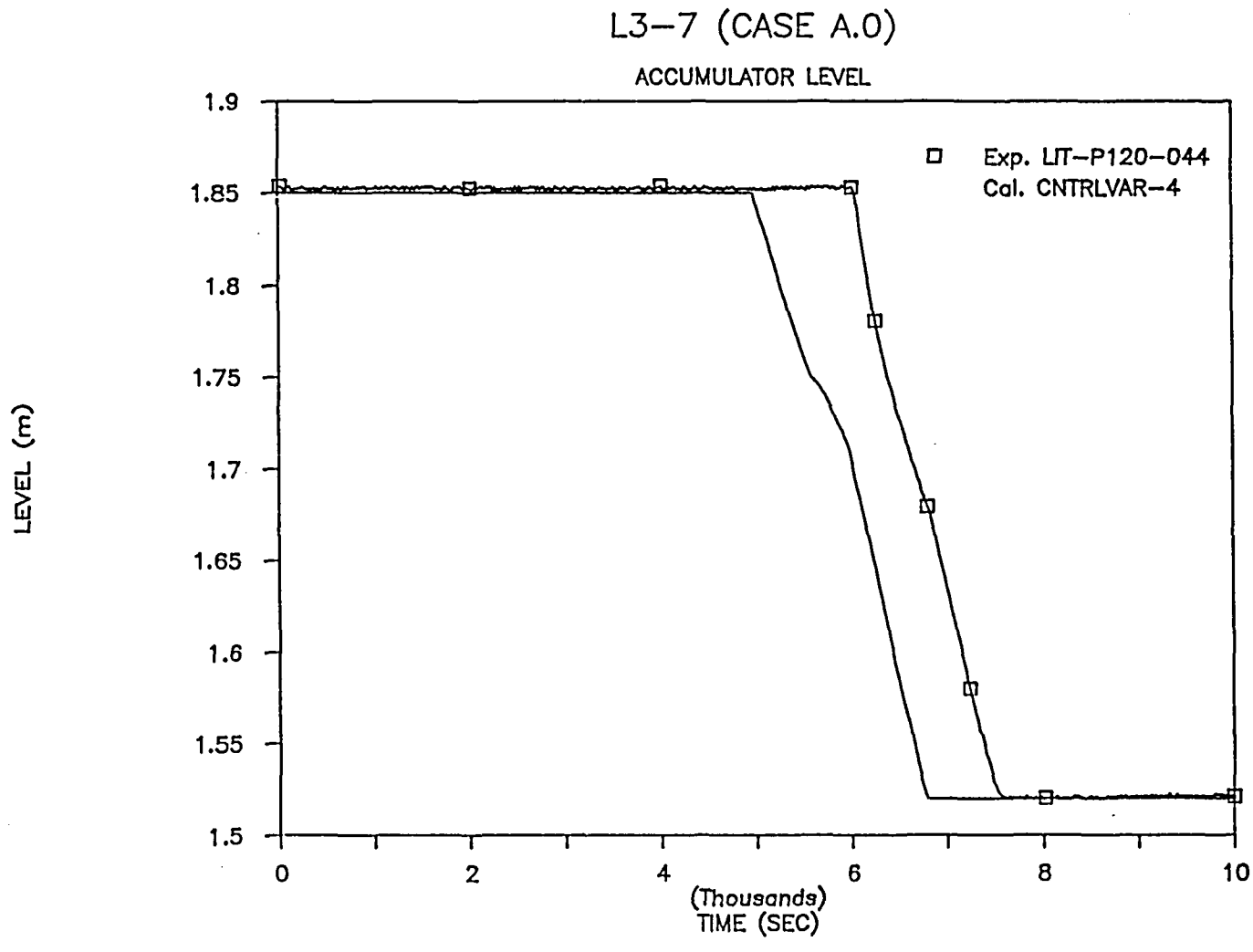

Figure B.I.9 Accumulator level (Case A.0 [Base] vs. Experiment L3-7)

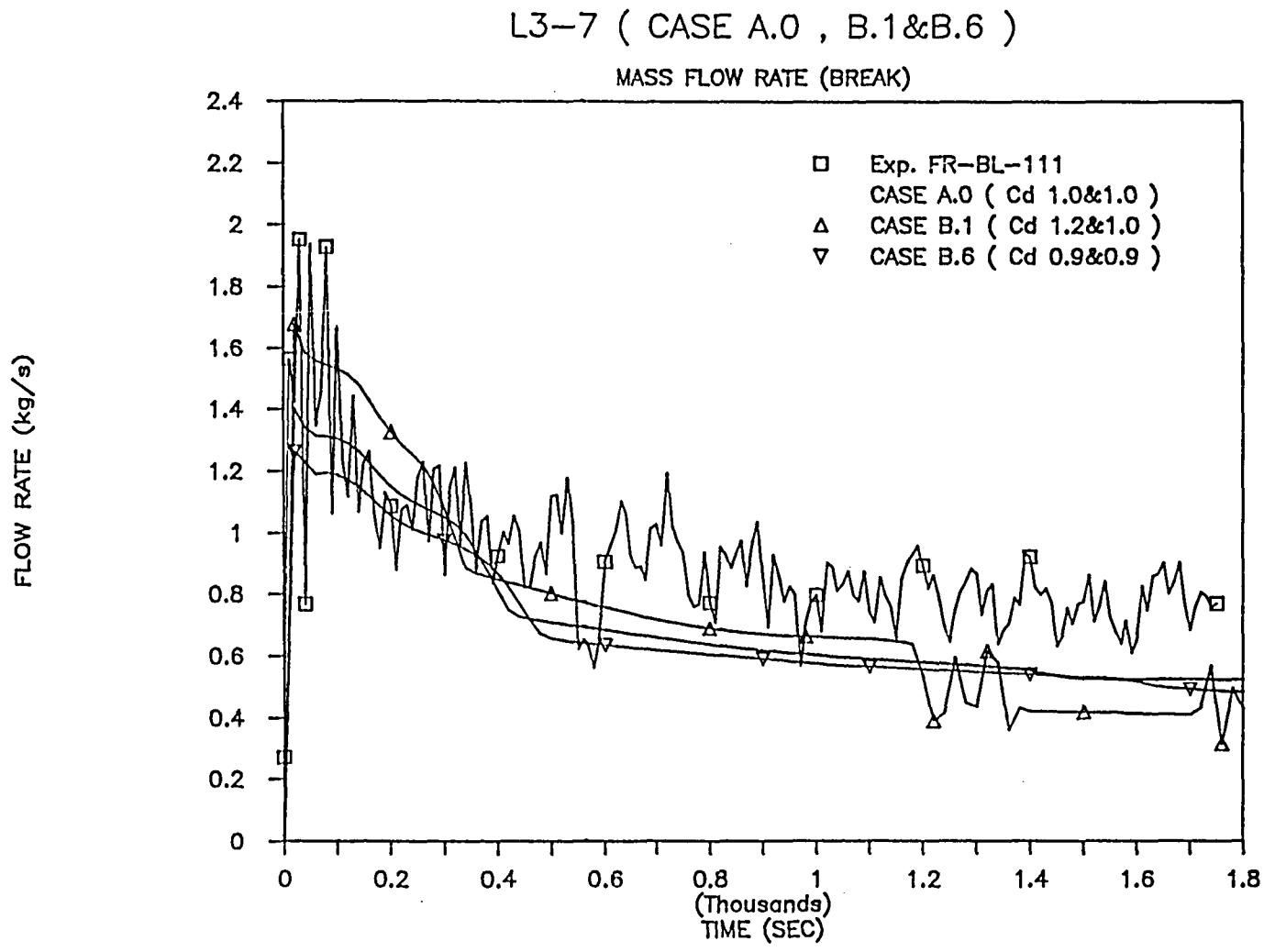

Figure B.II.1 The effect of break discharge coefficient on break flow

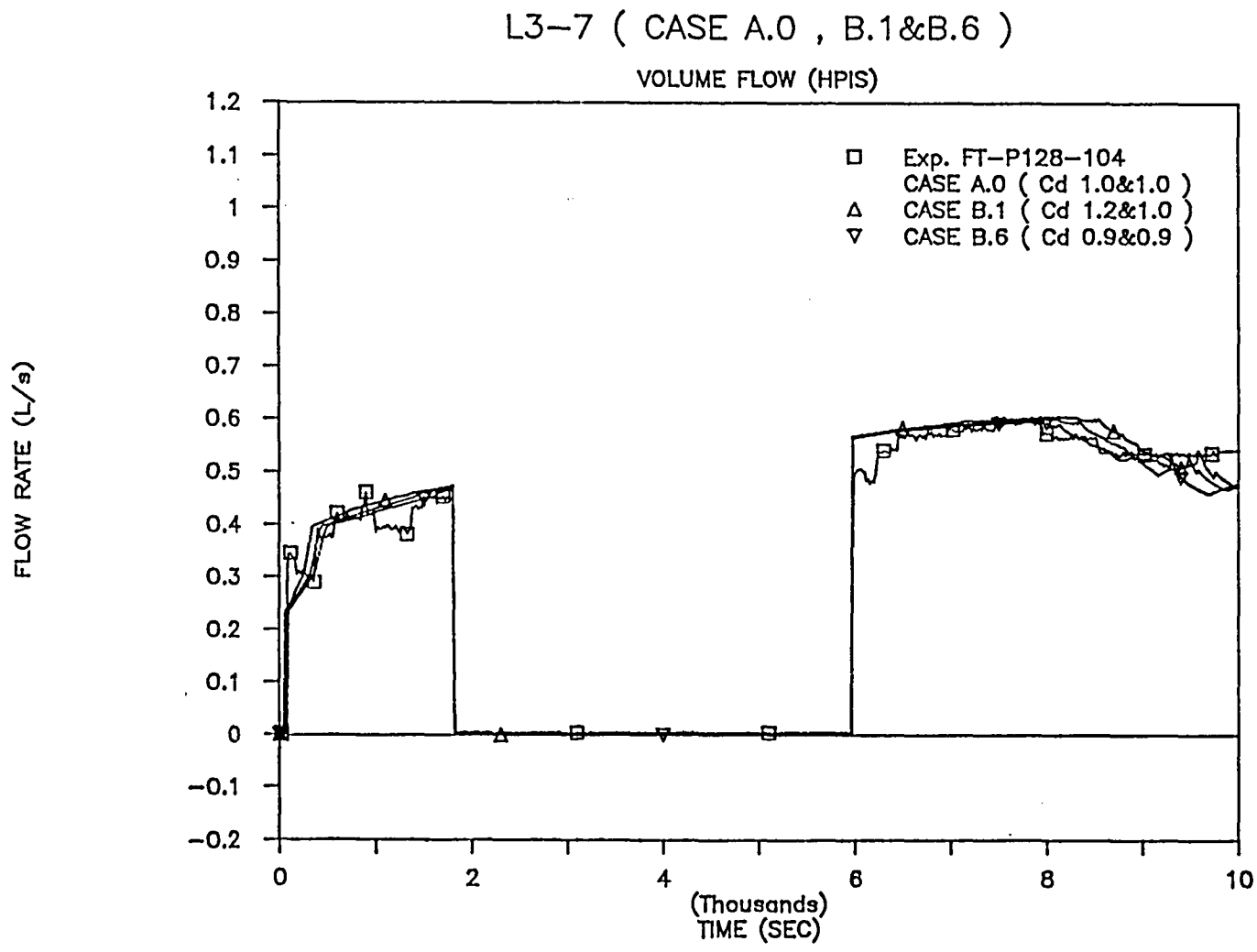

Figure B.II.2 The effect of break discharge coefficient on HPIS flow

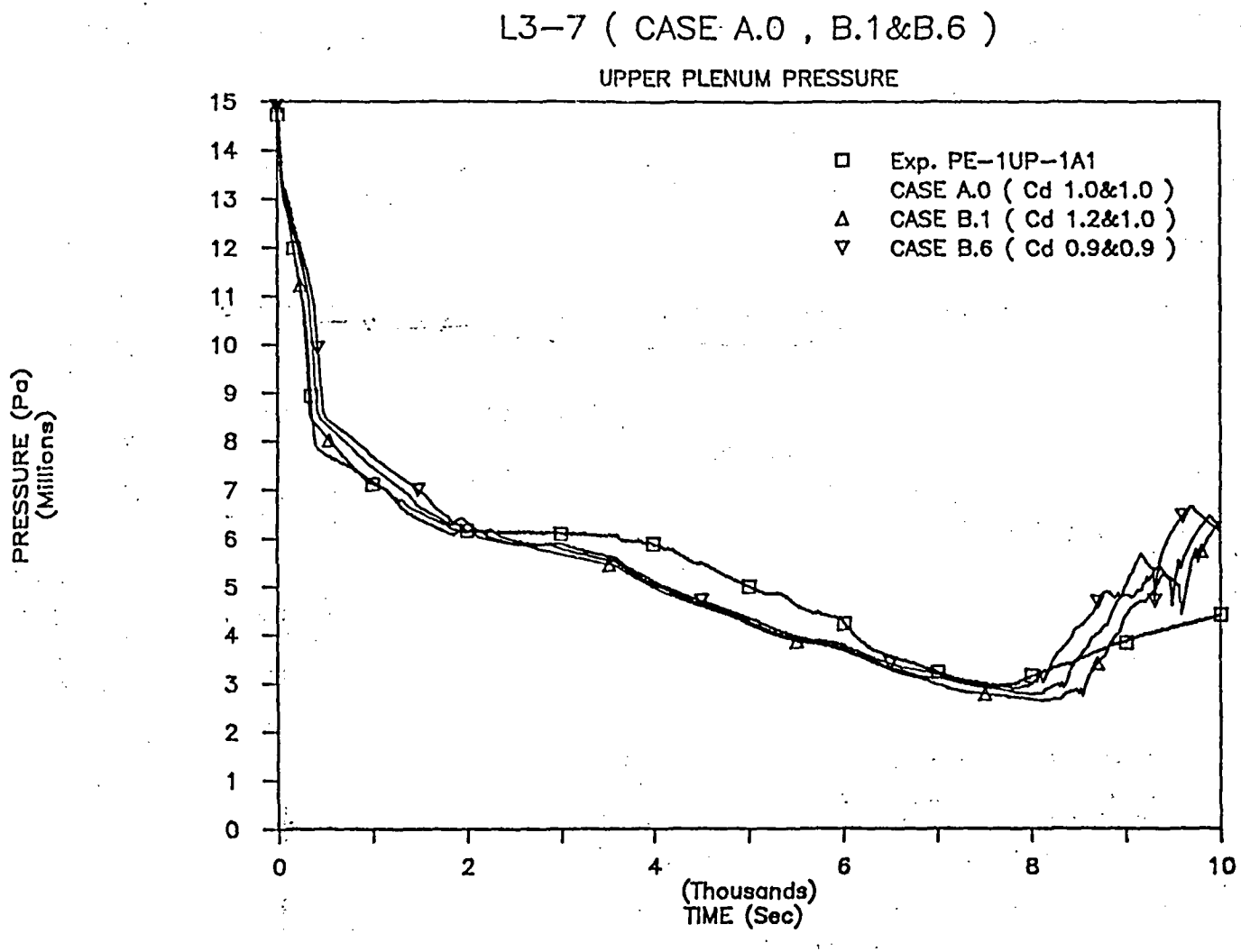

Figure B.II.3 The effect of break discharge coefficient on upper plenum pressure

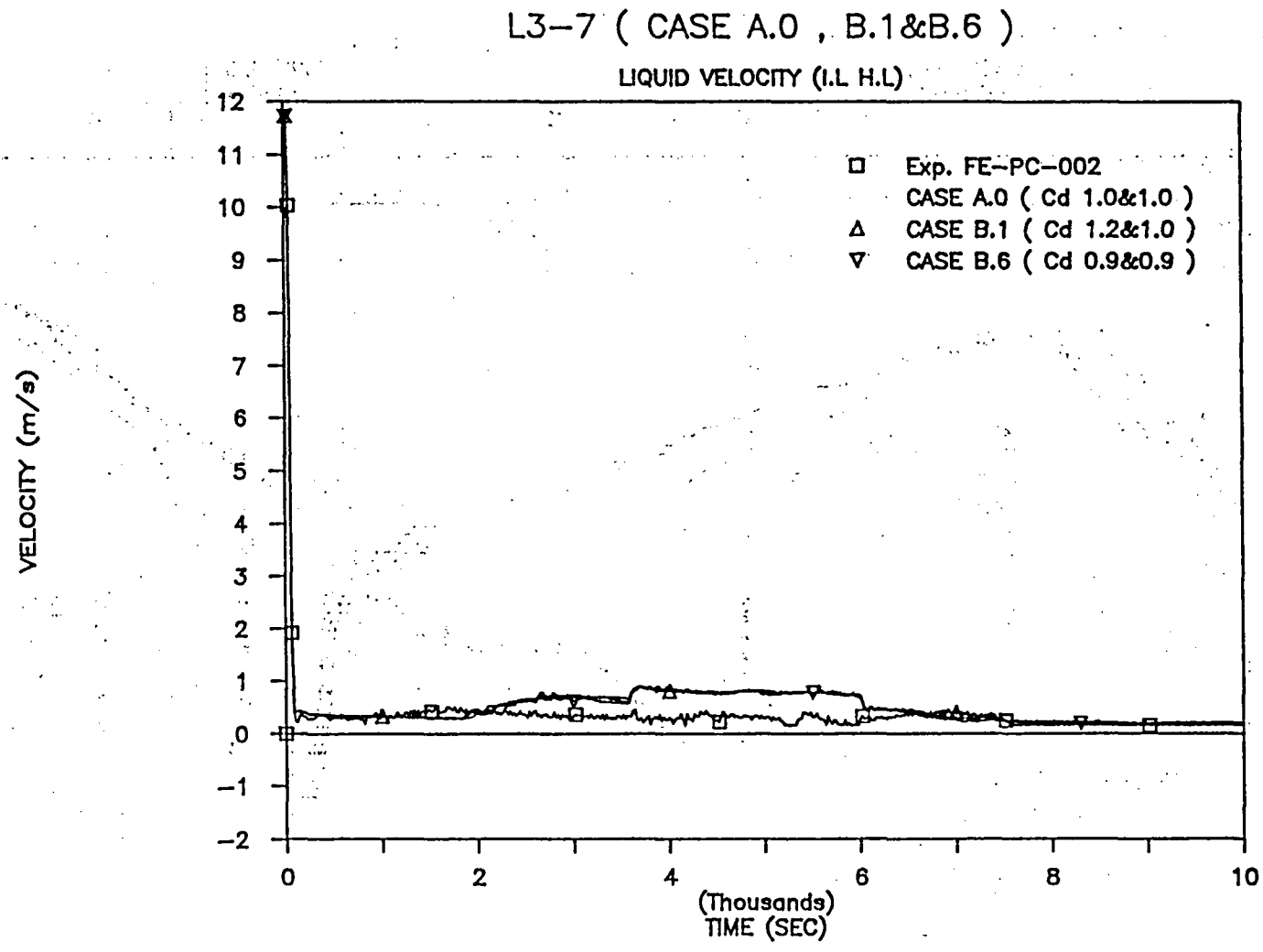

Figure B.II.4 The effect of break discharge coefficient on ILHL liquid velocity

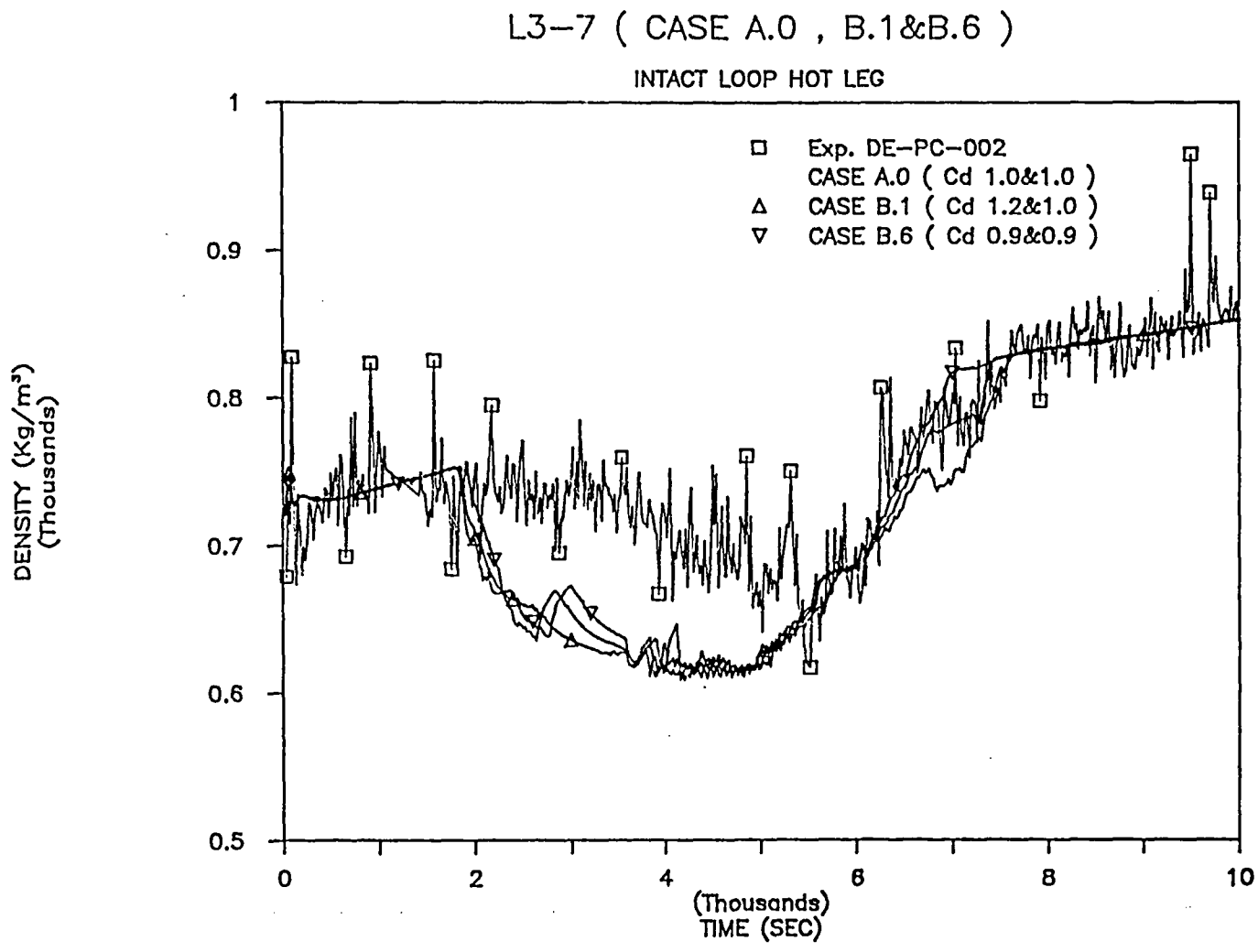

Figure B.II.5 The effect of break discharge coefficient on ILHL density

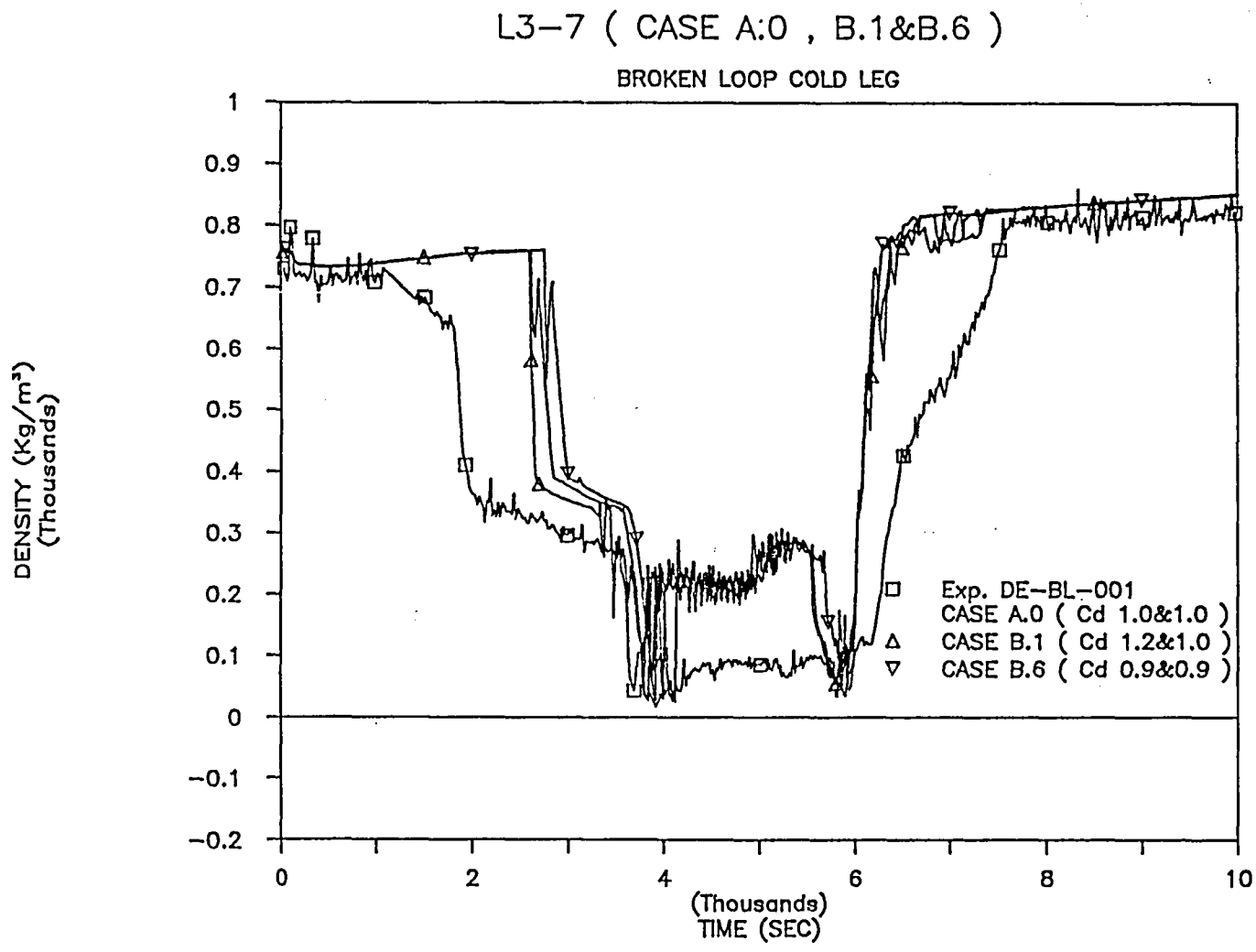

Figure B.II.6 The effect of break discharge coefficient on BLCL density

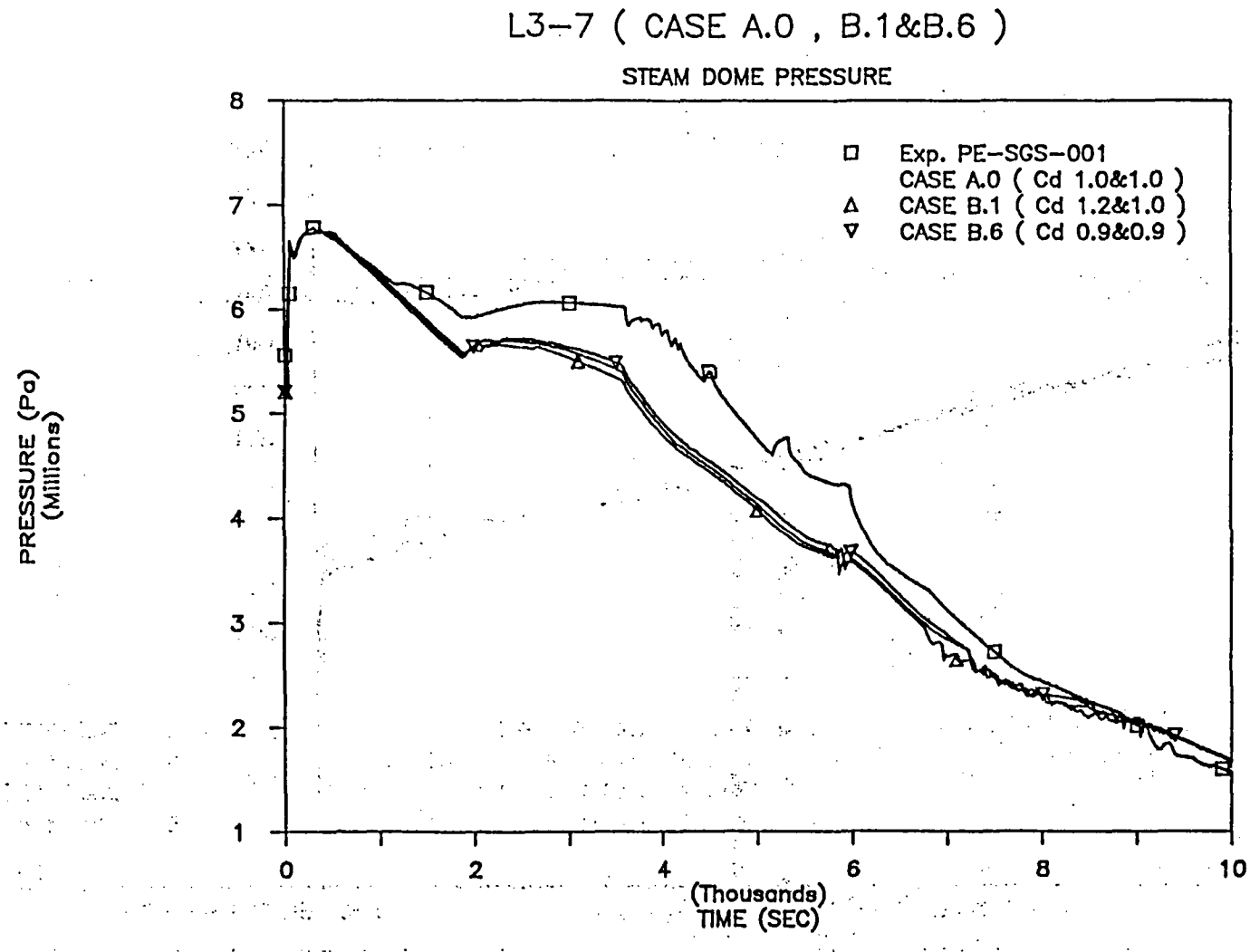

Figure B.II.7 The effect of break discharge coefficient on steam dome pressure

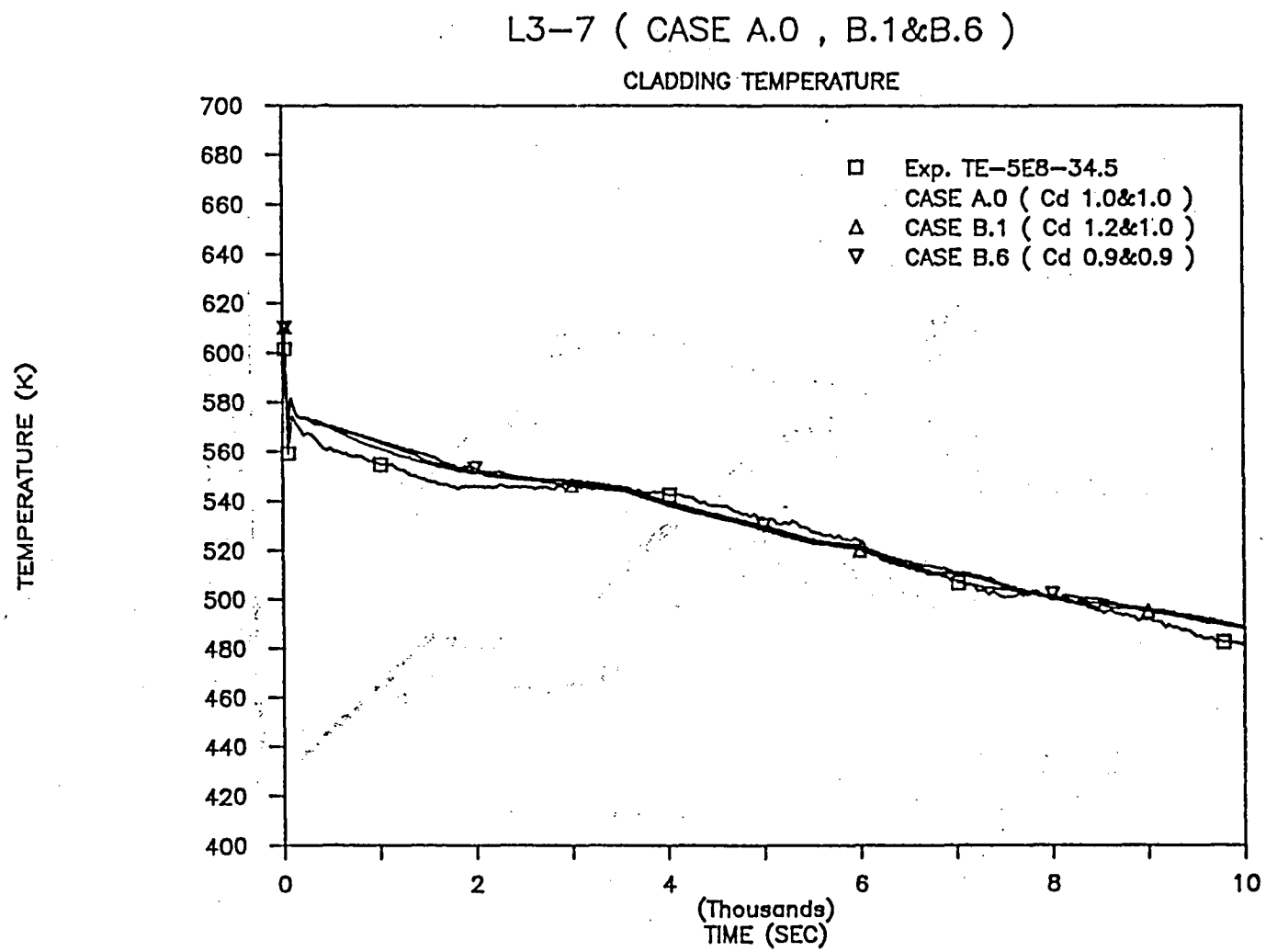

Figure B.II.8 The effect of break discharge coefficient on peak cladding temperature

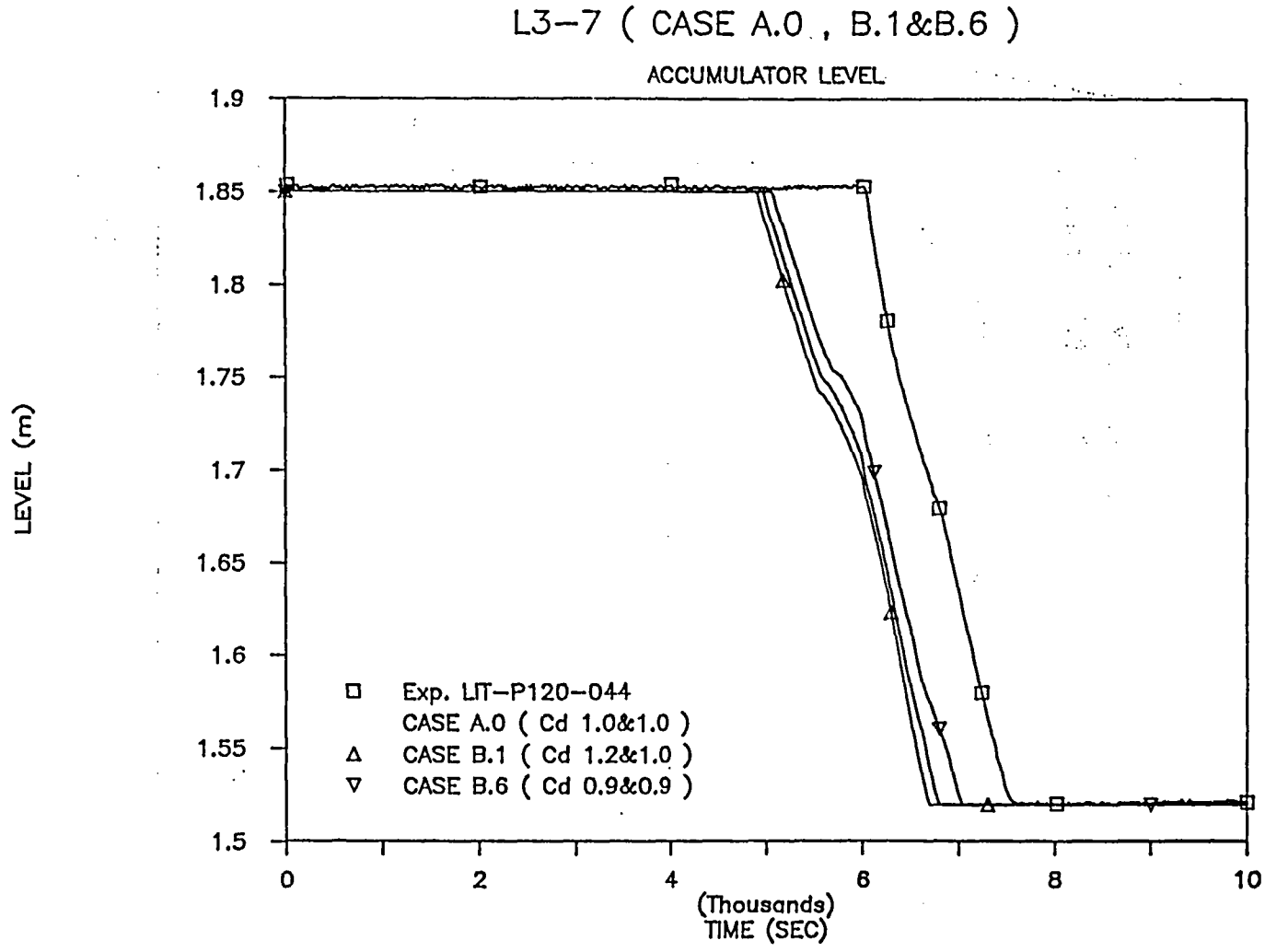

Figure B.II.9 The effect of break discharge coefficient on accumulator level

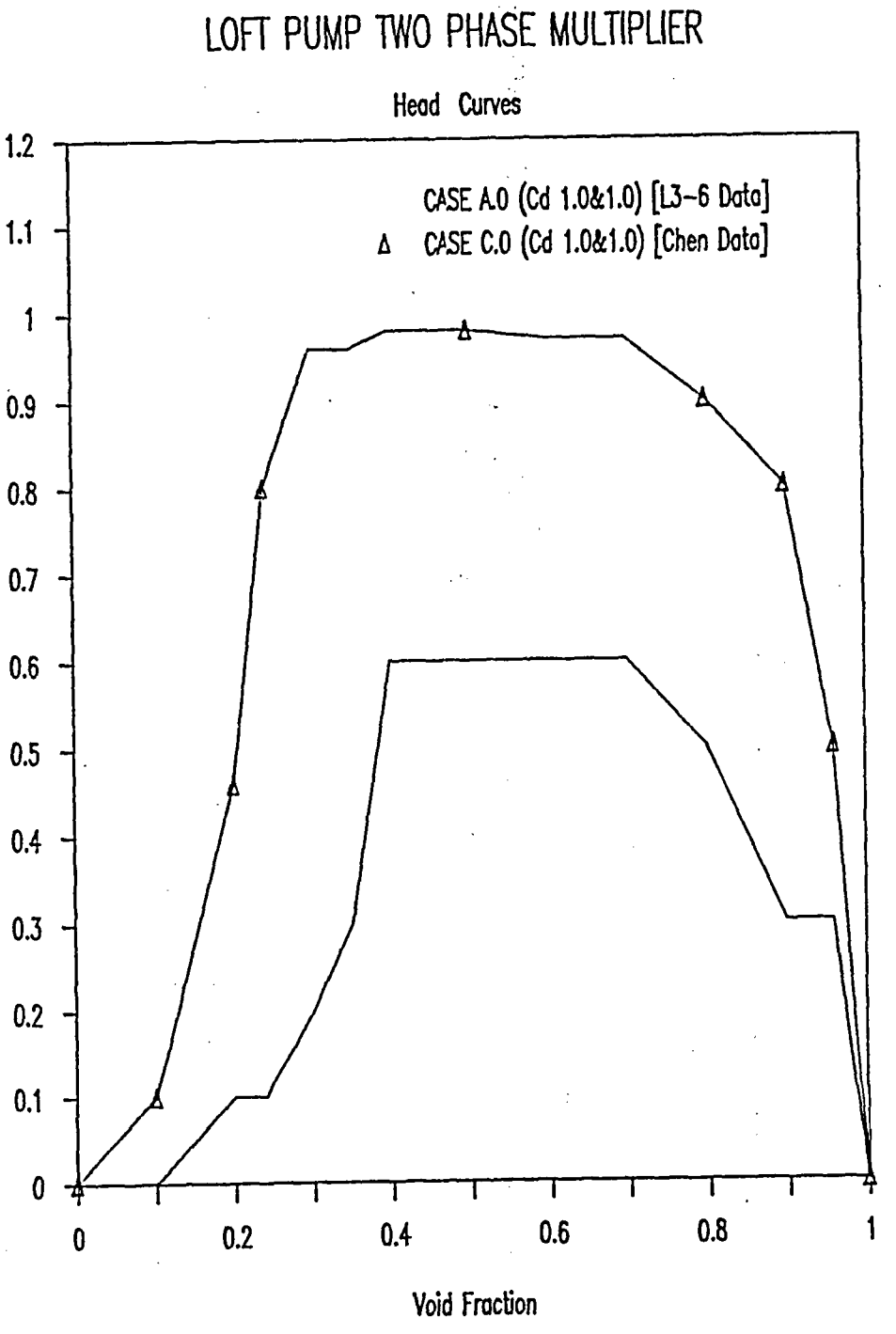

Figure B.III.1 The changes of pump two-phase multipliers

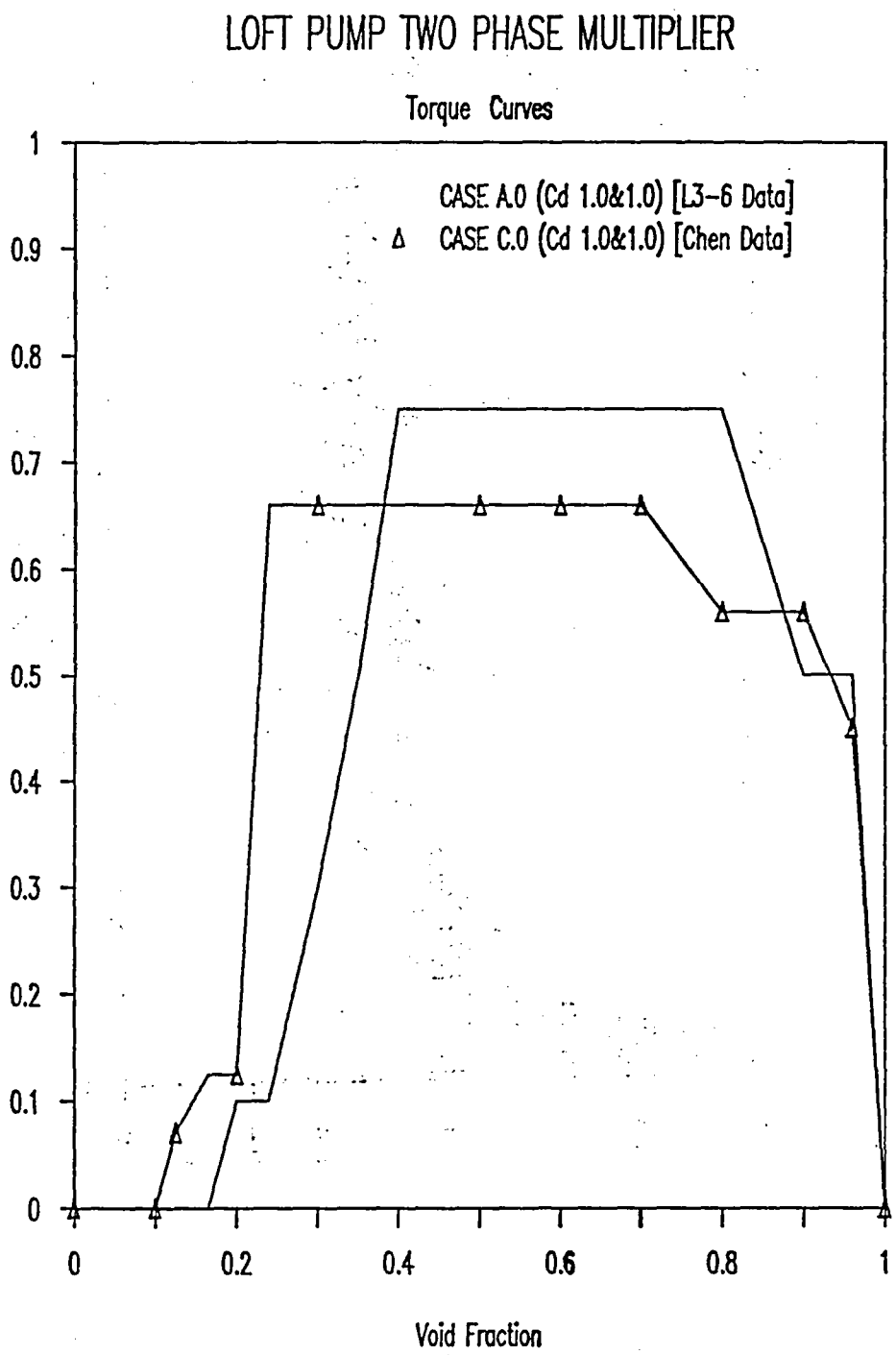

Figure B.III.1 The changes of pump two-phase multipliers

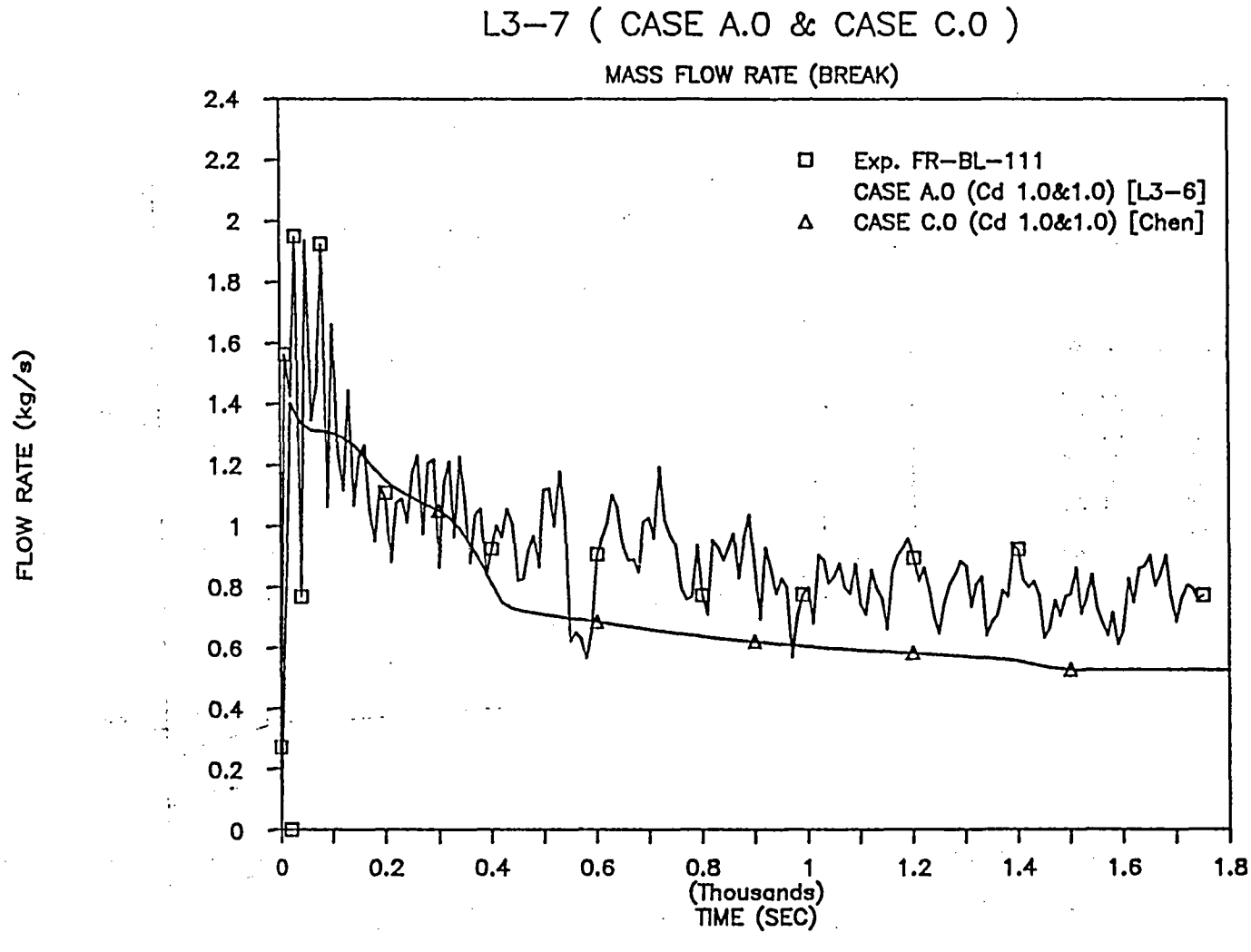

Figure B.III.2 The effect of pump 2-phase factor on break flow

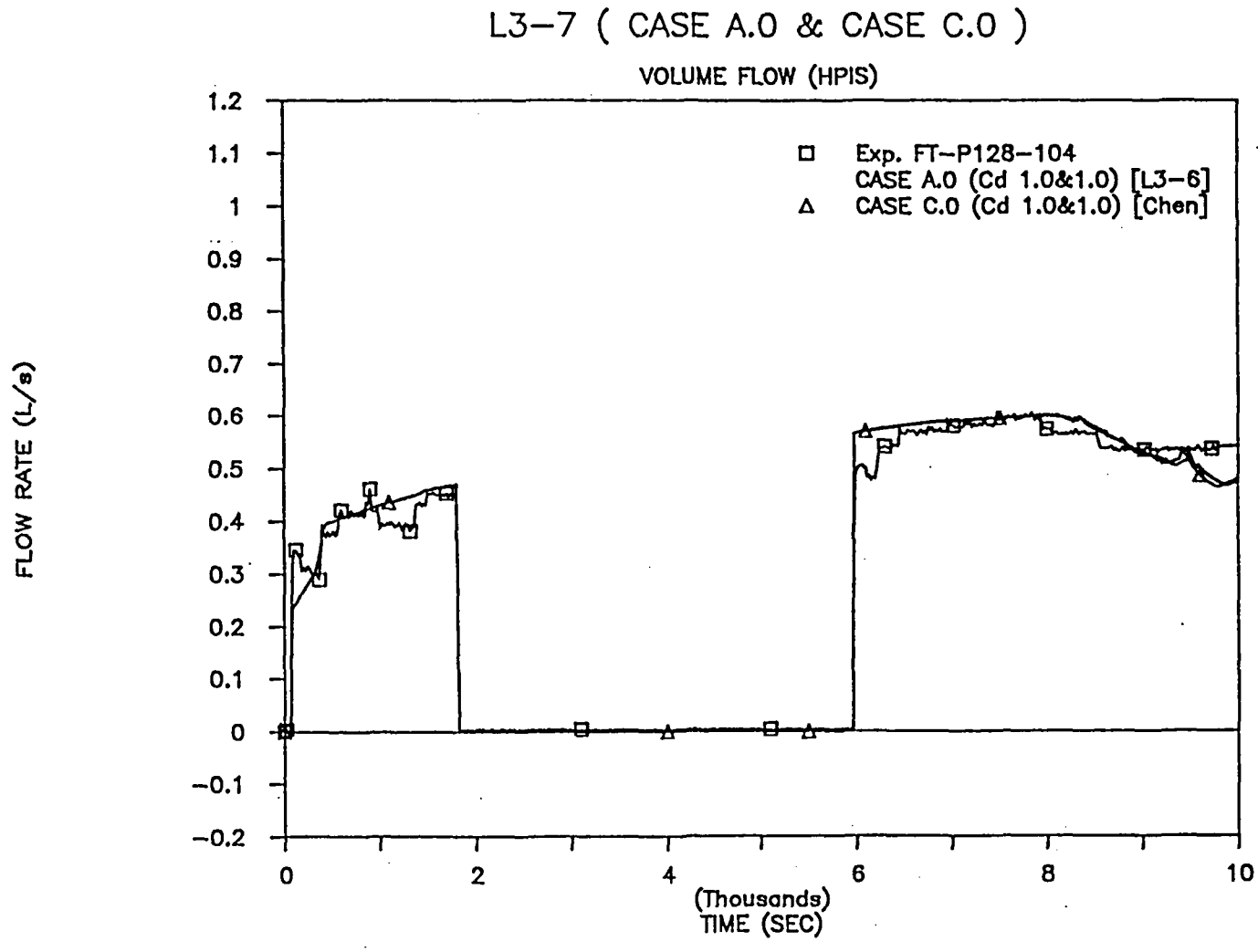

Figure B.III.3 The effect of pump 2-phase factor on HPIS flow

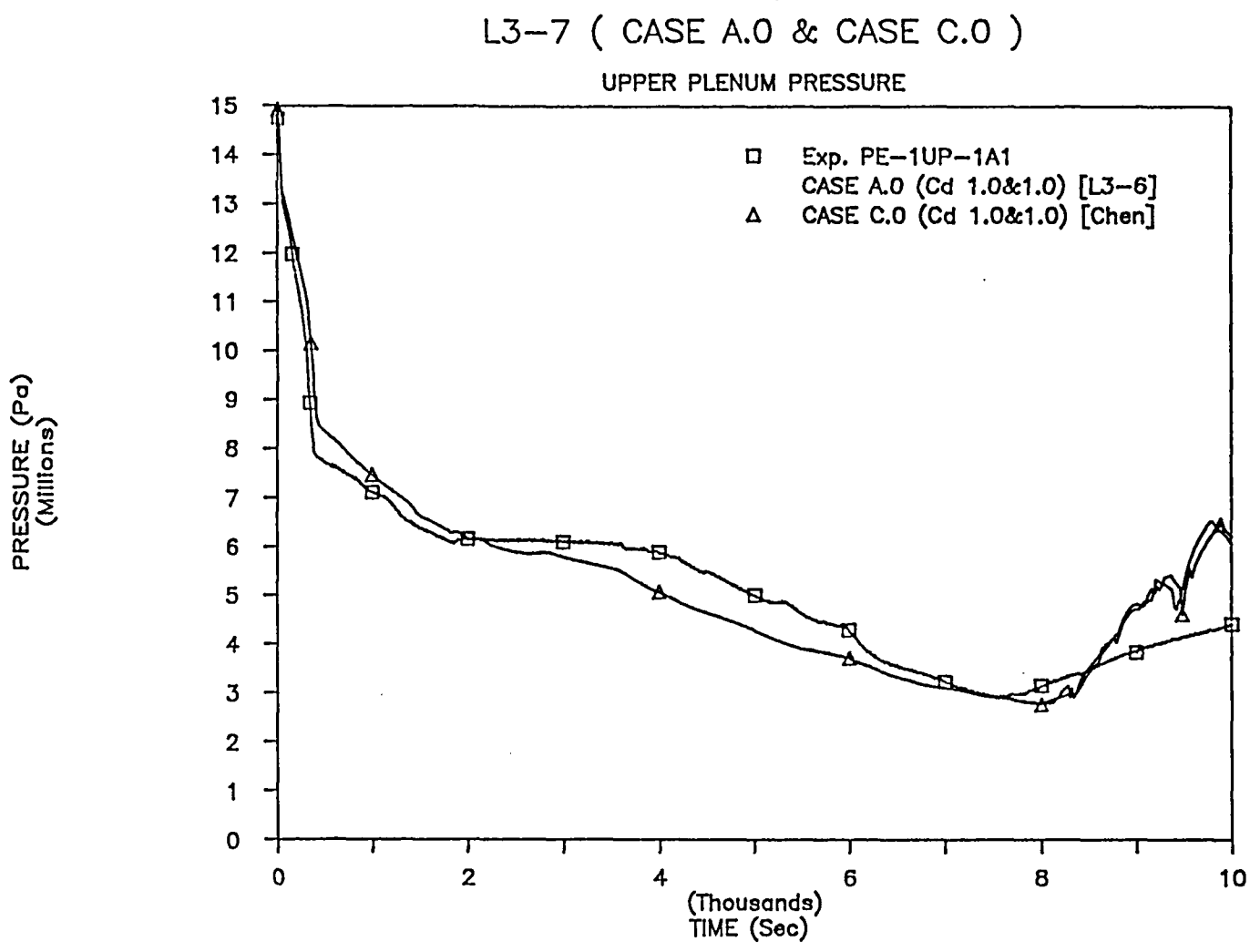

Figure B.III.4 The effect of pump 2-phase factor on upper plenum pressure

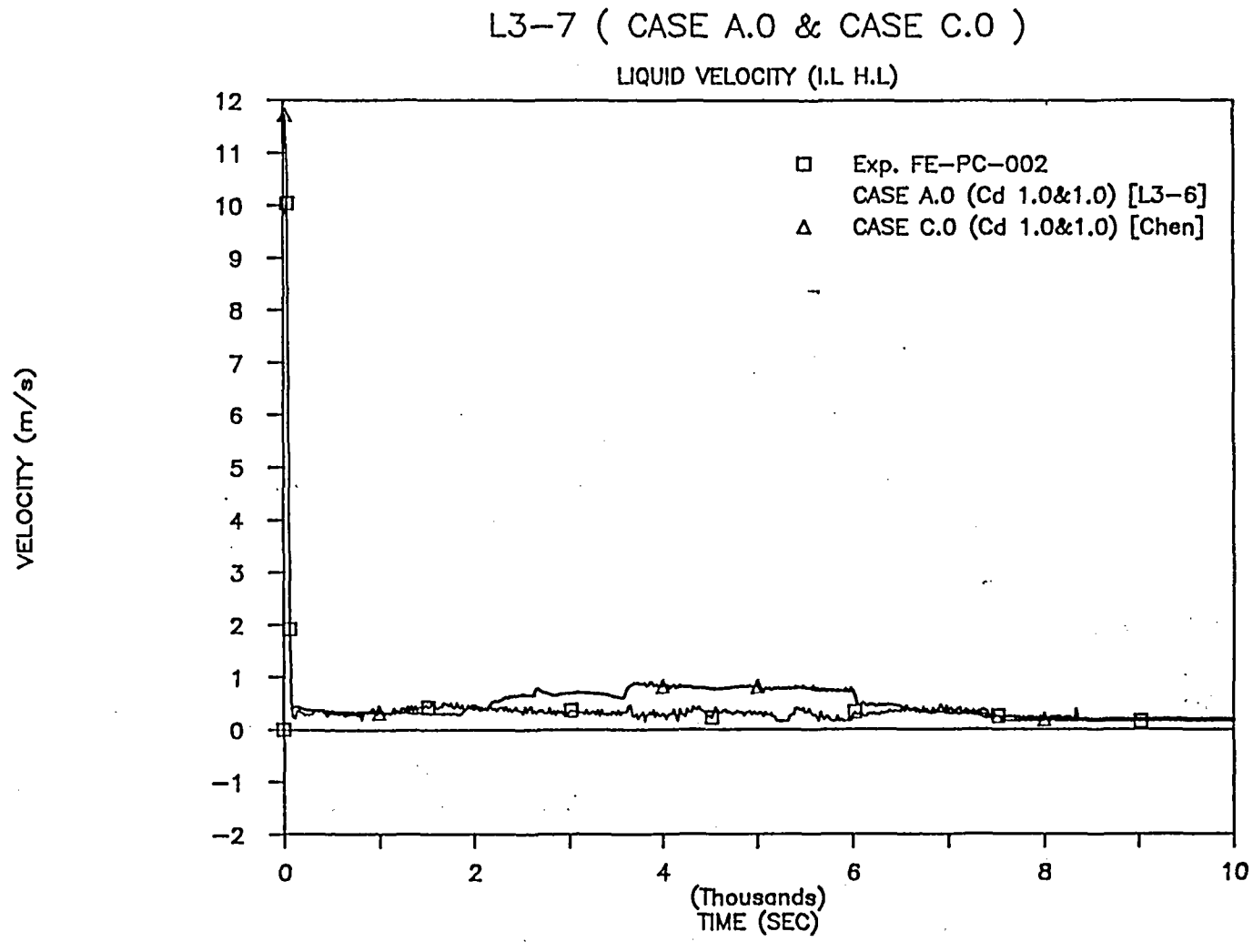

Figure B.III.5 The effect of pump 2-phase factor on ILHL liquid velocity

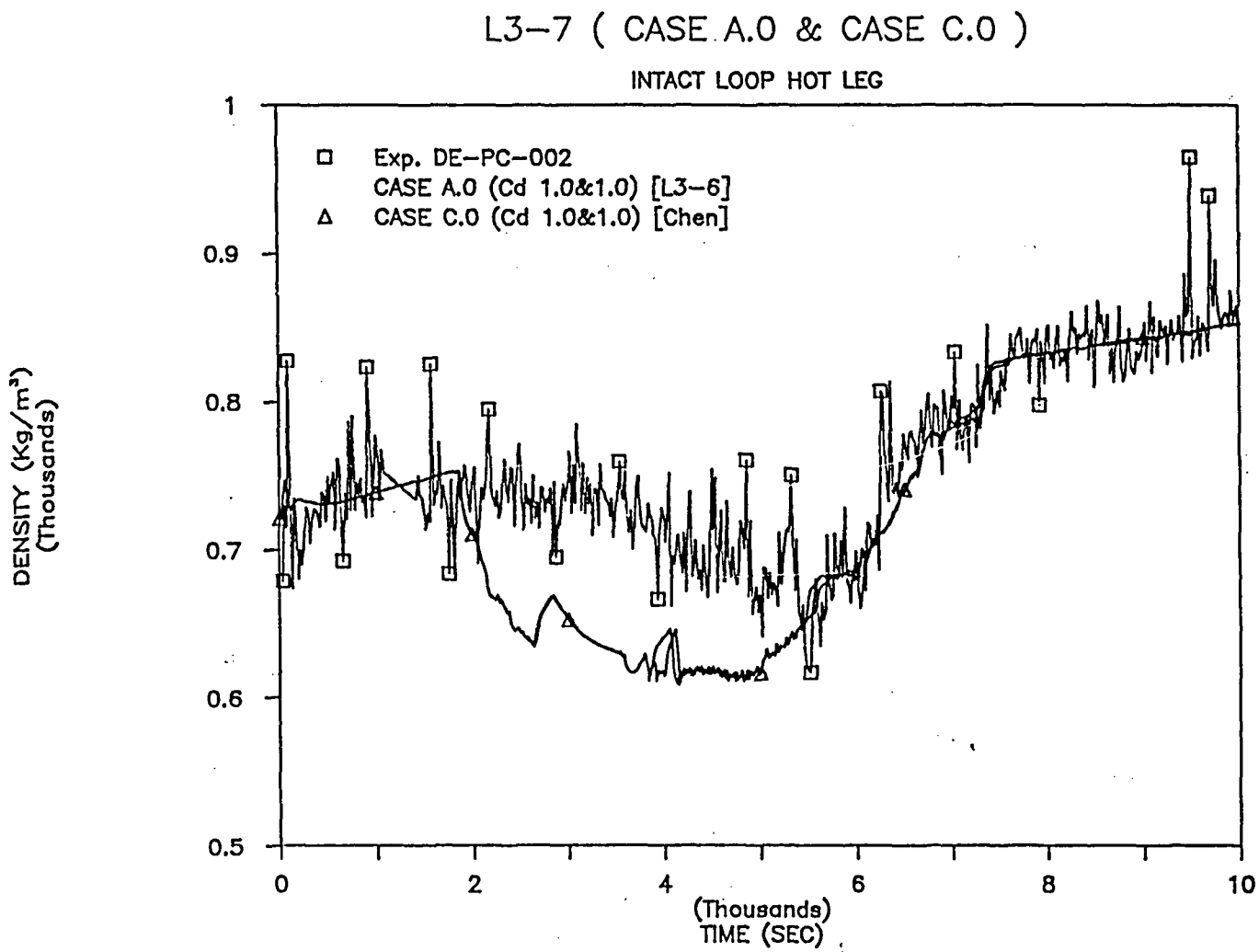

Figure B.III.6 The effect of pump 2-phase factor on ILHL density

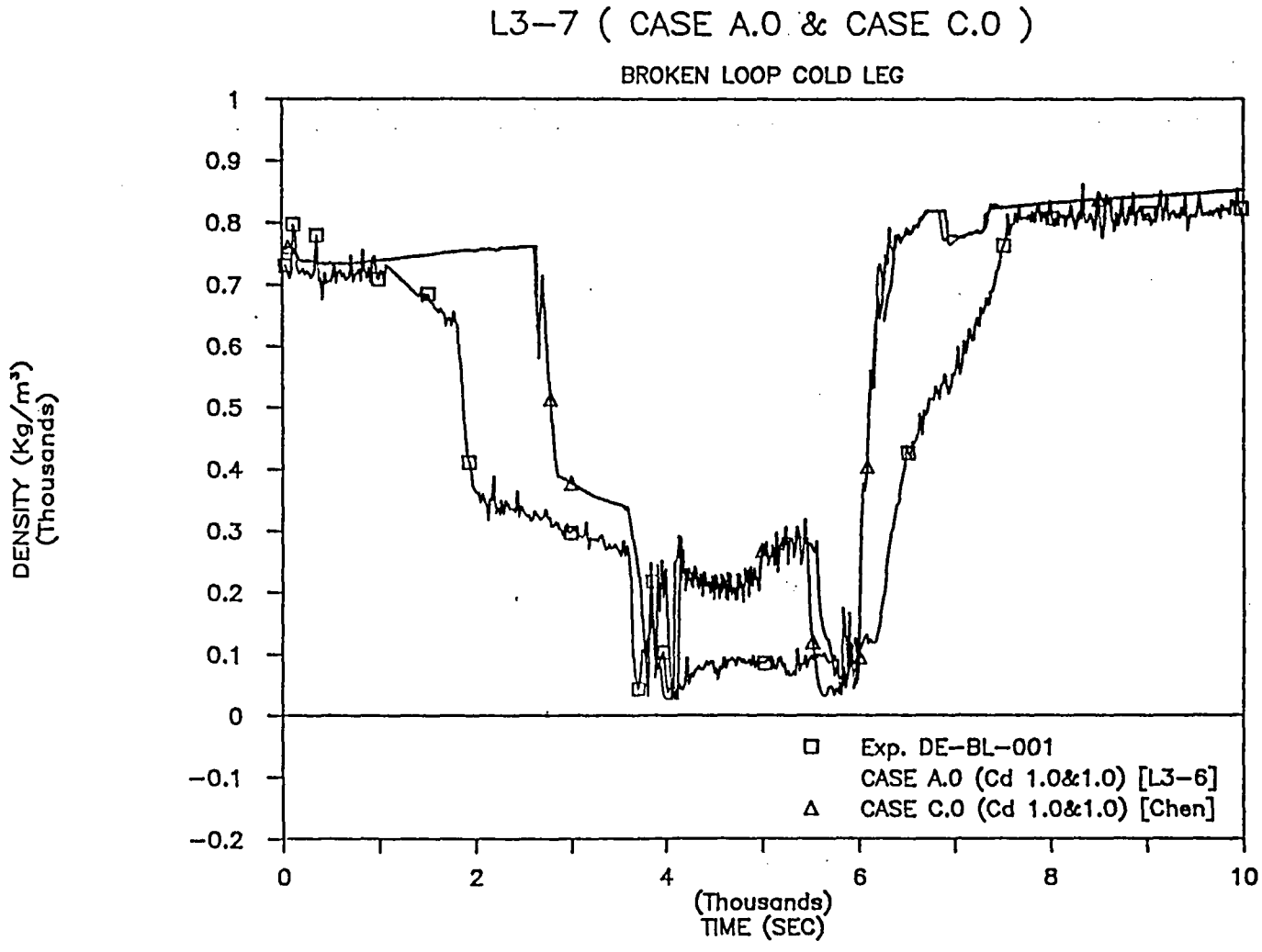

Figure B.III.7 The effect of pump 2-phase factor on BLCL density

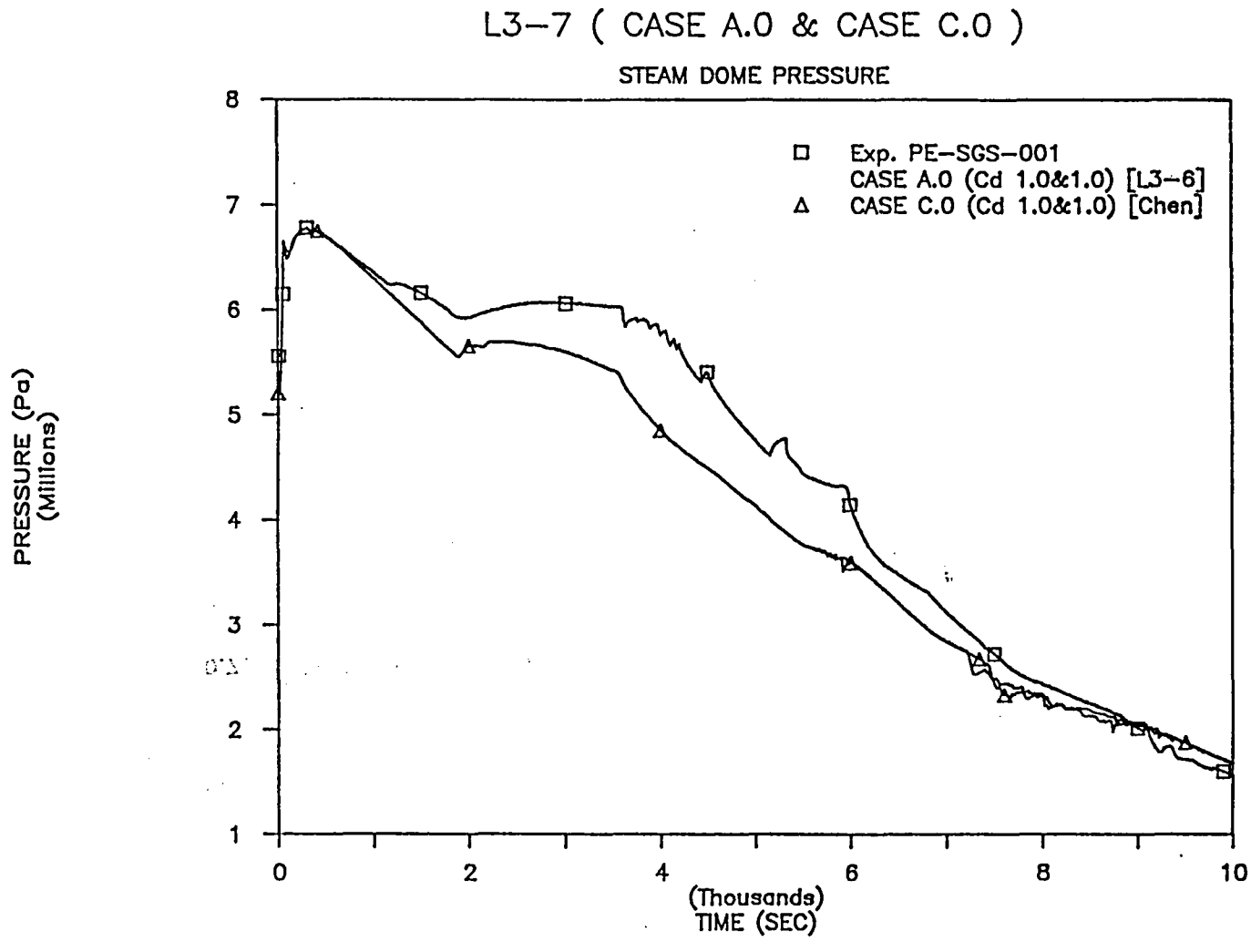

Figure B.III.8 The effect of pump 2-phase factor on steam dome pressure

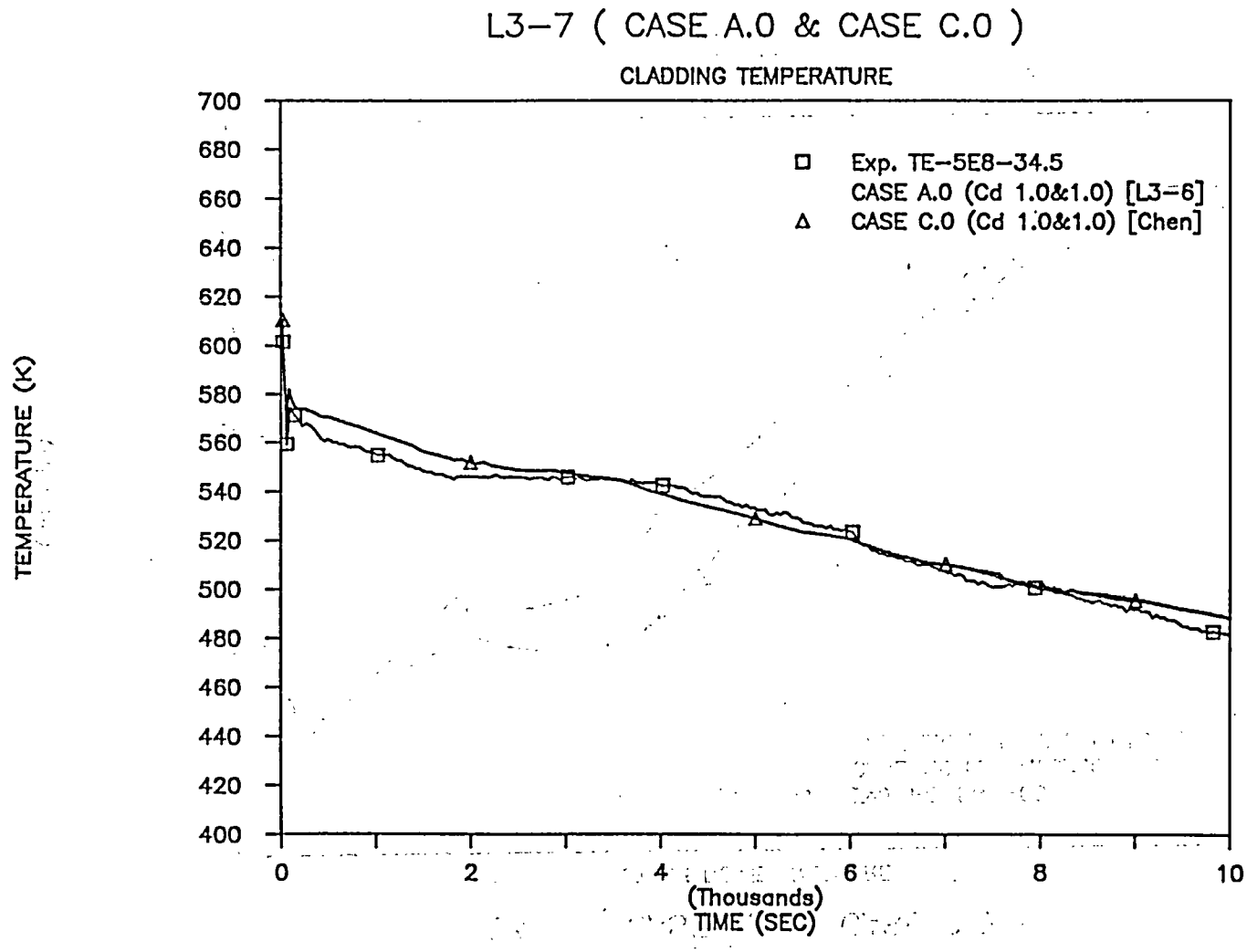

Figure B.III.9 The effect of pump 2-phase factor on peak cladding temperature

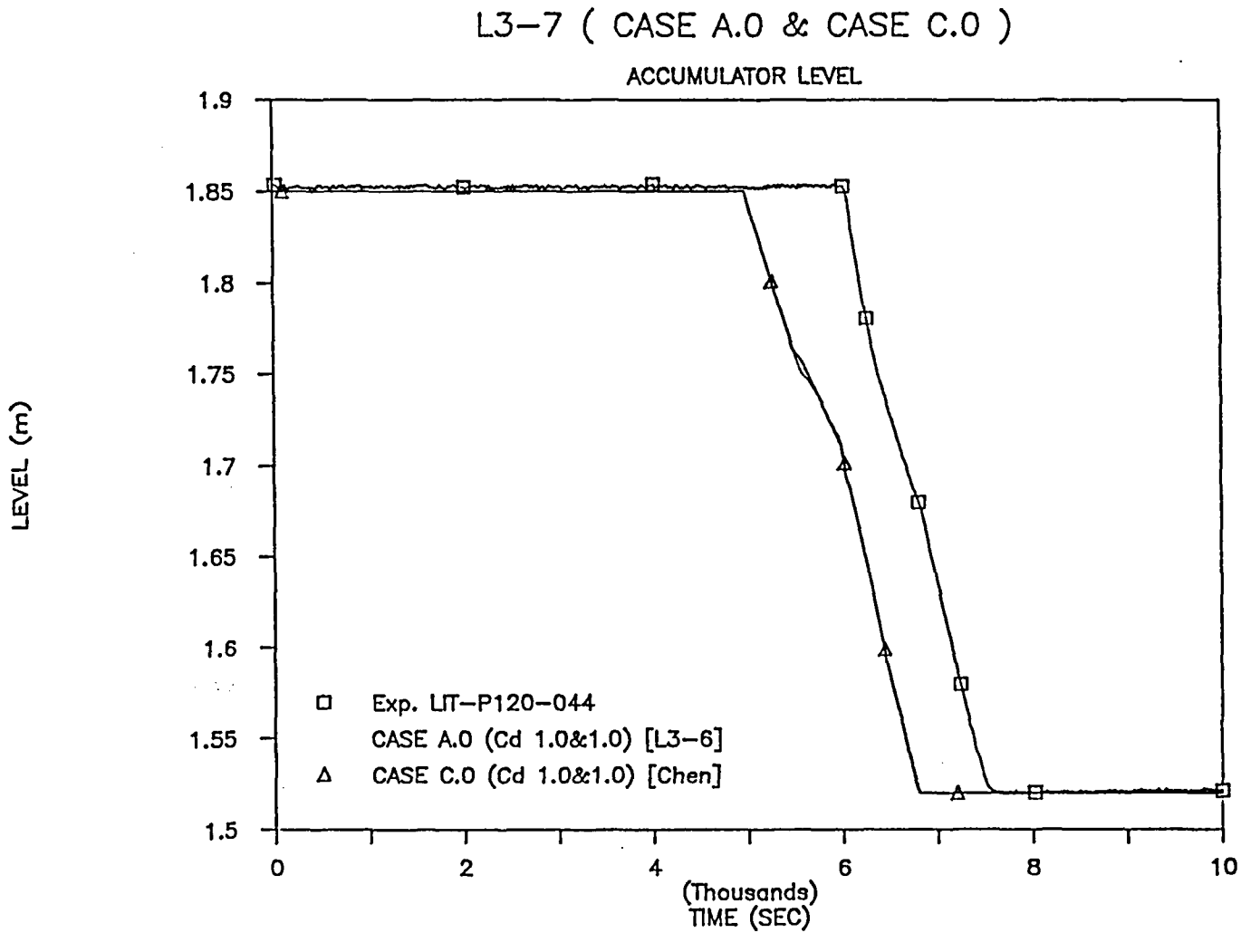

Figure B.III.10 The effect of pump 2-phase factor on accumulator level

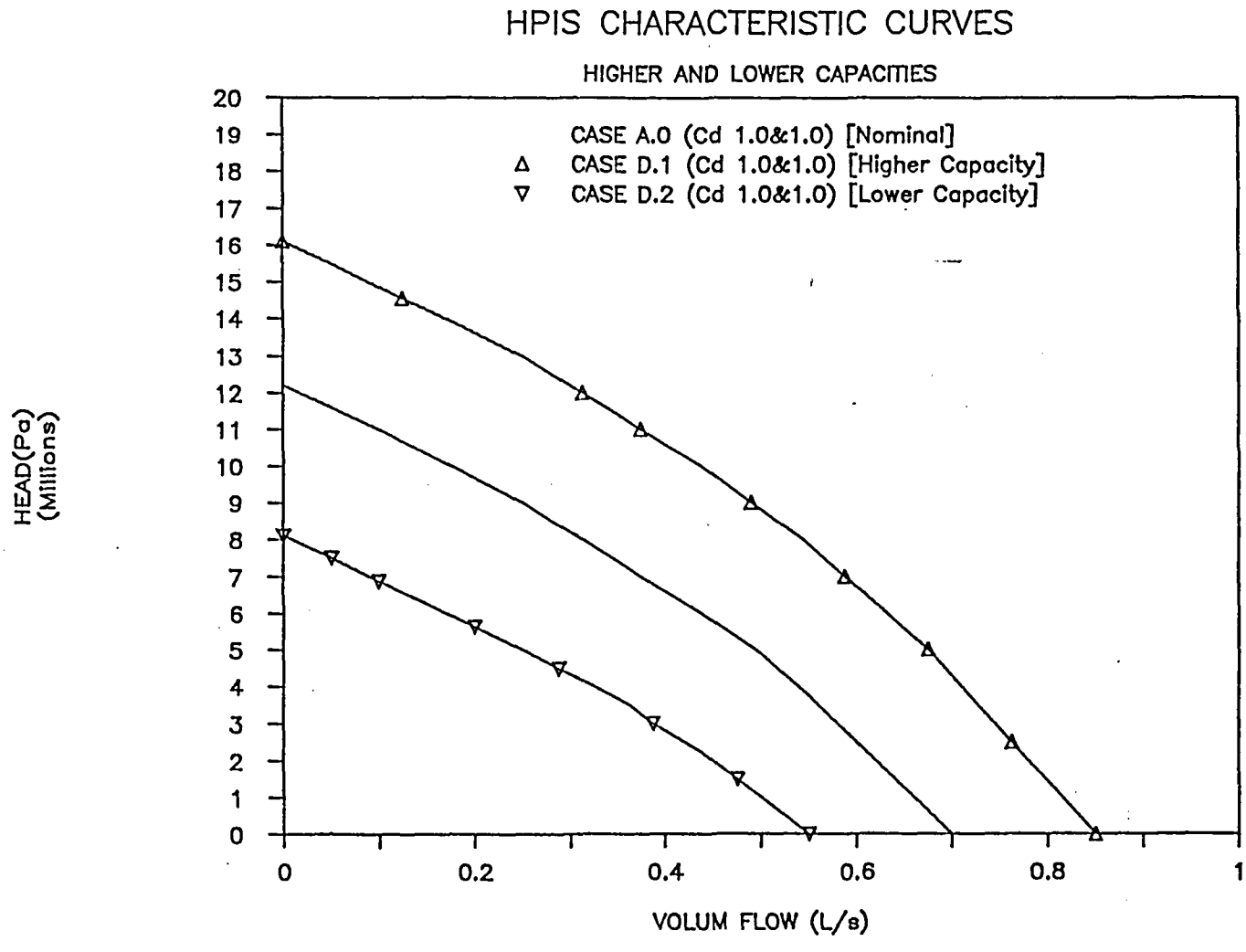

Figure B.IV.1 The changes of HPIS characteristics

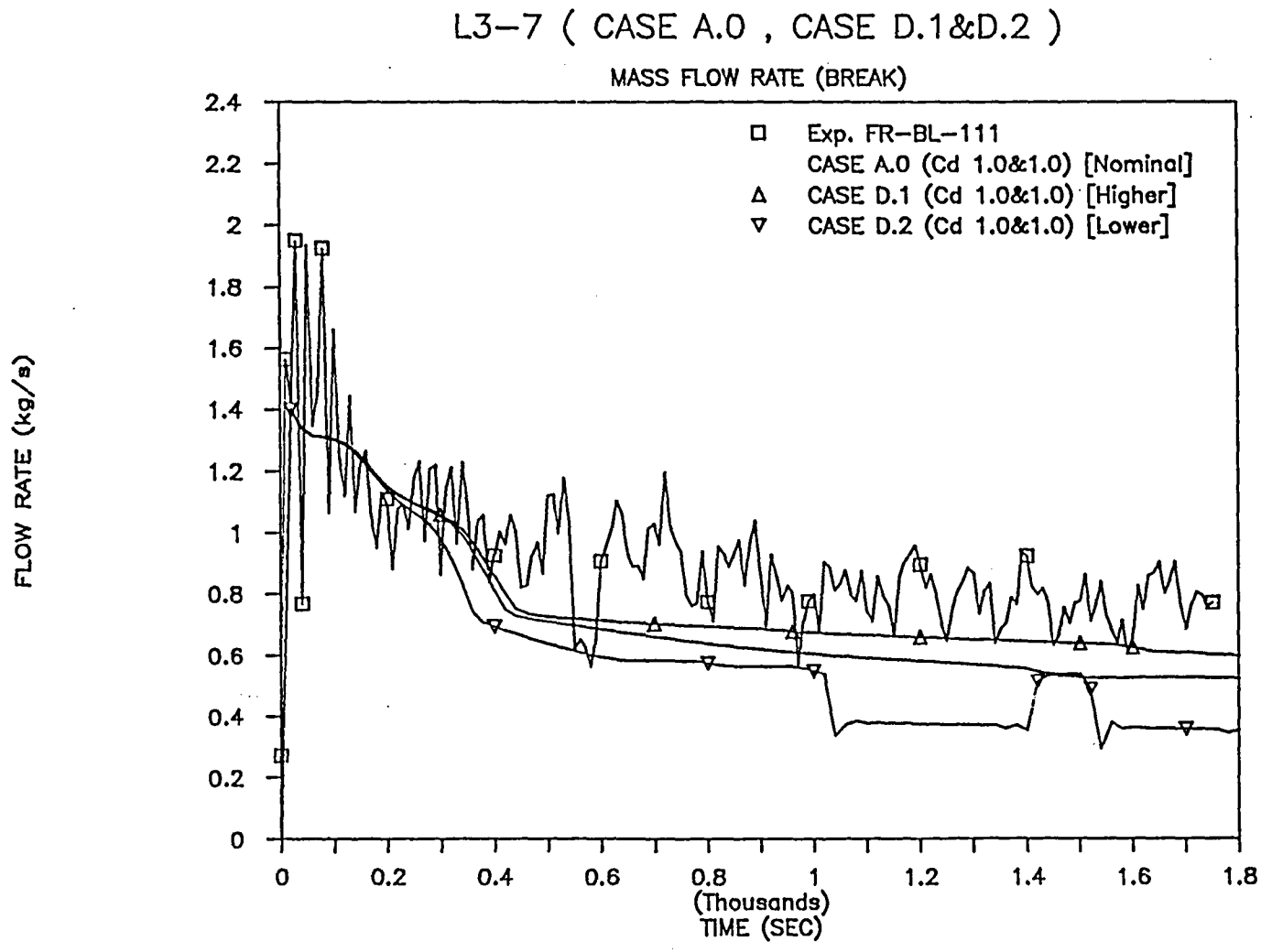

Figure B.IV.2 The effect of HPIS characteristic on break flow

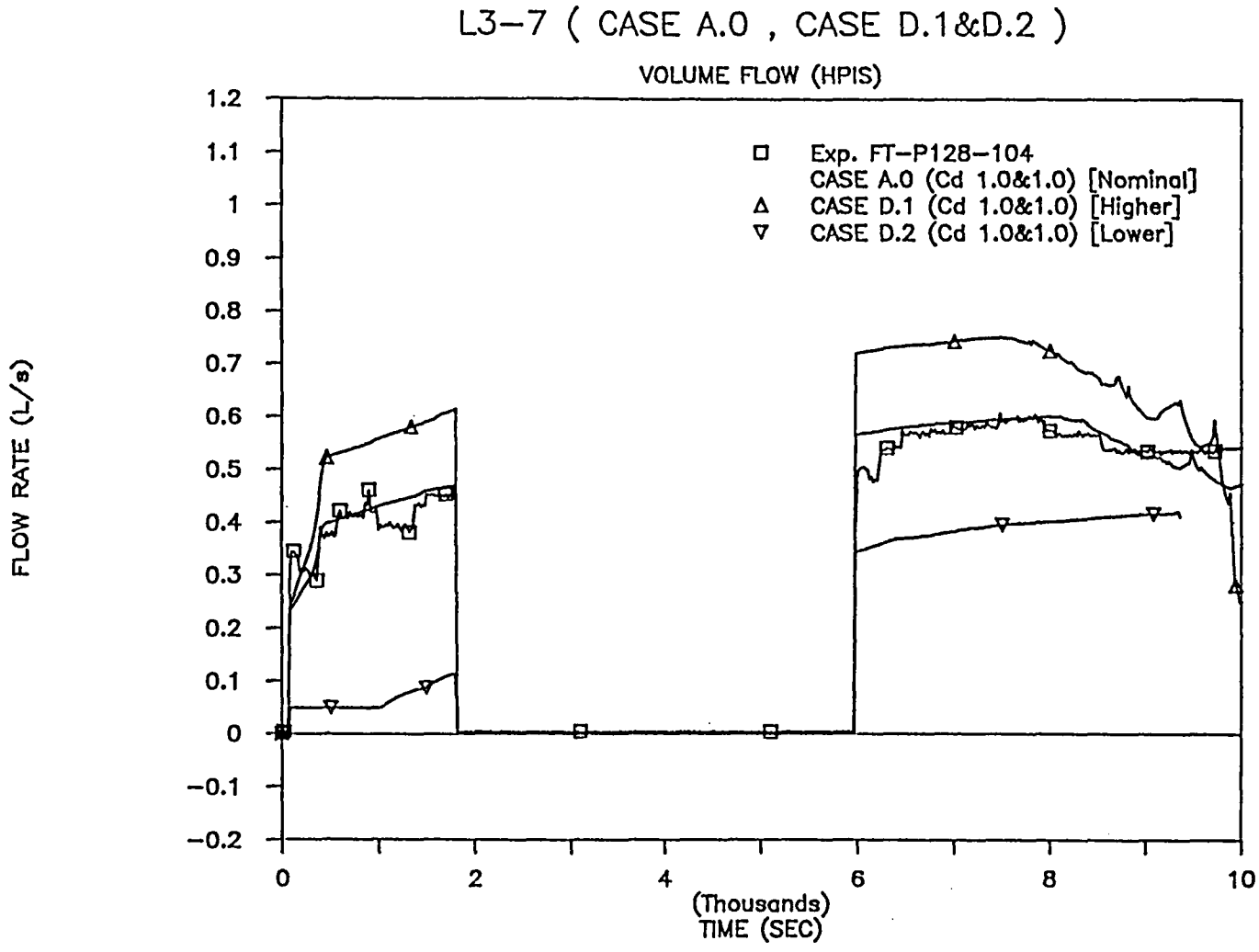

Figure B.IV.3 The effect of HPIS characteristic on HPIS flow

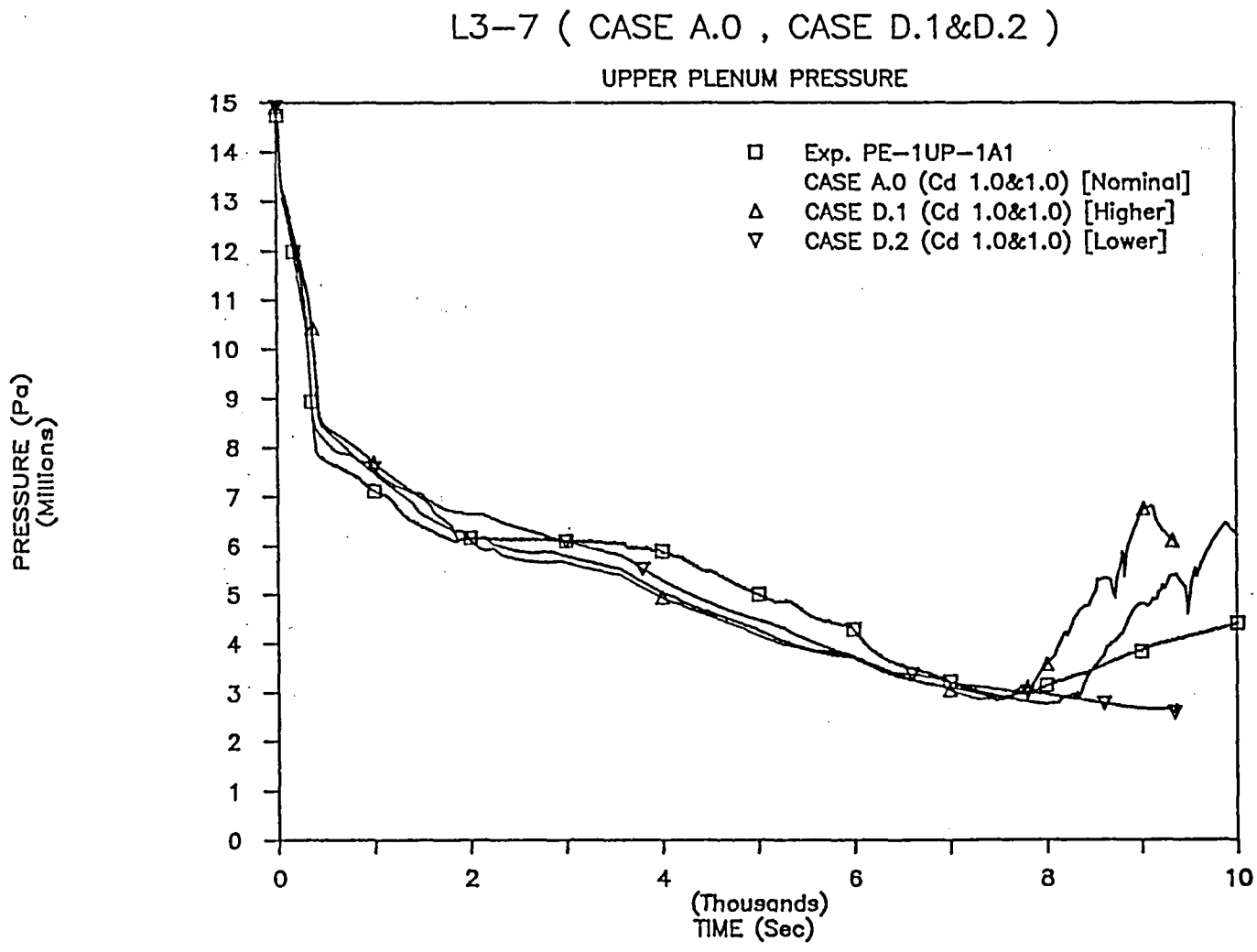

Figure B.IV.4 The effect of HPIS characteristic on upper plenum pressure

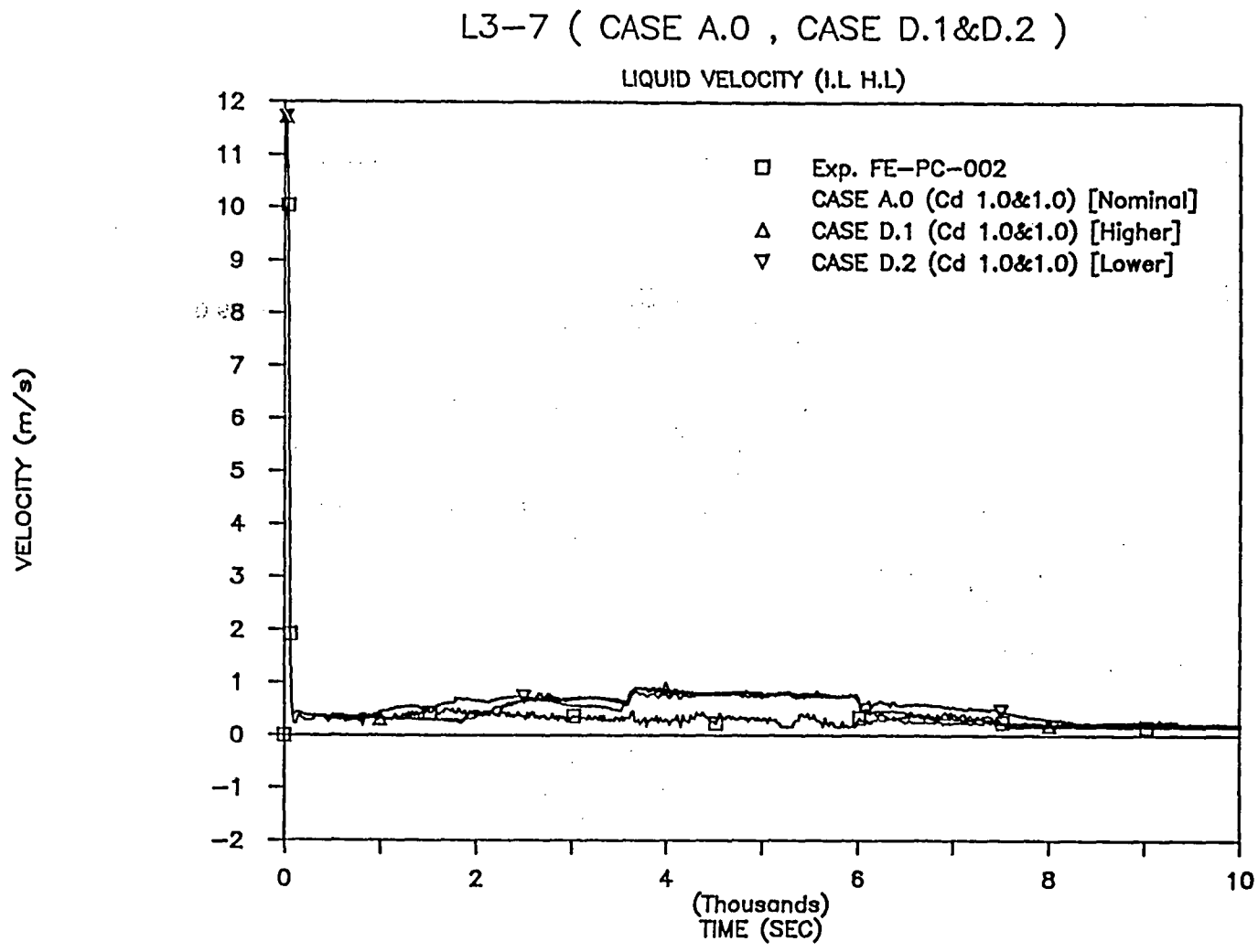

Figure B.IV.5 The effect of HPIS characteristic on ILHL liquid velocity

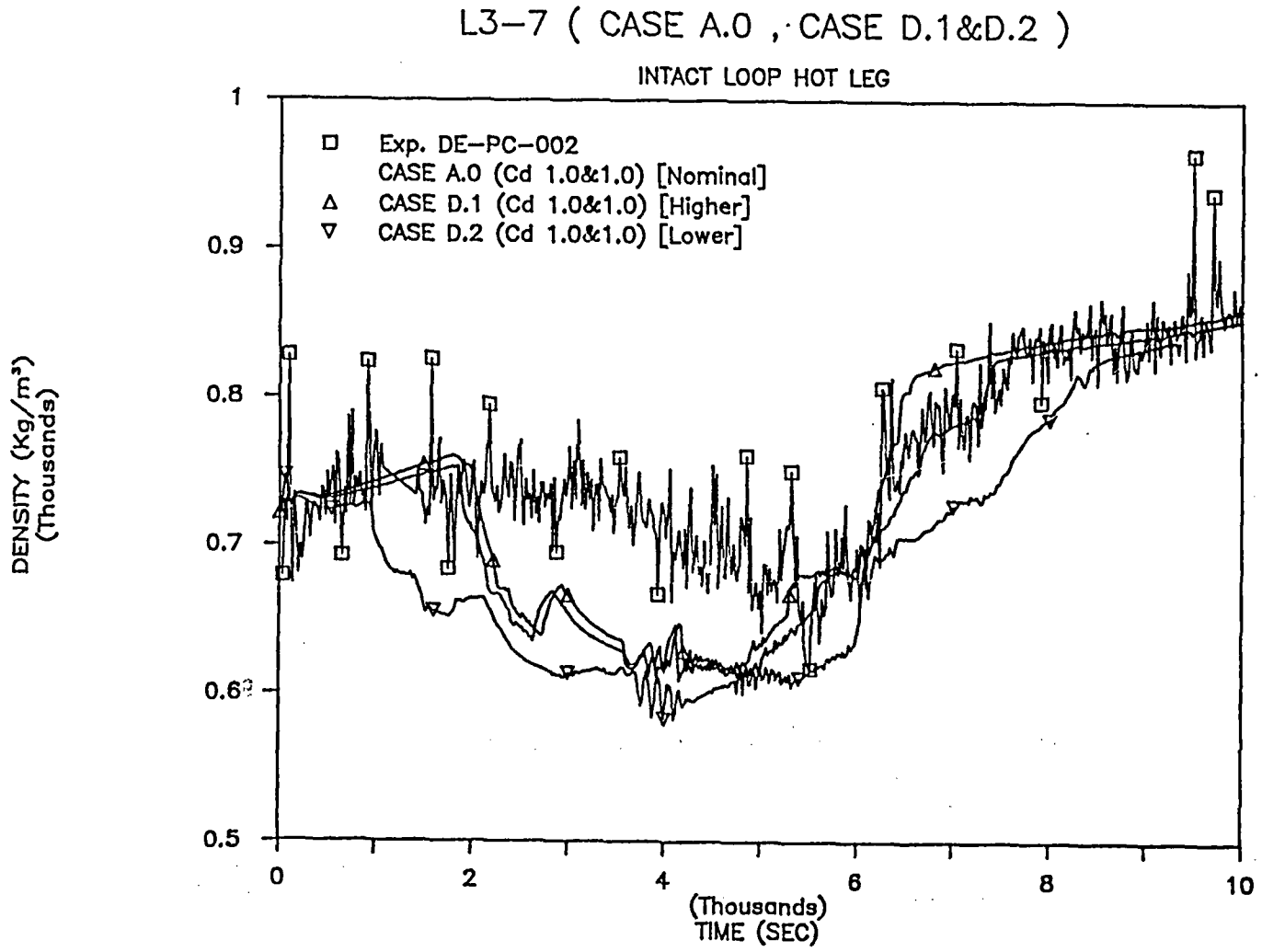

Figure B.IV.6 The effect of HPIS characteristic on ILHL density

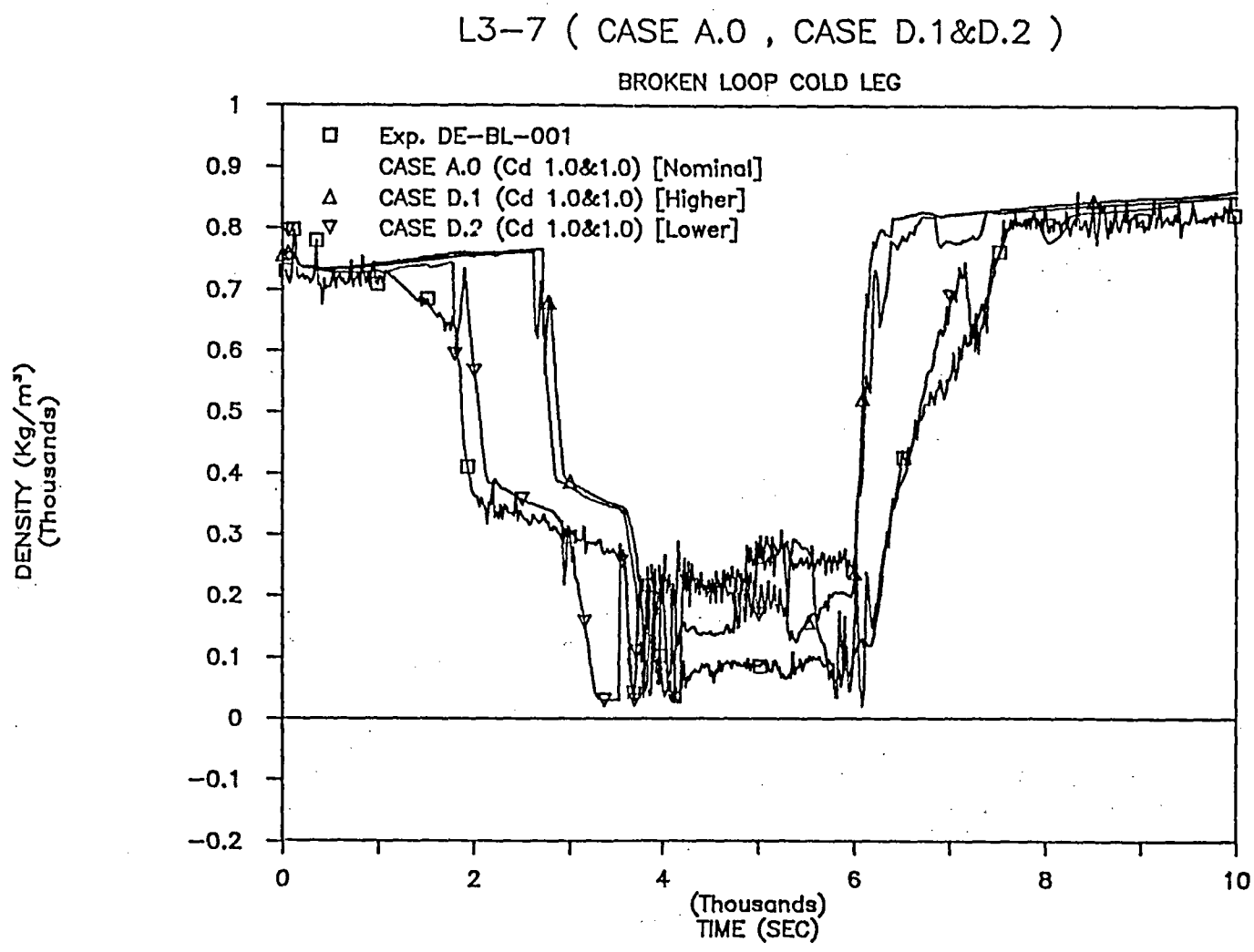

Figure B.IV.7 The effect of HPIS characteristic on BLCL density

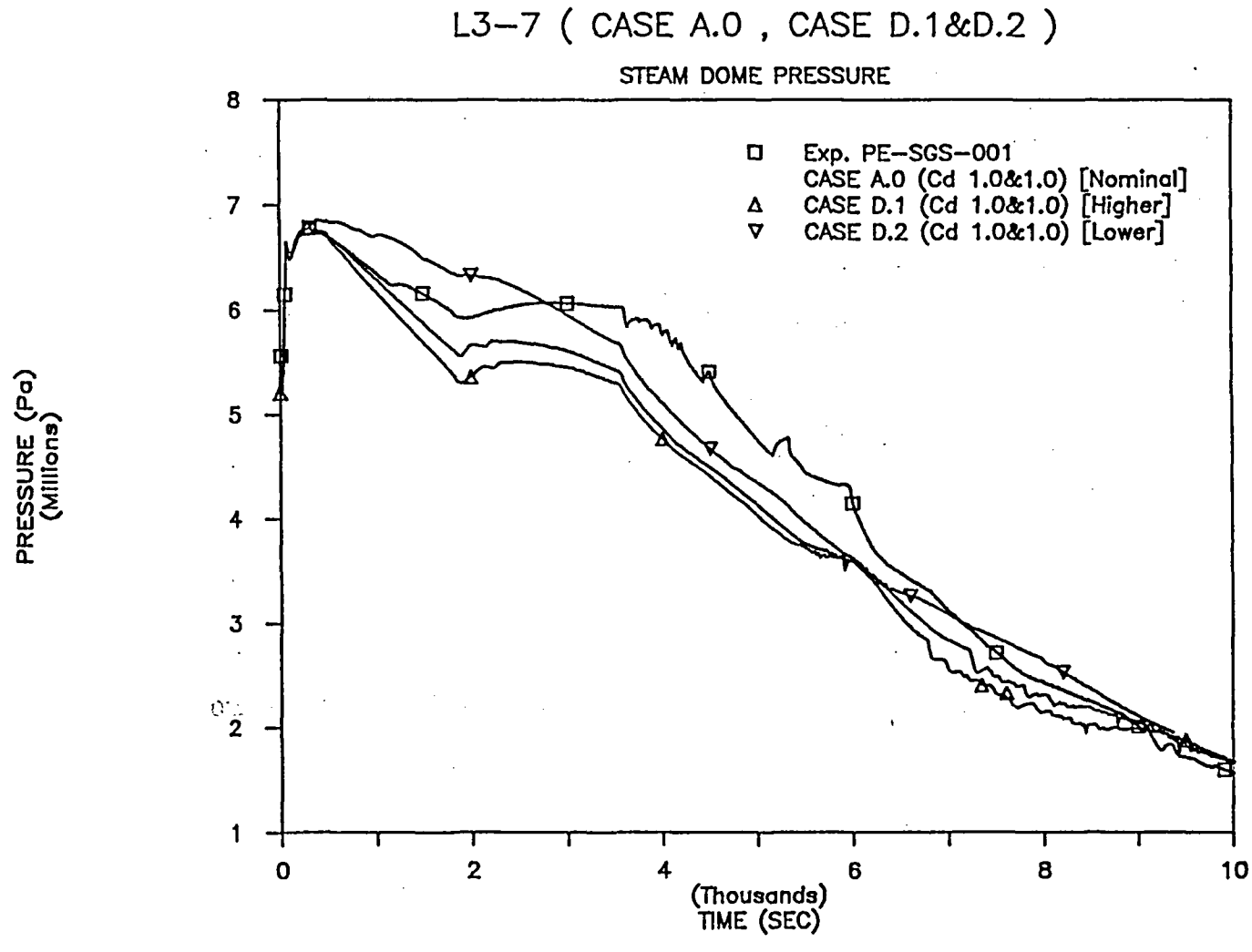

Figure B.IV.8 The effect of HPIS characteristic on steam dome pressure

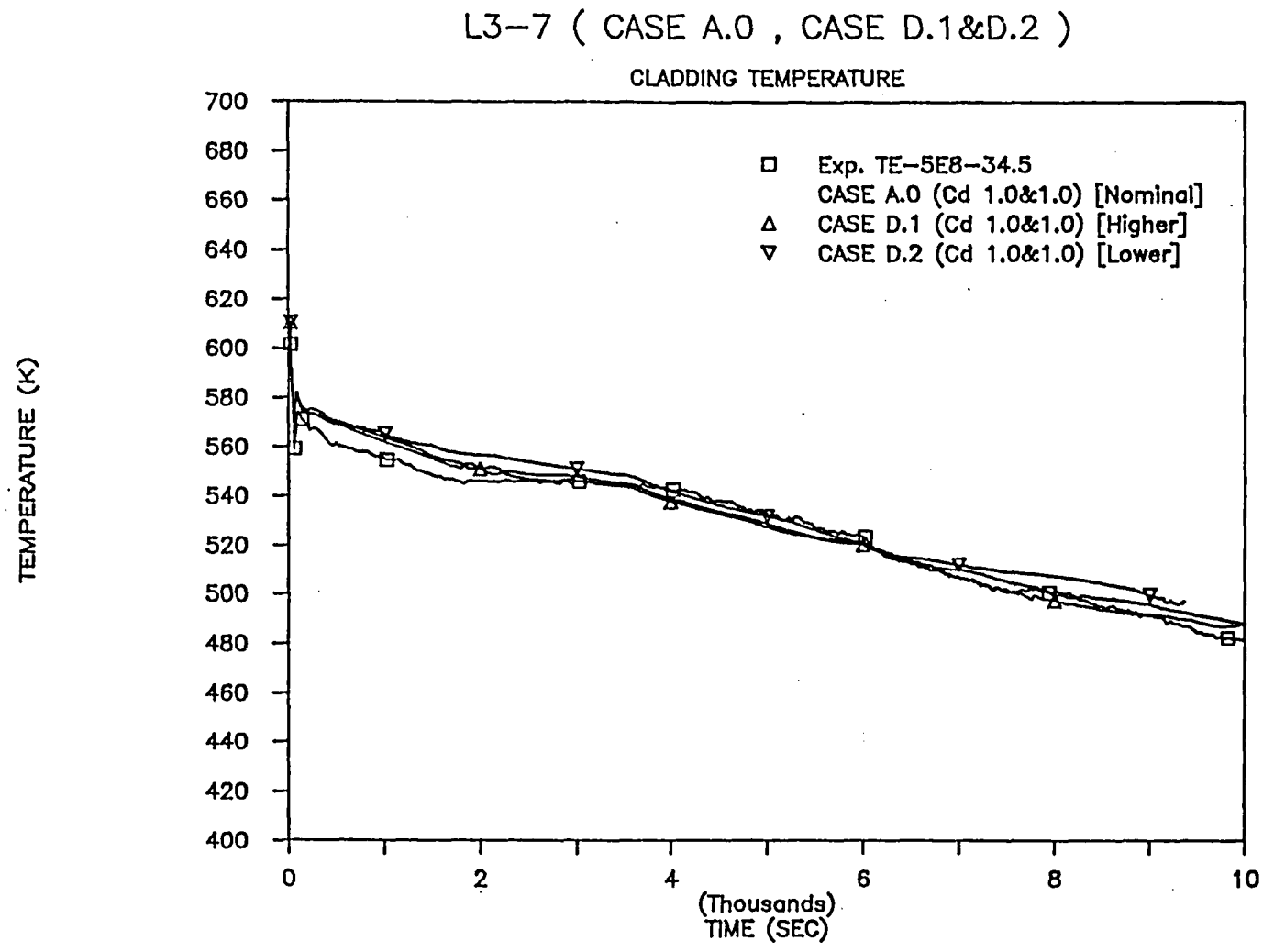

Figure B.IV.9 The effect of HPIS characteristic on peak cladding temeprature

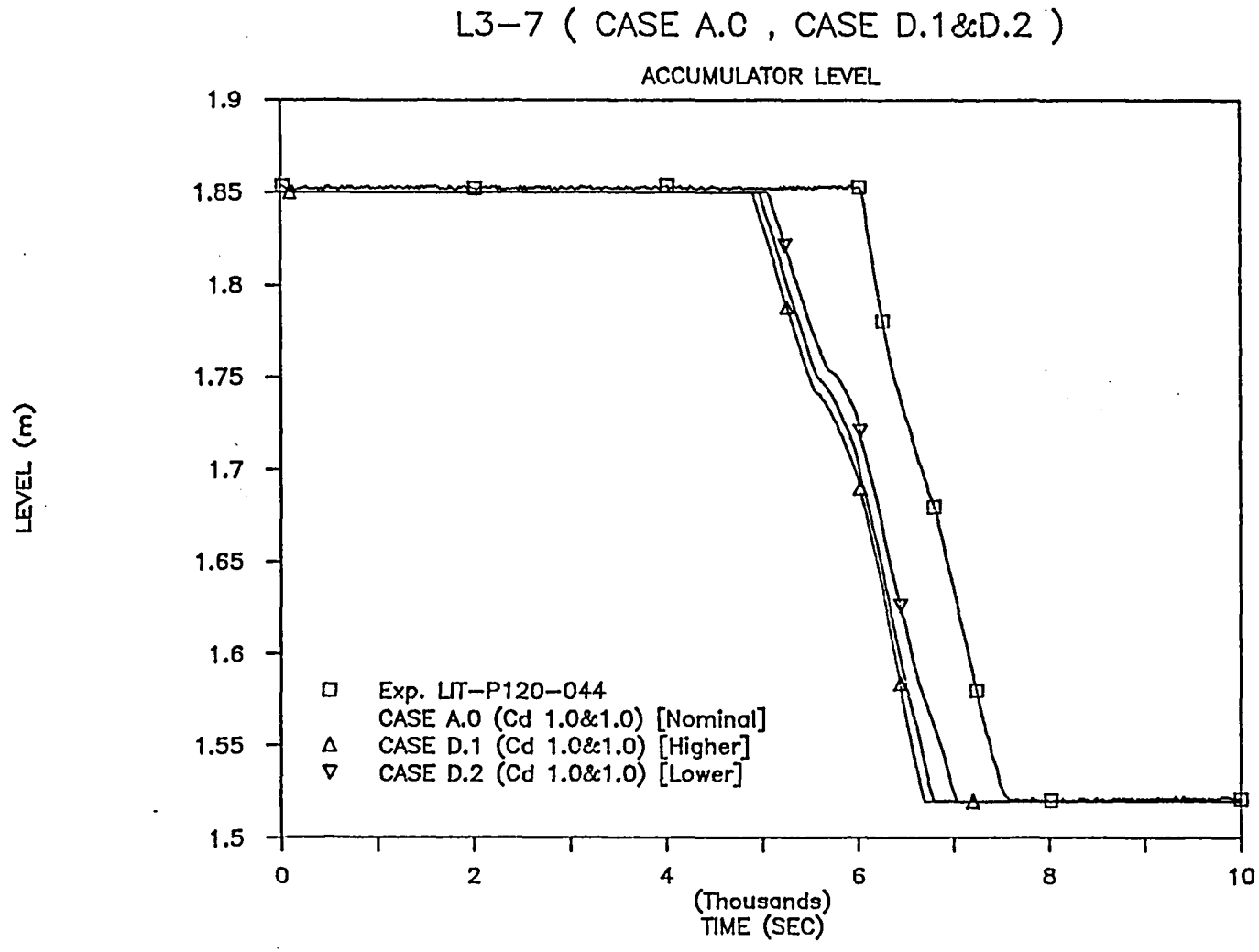

Figure B.IV.10 The effect of HPIS characteristic on accumulator level

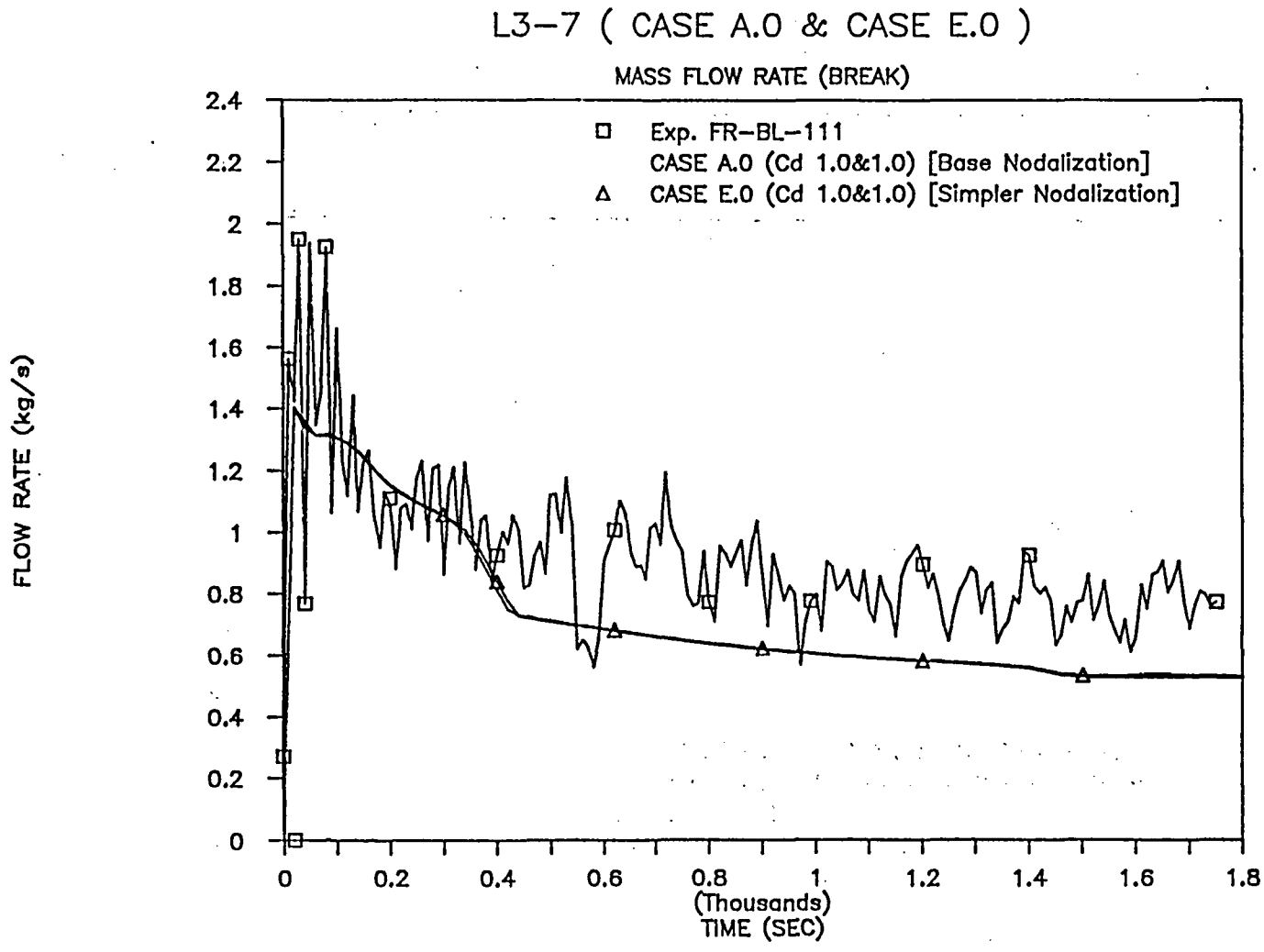

Figure B.V.1 The effect of simpler nodalization on break flow

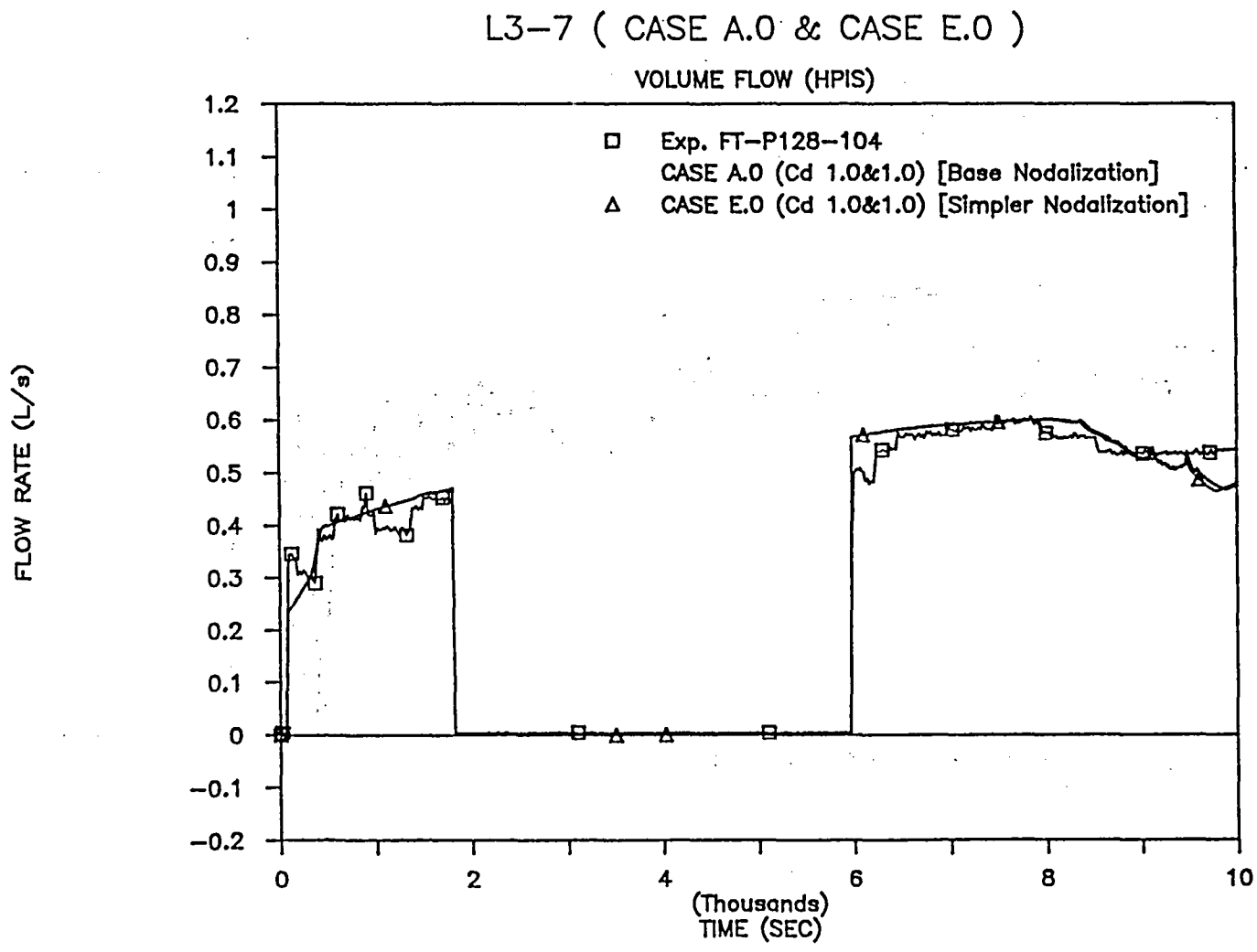

Figure B.V.2 The effect of simpler nodalization on HPIS flow

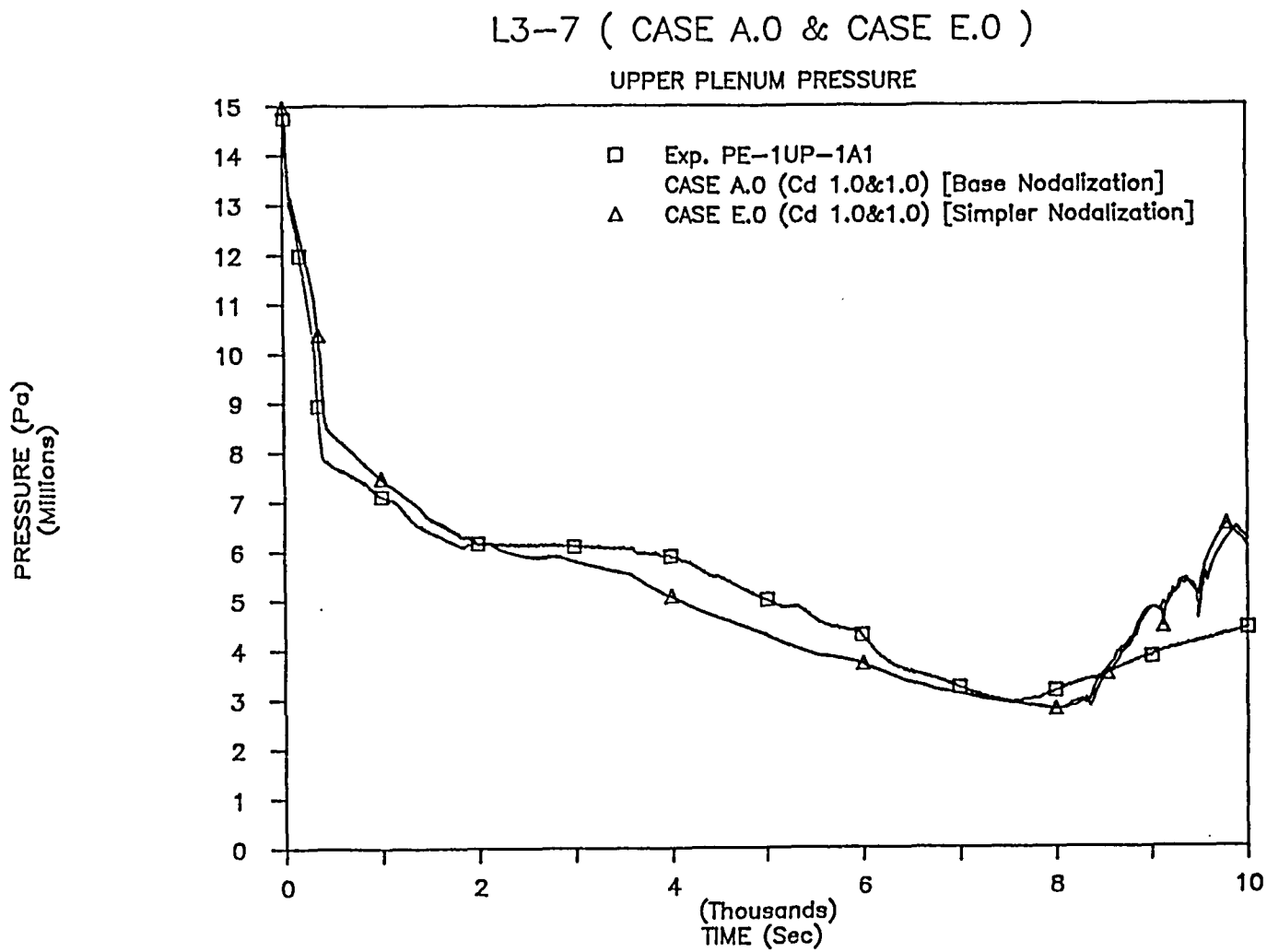

Figure B.V.3 The effect of simpler nodalization on upper plenum pressure

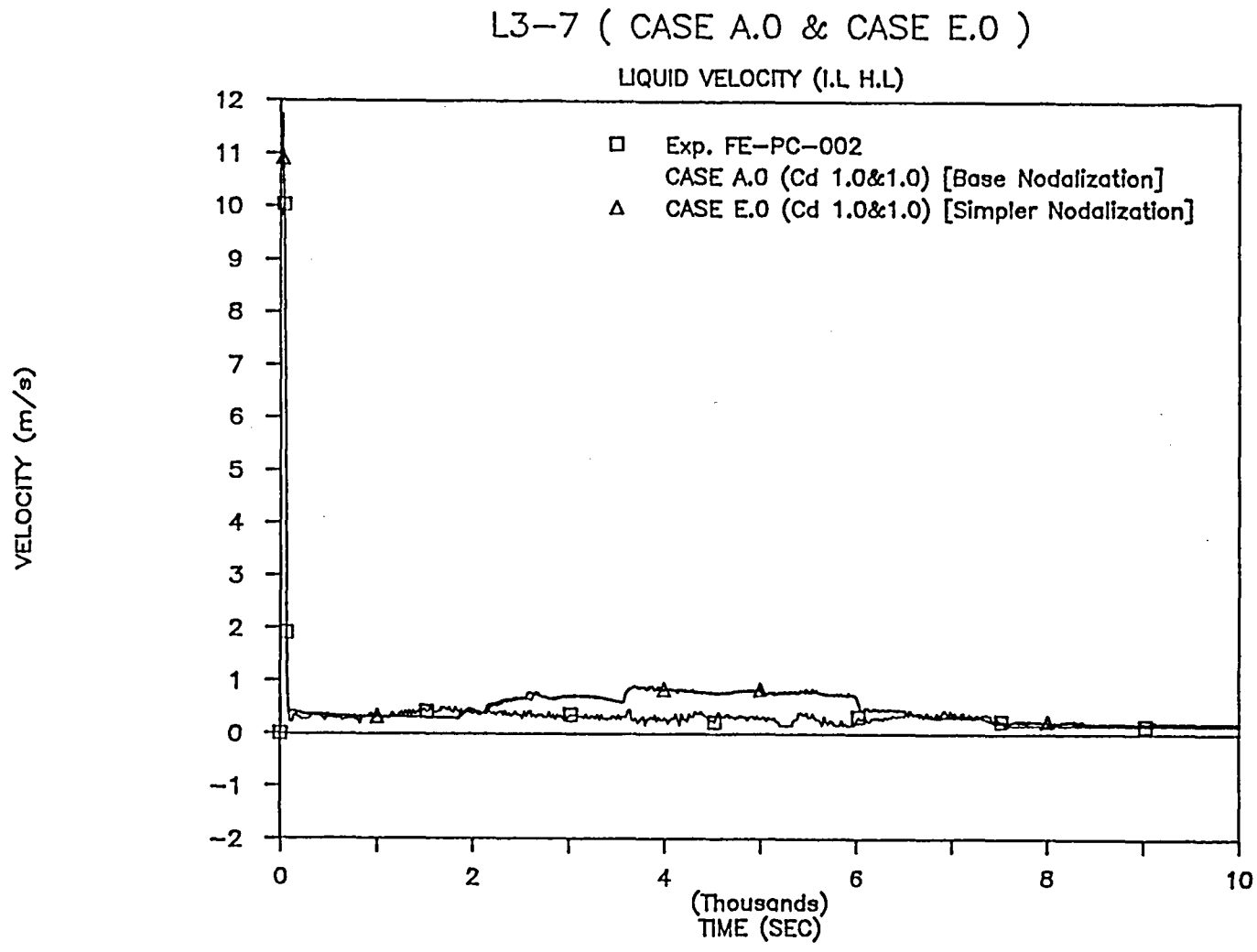

Figure B.V.4 The effect of simpler nodalization on ILHL liquid velocity

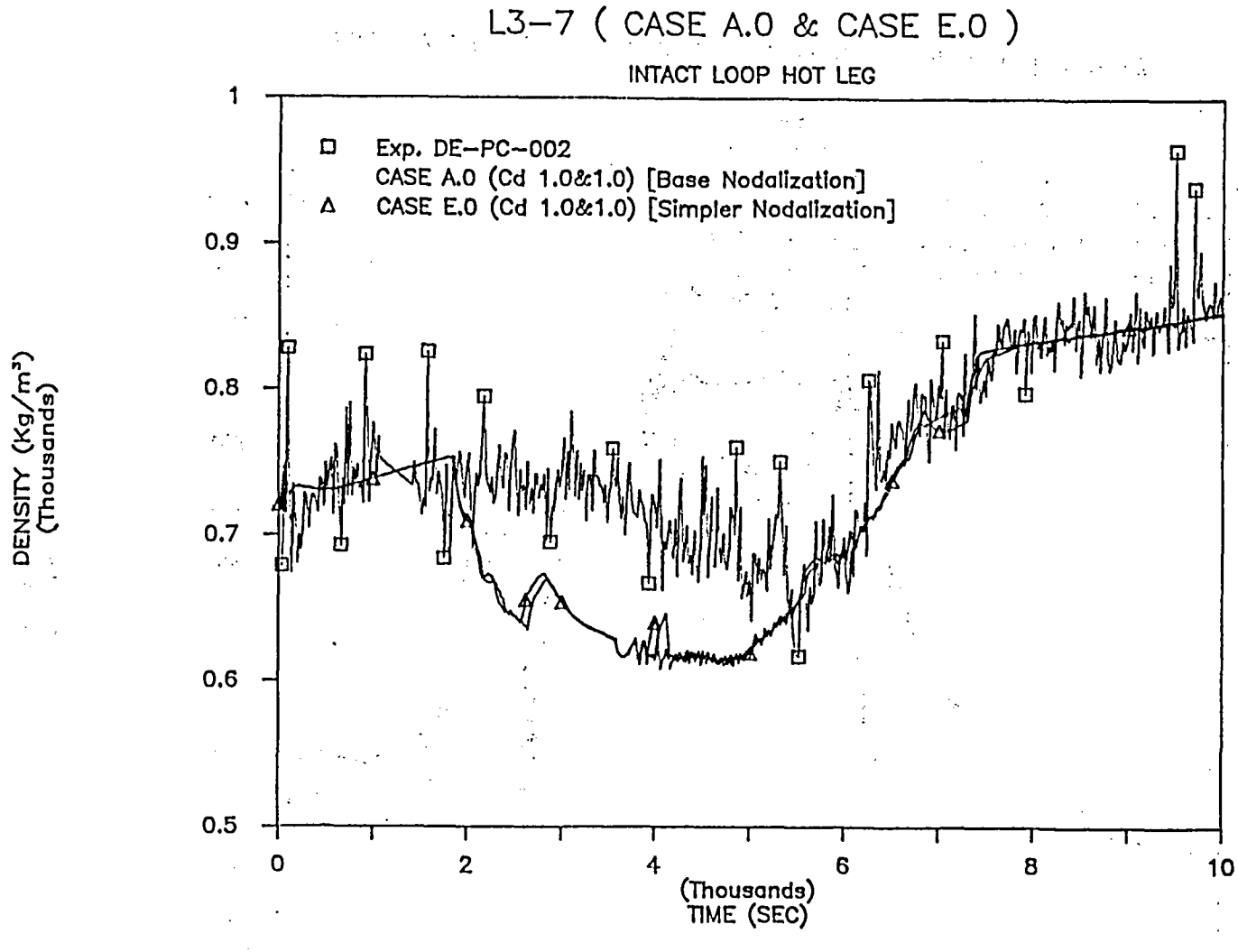

Figure B.V.5 The effect of simpler nodalization on ILHL density

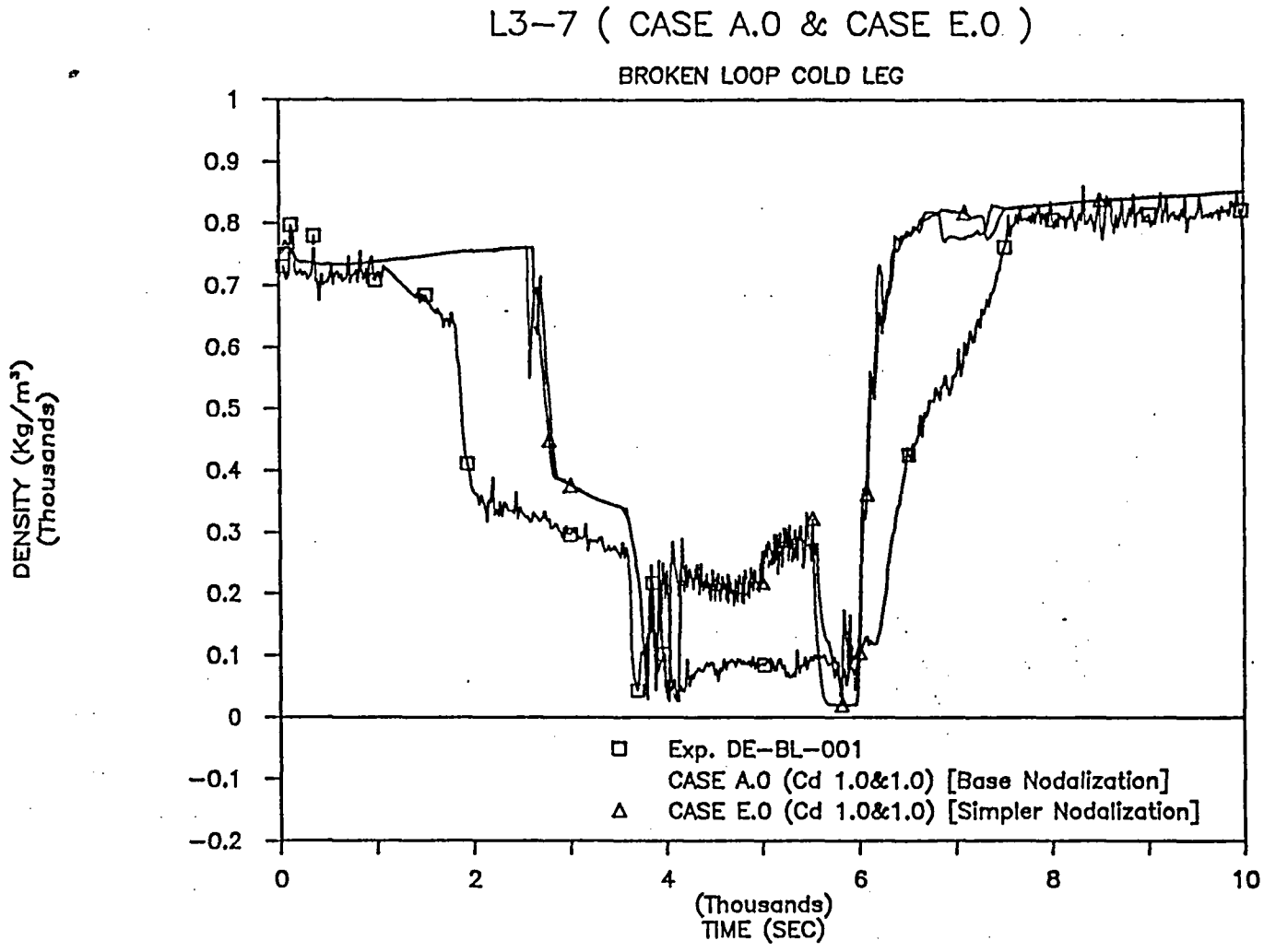

Figure B.V.6 The effect of simpler nodalization on BLCL density

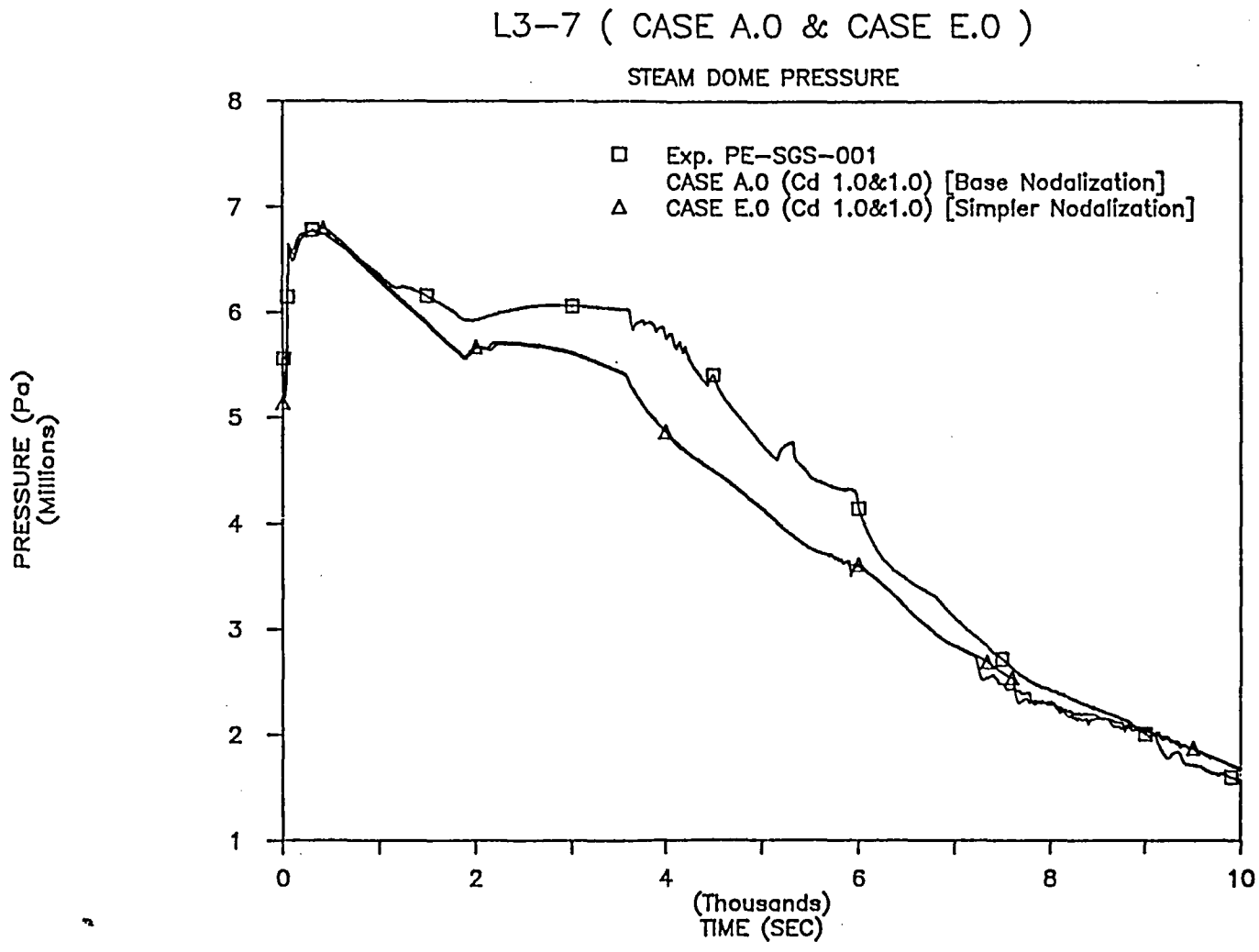

Figure B.V.7 The effect of simpler nodalization on steam dome pressure

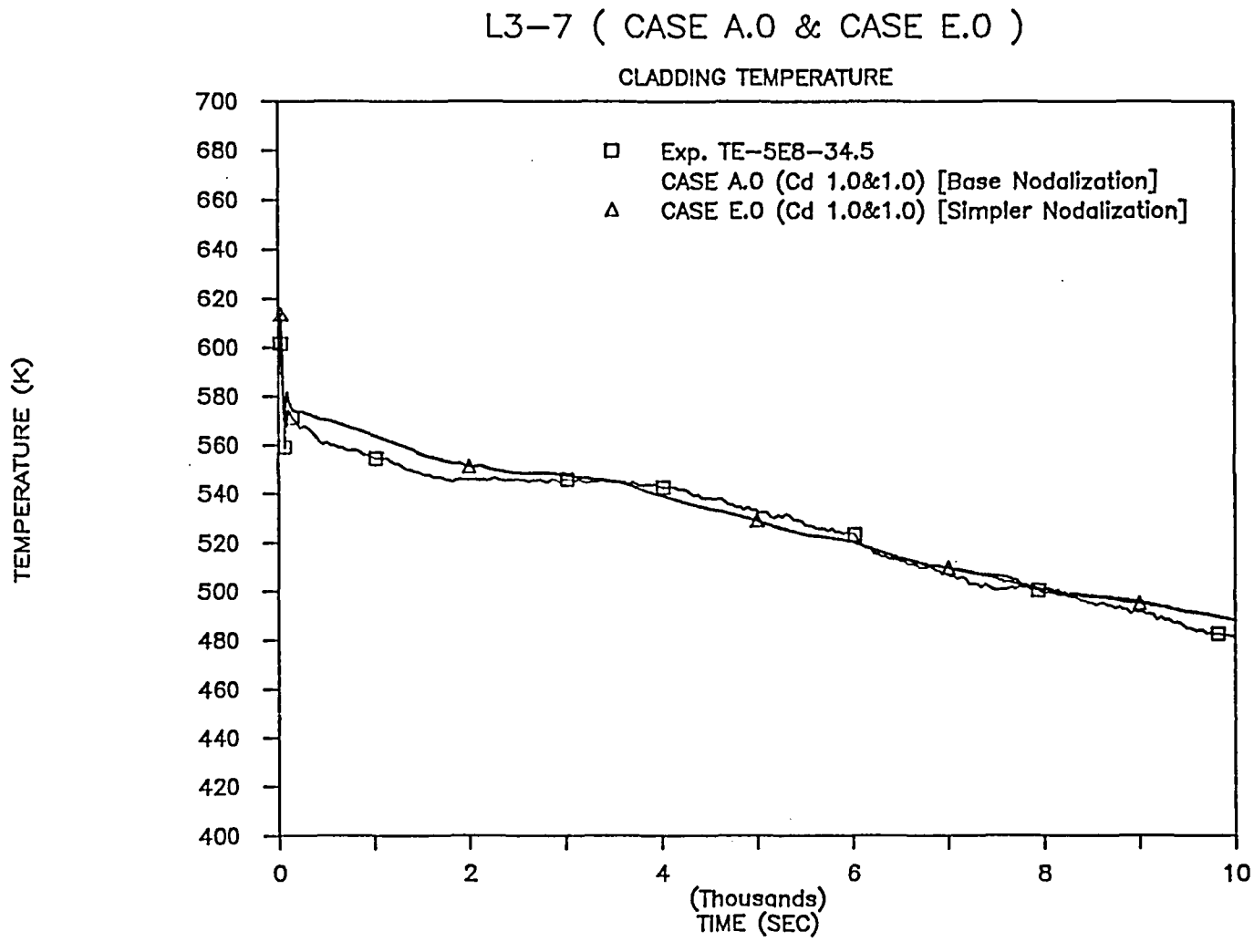

Figure B.V.8 The effect of simpler nodalization on peak cladding temperature

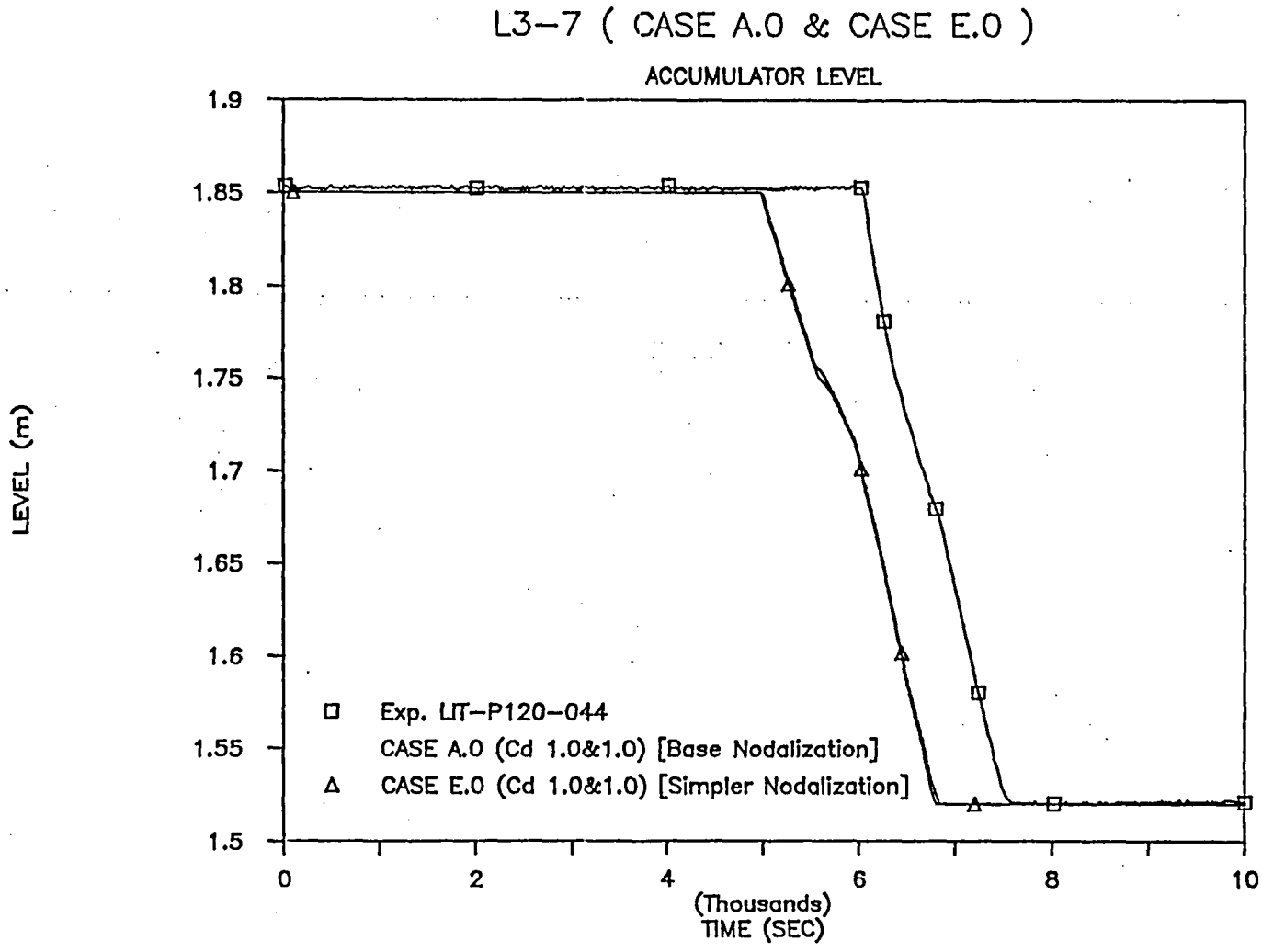

Figure B.V.9 The effect of simpler nodalization on accumulator level

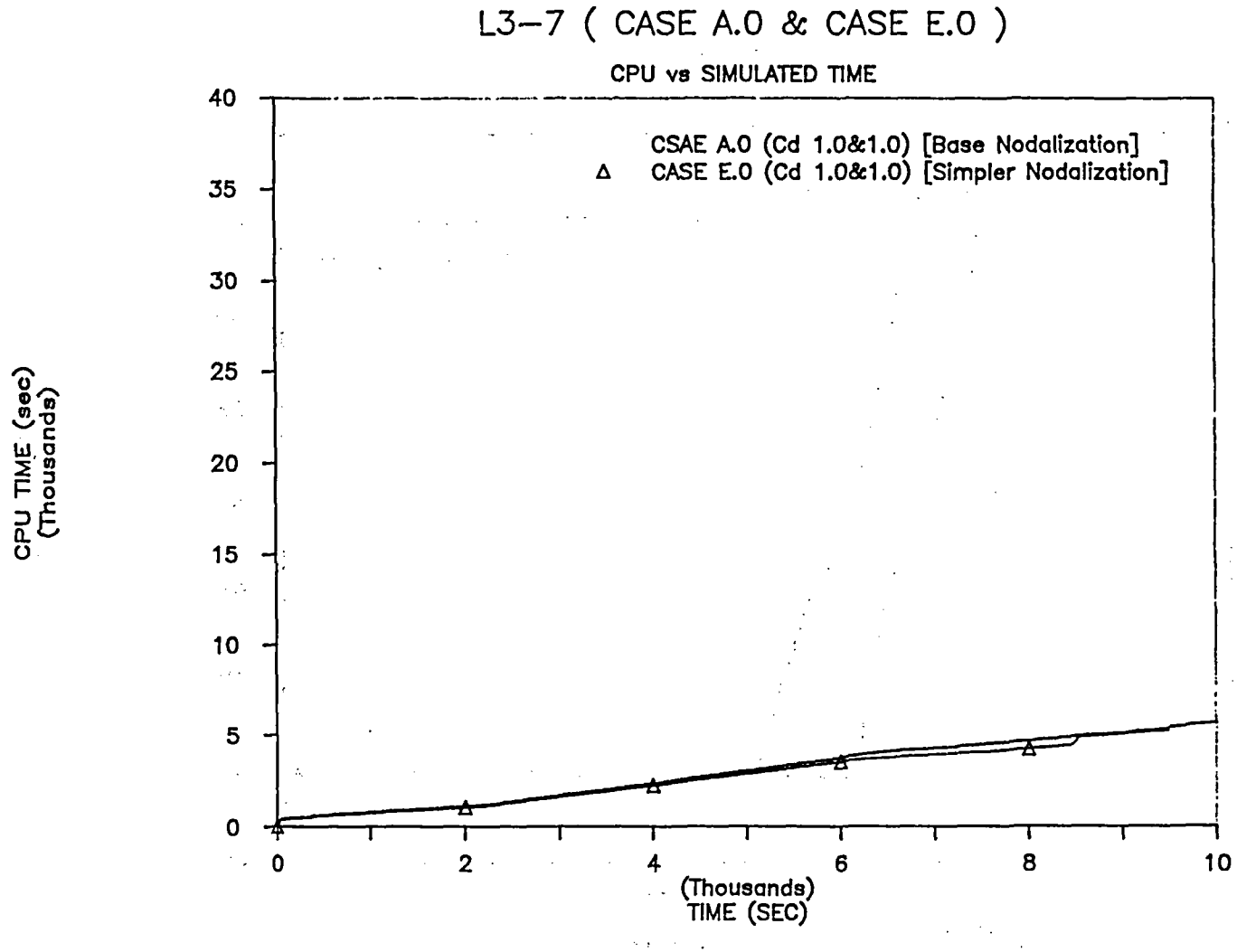

Figure B.V.10 The effect of simpler nodalization on CPU vs. simulated time

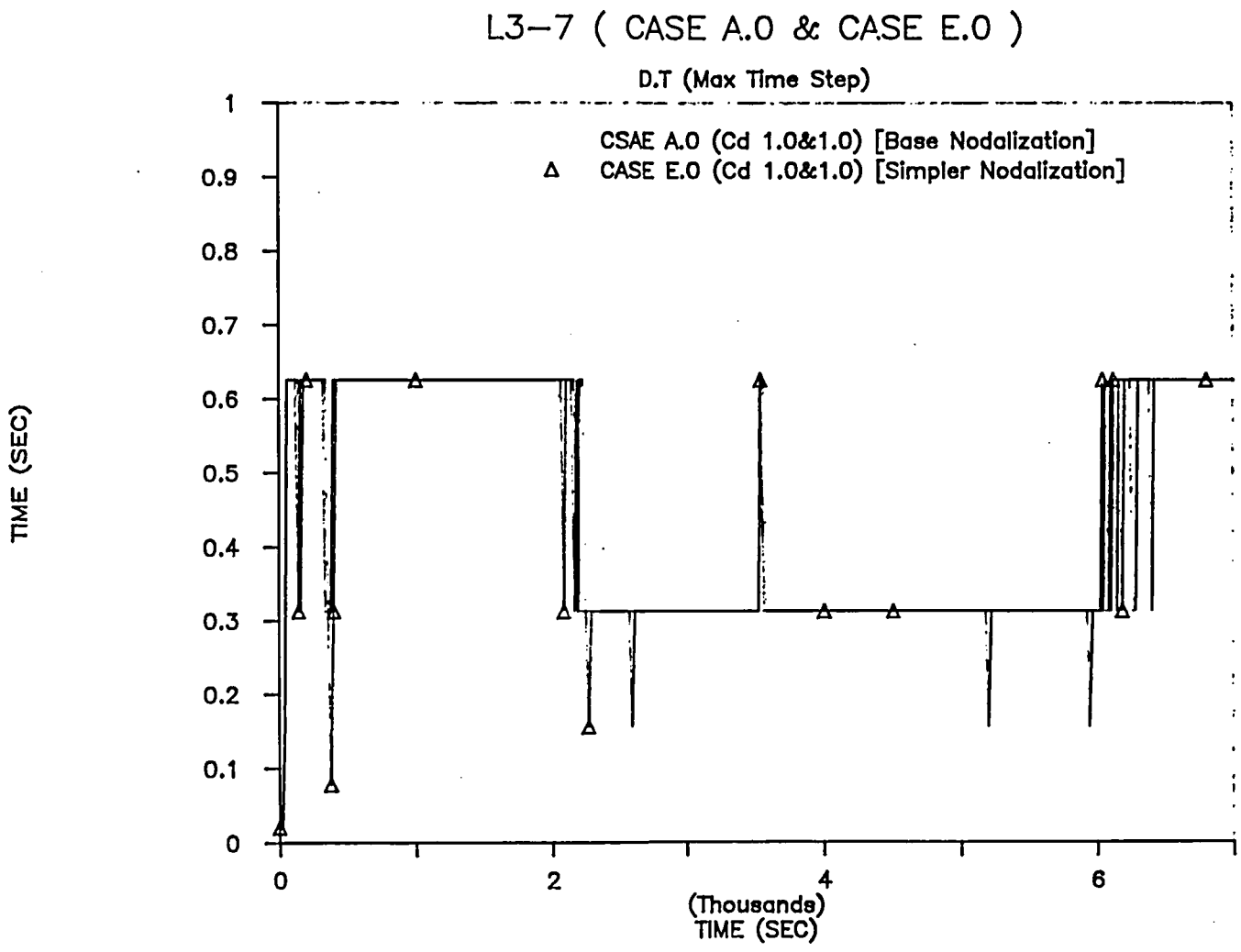

Figure B.V.11 The effect of simpler nodalization on DT vs. simulated time

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

The LOFT small break (1 in-dia) experiment L3-7 has been analyzed using the reactor thermal hydraulic analysis code RELAP5/MOD2, Cycle 36.05.

The base calculation (Case A) was completed and compared with the experimental data. Three types of sensitivity studies (Cases B, C and D) were carried out to investigate the effects of (1) break discharge coefficient Cd, (2) pump two-phase difference multiplier and (3) High Pressure Injection System (HPIS) capacity on major thermal and hydraulic (T/H) parameters. A nodalization study (Case E) was conducted to assess the Phenomena with a simplified nodalization.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

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