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International Agreement Report

Assessment of RELAP5/MOD2, Cycle 36.04 Against LOFT Small Break Experiment L3-6

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Office of Nuclear Regulatory Research
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Prepared as part of
The Agreement on Research Participation and Technical Exchange
under the International Thermal-Hydraulic Code Assessment
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ICAP
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ABSTRACT

The LOFT small break experiment L3-6 has been analyzed as part of Sweden's contribution to the International Thermal-Hydraulic Code Assessment and Applications Program (ICAP).

Three calculations, of which two were sensitivity studies, were carried out. The following quantities were varied:

- the content of secondary side fluid and the feed water valve closure
- the two-phase characteristics of the main pumps

All three predictions agreed reasonably well with most of the measured data. The sensitivity calculations resulted only in marginal improvements.

The predicted and measured data are compared on plots and their differences are quantified over intervals in real time.

Approved by Eric Hellstrand

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1 INTRODUCTION

An International Thermal-Hydraulic Code Assessment and Applications Program (ICAP) is at present being conducted by several countries under the auspices of the USNRC (Ref 1). The goal of the program is to make quantitative statements regarding the prediction capabilities of current best-estimate thermal-hydraulic computer codes. Such codes have been used for many years as state-of-the-art instruments to study and verify numerical and correlative computational models with experimental results. Some of these codes have reached a high degree of sophistication. They include models for all processes which are essential to thermal-hydraulic scenarios in the nuclear power reactor application. So far, however, these codes have not achieved status as reactor licensing tools, i.e. they do not fulfil the Appendix K rules (Ref 2), although they are often applied to other calculations. The present ICAP aims to quantify uncertainties in the codes so that the codes may be used for licensing purposes.

Sweden's contributions to ICAP encompass assessment calculations using the two thermal-hydraulic codes TRAC-PF1/MOD1 (Ref 3) and RELAP5/MOD2 (Ref 4). The work is conducted by Studsvik Energiteknik AB and is sponsored by the Swedish Nuclear Power Inspectorate.

A brief description of the LOFT test facility and the L3-6 experiment is given in Chapter 2. In Chapter 3 the model and procedures used in the calculations are discussed. The base case and sensitivity predictions are discussed and compared in Chapters 4 and 5 and in the plots, Appendix B. The run statistics is presented in Chapter 6 and Appendix C. Chapter 7 gives some conclusions from the code assessment. The input listings of the calculations are collected in Appendix A.

A data package on tape containing input files and predicted data has been produced. The content is described in Appendix D. A copy of this tape is submitted to USNRC as a part of the ICAP agreement.

2 FACILITY AND TEST DESCRIPTION

The LOFT-experiment series L3 was intended to provide large-scale blowdown system data for PWR small break transients. To the Swedish ICAP contribution two experiments of the L3 series were assigned. In the experiment LOFT L3-5, treated earlier in Ref 15, the main circulation pumps were stopped shortly after the break had been opened. In the experiment, LOFT L3-6, treated in this report, the pumps were allowed to operate at normal speed throughout the test in order to provide data for analyzing the differences in the two-phase scenarios between the two tests. Apart from the difference in pump operational mode the two experiments were nominally identical.

This chapter shall briefly describe the test facility, the L3-6 experiment, the assessment parameters used and some aspects of the measurement uncertainties.

2.1 Test Facility

The objective of the LOFT experiments was to demonstrate thermal-hydraulic phenomena which might occur in commercial PWR systems during abnormal situations. The facility is capable of performing a variety of operational transients and LOCAs. Brief descriptions of LOFT are given in a number of experiment reports such as Ref 5. The most thorough description is provided by Reeder (Ref 6). Only particular design features and characteristics relevant to the L3-6 experiment will be discussed in the following sections.

A general view of LOFT is shown in Figure 1. In the L3-6 small break experiment the two isolation valves on the broken loop legs were closed so as to prevent the passage of fluid via the header to the suppression vessel.

The break was simulated by a 205.9 mm^2 orifice in a T-branch line from the intact loop cold leg near the reactor vessel. The aim of the break configuration was to simulate an equally placed 4-in diameter small break on a four-loop 1000 MW(e) PWR.

During the L3-6 experiment the only primary coolant injection was carried out by the HPIS into the reactor vessel downcomer. The experiment was terminated before the LPIS pressure set point was reached.

2.2 The Experiment

After approximately 99 h of nuclear heating the initial conditions listed in Table 1 were obtained. The sequence of events which occurred during this experiment is listed in Table 2. Main imposed actions during the experiment were:

a. At the time of reactor scram (which for safety reasons had to be verified before the break) the steam generator feed water and steam line valves started to close.

b. LOCA initiated 5.8 s after the scram.

c. The HPIS injection started at 13.2 MPa.

d. The steam generator auxiliary feed was initiated and terminated manually.

2.3 Assessment Parameters

The selection of the appropriate assessment parameters for the LOFT L3-6 experiment, Table 3, followed the recommendations of the ICAP Guidelines (Ref 1). The selection was made during the input preparation since a number of expanded Edit/Plot variables from RELAP5/MOD2 calculations are not available from the restart file but must be collected as control variables.

In some cases liquid level data are compared as pressure differences. For the upper plenum and downcomer levels only bubble plot data shown in Ref 5 were available. These plots were converted into slightly smoothed elevation histories. Due to ambiguous plot data the resulting level behaviour is rather uncertain (Plots B.15 and B.16).

The early break flow was not qualified by the experiment until 50 s after the break, and showed rather large errors during the remainder of the transient. Predictions of mass inventory obtained through flow integration were therefore not carried out. For the energy balance, the steam generator heat transfer was not known, and could not be estimated by the steam produced.

2.4 Measurement Uncertainty

The experiment instrumentation involves a variety of transducers which may have different accuracies for the same kinds of quantities (Refs 5, 6). Table 4 is a summary of the accuracies of the measured quantities.

2.5 Experimental Data Preparation

The preparation of the experimental data for plotting and uncertainty analysis required several steps of manipulation of the information. First of all, the data were copied from the original blocked tape files to the CDC standard display code.

A program, LOFTDEC, was developed to sort out the keyword and channel information to be used in the assessment work. The program also decimated the channel data by averaging over time intervals so that information was copied to an intermediate channel information file only every 2nd second up to 200 s after the break, and then every 5th second.

A program, R5SILFT, was developed to select data for desired channels from the intermediate data file. These data were transformed into a new file with the same format as a RELAP5 restart file. Experimental and predicted data could later on be similarly used in plotting and assessment.

3 CODE AND MODEL DESCRIPTION

The assessment calculations with RELAP5/MOD2 for the LOFT L3-6 experiment were carried out using the cycle 36.04 code version. The code was implemented in June 1986 on a CDC 170-810 computer. The calculational model was based on available LOFT input files and listings, among those the L3-5 input (Ref 15). A number of geometrical model features were introduced as a result of findings in the L3-6 experiment.

3.1 Code Features

The descriptive document available for the RELAP5/MOD2 code is a rather detailed code manual (Ref 4). The main characteristics of the code are summarised in Table 5. A new feature of RELAP5/MOD2 is the cross junction which, according to code manual recommendations, was applied at the steam separator upstream volume and at the hot leg and cold leg vessel junctions.

3.2 Input Model

The preparation of the LOFT L3-6 input proceeded from an input of the closely similar L3-5 experiment which had earlier been assessed for ICAP (Ref 15). In its turn this input had been set up from a LOFT fast transient input and with additional updates from other available input listings (Refs 7, 8, 9).

Changes introduced for the L3-6 calculations, compared with those of the L3-5 case, include new initial conditions, other trip times and a continuous operation of the main recirculation pumps. However, some changes in the calculation model are due to experiences gained during the L3-5 assessment. Reasons for particular approaches used in the calculation model are presented below. Figure 2 shows the nodalization used. The input files are given in Appendix A.

3.2.1 Initial system pressure

To avoid an explicit steady-state pressurizer pressure and level control, the surge line junction was modeled as a trip valve which was closed until scram. The pressurizer initial conditions were satisfied with the correct fluid content and saturated water. Pressurizer heat structures were modeled with the outer surface at saturation temperature until scram and then at room temperature.

A time dependent volume was connected to the pressurizer surge line by a trip valve adjacent to the pressurizer bottom in order to maintain the initial primary pressure constant during the steady state calculation. During steady state the pressurizer was isolated from the surge line. The pressure of the time dependent volume was equal that of the pressurizer bottom volume. At scram the trip valve closed at the same time as the pressurizer isolation ceased.

3.2.2 Primary fluid temperatures

The measured temperatures of the coolant circulating through the core and the steam generator show considerable variations from the standpoint of heat balance. This is particularly the case in the vessel downstream of the core. The same situation was also noticed during the L3-5 assessment (Ref 5). However, the L3-6 measurements of 577.1 K in the hot leg and 557.9 K in the cold leg fulfil the conservation of energy and are consequently accepted for the steady state. In the calculation the primary fluid temperatures are controlled through the steam generator operation and feed water temperature, see Section 3.2.7.

3.2.3 Core flow bypass

Several core bypass flows exist. Two of these (Ref 7) were modelled by servo valves adjusted for the correct flows until scram:

- the inlet annulus to upper plenum with 6.6 % of primary loop flow
- the lower plenum to upper plenum with 3.6 % of primary loop flow
- the reflood assist bypass valve leakage with 1.3 % of primary loop flows.

The leakage from the vessel cold leg inlet annulus to the upper plenum is caused by a flow path in the narrow gap between the filler blocks and the vessel wall. This leakage has a vertical extension equal to the cold leg nozzle diameter. To achieve a more realistic description in the case of stratification the leakage has been divided into two flow path junctions. One low path connects the volumes below the inlet and outlet at their upper ends, junction 297 in Figure 2. Similarly, the higher level volumes are connected at their bottom ends by a second junction, junction 296. This second leakage junction will preferrably bypass steam in the case of void thus promoting a reduced leakage pressure difference.

3.2.4 Environmental heat losses

The exchange of heat with structure material is important in small break analysis. Since the initial input had only restricted material included, structures had to be added to the input. The bulk structures of the facility were modeled to represent the correct structural masses.

RELAP5/MOD2 does not facilitate an exterior surface heat transfer control during calculation. An environmental heat transfer coefficient had to be found by test calculations to obtain approximately the total heat loss of 250 kW as found in the experiment (Ref 7).

3.2.5 Break discharge coefficient

Test calculations show a too rapid decrease in the pressurizer inventory when the default subcooled discharge coetticient of unity was used. Applying a coefficient ot .85 the rates of emptying the pressurizer and of the early system depressurization turned out close to the experimental values. The assumption that the pressurizer emptying rate is an indicator of the break discharge flow is only applicable for a low flow pressure drop in the surge line as it occurs in small break experiments. The pressurizer level during the emptying period is shown on Plot B.54.

3.2.6 Pump model

The main circulation pumps were allowed to run at the constant initial speed during the L3-6 transient. The pump characteristics applied in the previous L3-5 calculation, which originated from an early LOFT base input (Ref 16), were also applied in the first two calculations, whereas modified two-phase characteristics were applied in the last calculation, Case C.

3.2.7 Steam generator

A RELAP5/MOD2 separator component is contained in the steam generator, see Figure 2 volume 520. The vapor outlet space above that volume is divided into two parallel and vertical volumes according to the recommendations of the code manual (Ref 4). Of these the one with the larger cross section area, volume 525, receives the steam from the separator component. This volume is connected by a cross-junction to the parallel volume 526, which has a smaller cross section area and which formally represents the downcomer top.

The steam generator initial conditions were established by using auxiliary components for the control of

- dome pressure
- downcomer water level
- rate of feedwater and steam mass flows
- recirculation ratio
- feedwater internal energy.

The dome pressure was controlled by a time dependent volume at the correct pressure and connected by an open junction to the steam dome. The downcomer level was regulated by the direction and flow rate through a time dependent junction connecting a time dependent volume with saturated water.

The initial feedwater mass flow rate, 27.8 kg/s, was obtained by using a time dependent junction. Moreover, the internal energy of the fluid in the time dependent volume, which delivers the feed water, was regulated by the steam flow generation rate which in its turn must be equal to the feedwater flow rate.

The initial main steam mass flow rate being equal to the feedwater mass flow rate is controlled by a time dependent junction. The flow rate during the valve closure, which starts at scram, is obtained from the valve characteristics (Ref 6) and a valve stem closure rate of 5 % per second. The reason for using this model is the simplicity by which the closed valve leakage can be calculated. Condie et al (Ref 7) estimated this leakage to be .120 kg/s at 4.5 MPa in the L3-6 experiment. At other pressures a linear dependence is assumed.

Uninitionally the steam valve partly let steam through from 89 s to 99 s after the break. The flow rate during this time interval was assumed to be correct by adjusting the steam lift so that a pressure drop rate close to the measured one (see Plot B.51) was found. The steam mass flow was during these 10 seconds only a few per cent of that for a fully opened valve.

The junction 516, Figure 2, at the bottom of the downcomer is modelled as a regulated valve to achieve an initial recirculation ratio of 4.7.

4 THE BASE CASE CALCULATION

The base case (Case A) calculation could be carried without any urgent code problems. Thus a very limited computation mass error, Plot B.62, was saved up by the code. Still, however, the computation CPU time required was very extensive, Plot B.61, as a consequence of time step transport limit caused by the continuous main pump operation. Thus one separate calculation consumed about 18 h CPU time on a Cyber 170-810.

The system heat balance was initially dominated by the reactor power, Plot B.2, which was mainly carried over to the steam generator secondary, Plot B.53. The predicted initial heat loss to the environments, was 260 kW, which is close to the 250 kW estimated in the experiment (Ref 7).

The heat generated in the core after scram was determinated by the space independent reactor kinetics option of the code. The predicted decay heat, Plot B.2, compares well with the decay heat curve given in Ref 5.

The mass flow rates predicted in the hot leg, Plot B.25, and at the core inlet, Plot B.11, show a smooth decrease during the transient which is mainly a result of the decrease of the fluid density. Unfortunately no internal flow rates in the experiment are qualified for comparisons after the break opened.

The predicted break mass flow rate, Plot B.39, is within the uncertainty band of the measured flow rate from 100 s on, see Ref 5. The experimental flow rate is qualified from 50 s. In the interval from 50 s to 100 s after the break the predicted break mass flow rate is apparently overestimated, however, some doubt may also be put on the experimental flow rate. During this time interval there is good agreement between the predicted break fluid density and the chordal density measurement, Plot B.38. Whereas the break fluid subcooled period ends at 44 s in the experiment, it is predicted to occur much later, at about 200 s, in the calculation, Table 2.

The behaviour of the main recirculation pumps is showing up in the pressure head, Plot B.36. An obvious cavitation in the experiment occurs at 290 s at which time also the loop seal becomes filled with water, Plot B.31, and the steam generator pressure difference, Plot B.46, rapidly diminishes (Ref 12). In addition effects from the cavitation in the experiment can be seen in the pump speed, Plot B.37, in the cold leg fluid density, Plot B.28, and in the break fluid density, Plot B.38. A pump cavitation is not predicted at the time it occurred in the experiment. On the other hand the prediction shows an earlier pump head loss when the two-phase fluid starts to appear in the suction line, Plot B.36.

The primary side depressurization, as in the hot leg, Plot B.27, is sligthly underpredicted from 300 s on. Pressures at high elevations, Plots B.21 and B.57, compare similarly. System pressures at low elevations as in the lower plenum, Plot B.22, and also in the cold legs, Plots B.34 and B.35, are still more underpredicted. As seen, there might be a systematic error in the prediction. However, the discrepancies are within the measurement errors, Table 4.

After the fast depressurization has ceased the primary fluid temperatures remain close to the saturation temperature, Plots B.9, B.17, B.18, B.20, B.26, B.33 and B.44. Minor deviations from this situation are due to errors in the measured temperatures, Table 4, and by the HPIS coolant injection.

As for the pressure, the predicted underestimate of primary temperatures for the rods, Plots B.3 through B.8, and for the fluid, Plots B.9, B.17, B.18, B.20, B.26, B.33, B.41 and B.44, increase in time. A possible reason for that is the uncertainty, 15 % up to 1 435 s, in the measured break flow and consequently also in the primary enthalphy content.

There is one plainly seen inconsistency in the secondary side prediction of Case A. The downcomer collapsed level, Plot B.49, falls about .6 m too low until the level starts to recover due to the injected auxilliary feedwater. This early level error, which corresponds to about 150 kg of fluid mass, then remains during all the transient. Secondly, too fast a depressurization particularly at the end of the transient is predicted, Plot B.51. Similar predicted pressure behaviours were obtained by the participants of the ISP11 (Ref 13) which also dealt with the L3-6 experiment. Consequently there are reasons to assume some inadequacy to be found in the commonly used steam generator models.

Several causes for the low fluid content may be suggested, including errors in the feedwater valve operation timing and the steam valve leakage. The void distribution in the boiling section may be wrong due to the geometric model used. Moreover, a non-negligible amount of water droplets may initially reside in the dome space above the fluid level of the steam separator volume.

The predicted pressurizer fluid temperatures in the liquid space, Plot B.55, and in the vapor space, Plot B.56, show substantial deviations from the experiment. In the liquid space the computed water temperature, close to the saturation line, was compared with apperently superheated steam sensed in the experiment. The computed steam superheating, Plot B.56, was not large enough. An other possible explanation, would be some direct influence from the pressurizer vessel wall in the experiment.

5 SENSITIVITY CALCULATIONS

The base case prediction displayed some deviations from the experiment which provide arguments for the sensitivity studies. A fluid temperature and system pressure decrease faster than in the experiment is in the first place assumed to be a consequence of the steam generator behaviour or simply of the choice of break discharge coefficient. In the Case B predictions the steam generator model is changed. The sudden pump cavitation in the experiment was not predicted. Consequently one calculation, Case C, applied other pump characteristics.

5.1 Case B

Steam generators are supposed to act as the dominant heat sinks during small break transients. However, the 4-in. diameter equivalent L3-6 experiment shows an substantial depletion of coolant through the break so the steam generators become less important as heat sinks, ref 5. Actually the steam generator heat transfer rate, Plot B.53, compared with the break energy release, Plot B.40, and the structure heat losses, Plot B.2, confirms that. Thus, the behaviour of the steam generator will be of less importance for the primary side cooling.

The steam generator design, Figure 3, exhibits a package of U-tubes which are supported by horizontal plates at equidistant heights. These plates have possibly been understood to be inpenetratable for fluid thus bringing the geometry found in the Case A input. Then the boiler flow is forced to a zigzaged flow path directed by the plates. In reality the tube support plates are ported to permit penetration of steam and water (Ref 6).

Consequently the boiling section flow was directed vertically in the Case B calculations. A more efficient void rise indeed increased the initial fluid mass by 90 kg. Further division of the boiler flow into two parallel paths, one with the ascending primary flow and one with the descending flow, added another 50 kg initial fluid mass. Although the changes in the boiler geometry increased the amount of initial water a lot, it accounted only for part of the fluid mass missing in the Case A calculation. According to Plot B.49 the discrepancy in liquid level between prediction and experiment increased with time in Case B contrary to Case A.

The transport time from the feedwater inlet to the downcomer bottom is quite short in the initial state. The liquid temperature at the downcomer bottom, Plot B.50, indicates that the feedwater valve closure starts later than at the scram. Consequently in the Case B calculation a feedwater valve closure starting at the HPIS trip signal was additionally applied. As a result another 70 kg of water was added to the fluid mass, Plot B.49.

5.2 Case C

The previous two calculations predicted from 300 s on a slightly faster decrease in primary system pressure and in fluid temperature than measured. On the other hand were fluid densities, Plots B.23, B.24, B.28, B.29, B.30 and B.38, reasonably well predicted. Discrepancies from the experiment starting at 290 s are more evident in the loop seal liquid level, Plot B.31, and in the downcomer liquid level, Plot B.15, as the pumps start to cavitate, Plot B.36. Obviously, the accumulation of water in low elevation areas of the loop starts with the cavitation. This is the time at which the discrepancy in the depressurization rate starts off.

The two-phase pump head, Plot B.36, was underpredicted in the Cases A and B. Chen (Ref 12) and Modro and Chen (Ref 14) found less degradation for mainly all void fractions compared with the pump characteristics of the LOFT base case input (Ref 16) so far assumed. Because of that the same pump data as those used by Grush et al. (Ref 8) were applied in the sensitivity calculation Case C. These data had been obtained from Chen's and Modros' works. In Case C also the updates of Case B were included.

The new two-phase pump characteristics resulted in a better prediction of the pump head, Plots B.36 and B.46. At the time of the pump cavitation, at 290 s, a rapid head loss appeared in Case C too. However, as before in the Cases A and B, the pump head turned out underpredicted during almost all the transient. In the same way the liquid levels in the downcomer, Plot B.15, and in the loop seal, Plot B.31, did not show any better agreement with the experiment.

6 RUN STATISTICS

The input model for the base case RELAP5/MOD2 calculation for LOFT L3-5 encompassed:

113	volumes
122	junctions
99	heat structures

The volumes include two pump components, one separator component and nine time dependent volumes of which three were involved for the steady state. Among the junctions there are totally five valve components and four time dependent junctions which are connected during steady state.

During the transient calculation the following resources were used:

computer time	CPU = 58 675 s
number of time steps	DT = 36 920
number of volumes	C = 113
transient real time	RT = 2 150 s

resulting in the following code efficiency factor (Ref 1)

$$\frac{CPU * 10^3}{C * DT} = 14.06$$

The computer used was a Cyber 170-810.

7 CONCLUSIONS

The LOFT L3-6 small break experiment has been calculated using the RELAP5/MOD2 code as part of Sweden's contribution to ICAP. The results from the three calculations done compare reasonably well with most of the experimental data. None of the sensitivity calculations has the capacity of considerably increasing the prediction quality. Consequently all three calculations show mostly rather similar curves jointly away from the measurements. Some more calculations had been desirable but could not be afforded.

The steady state calculation was done in the common way of applying auxiliary components and regulators to speed up and stabilize. Acceptance of a steady state followed when all the auxiliaries had lost importance for the subsequent calculations. Of a particular significance was the temperature regulation of the feedwater to achieve the correct steam generation rate.

One sensitivity calculation, Case B, addressed the question of why initial secondary side fluid content had been considerably underestimated in the base case calculation. The two updates of a vertical boiler flow and ot a delayed feed water valve closure were not capable to fully rise the low downcomer liquid level up to the measured value. Actually, the reason for the low predicted fluid content of the secondary side was not fully understood.

The other sensitivity calculation, Case C, focused on the behaviour of the main recirculation pumps which were allowed to run at a constant speed during the experiment. Updates in the two-phase characteristics improved the prediction of the pump head in the crucial degradation region. However, no other substantial improvements obviously turned out from this calculation.

The RELAP5/MOD2 code worked well during the calculations. The computer resources, made available by the Swedish Nuclear Power Inspectorate, were quite extensive for this assessment test case.

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Table 1

Initial conditions.

Quantity		Measured	Predicted Case A	Case B	Case C
Primary coolant system					
Mass flow rate	(kg/s)	483.3	483.3	483.3	483.3
Hot leg pressure	(MPa)	14.87	14.88	14.88	14.88
Cold leg temperature	(K)	557.9	559.7	560.4	560.4
Hot leg temperature	(K)	577.1	578.6	579.3	579.4
Reactor vessel					
Power level	(MW)	50.	50.	50.	50.
Pressurizer					
Water temperature	(K)	614.7	614.8	614.8	614.8
Pressure	(MPa)	14.90	14.90	14.90	14.90
Liquid level	(m)	1.18	1.18	1.18	1.18
Broken loop					
Cold leg temperature	(K)	557.6	559.6	560.6	560.6
Hot leg temperature	(K)	561.4	557.8	556.1	556.1
SG secondary side					
Water level	(m)	0.22	0.22	0.22	0.22
Water temperature	(K)	542.8	534.4	536.0	535.9
Pressure	(MPa)	5.57	5.57	5.57	5.57
Mass flow rate	(kg/s)	27.8	27.8	27.8	27.8

Table 2

Sequence of events.

Event	Time (s) Imposed action	System reaction	Predicted Case A	Case B	Case C
Reactor scrammed	-5.8		-5.8	-5.8	-5.8
LOCA initiated	0.		0.	0.	0.
HPIS injection initiated		3.6	2.3	2.6	2.6
Prssurizer emptied		20.2	25.4	25.4	25.4
Upper plenum reached saturation		28.5	40.	40.	40.
Intact loop hot leg voiding begin		29.4	38.7	38.9	39.1
Intact loop cold leg voidin begin		31.4	35.	35.	35.
End of subcooled break flow		44.2	91.6	91.6	91.6
SCS auxiliary feed initiated	73.4		73.4	73.4	73.4
SCS pressure exceeds primary pressure		930.	1925.	1720.	1740.
SCS auxiliary feed terminated	1856.		1856.	1856.	1856.

Table 3

Parameters plotted and used in assessment comparisons.

COMPONENT	CONTINOUS PARAMETER *	EXPERIMENT (IDENTIFIER)	PREDICTION (MINOR EDIT)	PLOT IDENTIF. EXP.	CALC.	PLOT NO.
CORE	FLUID DENSITY (INLET)	**	CNTRLVAR 901		C 1?	B. 1
	HEATING POWER	**	RKTPOW 0		C 2?	B. 2
	CLAD TEMPERATURE, VOLUME 1 (BOTTOM)	TE-2G14-011 TE-5G6-011 TE-5I6-005	CNTRLVAR 903	C 3X	C 3?	B. 3
	- " - , VOLUME 2	TE-1F7-015 TE-1F7-021 TE-2G08-021 TE-4I14-021 TE-5F4-015 TE-5I6-021	CNTRLVAR 903	C 4X	C 4?	B. 4
	- " - , VOLUME 3	TE-1F7-026 TE-1F7-030 TE-2G14-030 TE-2H02-032 TE-4H14-028 TE-4H14-032 TE-5H7-026	CNTRLVAR 905	C 5X	C 5?	B. 5
	- " - , VOLUME 4	TE-2G08-039 TE-2H01-037 TE-3C11-039 TE-4I14-039 TE-5H6-037	CNTLRVAR 906	C 6X	C 6?	B. 6
	- " - , VOLUME 5	TE-2G14-045 TE-4G14-045 TE-5F9-045 TE-5G6-045 TE-5H5-049	CNTRLVAR 907	C 7X	C 7?	B. 7
	- " - , VOLUME 6 (TOP)	TE-5H7-058 TE-5G6-062	CNTRLVAR 908	C 8X	C 8?	B. 8
	TEMPERTURE (OUTLET)	TE-1UP-001 TE-5UP-001 TE-5UP-003	CNTRLVAR 909	C 9X	C 9?	B. 9
	TEMP. DIFF. (OUTLET-INLET)	TE-1UP-001 - TE-1LP-001	CNTRLVAR 910	C AX	C A?	B.10
	CORE FLOW (INLET)	**	MFLOWJ 225.01		C B?	B.11
	CORE INVENTORY	PDE-RV-002 **	CNTRLVAR 912		C C?	B.12
VESSEL	DOWNCOMER MASS INVENTORY	PDE-RV-003 **	CNTRLVAR 913		V 1?	B.13
	MASS INVENTORY (TOTAL VESSEL)	**	CNTRLVAR 914		V 2?	B.14
	DOWNCOMER LIQUID LEVEL	LE-1ST-001 ***	CNTRLVAR 915	V 3X	V 3?	B.15
	UPPER PLENUM LIQUID LEVEL	LE-3UP-001 ***	CNTRLVAR 916	V 4X	V 4?	B.16
	DOWNCOMER TEMPERATURE (INLET)	TE-1ST-001 TE-2ST-001	TEMPF 205	V 5X	V 5?	B.17
	UPPER PLENUM TEMPERATURE	TE-1UP-001 TE-4UP-001 TE-5UP-001	TEMPF 240	V 6X	V 6?	B.18
	UPPER PLENUM FLUID SUBCOOLING	SC-5UP-102	CNTRLVAR 919	V 7X	V 7?	B.19
	LOWER PLENUM TEMPERATURE	TE-1LP-001	TEMPF 225	V 8X	V 8?	B.20
	UPPER PLENUM PRESSURE	PE-1UP-001A1	P 245	V 9X	V 9?	B.21
	LOWER PLENUM PRESSURE	PE-1ST-001A PE-2ST-001A	P 225	V AX	V A?	B.22
HOT LEG	FLUID DENSITY (I.L.)	DE-PC-205 ** DE-PC-002A DE-PC-002B ** DE-PC-002C **	RHO 105	HL1X	HL1?	B.23
	FLUID DENSITY (B.L.)	DE-BL-002B	RHO 305	HL2X	HL2?	B.24
	MASS FLOW RATE	FT-P139-27-1 ** FT-P139-27-2 ** FT-P139-27-3 **	MFLOWJ 110		HL3?	B.25
	TEMPERATURE (I.L.)	TE-PC-002B	TEMPF 105	HL4X	HL4?	B.26
	PRESSURE (I.L.)	PE-PC-002	P 105	HL5X	HL5?	B.27

Table 3 (cont'd)

COLD LEG	FLUID DENSITY (I.L)	DE-PC-115 ** DE-PC-001A DE-PC-001B DE-PC-001C **	RHO 185	CL1X	CL1?	B.28
	FLUID DENSITY (I.L. PUMP SUCTION)	DE-PC-305 /DE-PC-003A/ /DE-PC-003B/ /DE-PC-003C/	RHO 115.13	CL2X	CL2?	B.29
	FLUID DENSITY (B.L.)	DE-BL-105 ** DE-BL-001A DE-BL-001B DE-BL-001C **	RHO 345	CL3X	CL3?	B.30
	LIQUID LEVEL (I.L. LOOP SEAL)	LEPDE-PC-028	CNTRLVAR 931	CL4X	CL4?	B.31
	- " - (B.L.)	LEPDE-BL-014 **	CNTRLVAR 932		CL5?	B.32
	TEMPERATURE (I.L. NEAR VESSEL)	TE-PC-004	TEMPF 185	CL6X	CL6?	B.33
	PRESSURE (I.L.)	PE-PC-005	P 120	CL7X	CL7?	B.34
	- " - (B.L.)	PE-BL-001	P 345	CL8X	CL8?	B.35
	PRESS. DIFF. (ACROSS THE PUMPS)	PDE-PC-001	CNTRLVAR 936	CL9X	CL9?	B.36
	PUMP SPEED (PUMP 1)	RPE-PC-001	PMPVEL 135	CLAX	CLA?	B.37
BREAK	FLUID DENSITY	DE-PC-S02A	RHO 800	BR1X	BR1?	B.38
	MASS FLOW RATE	FR-PC-SBRK	MFLOWJ 805	BR2X	BR2?	B.39
	ENERGY RELEASE	**	CNTRLVAR 940		BR3?	B.40
	INLET TEMPERATURE	TE-PC-S01C	TEMPF 800	BR4X	BR4?	B.41
	INLET SUBCOOLING	ST-PC-S101 - TE-PC-S01C	CNTRLVAR 942	BR5X	BR5?	B.42
	INLET PRESSURE	PE-PC-S01	P 800	BR6X	BR6?	B.43
SG PRI. SIDE	TEMPERATURE (INLET)	TE-SG-001	TEMPF 115.03	SP1X	SP1?	B.44
	TEMP. DIFF. (INLET-OUTLET)	TE-SG-001 - TE-SG-002	CNTRLVAR 945	SP2X	SP2?	B.45
	PRESSURE DIFF.	PDE-PC-002	CNTRLVAR 946	SP3X	SP3?	B.46
SG SEC. SIDE	FLUID DENSITY	**	RHO 515.03		SS1?	B.47
	MASS FLOW RATE	**	MFLOWJ 516		SS2?	B.48
	LIQUID LEVEL	LD-P004-008B	CNTRLVAR 949	SS3X	SS3?	B.49
	LIQUID TEMPERATURE	TE-SG-003	TEMPF 515.03	SS4X	SS4?	B.50
	PRESSURE	PE-SGS-001	P 530.01	SS5X	SS5?	B.51
SG	PRIMARY-SECONDARY TEMP.-DIFF. (AT INLET)	TE-SG-001 - TE-SG-003	CNTRLVAR 952	S 1X	S 1?	B.52
	HEAT TRANSFER RATE	**	CNTRLVAR 953		S 2?	B.53
PRESSURIZER	LIQUID LEVEL	LT-P139-006	CNTRLVAR 954	P 1X	P 1?	B.54
	LIQUID TEMPERATURE	TE-P139-020	TEMPF 415.02	P 2X	P 2?	B.55
	STEAM TEMPERATURE	TE-P139-019	TEMPG 415.07	P 3X	P 3?	B.56
	PRESSURE	PE-PC-004	P 415.08	P 4X	P 4?	B.57
ECCS	HPIS VOLYMETRIC FLOW RATE	FT-P128-104	CNTRLVAR 958	EC1X	EC1?	B.58
SYSTEM	MASS BALANCE		CNTRLVAR 959		SY1?	B.59
	COOLANT EGY. BALANCE (INTEGR.)	**	CNTRLVAR 960		SY2?	B.60
	PRIM. EXTERNALS HEATFLOW	**	CNTRLVAR 982		SY3?	B. 2
RELAP5	COMPUTATION CPU TIME	**	CPUTIME 0		R 1?	B.61
	COMPUTATION MASS ERROR	**	EMASS 0		R 2?	B.62

* THE COMPARISON PARAMETERS ARE THOSE REPORTED AS DIRECTLY MEASURED OR AS COMPUTED RESULTS FROM THE EXPERIMENT

** NO DATA AVAILABEL FROM THE EXPERIMENT

*** DATA OBTAINED FROM BUBBLE PLOT IN EXPERIMENT REPORT

/ / EXPERIMENT DATA AVAILABLE BUT NOT USED IN COMPARISONS

? CALCULATION CASE (A, B OR C)

Table 4

Measurement errors

Quality	Uncertainty	Comment
Pressure	251-282 kPa	Primary side
	120 kPa	Secondary side
Fluid temp	2.7-3.1 K	Mostly
	.5 K	TE-P139-019, steam
	5.9 K	TE-SG-001, TE-SG-002
	10.4 K	TE-PC-004
Fluid density	78-82 kg/m^3	Many measure
	129-131 kg/m^3	DE-BL-001A, DE-BL-001C DE-PC-002B, DE-PC-002C
Cladding temp	3.1-3.2 K	All
Diff Pressure	.49 k Pa	PDE-RV-003
	1. kPa	PDE-PC-002
	1.3 kPa	PDE-RV-002
	1.8 kPa	PDE-PC-001
Mass flow	.02 L/s	HPIS
	6.3 kg/s	I.L. init condition
	17 kg/s	I.L. hot leg
	25 percent	Break, 40-750 s
	1 kg/s	Break, 750-2100 s
Liq level	.04 m	Pressurizer
	.05 m	SG secondary
	.099-.137 m	Cold legs
	Bubble plot	Upper plen, downcomer
Speed	1.22 rad/s	Main recirc pumps

Table 5

RELAP5/MOD2 code features.

COMPUTATION PROCESSING FEATURES

- Several problem type and execution control options as
    a. steady state initialisation using fictitious structure heat capacities for faster convergence
    b. transient calculation
    c. strip type execution, to select requested parameters from a restart file
    d. trip system, to decide on actions during calculation due to reaching specified conditions in calculation parameters.
    e. ability to delete or add hydrodynamic components, structure components and control variables at a restart of calculation.

CLASSIFICATION OF HYDRODYNAMIC MODEL

- One-dimensional, with provisions for
    a. choked flow model
    b. abrupt area change model
    c. cross flow junctions.
- Two-fluid, six equation, space-time numerical solution scheme.
- flow regime oriented field characteristics depending on mass flux and void fraction for
    a. horizontal flow with bubbly, slug, mist and stratified fields
    b. vertical flow with bubbly, slug, annular-mist (and stratified) fields
    c. high mixing flow with bubbly and mist fields (for pumps).

Table 5 cont'd

HYDRODYNAMIC COMPONENENTS (Input systematics)

- Volume type components
  a. single volume
  b. pipe and annulus, for condensed input of several similar single volumes
  c. time dependent volume, for defining a boundary source with a time dependent fluid state
  d. branch, a volume capable of two or more connecting junctions at either end
  e. pump, characterized by rated values for flow, head, torque, density and moment of inertia. The single phase homologous curve, two-phase multipliers and phase difference tables to model the dynamic pump behaviour
  f. special system components for steam separator, jetmixer, turbine and accumulator.

- Junction type components
  a. single junction
  b. time dependent junction, for a time dependent junction flow whith a time dependent or controlled flow state
  c. cross-flow junction, to model a small cross flow, a tee branch or a small leak flow
  d. valve, various operation characteristics available for check valve, trip valve, inertial valve and relief valve.

INTERPHASE CONSTITUTIVE EQUATIONS

- Interphase drag
  a. steady drag due to viscous shear depending on flow regime. Semi-empirical mechanisms to describe flow regime transitions
  b. dynamic drag due to virtual mass effect.

- Interphase mass and heat transfer depending on flow regime and the fluid fields to saturation temperature differences

Table 5 cont'd

FLUID TO WALL CONSTITUTIVE EQUATIONS

- Wall friction due to wall shear effects formulated for flow regimes and based on a two-phase multiplier approach.

- Wall heat transfer depending on flow characteristics defined for

  a. single-phase forced convection (Dittus-Boelter)

  b. saturated nucleate boiling (Chen)

  c. subcooled nucleate boiling (modified Chen)

  d. critical heat flux (Biasi or modified Zuber)

  e. transition film boiling (Chen)

  f. film boiling (Bromley-Pomeranz and Dougall-Rohsenow)

  g. condensation (partly Dittus-Boelter).

- Interfacial mass transfer at the wall depending on wall, fluid and saturation temperatures for

  a. subcooled and saturated boiling

  b. transition film and film boiling

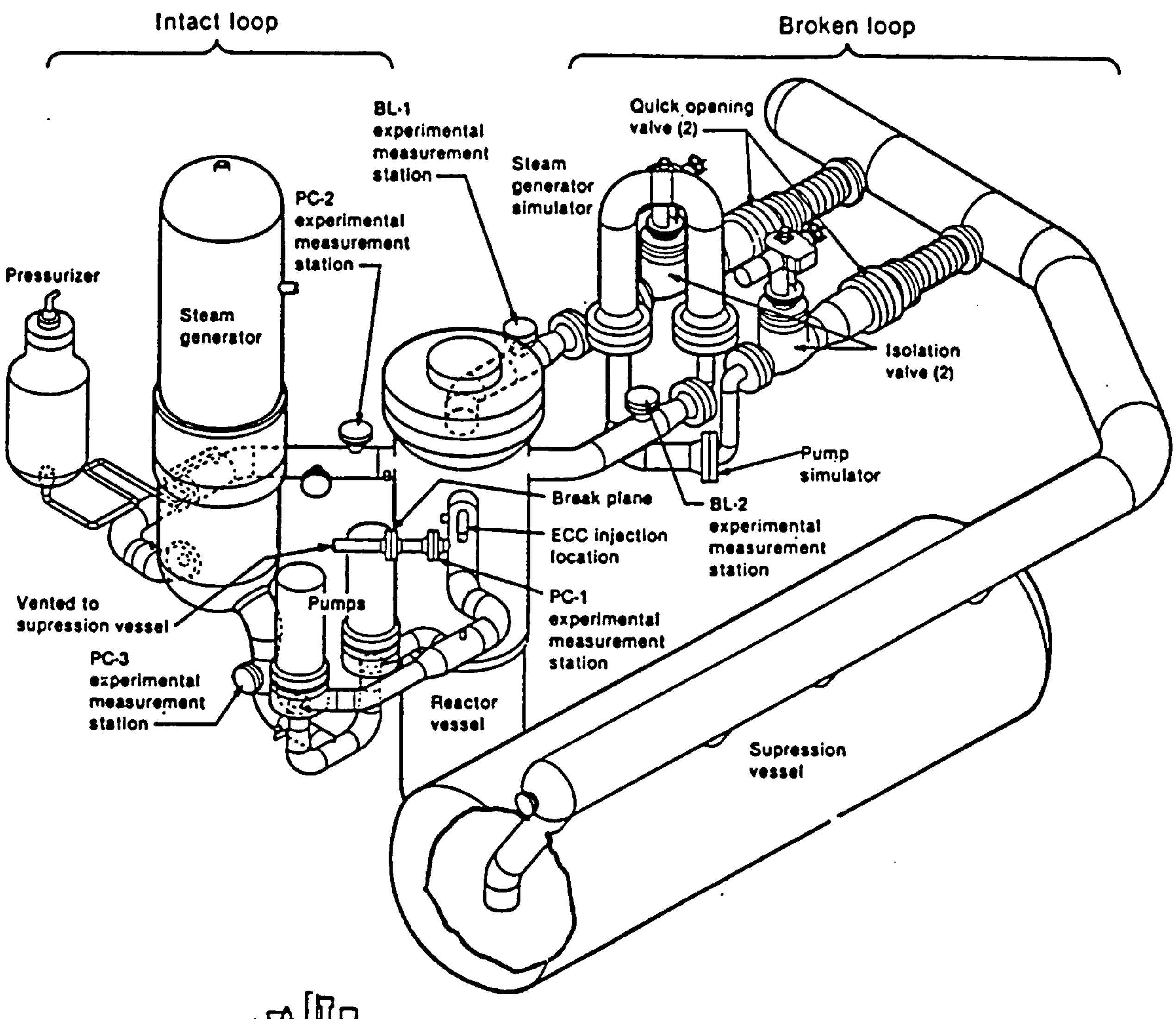
  c. condensation.

HEAT STRUCTURES

These may be rectangular, cylindrical or spherical in shape. The structure position is defined through component numbers of left and right hand side hydraulic components. A structure is physically defined by the geometry and the temperature dependent conductivity and volumetric heat capacity data. The structure model is further specified by the number of internal mesh points in the direction of heat flow.

CONTROL COMPONENTS

By these new (control) variables are defined from calculated parameters using algebra, standard functions, trip type operands or integrals.



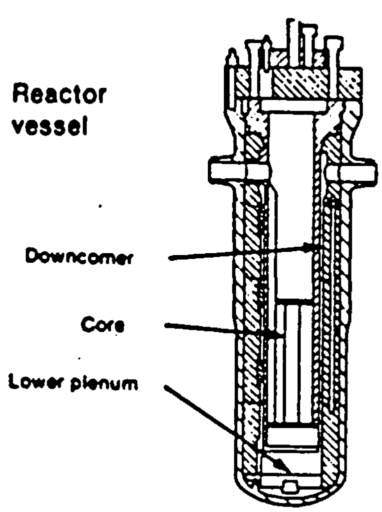


Figure 1

LOFT system configuration.

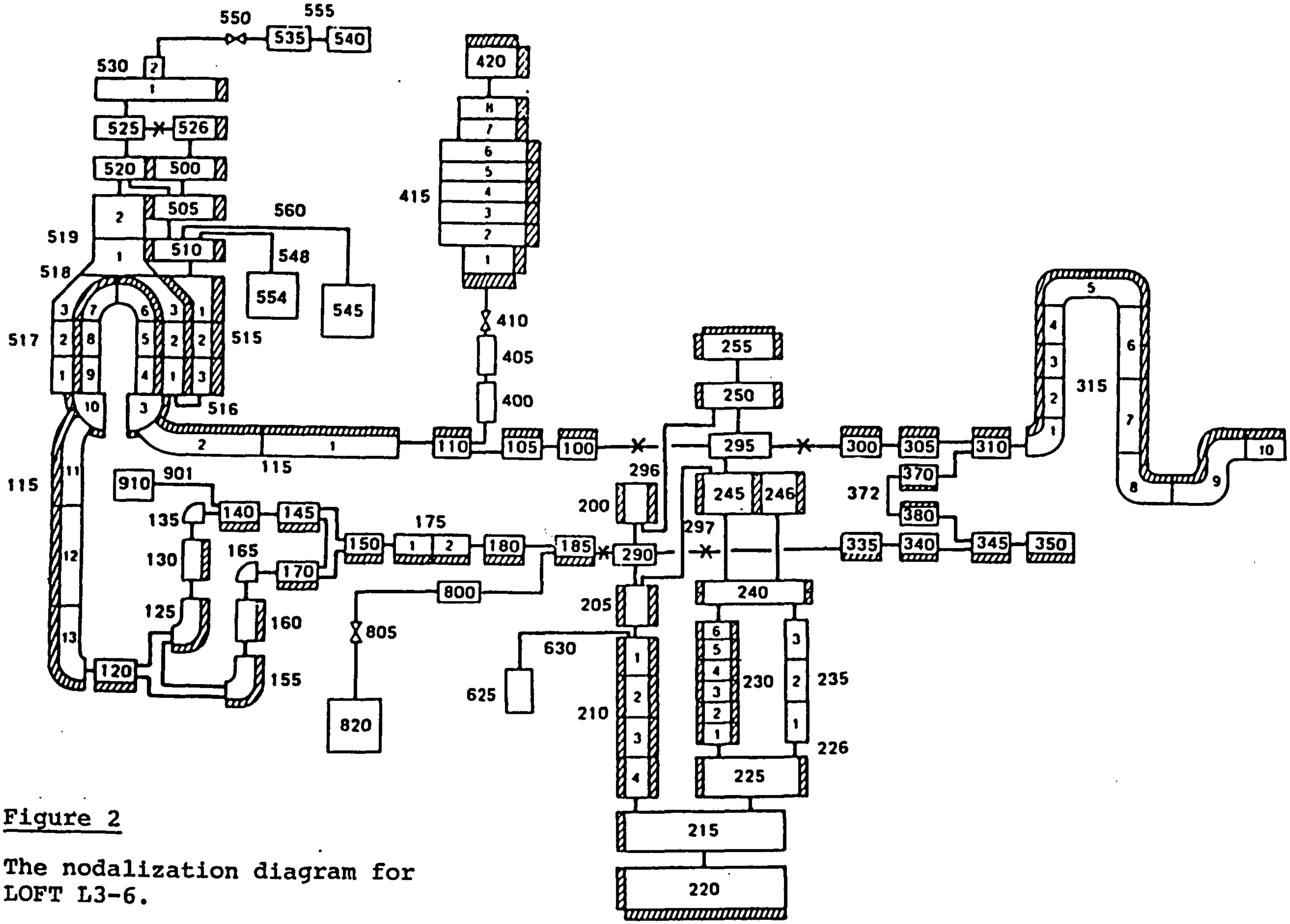


Figure 2

The nodalization diagram for LOFT L3-6.

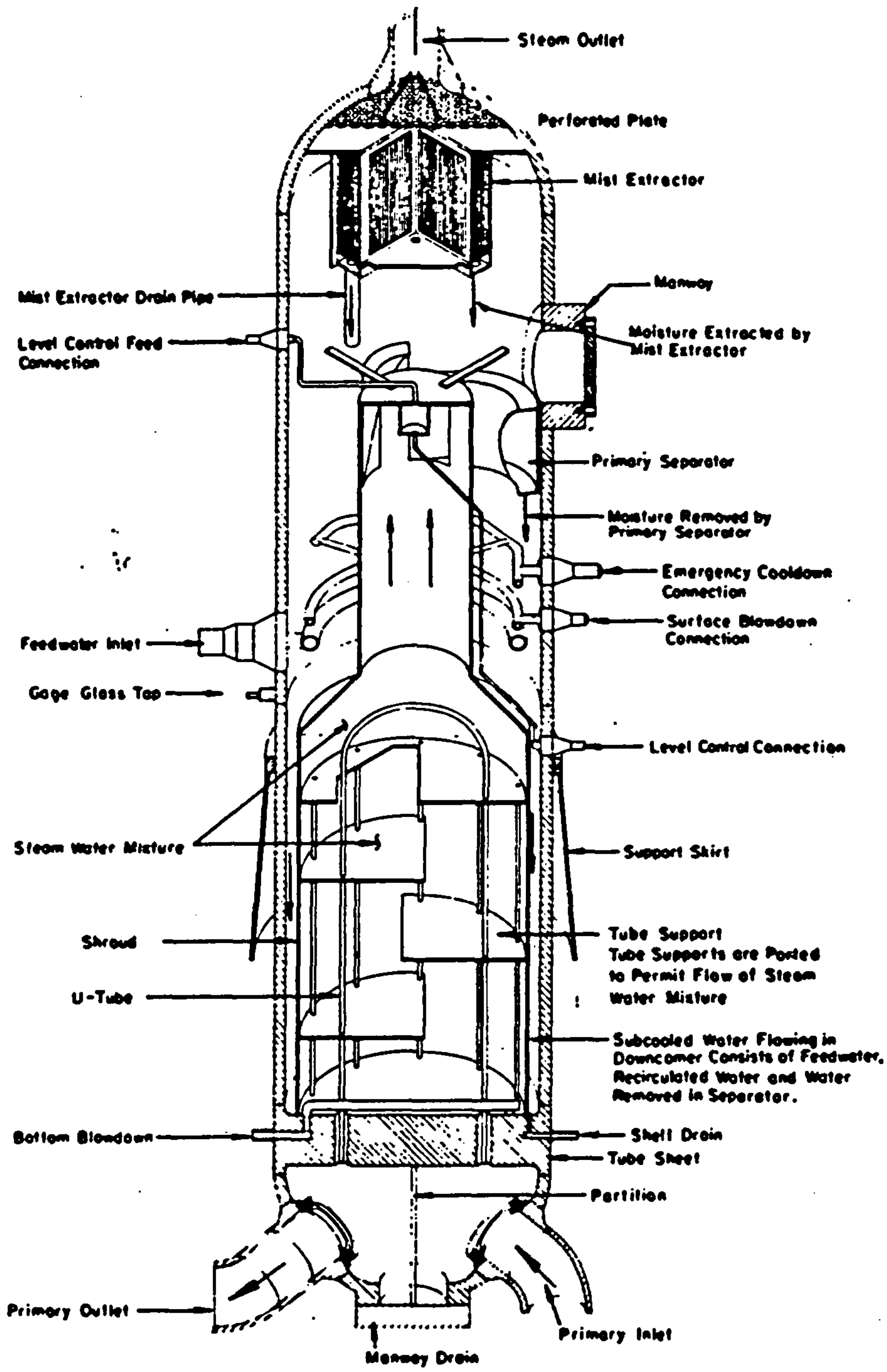


Figure 3

The LOFT steam generator.

```
* ** LOFT L3-6 ANALYSIS (PRIMRY+SECNDRY+KINTCS) **
****************************************************************
*
0000100   NEW       STDY-ST
*
0000101   RUN
*
0000102   SI        SI
*
*0000104   NOACTION
*
0000105   120.     200.0
*
0000120    100010000 0.0      WATER    PRIMARY
0000121    517010000 0.0      WATER    SECONDARY
*
*         TIME END  MIN STP  MAX STP  EDT OPT  MNOR  MAJR  RST
0000201    144.2     1.0E-6    .20     00001    25   4000  4000
*
****************************************************************
****************************************************************
*
* MINOR EDIT VARIABLES FOR THE ICAP ASSESSMENT
*
****************************************************************
*
* CORE
*
0000301   CNTRLVAR  901
0000302   RKTPOW    0
0000303   CNTRLVAR  903
0000304   CNTRLVAR  904
0000305   CNTRLVAR  905
0000306   CNTRLVAR  906
0000307   CNTRLVAR  907
0000308   CNTRLVAR  908
0000309   CNTRLVAR  909
0000310   CNTRLVAR  910
0000311   MFLOWJ    225010000
0000312   CNTRLVAR  912
****************************************************************
* VESSEL
*
0000313   CNTRLVAR  913
0000314   CNTRLVAR  914
0000315   CNTRLVAR  915
0000316   CNTRLVAR  916
0000317   TEMPF     205010000
0000318   TEMPF     240010000
0000319   CNTRLVAR  919
0000320   TEMPF     225010000
0000321   P         245010000
0000322   P         225010000
****************************************************************
* HOT LEG
*
0000323   RHO       105010000
0000324   RHO       305010000
0000325   MFLOWJ    110010000
0000326   TEMPF     105010000
0000327   P         105010000
****************************************************************
* COLD LEG
*
0000328   RHO       185010000
0000329   RHO       115020000
0000330   RHO       345010000
0000331   CNTRLVAR  931
0000332   CNTRLVAR  932
0000333   TEMPF     185010000
0000334   P         120010000
0000335   P         345010000
0000336   CNTRLVAR  936
0000337   PMPVEL    135
****************************************************************
* BREAK
*
0000338   RHO       185010000
0000339   MFLOWJ    805000000
0000340   CNTRLVAR  940
0000341   TEMPF     800010000
0000342   CNTRLVAR  942
0000343   P         185010000
0000344   TEMPF     115030000
****************************************************************
* STEAM GENERATOR
*
0000345   CNTRLVAR  945
0000346   CNTRLVAR  946
0000347   RHO       515030000
0000348   MFLOWJ    516000000
0000349   CNTRLVAR  949
0000350   TEMPF     515030000
0000351   P         530010000
0000352   CNTRLVAR  952
0000353   CNTRLVAR  953
****************************************************************
* PRESSURIZER
*
0000354   CNTRLVAR  954
0000355   TEMPF     415020000
0000356   TEMPG     415070000
0000357   P         415080000
****************************************************************
* ECCS
*
0000358   CNTRLVAR  958
****************************************************************
* SYSTEM
*
0000359   CNTRLVAR  959
0000360   CNTRLVAR  960
0000382   CNTRLVAR  982
****************************************************************
* RELAP5
*
0000361   CPUTIME   0
0000362   EMASS     0
****************************************************************
* STEADY STATE CONTROLS
*
0000370   CNTRLVAR  226
0000371   CNTRLVAR  296
0000372   CNTRLVAR  372
0000373   CNTRLVAR  291
0000374   CNTRLVAR  216
0000375   CNTRLVAR  601
0000376   CNTRLVAR  606
0000360   CNTRLVAR  960
0000382   CNTRLVAR  982
```

```
*
****************************************************************
****************************************************************
* TRIP INPUT DATA                                              *
*
* 501     SCRAM     REACTIVITY, GEN. TABLE            609
*                   SS AUX PRESSURIZ, VALVE CLOS      410
*                   MAIN STEAM VALVE, CLOSE           550
*                   FEED WATER VALVE, CLOSE           560
*
* 510     BREAK     TIME
*                   AUX FEED WATER                    548
*
* 511     TRIP      PUMP 1                            135
*                   PUMP 2                            165
*
* 514     BREAK     CLOSE                             805
*
* 515               AFTER EXPERIMENT END
*
* 518     MFLOW     DIRECTION OF FLOW FROM CORE       240
*
* 535     50 S      EXP. BREAK FLOW QUALIFIED         805
*
* 600               STOP ADV. OF CALCULATION
*
* 645               BREAK OPEN                        805
*
* 646               PRESS. VALVE OPEN, AFTER SS       435
*
* 661     HPIS      INITIATED                         640
*
* 699               PUMP COOLANT INJECTION            901
*
*
****************************************************************
*
501     TIME      0           GE      NULL 0     144.2    L
508     TIME      0           GE      NULL 0     0.0      L
510     TIME      0           GE    TIMEOF 501   5.8      L
511     TIME      0           GE    TIMEOF 510   10000.   L
512     TIME      0           GE      NULL 0     10000.   L
513     P         100010000   LE      NULL 0     13.2E6   N
514     P         100010000   LE      NULL 0     2.15E6   L
515     TIME      0           GE    TIMEOF 514   20.      L
518     VELFJ     240010000   GE    NULL    0    0.0      N
520     P         530020000   GT      NULL 0     5.63E6   N
521     P         530020000   LT      NULL 0     5.61E6   N
522     P         530020000   GT      NULL 0     5.55E6   N
523     P         530020000   LT      NULL 0     5.53E6   N
*530     CNTRLVAR  10          LT      NULL 0     3.10      N
*531     CNTRLVAR  10          GT      NULL 0     3.18      N
535     TIME      0           GE     TIMEOF 510    50.    L
533     TIME      0           GT    TIMEOF 510   63.      N
561     P     100010000 GT       P   530020000 0.         N
562     TIME      0           GE    TIMEOF 660   1800.    L
600     515
660     514       AND         561     N
661     513       AND         -514    N
699     -514      AND         -514    N
*601     530       OR          602     N
*602     -531      AND         601     N
*603     562       AND         602     N
*
610     612       OR          520     N
```

```
611         -521      AND      -616      N
612         611       AND      610       N
*
613         616       OR       523       N
614         -522      AND      613       N
615         -612      AND      501       N
616         615       AND      614       N
*
633         533       AND      -660      N
*634        633       OR       603       N
634         510       AND      510       L
*
645         510       AND      -514      N
*
546         -501      AND      -501      N
*
*****************************************************************
*****************************************************************
*
*                        INTACT LOOP
*
*****************************************************************
*
* REACTOR VESSEL NOZZLE INTACT LOOP HOT LEG                     *
*
1000000    RVNILHL    BRANCH
1000001    2          1
1000101    0.0634     1.5373    0.0       0.0       0.0       0.0
1000102    4.0E-5     0.0       00
1001101    295010000 100000000 0.0634    0.1       0.1       0102
1002101    100010000 105000000 0.0       0.085     0.085     0100
*
*****************************************************************
* PRESSURIZER CONNECTION TEE REACTOR VESSEL SIDE                *
*
1050000    PRCTRVS    BRANCH
1050001    1          1
1050101    0.0634     1.634     0.0'      0.0       0.0       0.0
1050102    4.0E-5     0.0       00
1051101    105010000 110000000 0.0       0.085     0.085     0100
*
*****************************************************************
* STEAM GENERATOR INLET PIPING                                  *
*
1100000    SGINLP     BRANCH
1100001    1          1
1100101    0.0        1.1303    0.06204   0.0       0.0       0.0
1100102    4.0E-5     0.0       00
1101101    110010000 115000000 0.0       0.17      0.17      0100
*
*****************************************************************
* STEAM GENERATOR PLUS PIPING                                   *
*
1150000    SGAPS      PIPE
1150001    13
1150101    0.0        3
1150102    0.151      9
1150103    0.0        12
1150104    0.0634     13
1150201    0.0        1
1150202    0.0512     2
1150203    0.0        9
1150204    0.0512     10
1150205    0.0        12
1150301    0.93124    1
1150302    0.708      2
1150303    0.63       3
1150304    1.0022     4
1150305     .7102     5
1150306    0.8576     7
1150307     .7102     8
1150308    1.0022     9
1150309    0.63       10
1150310    0.547      11
1150311    0.689      12
1150312    0.559      13
1150401    0.05826    1
1150402    0.057      2
1150403    0.223      3
1150404    0.0        9
1150405    0.223      10
1150406    0.0437     11
1150407    0.0462     12
1150408    0.0        13
1150501    0.0        13
1150601    0.0        1
1150602    90.0       6
1150603    -90.0      13
1150701·   0.0        1
1150702    0.246      2
1150703    0.613      3
1150704    1.0022     4
1150705     .7102     5
1150706    0.8576     6
1150707    -0.8576    7
1150708     -.7102    8
1150709    -1.0022    9
1150710    -0.613     10
1150711    -0.498     11
1150712    -0.689     12
1150713    -0.356     13
1150801    4.0E-5     0.0       2
1150802    4.0E-5     0.0102    3
1150803    1.0E-5     0.0103    9
1150804    4.0E-5     0.0102    10
1150805    4.0E-5     0.0       13
1150901    0.255      0.255     1
1150902    0.048      0.048     2
1150903    0.0        0.0       4
1150904    0.096      0.096     5
1150905    0.192      0.192     6
1150906    0.096      0.096     7
1150907    0.0        0.0       9
1150908    0.048      0.048     11
1150909    0.096      0.096     12
1151001    00         13
1151101    0100       3
1151102    0000       8
1151103    0100       12
1151300    1
*
*****************************************************************
* PUMP SUCTION TEE                                              *
*
1200000    PSTEE      BRANCH
1200001    3          1
1200101    0.0634     0.76      0.0       0.0       0.0       0.0
1200102    4.0E-5     0.0       00
1201101    115010000 120000000 0.0       0.096     0.096     0000
1202101    120010000 125000000 0.0317    0.2       0.2       0100
1203101    120010000 155000000 0.0317    0.2       0.2       0100
*
*****************************************************************
* PUMP1 SUCTION TEE OUTLET                                      *
*
1250000    PISTOL     BRANCH
1250001    2          1
1250101    0.0        1.003     0.0613    0.0       90.0      0.521
1250102    4.0E-5     0.0       00
1251101    125010000 130000000 0.0       0.1       0.1       0100
1252101    125000000 155000000   .028417 0.0       0.0       0100
*
*****************************************************************
* PUMP 1 INLET                                                  *
*
1300000    P1INL      SNGLVOL
1300101    0.0        0.457     0.0189 .  0.0       90.0      0.457
1300102    4.0E-5     0.0       00
*
*****************************************************************
* PRIMARY COOLANT PUMP 1     TRIP=511                           *
*
1350000    PCP1       PUMP
1350101    0.0366     0.0       0.099     0.0       90.0      0.319
1350102    0
1350108    130010000 0.0        0.0       0.0       0100
1350109    140000000 0.0        0.05      0.05      0100
1350301    0    0     0    -1   -1   511  0
1350302    369.0      0.911     0.3155    96.0      500.6     1.431
1350303    613.6      0.0       207.4     0.004     19.698    0.0
1350308    .212465    0.0       -25.      29.5      6.28
1350310    0.0        0.0       0.0
*
*****************************************************************
* PUMP 1 OUTLET PUMP SIDE                                       *
*
1400000    P1OTLPS    SNGLVOL
1400101    0.0366     0.502     0.0       0.0       0.0       0.0
1400102    4.0E-5     0.0       00
*
*****************************************************************
* COOLANT PUMP INJ. (JOINED ONE PUMP)
*
9010000    PCPINJ1    TMDPJUN
9010101    910000000 140000000 0.0
9010200    1          699
9010201    -1.        0.0       0.0       0.0
9010202    0.0        .098      0.0       0.0
9010203    10000.     .098      0.0       0.0
*
9100000    PCPWATER   TMDPVOL
9100101    7.E-3      1.0       0.0  0.0  0.0  0.0
9100102    0.0        0.0       00
9100200    1
9100201    0.0        305.      0.0
9100202    10000.     305.      0.0
*
*****************************************************************
* PUMP1 OUTLET PIPE TEE SIDE                                    *
*
1450000    POPTS      BRANCH
1450001    2          1
1450101    0.0        1.4084    0.0633    0.0       0.0       0.0
1450102    4.0E-5     0.0       00
1451101    140010000 145000000 0.0       0.0       0.0       0100
```

```
1452101    145010000 150000000  .035873  0.0       0.0       0100
*
****************************************************************
* PUMP OUTLET TEE                                              *
*
1500000    POTLTEE   BRANCH
1600001    2         1
1500101    0.0634    0.4966     0.0      0.0       0.0       0.0
1500102    4.0E-5    0.0        00
1601101    170010000 150000000  .027528  0.2       0.2       0100
1502101    150010000 175000000 0.0       0.134     0.134     0100
*
****************************************************************
* PUMP 2 SUCTION TEE OUTLET                                    *
*
1550000    P2STOL    BRANCH
1550001    1         1
1550101    0.0       1.003      0.0813   0.0       90.0      0.521
1550102    4.0E-5    0.0        00
1551101    155010000 160000000 0.0       0.05      0.05      0100
*
****************************************************************
* PUMP 2 INLET PIPE                                            *
*
1600000    P2INL     SNGLVOL
1600101    0.0       0.457      0.0189   0.0       90.0      0.457
1600102    4.0E-5    0.0        00
*
****************************************************************
* PRIMARY COOLANT PUMP 2                                       *
*
1650000    PCP2      PUMP
1650101    0.0366    0.0        0.099    0.0       90.0      0.319
1650102    0
1650108    160010000 0.0        0.0      0.0       0100
1650109    170000000 0.0        0.05     0.05      0100
1650301    135  135  135  -1    -1   511 0
1650302    369.0     0.315      0.3155   96.0      500.6     1.431
1650303    613.6     0.0        207.4    0.004     19.598    0.0
1650308    .212465   0.0        -25.     29.5      6.28
1650310    0.0       0.0        0.0
*
****************************************************************
* PUMP 2 OUTLET                                                *
*
1700000    P2OUTL    BRANCH
1700001    1         1
1700101    0.0366    0.514      0.0      0.0       0.0       0.0
1700102    4.0E-5    0.0        00
1701101    145010000 170010000 0.009073  0.2       0.2       0100
*
****************************************************************
* COLD LEG PIPE TO ECC  CONNECTION TEE                         *
*
1750000    PTECT     PIPE
1750001    2
1750101    0.0634    2
1750201    0.0       1
1750301    0.559     1
1750302    0.613     2
1750401    0.0       2
1750501    0.0       2
1750601    0.0       2
1750701    0.0       2
1750801    4.0E-5    0.0        2
1750901    0.15      0.15       1
1751001    00        2
1751101    0100      1
1751300    1
*
****************************************************************
* ECC CONNECTION TEE PUMP SIDE                                 *
*
1800000    ECTPS     BRANCH
1800001    1         1
1800101    0.0634    .701       0.0      0.0       0.0       0.0
1800102    4.0E-5    0.0        00
1801101    175010000 180000000 0.0       0.0664    0.0664    0100
*
****************************************************************
* COLD LEG PIPE FROM ECC CONNECTION TO REACTOR VESSEL          *
*
1850000    CLPRVS    BRANCH
1850001    2         1
1850101    0.0634    1.461      0.0      0.0       0.0       0.0
1850102    4.0E-5    0.0        00
1851101    185010000 290000000 0.0634    1.        1.        0101
1852101    180010000 185000000 0.0       0.0       0.0       0100
*
****************************************************************
****************************************************************
*
*          BREAK
*
****************************************************************
*
* DISCHARGE VOLUME
*
8200000    BREAKVOL  TMDPVOL
8200101    3.5E-3    1.         0.0      0.0       0.0       0.0
8200102    0.0       0.0        0.0
8200200    2
8200201    0.0       1.E5       1.
8200202    10000.    1.E5       1.
*
****************************************************************
* BREAK OUTLET LINE
*
8000000    BRKOUTL   BRANCH
8000001    1         1
8000101    .000908   1.8        0.0      0.0       0.0       0.0
8000102    1.E-5     0.0        00
8001101    185010000 800000000 0.0       .5        .5        0102
*
****************************************************************
* BRAKE VALVE (ORIFICE)
8050000    BRKVLV    VALVE
8050101    800010000 820000000 205.6E-6   .4  .4   0100   .85  .85
8050300    MTRVLV
8050301    645       514        5.       0.0
*
****************************************************************
****************************************************************
*
*                REACTOR VESSEL
*
****************************************************************
*
* COLD LEG INLET ANNULUS
*
2900000    INANLCVOL BRANCH
2900001    1    1
2900101    0.0       .30        .078     0.0  -90.   -.30
2900102    4.E-5     .172       00
2901101    200010000 290000000 0.0  0.0  0.0         0100
*
****************************************************************
* INLET ANNULUS TOP VOLUME                                     *
*
2000000    IANLTVOL  BRANCH
2000001    0         1
2000101    0.0       0.18       0.0465   0.0       90.0      0.18
2000102    4.0E-5    0.178      00
*
****************************************************************
* INLET ANNULUS LOWER VOLUME                                   *
*
2050000    IANLVOL   BRANCH
2050001    1         1
2050101    0.0       0.274      0.071    0.0       -90.0     -0.274
2050102    4.0E-5    0.172      00
2051101    205010000 210000000 0.0       0.0       0.0       0100
*
****************************************************************
* DOWNCOMER                                                    *
*
2100000    DWNCOMR   PIPE
2100001    4
2100101    0.142     4
2100201    0.0       3
2100301    0.958     4
2100401    0.0       4
2100501    0.0       4
2100601    -90.0     4
2100801    4.0E-5    0.102      4
2100901    0.0       0.0        3
2101001    00        4
2101101    0000      3
2101300    1
*
****************************************************************
* LOWER PLENUM UPPER VOLUME                                    *
*
2150000    LPUPVOL   BRANCH
2150001    3         1
2150101    0.740     0.360      0.0      0.0       -90.0     -0.360
2150102    4.0E-5    0.0        00
2151101    210010000 215000000 0.0       0.0       0.0       0100
2152101    215010000 220000000 0.0       0.0       0.0       0100
2153101    215000000 225000000 0.15      0.0       0.0       0100
*
****************************************************************
* LOWER PLENUM LOWER VOLUME                                    *
*
2200000    LPLOVOL   SNGLVOL
2200101    0.790     0.370      0.0      0.0       -90.0     -0.370
2200102    4.0E-5    0.0        00
*
****************************************************************
* LOWER CORE SUPPORT STRUCTURE                                 *
*
2250000    LCOSUST   BRANCH
2250001    1         1
2260101    0.25      0.52       0.0      0.0       90.0      0.52
2250102    4.0E-5    0.095      00
```

```
2251101   225010000 230000000 0.0975   2.4      2.4      0100
*
*****************************************************************
* VALVE JUNCTION FOR CORE BYPASS FLOW
*
2260000   CBPVLV    VALVE
2260101   225010000 235000000 .015     1.       1.       0100
2260201   1         20.       0.0      0.0
2260300   SRVVLV
2260301   226
*
*****************************************************************
* ACTIVE CORE                                                   *
*
2300000   CORE      PIPE
2300001   6
2300101   0.1705    6
2300201   0.1705    1
2300202   0.1440    2
2300203   0.1705    3
2300204   0.1440    4
2300205   0.1705    5
2300301   0.2795    5
2300302   0.3776    6
2300401   0.0       6
2300501   0.0       6
2300601   90.0      6
2300801   4.0E-5    0.012     6
2300901   0.0       0.0       1
2300902   .5        .5        2
2300903   0.0       0.0       3
2300904   .5        .5        4
2300905   0.0       0.0       5
2301001   00        6
2301101   0100      5
2301300   1
*
*****************************************************************
* BYPASS VOLUME                                                 *
*
2350000   BYPVOL    PIPE
2350001   3
2350101   0.015     3
2350201   0.0       2
2350301   0.559     2
2350302   0.657     3
2350401   0.0       3
2350501   0.0       3
2350601   90.0      3
2350801   4.0E-5    0.003     3
2350901   0.0       0.0       2
2351001   00        3
2351101   0000      2
2351300   1
*
*****************************************************************
* UPPER CORE SUPPORT  STRUCTURE                                 *
*
2400000   UCOSST    BRANCH
2400001   2         1
2400101   0.297     1.118     0.0      0.0      90.0     1.118
2400102   4.0E-5    0.145     00
2401101   230010000 240000000 0.12     2.40     2.40     0100
2402101   235010000 240000000 0.0      1.50     1.50     0100
*
```

```
*****************************************************************
* UPPER  FLOW SKIRT REGION                                      *
*
2450000   UFOSRE    BRANCH
2450001   1         1
2450101   0.114     0.693     0.0      0.0      90.0     0.693
2450102   4.0E-5    0.131     00
2451101   240010000 245000000 0.0      0.0      0.0      0100
*
*****************************************************************
* DEAD END OF FUEL MODULES                                      *
*
2460000   FUMODL    BRANCH
2460001   1         1
2460101   0.183     0.700     0.0      0.0      90.0     0.700
2460102   4.0E-5    0.214     00
2461101   240010000 246000000 0.0      0.0      0.0      0100
*
*****************************************************************
* REACTOR VESSEL HOT LEG OUTLET
*
2950000   RVHLOUT   BRANCH
2950001   1    1
2950101   .201      .30       0.0  0.0  90.      .30
2950102   4.E-5     0.0       00
2951101   245010000 295000000 0.0  0.0  0.0      0100
*
*****************************************************************
* VALVE JUNCTION INLET ANN. TO UPPER PLENUM
*
2960000   IAUPVLV   VALVE
2960101   200010000 250000000 .01      1.       1.       0100
2960201   1         15.9      0.0      0.0
2960300   SRVVLV
2960301   296
*
*****************************************************************
* VALVE JUNCTION INLET ANN. TO UPPER PLENUM
*
2970000   IAUPVL1   VALVE
2970101   205000000 245010000 .01      1.       1.       0100
2970201   1         15.9      0.0      0.0
2970300   SRVVLV
2970301   296
*
*****************************************************************
* VALVE JUNCTION INLET ANN. TO DOWNCOMER
*
2910000   IAUDOWN   VALVE
2910101   290010000 205000000 0.259    1.       1.       0100
2910201   1         444.9     0.0      0.0
2910300   SRVVLV
2910301   291
*
*****************************************************************
* UPPER PLENUM LOWER VOLUME                                     *
*
2500000   UPLLVOL   BRANCH
2500001   2         1
2500101   0.288     0.704     0.0      0.0      90.0     0.704
2500102   4.0E-5    0.0       00
2501101   295010000 250000000 0.0      0.0      0.0      0100
2502101   250010000 255000000 0.0      0.0      0.0      0100
*
*****************************************************************
```

```
* UPPER PLENUM UPPER VOLUME                                     *
*
2550000   UPLUVOL   SNGLVOL
2550101   0.244     0.712     0.0      0.0      90.0     0.712
2550102   4.0E-5    0.0       00
*
*****************************************************************
*****************************************************************
*
*                    PRESSURIZER
*
*****************************************************************
*
* SURGE LINE PCS SIDE                                           *
*
4000000   SLPCS     BRANCH
4000001   2         1
4000101   0.00145   3.45      0.0      0.0      90.0     0.64
4000102   4.0E-5    0.0       00
4001101   110000000 400000000 0.0      0.93     0.93     0100
4002101   400010000 405000000 0.0      0.93     0.93     0000
*
*****************************************************************
* SURGE LINE PRESSURIZER VESSEL                                 *
*
4050000   SLPRV     SNGLVOL
4050101   0.00145   3.45      0.0      0.0      90.0     0.60
4050102   4.0E-5    0.0       00
*
*****************************************************************
* PRESSURIZER SURGE LINE VALVE                                  *
*
4100000   SLVALV    VALVE
4100101   405010000 415000000 0.0      0.93     0.93     0100
4100300   TRPVLV
4100301   501
*
*****************************************************************
* PRESSURIZER VESSEL                                            *
*
4150000   PRESSV    PIPE
4150001    8
4150101    0.362     1
4150102    0.565     5
4150103    0.466     7
4150104    0.13      8
4150201    0.0       7
4150301    0.224     1
4150302    0.403     3
4150303    0.207     5
4150304    0.1705    7
4150305    0.118     8
4150401    0.0       8
4150501    0.0       8
4150601    90.0      8
4150801    4.0E-5    0.0      8
4151001    00        4
4151002    01        8
4151101    0100      1
4151102    0000      7
4151300   1
*
*****************************************************************
* TOP VOLUME PRESSURIZER                                        *
*
```

```
4200000   TOPPRE     BRANCH
4200001   1          0
4200101   0.13       0.236    0.0      0.0       90.0     0.236
4200102   4.5E-5   0.0    01
4201101   415010000  420000000  0.0    0.0    0.0    0000
*
****************************************************************
****************************************************************
*
*                HEAT STRUCTURE INPUT DATA
*
****************************************************************
* REACTOR VESSEL HEAT STRUCTURES                               *
*
****************************************************************
* FILLER BLOCKS INLET ANNULUS TOP VOLUME                       *
*
12000000  1          5        2        1        0.608
12000100  0          1
12000101  4          0.773
12000201  4          4
12000301  0.0        4
12000401  565.2      5
12000501  200010000  0        1        1        0.33      1
12000601  0          0        0        1        0.33      1
12000701  0          0.0      0.0      0.0      1
12000801  0          .178     0.0      0.33     1
*
****************************************************************
* FILLER BLOCKS INLET ANNULUS LOWER VOLUME                     *
*
12050000  1          5        2        1        0.601
12050100  0          1
12050101  4          0.766
12050201  4          4
12050301  0.0        4
12050401  565.2      5
12050501  205010000  0        1        1        0.424     1
12050601  0          0        0        1        0.424     1
12050701  0          0.0      0.0      0.0      1
12050801  0          .172     0.0      0.424    1
*
****************************************************************
* FILLER BLOCKS DOWNCOMER AND LOWER PLENUM                     *
*
12100000  6          5        2        1        0.47
12100100  0          1
12100101  4          0.736
12100201  4          4
12100301  0.0        4
12100401  565.2      5
12100501  210010000  0        1        1        0.958     1
12100503  210030000  0        1        1        0.958     3
12100504  210040000  0        1        1        0.958     4
12100505  215010000  0        1        1        0.36      5
12100506  220010000  0        1        1        0.37      6
12100601  0          0        0        1        0.958     4
12100602  0          0        0        1        0.36      5
12100603  0          0        0        1        0.37      6
12100701  0          0.0      0.0      0.0      6
12100801  0          0.102    0.0      0.958    4
12100802  0          0.971    0.0      0.36     5
12100803  0          1.003    0.0      0.37     6
*
****************************************************************
* CORE SUPPORT BARREL                                          *
*
12010000  6          5        2        1        0.3810
12010100  0          1
12010101  4          0.4191
12010201  4          4
12010301  0.0        4
12010401  565.2      5
12010501  200010000  0        1        1        0.33      1
12010502  205010000  0        1        1        0.424     2
12010503  210010000  0        1        1        0.958     3
12010504  210020000  0        1        1        0.958     4
12010505  210030000  0        1        1        0.958     5
12010506  210040000  0        1        1        0.958     6
12010601  0          0        0        1        0.33      1
12010602  0          0        0        1        0.424     2
12010603  0          0        0        1        0.958     3
12010604  0          0        0        1        0.958     4
12010605  0          0        0        1        0.958     5
12010606  0          0        0        1        0.958     6
12010701  0          0.0      0.0      0.0      6
12010801  0          0.178    0.0      0.33     1
12010802  0          0.172    0.0      0.424    2
12010803  0          0.102    0.0      0.958    6
*
****************************************************************
* FLOW SKIRT - CORE FILLER ASSEMBLY                            *
*
12250000  10         5        2        1        0.3
12250100  0          1
12250101  4          0.38
12250201  4          4
12250301  0.0        4
12250401  565.2      5
12250501  225010000  0        1        1        0.52      1
12250502  230010000  10000    1        1        0.2795    6
12250503  230060000  0        1        1        0.3775    7
12250504  240010000  0        1        1        1.118     8
12250505  245010000  0        1        1        0.42      9
12250506  246010000  0        1        1        0.35      10
12250601  0          0        0        1        0.52      1
12250602  0          0        0        1        0.2795    6
12250603  0          0        0        1        0.3775    7
12250604  0          0        0        1        1.118     8
12250605  0          0        0        1        0.42      9
12250606  0          0        0        1        0.35      10
12250701  0          0.0      0.0      0.0      10
12250801  0          0.       0.0      0.52     1
12250802  0          0.012    0.0      0.2795   6
12250803  0          0.012    0.0      0.3775   7
12250804  0          0.145    0.0      1.118    8
12250805  0          0.131    0.0      0.42     9
12250806  0          0.214    0.0      0.35     10
*
****************************************************************
* ACTIVE CORE                                                  *
*
12300000  6          9        2        1        0.0
12300100  0          1
12300101  5          4.647E-3
12300102  1          4.742E-3
12300103  2          5.359E-3
12300201  1          5
12300202  -2         6
12300203  -3         8
12300301  1.0        5
12300302  0.0        8
12300401  1100.      6
12300402   560.      8
12300501  0          0        0        1        363.35    5
12300502  0          0        0        1        490.75    6
12300601  230010000  10000    1        1        363.35    5
12300602  230060000  0        1        1        490.75    6
12300701  1000       0.061    0.0      0.0      1
12300702  1000       0.282    0.0      0.0      2
12300703  1000       0.245    0.0      0.0      3
12300704  1000       0.228    0.0      0.0      4
12300705  1000       0.146    0.0      0.0      5
12300706  1000       0.038    0.0      0.0      6
12300901  0          0.01250  0.0      0.2795   5
12300902  0          0.01250  0.0      0.3775   6
****************************************************************
* FUEL MODULES                                                 *
*
12460000  1          5        1        1        0.0
12460100  0          1
12460101  4          0.01
12460201  4          4
12460301  0.0        4
12460401  565.2      5
12460501  245010000  0        1        1        1.8       1
12460601  246010000  0        1        1        1.8       1
12460701  0          0.0      0.0      1.8      1
12460801  0          0.131    0.0      1.8      1
12460901  0          0.214    0.0      1.8      1
****************************************************************
* REACTOR VESSEL BOTTOM                                        *
*
12200000  1          5        1        1        0.0
12200100  0          1
12200101  4          0.092
12200201  4          4
12200301  0.0        4
12200401  565.2      5
12200501  -999       0        3949     0        1.68      1
12200601  220010000  0        1        0        1.68      1
12200701  0          0.0      0.0      0.0      1
12200901  0          0.0      0.0      0.52     1
****************************************************************
* LOWER CORE SUPPORT STRUCTURE                                 *
*
12260000  1          5        2        1        0.282
12260100  0          1
12260101  4          0.3
12260201  4          4
12260301  0.0        4
12260401  565.2      5
12260501  225010000  0        1        1        0.52      1
12260601  0          0        0        1        0.52      1
12260701  0          0.0      0.0      0.0      1
12260801  0          0.0      0.0      0.52     1
****************************************************************
* UPPER CORE SUPPORT STRUCTURE                                 *
*
12400000  1          5        2        1        0.282
12400100  0          1
```

```
12400101 4         0.31
12400201 4         4
12400301 0.0       4
12400401 565.2     5
12400501 240010000 0         1         1         .559      1
12400601 0         0         0         1         .559      1
12400701 0         0.0       0.0       0.0       1
12400801 0         0.145     0.0       .559      1
*
****************************************************************
* UPPER HEAD TOP PLATE                                         *
*
12550000 1         5         1         1         0.0
12550100 0         1
12550101 4         0.474
12550201 4         4
12550301 0.0       4
12550401 565.2     5
12550501 255010000 0         1         1         0.712     1
12550601 -999      0         3949      1         0.712     1
12550701 0         0.0       0.0       0.0       1
12550801 0         0.0       0.0       0.712     1
*
****************************************************************
* CORE SUPPORT BARREL UPPER PLENUM LOWER VOLUME                *
*
12500000 1         5         2         1         0.381
12500100 0         1
12500101 4         0.419
12500201 4         4
12500301 0.0       4
12500401 565.2     5
12500501 250010000 0         1         1         0.854     1
12500601 0         0         0         1         0.854     1
12500701 0         0.0       0.0       0.0       1
12500801 0         0.0       0.0       0.854     1
*
****************************************************************
* CORE SUPPORT BARREL UPPER PLENUM TOP VOLUME                  *
*
12520000 1         5         2         1         0.381
12520100 0         1
12520101 4         0.728
12520201 4         4
12520301 0.0       4
12520401 565.2     5
12570501 255010000 0         1         1         0.712     1
12520601 -999      0         3949      1         0.712     1
12520701 0         0.0       0.0       0.0       1
12520801 0         0.0       0.0       0.712     1
*
****************************************************************
* INTERNALS UPPER PLENUM                                       *
*
12510000 2         5         1         1         0.0
12510100 0         1
12510101 4         0.005
12510201 4         4
12510301 0.0       4
12510401 565.2     5
12510501 250010000 0         1         1         1.0       1
12510502 255010000 0         1         1         1.0       2
12510601 0         0         0         1         1.0       1
12510602 0         0         0         1         1.0       2
12510701 0         0.0       0.0       0.0       2
12510801 0         0.0       0.0       1.0       1
12510802 0         0.0       0.0       1.0       2
*
****************************************************************
****************************************************************
*
* PRIMARY SYSTEM PIPING
*
****************************************************************
*
* BROKEN HOT LEG
*
13150000 2         6         2         1         .0515
13150100 0         1
13150101 5         .0705
13150201 4         5
13150301 0.0       5
13150401 540.      6
13150501 315010000 0         1         1         .4054     1
13150502 315020000 0         1         1         .5265     2
13150601 -997      0         3949      1         .4054     1
13150602 -997      0         3949      1         .5265     2
13150701 0         0         0         0         2
13150801 0         0         0         .4054     1
13150802 0         0         0         .5265     2
*
13151000 1         6         2         1         .1074
13151100 0         1
13151101 5         .1350
13151201 4         5
13151301 0.0       5
13151401 540.      6
13151501 315080000 0         1         1         2.671     1
13151601 -997      0         3949      1         2.671     1
13151701 0         0         0         0         1
13151801 0         0         0         2.671     1
*
13152000 1         6         2         1         .0660
13152100 0         1
13152101 5         .0840
13152201 4         5
13152301 0.0       5
13152401 540.      6
13152501 315090000 0         1         1         1.842     1
13152601 -997      0         3949      1         1.842     1
13152701 0         0         0         0         1
13152801 0         0         0         1.842     1
*
13153000 5         6         2         1         .1835
13153100 0         1
13153101 5         .2285
13153201 4         5
13153301 0.0       5
13153401 540.      6
13153501 315030000 10000     1         1         1.699     4
13153502 315070000 0         1         1         .362      5
13153601 -997      0         3949      1         1.699     4
13153602 -997      0         3949      1         .362      5
13153701 0         0         0         0         5
13153801 0         0         0         1.699     4
13153802 0         0         0         .362      5
*
13154000 1         6         2         1         .1285
13154100 0         1
13154101 5         .1620
13154201 4         5
13154301 0.0       5
13154401 540.      6
13154501 315100000 0         1         1         .667      1
13154601 -997      0         3949      1         .667      1
13154701 0         0         0         0         1
13154801 0         0         0         .667      1
*
13000000 3         6         2         1         .1420
13000100 0         1
13000101 5         .1780
13000201 4         5
13000301 0.0       5
13000401 540.      6
13000501 300010000 0         1         1         .8760     1
13000502 305010000 0         1         1         .6980     2
13000503 310010000 0         1         1         1.424     3
13000601 -999      0         3949      1         .8760     1
13000602 -999      0         3949      1         .6980     2
13000603 -999      0         3949      1         1.424     3
13000701 0         0         0         0         3
13000801 0         0         0         .8760     1
13000802 0         0         0         .6980     2
13000803 0         0         0         1.424     3
*
****************************************************************
* REFLOD ASSIST BYPASS
*
13750000 2         6         2         1         .111
13750100 0         1
13750101 5         .1365
13750201 4         5
13750301 0.0       5
13750401 540.      6
13750501 370010000 0         1         1         4.415     1
13750502 380010000 0         1         1         5.240     2
13750601 -999      0         3949      1         4.415     1
13750602 -999      0         3949      1         5.240     2
13750701 0         0         0         0         2
13750801 0         0         0         4.415     1
13750802 0         0         0         5.240     2
*
****************************************************************
* B.L. COLD LEG
*
13350000 3         6         2         1         .1420
13350100 0         1
13350101 5         .1780
13350201 4         5
13350301 0.0       5
13350401 540.      6
13350501 335010000 0         1         1         .7495     1
13350502 340010000 0         1         1         .6980     2
13350503 345010000 0         1         1         .9740     3
13350601 -999      0         3949      1         .7495     1
13350602 -999      0         3949      1         .6980     2
13350603 -999      0         3949      1         .9740     3
13350701 0         0         0         0         3
13350801 0         0         0         .7495     1
13350802 0         0         0         .6980     2
13350803 0         0         0         .9740     3
*
13501000 1         6         2         1         .0803
13501100 0         1
13501101 5         .1287
```

```
13501201  4          5
13501301  0.0        5
13501401  540.       6
13501501  350010000  0       1       1       2.0965  1
13501601  -997       0       3949    1       2.0965  1
13501701  0          0       0       0       1
13501801  0          0       0       2.0965  1
*
***********************************************************************
* INTACT LOOP PIPING
*
11001000  12         6       2       1       .142
11001100  0          1
11001101  5          .178
11001201  4          5
11001301  0.0        5
11001401  540.       6
11001501  100010000  0       1       1       1.5373  1
11001502  105010000  0       1       1       1.6340  2
11001503  110010000  0       1       1       1.1303  3
11001504  115010000  0       1       1       .93124  4
11001505  115120000  0       1       1       .6890   5
11001506  115130000  0       1       1       .5590   6
11001507  120010000  0       1       1       .7600   7
11001508  150010000  0       1       1       .4966   8
11001509  175010000  0       1       1       .5590   9
11001510  175020000  0       1       1       .6130   10
11001511  180010000  0       1       1       .7010   11
11001512  185010000  0       1       1       1.4610  12
11001601  -999       0       3949    1       1.5373  1
11001602  -999       0       3949    1       1.6340  2
11001603  -999       0       3949    1       1.1303  3
11001604  -999       0       3949    1       .93124  4
11001605  -999       0       3949    1       .6890   5
11001606  -999       0       3949    1       .5590   6
11001607  -999       0       3949    1       .7600   7
11001608  -999       0       3949    1       .4966   8
11001609  -999       0       3949    1       .5590   9
11001610  -999       0       3949    1       .6130   10
11001611  -999       0       3949    1       .7010   11
11001612  -999       0       3949    1       1.461   12
11001701  0          0       0       0       12
11001801  0          0       0       1.5373  1
11001802  0          0       0       1.6340  2
11001803  0          0       0       1.12303 3
11001804  0          0       0       .93124  4
11001805  0          0       0       .6890   5
11001806  0          0       0       .5590   6
11001807  0          0       0       .7600   7
11001808  0          0       0       .4966   8
11001809  0          0       0       .5590   9
11001810  0          0       0       .6130   10
11001811  0          0       0       .7010   11
11001812  0          0       0       1.461   12
*
11002000  2          6       2       1       .1625
11002100  0          1
11002101  5          .2030
11002201  4          5
11002301  0.0        5
11002401  540.       6
11002501  115020000  0       1       1       .708    1
11002502  115110000  0       1       1       .547    2
11002601  -999       0       3949    1       .708    1
11002602  -999       0       3949    1       .547    2
11002701  0          0       0       0       2
11002801  0          0       0       .708    1
11002802  0          0       0       .547    2
*
11003000  7          6       2       1       .106
11003100  0          1
11003101  5          .1365
11003201  4          5
11003301  0.0        5
11003401  540.       6
11003501  125010000  0       1       1       1.003   1
11003502  130010000  0       1       1       .457    2
11003503  140010000  0       1       1       .502    3
11003504  145010000  0       1       1       1.4084  4
11003505  155010000  0       1       1       1.003   5
11003506  160010000  0       1       1       .457    6
11003507  170010000  0       1       1       .514    7
11003601  -999       0       3949    1       1.003   1
11003602  -999       0       3949    1       .457    2
11003603  -999       0       3949    1       .502    3
11003604  -999       0       3949    1       1.4084  4
11003605  -999       0       3949    1       1.003   5
11003606  -999       0       3949    1       .457    6
11003607  -999       0       3949    1       .514    7
11003701  0          0       0       0       7
11003801  0          0       0       1.003   1
11003802  0          0       0       .457    2
11003803  0          0       0       .502    3
11003804  0          0       0       1.4084  4
11003805  0          0       0       1.003   5
11003806  0          0       0       .457    6
11003807  0          0       0       .514    7
*
11004000  2          6       3       1       .6858
11004100  0          1
11004101  5          .7747
11004201  4          5
11004301  0.0        5
11004401  540.       6
11004501  115030000  0       1       1       .25     1
11004502  115100000  0       1       1       .25     2
11004601  -999       0       3949    1       .25     1
11004602  -999       0       3949    1       .25     2
11004701  0          0       0       0       2
11004801  0          0       0       .630    1
11004802  0          0       0       .630    2
11004901  0          0       0       .630    2
*
***********************************************************************
* PRESSURIZER HEAT STRUCTURES
*
14151000  1          6       1       1       0.0
14151100  0          1
14151101  5          .0762
14151201  5          5
14151301  0.0        5
14151401  618.       6
14151501  415010000  0       1       1       .362    1
14151601  -998       0       3949    1       .362    1
14151701  0          0       0       0       1
14151801  0          0.0     0.0     0.0     1
14152000  7          6       2       1       .42291
14152100  0          1
14152101  5          .49911
14152201  5          5
14152301  0.0        5
14152401  618.       6
14152501  415010000  0       1       1       .224    1
14152502  415020000  10000   1       1       .403    3
14152503  415040000  10000   1       1       .207    5
14152504  415060000  10000   1       1       .1705   7
14152601  -998       0       3949    1       .224    1
14152602  -998       0       3949    1       .403    3
14152603  -998       0       3949    1       .207    5
14152604  -998       0       3949    1       .1705   7
14152701  0          0       0       0       7
14152801  0          0.0     0.0     0.0     7
14162000  1          6       2       1       .2032
14162100  0          1
14162101  5          .3683
14162201  5          5
14162301  0.0        5
14162401  618.       6
14162501  415060000  0       1       1       .118    1
14162601  -998       0       3949    1       .118    1
14162701  0          0       0       0       1
14162801  0          0.0     0.0     0.0     1
14202000  1          6       2       1       .2032
14202100  0          1
14202101  5          .3683
14202201  5          5
14202301  0.0        5
14202401  618.       6
14202501  420010000  0       1       1       .118    1
14202601  -998       0       3949    1       .116    1
14202701  0          0       0       0       1
14202801  0          0.0     0.0     0.0     1
14201000  1          6       1       1       0.0
14201100  0          1
14201101  5          .18415
14201201  5          5
14201301  0.0        5
14201401  618.       6
14201501  420010000  0       1       1       .130    1
14201601  -998       0       3949    1       .130    1
14201701  0          0       0       0       1
14201801  0          0.0     0.0     0.0     1
***********************************************************************
*
* STEAM GENERATOR PRI-SEC HEAT STRUCTURES
*
***********************************************************************
* STEAM GENERATOR TUBING (INCL. HALF THE TUBE SHEET)                  *
*
10060000  6          8       2       1       0.0051054
10060100  0          1
10060101  7          0.006348984
10060201  6          7
10060301  0.0        7
10060401  540.0      8
10060601  517010000  0       1  1  1579.69   1
10060602  517020000  0       1  1  1310.32   2
10060603  517030000  0       1  1  1582.27   3
10060604  517030000  0       1  1  1582.27   4
10060605  517020000  0       1  1  1310.32   5
10060606  517010000  0       1  1  1579.69   6
10060501  115040000  0       1  1  1579.69   1
10060502  115050000  0       1  1  1310.32   2
```

```
10060503  115060000 0        1  1  1582.27   3
10060504  115070000 0        1  1  1582.27   4
10060505  115080000 0        1  1  1310.32   5
10060506  115090000 0        1  1  1579.69   6
10060701  0         0         0         0         6
10060801  0         0         0         0         6
10060901  0         0         0         0         6
*
************************************************************
************************************************************
*
* HEAT STRUCTURE THERMAL PROPERTY DATA                     *
*
20100100  TBL/FCTN  1         1    * UO2
20100200  TBL/FCTN  1         1    * GAP
20100300  TBL/FCTN  1         1    * ZR
20100400  S-STEEL
20100500  C-STEEL
20100600  TBL/FCTN  1         1    * INCONEL 600
************************************************************
* THERMAL CONDUCTIVITY UO2
*
20100101   366.48  7.7796    449.81  6.6287    533.15  5.7824
20100102   616.48  4.6228    699.82  4.6332    783.15  422.13
20100103   866.48  3.8803    949.82  3.5965    1033.15 3.3576
20100104   1088.71 3.1551    1199.82 2.9838    1283.15 2.8367
20100105   1366.48 2.7138    1449.82 2.6082    1533.32 2.5217
20100106   1616.48 2.4490    1699.82 2.3919    1977.59 2.2898
20100107   2255.37 2.3071    2533.15 2.4334    2810.93 2.6619
20100108   3088.71 2.9942
*
************************************************************
* VOLYMETRIC HEAT CAPACITY UO2
*
20100151   273.15  2.3104E6  323.15  2.5720E6  373.15  2.7464E6
20100152   473.15  2.9207E6  673.15  3.1387E6  1373.15 3.4438E6
20100153   1773.15 3.5310E6  1973.15 3.7926E6  2173.15 4.2285E6
20100154   2373.15 4.8824E6  2673.15 6.0158E6  2773.15 6.3210E6
20100155   2873.15 6.5825E6  2973.15 6.7133E6  3113.15 6.8005E6
20100156   4699.82 6.8005E6
*
************************************************************
* THERMAL CONDUCTIVITY ZR
*
20100301   273.15  9.5744    473.15  12.0044   673.15  14.0051
20100302   873.15  17.0079   1073.15 19.0087   1273.15 22.0098
20100303   1473.15 25.0109   1673.15 30.0127   1873.15 36.0149
20100304   2073.15 44.0178   2273.15 55.0235   2473.15 68.0283
*
************************************************************
* VOLYMETRIC HEAT CAPACITY ZR
*
20100351   255.37  1.9041E6  1077.59 2.3122E6  1185.93 5.7124E6
20100352   1248.43 2.3118E6  2199.82 2.3122E6
*
*
************************************************************
* THERMAL CONDUCTIVITY GAP                                 *
*
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
```

```
*
************************************************************
* THERMAL CONDUCTIVITY INCONEL 600
*
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
*
************************************************************
* VOLUMETRIC HEAT CAPACITY GAP                             *
*
20100251  273.15     5.4
20100252  3260.0     5.4
*
************************************************************
* VOLUMETRIC HEAT CAPACITY INCONEL 600                     *
*
20100651  366.5      3.908E5
20100652  477.6      4.084E5
20100653  588.7      4.260E5
20100654  700.0      4.436E5
20100656  810.9      4.665E5
20100657  922.0      4.929E5
20100658  1033.2     5.105E5
20100659  1477.6     5.727E5
*
************************************************************
* HEAT STRUCTURE GENERAL TABLES.
*
20299900   TEMP
20299901   0.0        305.
*
20299800   TEMP     501
20299801   -1.        614.7
20299802   0.0        305.
*
20299700   TEMP     501
20299701   -1.        558.
20299702   0.0        305.
*
20294900   HTC-T
20294901   0.0        20.  * 250 KW SS SURROUNDINGS HEAT LOSS
*
************************************************************
* POWER                                                    *
*
20290000  POWER
20290001  0.0        0.0
20290002  1000.0     0.0
*
************************************************************
************************************************************
*
*                     PUMP DATA
*
************************************************************
*
* SINGLE PHASE HEAD CURVES                                 *
************************************************************
```

```
*
* HEAD CURVE NO. 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
************************************************************
* HEAD CURVE NO. 2                                         *
*
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
************************************************************
* HEAD CURVE NO. 3                                         *
*
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
************************************************************
* HEAD CURVE NO. 4                                         *
*
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
************************************************************
* HEAD CURVE NO. 5                                         *
*
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
************************************************************
* HEAD CURVE NO. 6                                         *
*
1351600   1               6
1351601   0.000000E+00    9.342790E-01
1351602   9.109900E-02    9.229000E-01
1351603   1.865090E-01    8.968000E-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
************************************************************
* HEAD CURVE NO. 7                                         *
*
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
************************************************************
* HEAD CURVE NO. 8                                         *
*
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
*
************************************************************
* SINGLE PHASE TORQUE DATA                                 *
*
************************************************************
* TORQUE CURVE NO. 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
************************************************************
* TORQUE CURVE NO. 2                                       *
*
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
************************************************************
* TORQUE CURVE NO. 3                                       *
*
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
************************************************************
* TORQUE CURVE NO. 4                                       *
*
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
************************************************************
* TORQUE CURVE NO. 5                                       *
*
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
************************************************************
* TORQUE CURVE NO. 6                                       *
*
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
************************************************************
* TORQUE CURVE NO. 7                                       *
*
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
************************************************************
* FOR TORQUE CURVE NO. 8                                   *
*
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
*
************************************************************
* TWO - PHASE MULTIPLIER DATA                              *
*
************************************************************
* HEAD CURVE                                               *
*
1353000   0
1353001   0.000000E+00      0.000000E+00
1353002   2.000000E-02      2.000000E-02
1353003   6.000000E-02      5.000000E-02
1353004   1.000000E-01      1.000000E-01
1353005   2.000000E-01      4.600000E-01
1353006   2.400000E-01      8.000000E-01
1353007   3.000000E-01      9.600000E-01
1353008   4.000000E-01      9.800000E-01
1353009   6.000000E-01      9.700000E-01
1353010   8.000000E-01      9.000000E-01
1353011   9.000000E-01      8.000000E-01
1353012   9.600000E-01      5.000000E-01
1353013   1.000000E+00      0.000000E+00
************************************************************
* TORQUE CURVE                                             *
*
1353100   0
1353101   0.000000E+00      0.000000E+00
1353102   1.250000E-01      7.000000E-02
1353103   1.650000E-01      1.250000E-01
1353104   2.400000E-01      5.600000E-01
1353105   8.000000E-01      5.600000E-01
1353106   9.600000E-01      4.500000E-01
1353107   1.000000E+00      0.000000E+00
*
************************************************************
* PUMP 2-PHASE DIFFERENCE DATA                             *
*
************************************************************
* HEAD CURVE NO. 1                                         *
*
1354100   1                 1
1354101   0.000000E+00      0.000000E+00
1354102   1.000000E-01      8.300000E-01
1354103   2.000000E-01      1.090000E+00
1354104   5.000000E-01      1.020000E+00
1354105   7.000000E-01      1.010000E+00
1354106   9.000000E-01      9.400000E-01
1354107   1.000000E+00      1.000000E+00
************************************************************
* HEAD CURVE NO. 2                                         *
*
1354200   1                 2
1354201   0.000000E+00      0.000000E+00
1354202   1.000000E-01      -4.000000E-02
1354203   2.000000E-01      0.000000E+00
1354204   3.000000E-01      1.000000E-01
1354205   4.000000E-01      2.100000E-01
1354206   8.000000E-01      6.700000E-01
1354207   9.000000E-01      8.000000E-01
1354208   1.000000E+00      1.000000E+00
************************************************************
* HEAD CURVE NO. 3                                         *
*
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
************************************************************
* HEAD CURVE NO. 4                                         *
*
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
```

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1354410   0.000000E+00        1.100000E-01
************************************************************
* HEAD CURVE NO. 5                                         *
*
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
************************************************************
* HEAD CURVE NO. 6                                         *
*
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
************************************************************
* HEAD CURVE NO. 7                                         *
*
1354700   1                   7
1354701   -1.000000E+00       0.000000E+00
1354702   0.000000E+00        0.000000E+00
************************************************************
* HEAD CURVE NO. 8                                         *
*
1354800   1                   8
1354801   -1.000000E+00       0.000000E+00
354802    0.000000E+00        0.000000E+00
************************************************************
* TORQUE CURVE NO. 1                                       *
*
1354900   2                   1
1354901   0.000000E+00        6.032000E-01
1354902   1.930000E-01        6.325000E-01
1354903   3.930000E-01        7.369000E-01
54904     5.955200E-01        8.331000E-01
1354905   7.978200E-01        9.229000E-01
1354906   1.000000E+00        1.000000E+00
************************************************************
* TORQUE CURVE NO. 2                                       *
*
1355000   2                   2
1355001   0.000000E+00        -6.700000E-01
1355002   4.000000E-01        -2.500000E-01
1355003   5.000000E-01        1.500000E-01
1355004   7.372550E-01        5.265860E-01
1355005   7.680490E-01        6.065940E-01
1355006   8.672300E-01        7.436600E-01
1355007   1.000000E+00        1.000000E+00
************************************************************
* TORQUE CURVE NO. 3                                       *

55100     2                   3
55101     -1.000000E+00       1.984300E+00
55102     -8.009600E-01       1.394000E+00
355103    -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
************************************************************
* TORQUE CURVE NO. 4                                       *
*
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   -4.586300E-01       1.557000E+00
1355205   -2.670230E-01       1.436200E+00
1355206   -1.761070E-01       1.367900E+00
1355207   -8.931000E-02       1.348100E+00
1355208   0.000000E+00        1.233610E+00
************************************************************
* TORQUE CURVE NO. 5                                       *
*
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
************************************************************
* TORQUE CURVE NO. 6                                       *
*
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        3.568000E-01
************************************************************
* TORQUE CURVE NO. 7                                       *
*
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
************************************************************
* TORQUE CURVE NO. 8                                       *
*
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
*
************************************************************
************************************************************
*
*  REACTOR KINETICS                                        *
*
************************************************************
*
* POINT KINETICS                                           *
*
30000000  POINT
30000001  GAMMA-AC  50.0E6    0.        371.875

*
************************************************************
* DELAYED NEUTRON CONSTANTS                                *
*
30000101  0.042     3.01
30000102  0.1150    1.14
30000103  0.3950    3.301
30000104  0.1960    0.301
30000105  0.2190    0.305
30000106  0.0330    0.0124
*
************************************************************
* POWER HISTORY                                            *
*
30000401  25.E+6    30.       HR
30000402  50.0E+6   69.       HR
*
************************************************************
* REACTIVITY CURVE                                         *
*
30000011  609
*
************************************************************
* MODERATOR DENSITY REACTIVITY TABLE                       *
*
30000501  0.8125  -3.4
30000502  0.875   -1.8
30000503  0.9375  -0.3
30000504    1.0    1.0
30000505  1.0625   2.2
30000506  1.125    3.1
30000507  1.1875   4.0
30000508  1.25     4.9
*
************************************************************
* DOPPLER  REACTIVITY TABLE                                *
*
30000601    255.     1.5
30000602    500.     0.3
30000603    750.    -0.7
30000604   1000.     -1.6
30000605   1250.     -2.3
30000606   1500.     -3.0
30000607   1750.     -3.7
30000608   2000.     -4.3
30000609   2250.     -4.9
30000610   2500.     -5.4
30000611   2750.     -5.9
30000612   3000.     -6.3
*
************************************************************
* SCRAM ROD WORTH CURVE     609                            *
*
20260900  REAC-T     501
20260901  0.0        0.0
20260902  0.1       -2.1
20260903  0.2       -4.3
20260904  0.3       -6.8
20260905  0.4       -9.2
20260906  0.5       -11.1
20760907  0.6       -12.2
20260908  0.7       -12.9
20260909  0.8       -13.3
20260910  0.9       -13.6
20260911  1.0       -13.7
```

```
20260912  1.1      -13.8
20260913  1.2      -13.9
20260914  1.8      -14.0
20260915  1000.    -14.0
*
**************************************************************
* MODERATOR DENS. FEEDBACK                                   *
*
30000701  230010000      0    0.15746   0.0
30000702  230020000      0    0.15746   0.0
30000703  230030000      0    0.15746   0.0
30000704  230040000      0    0.15746   0.0
30000705  230050000      0    0.15746   0.0
30000706  230060000      0    0.21270   0.0
*
**************************************************************
* DOPPLER  FEEDBACK                                          *
*
30000801  2300001        0    0.0170    0.0
30000802  2300002        0    0.3639    0.0
30000803  2300003        0    0.2747    0.0
30000804  2300004        0    0.2379    0.0
30000805  2300005        0    0.0976    0.0
30000806  2300006        0    0.0089    0.0
*
**************************************************************
**************************************************************
*
*          STEAM GENERATOR SECONDARY SIDE
*
**************************************************************
 TOP OF DOWNCOMER (OUTLET OF PRIMARY SEPARATOR)              *
 
.0000     DOWNTOP    BRANCH
 0001     1          1
 0101     1.273      0.718     0.0       0.0       -90.0   -0.718
50 0102   4.E-5      0.7874    00
5 01101   500010000 505000000 0.0     0.0      0.0      0100
*
**************************************************************
* LOWER SEPARATOR SECTION                                    *
*
 0000     LWR-SEP    SNGLVOL
 0101     1.273      0.718     0.0       0.0       -90.0   -0.718
 0102     4.E-5      0.7874    00

  ************************************************************
  ED INLET VOLUME                                            *

  000     FEED-INLET           BRANCH
  101     2     1
  0101    0.7525     0.518     0.0       0.0       -90.0   -0.518
  0102    4.E-5      0.10796   00
  01101   505010000 510000000 0.0        0.0       0.0      0100
  02101   510010000 515000000 0.0        0.0       0.0      0100

  ************************************************************
  SEPARATOR (INSIDE SHROUD, ABOVE TUBES)

5200000   SEPAR      SEPARATR
5200001   3          1
5200101   0.27871    0.718     0.0       0.0       90.0     0.718
5200102   4.E-5      0.0       00
5201101   520010000 525000000 0.0     2.       2.       1000  .5
```

```
5202101   520000000 505000000 0.0    5.        5.       1000  .10
5203101   519010000 520000000 0.196  0.4       0.4      1000
*
**************************************************************
* BELOW MIST EXTRACTOR, ABOVE TOP OF SHROUD IN STEAM DOME    *
*
5250000   BOTSTMDM             BRANCH
5250001   1          1
5250101   .90        0.762     0.0       0.0       90.0     0.762
5250102   4.E-5      0.0       00
5251101   525010000 530000000 0.0        0.8       0.8      0100
*
**************************************************************
* BELOW MIST EXTRACTOR, PRALLEL VOLUME
*
5260000   BOTSTMDMP            BRANCH
5260001   2          1
5260101   .2148      0.762     0.0       0.0       -90.0   -0.762
5260102   4.E-5      0.0       00
5261101   526010000 525000000 0.0        0.8       0.8      0103
5262101   526010000 500000000 0.0        0.0       0.0      0100
*
**************************************************************
* MIST EXTRACTOR AND STEAM GEN OUTLET PIPE TO SCV            *
*
5300000   STMDM-PIPE           PIPE
5300001   2
5300101   0.799008    1
5300102   0.04635    2
5300201   0.01365    1
5300301   0.762      1
5300302   25.074     2
5300401   0.0        2
5300601   90.0       1
5300602   0.0        2
5300801   4.E-5      0.0       2
5300901   0.4        0.4       1
5301001   00         2
5301101   0100       1
5301300   0
5301300   1
*
**************************************************************
* PIPE DOWNSTREAM OF SCV                                     *
*
5350000   CONDINL              SNGLVOL
5350101   0.06557    54.44     0.0       0.0       0.0      0.0
5350102   4.E-5      0.0       00
*
**************************************************************
* AIR COOLED CONDENSER                                       *
*
5400000   CONDSER              TMDPVOL
5400101   0.21677   17.67      0.0       0.0       0.0      0.0
5400102   4.E-5      0.02      00
5400200   2
5400207   0.0        2.0200E6 1.0
5400208 1000.        2.0200E6 1.0
*
**************************************************************
* MAKE UP FEED STORAGE TANK                                  *
*
5450000   FEEDTANK             TMDPVOL
5450101   29.81      3.048     0.0       0.0       0.0      0.0
5450102   4.E-5      0.0       00
```

```
5450200   0        0       CNTRLVAR  606
5450201   .8540E6  6.0E6    .8540E6  2.785E6   .5
5450202   1.0378E6 6.0E6   1.0378E6  2.785E6   .5
*
**************************************************************
* FLOW PATH TO THE AIR COOLED CONDENSER
*
5550000   COACCO    SNGLJUN
5550101   535010000 540000000 0.0    0.0       0.0      0100
**************************************************************
**************************************************************
*
*               HEAT STRUCTURE INPUT DATA
*
**************************************************************
*
* STEAM GENERATOR HEAT STRUCTURES                            *
*
**************************************************************
* SHROUD SECONDARY SIDE STEAM GENERATOR                      *
15000000  3         4          2      1       0.3048
15000100  0         1
15000101  3         0.314325
15000201  5         3
15000301  0.0       3
15000401  540.0     4
15000501  500010000 0          1      1       0.7725    1
15000502  505010000 0          1      1       0.7725    2
15000503  510010000 0          1      1       0.152     3
15000601  520010000 0          1      1       0.7725    1
15000602  519020000 0          1      1       0.7725    2
15000603  519010000 0          1      1       0.152     3
15000701  0         0          0      0       3
15000801  0         0.0        0.0    0.0     3
15000901  0         0.0        0.0    0.0     3
15150000  4         4          2      0       0.6445
15150100  0         1
15150101  3         0.6572
15150201  5         3
15150301  0.0       3
15150401  540.0     4
15150501  510010000 0          1      1       0.152     1
15150502  515010000 10000      1      1       0.7113    4
15150601  519010000 0          1      1       0.152     1
15150602  517030000 -10000     1      1       0.7113    4
15150701  0         0          0      0       4
15150801  0         0.0        0.0    0.0     4
15150901  0         0.0        0.0    0.0     4
**************************************************************
* SG VESSEL VALL - SURROUNDINGS
*
15050000  5         4          2      1       .7112
15050100  0         1
15050101  3         .73819
15050201  5         3
15050301  0.0       3
15050401  540.      4
15050501  505010000 0          1      1       .718      1
15050502  510010000 0          1      1       .518      2
15050503  515010000 10000      1      1       .7102     5
15050601  -999      0          3949   1       .718      1
15050602  -999      0          3949   1       .518      2
15050603  -999      0          3949   1       .7102     5
```

```
15050701   0        0.0       0.0       0.0       5
15050801   0        0.0       0.0       0.0       5
15050901   0        0.0       0.0       0.0       5
*
*****************************************************************
*****************************************************************
*
*               S.G. SECONDARY DWNC-BOIL-RISR
*
*****************************************************************
*
* STEAM GENRATOR DOWNCOMER
*
5150000   DWNCMR                 PIPE
5150001   3
5150101   0.23226   3
5150201   0.0       2
5150301   0.7102    3
5150401   0.0       3
5150601   -90.      3
5150701   -0.7102   3
5150801   4.E-5     0.10796   3
5150901   0.0       0.0       2
5151001   00        3
5151101   0000      2
5151300   1
*
**************************************************************
* STEAM GENERATOR BOILING SECTION
*
5170000   BILSCT                 PIPE
5170001   3
5170101   0.27871   3
5170201   0.0       2
5170301   1.85075   3
5170401   0.0       3
5170601   21.0      3
5170701   0.7102    3
5170801   4.E-5     0.0192    3
5170901   0.0       0.0       1
5170902   0.0       0.0       2
5171001   00        3
5171101   0000      2
5171300   0
*
*****************************************************************
* STEAM GENERATOR RISER                                         *
*
5190000   RISER                  PIPE
5190001   2
5190101   0.27871   2
5190201  0.0        1
5190301   1.85075   1
5190302   0.718     2
5190401   0.0       2
5190601   16.0      1
5190602   90.0      2
5190701   0.518     1
5190702   0.718     2
5190801   4.E-5     0.5957    1
5190802   4.E-5     0.0       2
5190901   0.0       0.0       1
5191001   00        2
5191101   0000      1
5191300   0
```

```
*
*****************************************************************
* SG DOWNCOMER TO BOILING SECTION, VALVE FOR RECIRCULATION RATIO
*
5160000   DWNBOIL   VALVE
5160101   515010000 517000000  .232     1.       1.       0100
5160201   1         130.7     0.0       0.0
5160300   SRVVLV
5160301   216
*
*
*****************************************************************
* SG BOILING SECTION TO RISER
*
5180000   BOILRSR             SNGLJUN
5180101   517010000 519000000 0.0       0.0       0.0       0000
*
*****************************************************************
*****************************************************************
*
*                  BROKEN LOOP
*
*****************************************************************
* REACTOR VESSEL BROKEN LOOP HOT LEG                            *
*
3000000   RVBLHL    BRANCH
3000001   2         1
3000101   0.0634    0.876     0.0       0.0       0.0       0.0
3000102   4.0E-5    0.0       00
3001101   295010000 300000000 0.0634    0.1       0.1       0102
3002101   300010000 305000000 0.0       0.1       0.1       0000
*
*****************************************************************
* HOT LEG PIPE TO REFLOOD ASSIST BYPASS TEE                     *
*
3050000   HLPRAS    BRANCH
3050001   1         1
3050101   0.0634    0.698     0.0       0.0       0.0       0.0
3050102   4.0E-5    0.0       00
3051101   305010000 310000000 0.0       0.05      0.05      0100
*
*****************************************************************
* STEAM GENERATOR SIMULATOR INLET                               *
*
3100000   SGSII   BRANCH
3100001   2       1
3100101   0.0  1.424  0.0668  0.0  0.0  0.0
3100102   4.0E-5  0.0   00
3101101   370010000 310000000 0.0  0.0  0.0  0100
3102101   310010000 315000000  0.0  0.05  0.05  0100
*
*****************************************************************
* S.G. PIPE AND PUMP SIMULATOR                                  *
*
3150000   SGPSI     PIPE
3150001  10
3150101   0.00836  2
3150102   0.108    7
3150103   0.0      8
3150104   0.00836 9
3150105   0.0525   10
3150201   0.0      2
3150202   0.0326   6
3150203   0.0      7
3150204   0.0081   8
```

```
3150205   0.0       9
3150301   0.4054     1
3150302    0.5265   2
3150303   0.362  3
3150304   1.692  4
3150305   1.699  5
3150306   1.692  6
3150307   0.362  7
3150308   2.671  8
3150309   1.842  9
3150310   0.667  10
3150401   0.0        7
3150402   0.081      8
3150403   0.0        10
3150601   90.        4
3150602   0.         5
3150603   -90.       8
3150604   90.        9
3150605   0.         10
3150701   0.127    1
3150702   0.488    2
3150703   0.362    3
3150704   1.692    4
3150705   0.0      5
3150706   -1.692   6
3150707   -0.362   7
3150708   -1.829    8
3150709   1.214     9
3150710   0.0   10
3150801   4.0E-5    0.0  3
3150802   4.0E-5   0.124  4
3150803   4.0E-5   0.0   5
3150804   4.0E-5   0.124  6
3150805   4.0E-5   0.0  10
3150901  0.1  0.1   1
3150902  0.1  0.1   2
3150903  93.9  93.9  4
3150904  93.9  93.9  6
3150905  0.0  0.0  7
3150906  4.1  4.1  8
3150907  0.4  0.4  9
3151001  00  10
3151101  0100  9
3151300   1
*
*****************************************************************
* BROKEN LOOP COLD LEG REACTOR VESSEL NOZZLE                    *
*
3350000   RVNBL     BRANCH
3350001   2         1
3350101   0.0634    0.7495    0.0       0.0       0.0       0.0
3350102   4.0E-5    0.0       00
3351101   290000000 335000000 0.0634    1.0       1.0       0102
3352101   335010000 340000000 0.0       0.1       0.1       0000
*
*****************************************************************
* CONNECTION TEE OF THE BYPASS ASSIST SYSTEM REACTOR VESSEL SIDE*
*
3400000   CTBARV    BRANCH
3400001   1         1
3400101   0.0634    0.698     0.0       0.0       0.0       0.0
3400102   4.0E-5    0.0       00
3401101   340010000 345000000 0.0       0.1       0.1       0000
*
*****************************************************************
```

```
* BYPASS ASSIST OUTLET ECC TEE COLD LEG
*
3450000   BAOET     BRANCH
3450001   2    1
3450101   0.0634    0.974   0.0  0.0  0.0  0.0
3450102   4.0E-5    0.0    00
3451101   380010000 345000000  0.0   0.0   0.0   0100
3452101   345010000 350000000  0.0   0.0   0.0   0100
*
***************************************************************
* ECC TEE OF BROKEN LOOP                                      *
*
3500000   ETIVCL    SNGLVOL
3500101   0.0   2.0965   0.08311   0.0   0.0   0.0
3500102   4.0E-5    0.0    00
*
***************************************************************
* REFLOOD ASSIST HOT LEG                                      *
*
3700000   RFASHL    SNGLVOL
3700101   0.0388    0.0    0.1713  0.0  90.  0.653
3700102   4.0E-5    0.0    00
*
***************************************************************
* VALVE JUNCTION FOR THE RABV

.20000     RABV      VALVE
..20101    380000000 370000000  .01       1.        1.        0100
3720201    1         6.28       0.0       0.0
3720300    SRVVLV
3720301    372
*
***************************************************************
* REFLOOD ASSIST BYPASS SINGLE PIPE COLD LEG SIDE             *
*
3800000   RFASCL    SNGLVOL
3800101   0.0388    0.0    0.20353  0.0  90.  0.653
3800102   4.0E-5    0.0    00
*
***************************************************************
***************************************************************
*
*                   ECC SYSTEM
*
***************************************************************
*
* BWST HPIS                                                   *
*
6250000    BWTHPI    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  1.0E5   305.0
6250202  1000.0 1.0E5   305.0
*
***********************************************************
* HIGH PRESSURE INJECTION SYSTEM - A+B
*
6300000   HPIS        TMDPJUN
6300101   625000000 210000000      0.009099
6300200   1           661       P          210010000
6300201  -1.0         0.0       0.0        0.0
6300202   0.0         0.0       0.0        0.0
6300203   0.0         .75687    0.0        0.0
6300204   .7725E6     .75687    0.0        0.0
6300205   8.3597E6  .31536    0.0        0.0
6300206   17.2436E6 .31536    0.0        0.0
*
***************************************************************
***************************************************************
*
* ICAP ASSESSMENT PARAMETERS
*
***************************************************************
*
* CORE INLET FLUID DENSITY
20550100   DCOREINF  MULT       1.        0.0        1
20550101   VOIDFJ    225010000
20550102   RHOFJ     225010000
*
20550200   DCOREING  MULT       1.        0.0        1
20550201   VOIDGJ    225010000
20550202   RHOGJ     225010000
*
20590100   DENSCORIN SUM        1.        0.0        1
20590101   0.0       1.         CNTRLVAR  501
20590102             1.         CNTRLVAR  502
*
* ROD CLADDING TEMPERATURE SAVE UP
20590300   CLDTEMP1  MULT       1.        0.0        1
20590301   HTTEMP    230000109
20590400   CLDTEMP2  MULT       1.        0.0        1
20590401   HTTEMP    230000209
20590500   CLDTEMP3  MULT       1.        0.0        1
20590501   HTTEMP    230000309
20590600   CLDTEMP4  MULT       1.        0.0        1
20590601   HTTEMP    230000409
20590700   CLDTEMP5  MULT       1.        0.0        1
20590701   HTTEMP    230000509
20590800   CLDTEMP6  MULT       1.        0.0        1
20590801   HTTEMP    230000609
*
* FLUID TEMPERATURE AT THE CORE OUTLET
20550400   FLOWDIR   TRIPUNIT   1.        0.0        1
20550401   518
*
20550500   TDIRP     MULT       1.        0.0        1
20550501   CNTRLVAR  504
20550502   TEMPF     230060000
*
20550600   FLOWDIRM  TRIPUNIT   1.        0.0        1
20550601   -518
*
20550700   TDIRM     MULT       1.        0.0        1
20550701   CNTRLVAR  506
20550702   TEMPF     240010000
*
20590900   TCOROUT   SUM        1.        0.0        1
20590901   0.     1. CNTRLVAR   505
20590902          1. CNTRLVAR   507
*
* CORE TEMPERATURE DIFFERENCE
20591000   CTDIFF    SUM        1.        0.0        1
20591001   0.        1.         TEMPF     240010000
20591002             -1.        TEMPF     225010000
*
* PRESS. DIFF. OVER THE CORE
20591200   COREINV   SUM        1.        0.0        1
20591201   0.0       1.         P         225010000
20591202             -2.26      RHO       225010000
20591203             -1.        P         245010000
20591204             3.31       RHO       245010000
*
* PRESS.DIFF. OVER THE DOWNCOMER
20591300   DOWNINV   SUM        1.        0.0        0
20591301   0.0       1.         P         185010000
20591302             -1.        P         215010000
20591303             .78        RHO       215010000
*
* VESSEL MASS INVENTORY
20551400   VESSMS1   SUM        1.        0.0        1
20551401   0.0       .0465      RHO       200010000
20551402             .078       RHO       290010000
20551403             .071       RHO       205010000
20551404             .136036    RHO       210010000
20551405             .136036    RHO       210020000
20551406             .136036    RHO       210030000
20551407             .136036    RHO       210040000
20551408             .2664      RHO       215010000
20551409             .2923      RHO       220010000
20551410             .130       RHO       225010000
20551411             .047655    RHO       230010000
20551412             .047655    RHO       230020000
20551413             .047655    RHO       230030000
20551414             .047655    RHO       230040000
20551415             .047655    RHO       230050000
20551416             .064364    RHO       230060000
*
20551500   VESSMS2   SUM        1.        0.0        1
20551501   0.0       .008385    RHO       235010000
20551502             .008385    RHO       235020000
20551503             .008385    RHO       235030000
20551504             .332046    RHO       240010000
20551505             .079002    RHO       245010000
20551506             .1281      RHO       246010000
20551507             .0603      RHO       295010000
20551508             .202752    RHO       250010000
20551509             .173728    RHO       255010000
*
20591400   VESSMASS  SUM        1.        0.0        1
20591401   0.0       1.         CNTRLVAR  514
20591402             1.         CNTRLVAR  515
*
* DOWNCOMER LIQUID LEVEL
20591500   DOWNLEV   SUM        1.        0.0        1
20591501   0.162     .1065      VOIDF     200010000    **
20591502             .300       VOIDF     290010000
20591503             .274       VOIDF     205010000
20591504             .958       VOIDF     210010000
20591505             .958       VOIDF     210020000
20591506             .958       VOIDF     210030000
20591507             .958       VOIDF     210040000
20591508             .360       VOIDF     215010000
20591509             .208       VOIDF     220010000    **
*
* UPPER PLENUM LIQUID LEVEL
20591600   UPLEV     SUM        1.        0.0        1
20591601   3.764     .3084      VOIDF     240010000    **
20591602             .693       VOIDF     245010000
20591603             .300       VOIDF     295010000
20591604             .3251      VOIDF     250010000    **
*
* UPPER PLENUM SUBCOOLING
20591900   UPSCOOL   SUM        1.        0.0        1
20591901   0.0       1.         SATTEMP   240010000
```

```
20591902               -1.        CNTRLVAR  909
*
* I.L. LIQUID LEVEL, FOR .66 M / LEPDE-PC-28
20553100   P31A       SUM        1.        0.0         1
20553101   0.0        1.         P         120010000
20553102              -.183      P         155010000
20553103              -.817      P         160010000
20553104              -6.475     RHOG      165010000
*
20553200   P31B       SUM        9.81      0.0         1
20553201   0.0        1.         RHOF      155010000
20553202              -1.        RHOG      165010000
*
20593100   LIQLIL     DIV        1.        0.0         1
20593101   CNTRLVAR   532
20593102   CNTRLVAR   531
*
* B.L. LIQUID LEVEL, FOR 4.88 M / LEPDE-BL-14
20553300   P32A       SUM        1.        0.0         1
20553301   0.0        1.         P         315080000
20553302              8.97       RHO       315080000
20553303              -1.        P         315050000
20553304              -47.87     RHOG      315060000
*
20553400   P32B       SUM        9.81      0.0         1
20553401   0.0        1.         RHOF      315060000
20553402              -1.        RHOG      315060000
*
20593200   LIQLBL     DIV        1.        0.0         1
20593201   CNTRLVAR   534
20593202   CNTRLVAR   533
*
* PUMP PRESSURE DIFF.
20593600   DPPUMP     SUM        1.        0.0         1
20593601   0.0        .5         P         150010000
20593602              .5         P         145010000
20593603              -1.        P         120010000
*
* BREAK ENERGY RELEASE
20553700   PRESSE     MULT       1.        0.0         1
20553701   MFLOWJ     805000000
20553702   P          800010000
*
20553800   PRESSENT   DIV        1.        0.0         1
20553801   RHO        800010000
20553802   CNTRLVAR   537
*
20553900   BRUFFL     MULT       205.9E-6  0.0         1
20553901   UFJ        805000000
20553902   VELFJ      805000000
20553903   VOIDFJ     805000000
20553904   RHOFJ      805000000
*
20554000   BRUGFL     MULT       205.9E-6  0.0         1
20554001   UGJ        805000000
20554002   VELGJ      805000000
20554003   VOIDGJ     805000000
20554004   RHOGJ      805000000
*
20594000   BRENRELEA SUM         1.        0.0         1
20594001   0.0        1.         CNTRLVAR  539       * FLUID INNER ENERGY
20594002              1.         CNTRLVAR  540       * STEAM INNER ENERGY
20594003              1.         CNTRLVAR  538       * P*V ENTHALPY PART
*
* BREAK INLET FLUID SUBCOOLING
20594200   BRSUBCOOL SUM         1.        0.0         1
20594201   0.0        1.         SATTEMP   800010000
20594202              -1.        TEMPF     800010000
*
* SG PRIM. TEMPERATURE DIFF.
20594500   SGTEDIFF   SUM        1.        0.0         1
20594501   0.0        1.         TEMPF     115030000
20594502              -1.        TEMPF     115100000
*
* SG PRIM. PRESSURE DIFF.
20594600   SGPRPRS    SUM        1.        0.0         1
20594601   0.0        1.         P         115010000
20594602              -1.        P         120010000
*
* SG LIQUID LEVEL
20594900   SGLIQLEV   SUM        1.        0.0         1
20594901   -2.946     .7102      VOIDF     515010000
20594902              .7102      VOIDF     515020000
20594903              .7102      VOIDF     515030000
20594904              .518       VOIDF     510010000
20594905              .718       VOIDF     505010000
20594906              .718       VOIDF     500010000
20594907              .762       VOIDF     526010000
*
* SG PRIM. TO SEC. TEMP DIFFERENCE, INLET
20595200   SGPRSETD   SUM        1.        0.0         1
20595201   0.0        1.         TEMPF     115030000
20595202              -1.        TEMPF     515030000
*
* SG HEAT TRANSFER RATE
20595300   SGHTTRANS SUM         -1.       0.0         1
20595301   0.0        50.6736    HTRNR     006000100
20595302              42.0327    HTRNR     006000200
20595303              50.7563    HTRNR     006000300
20595304              50.7563    HTRNR     006000400
20595305              42.0327    HTRNR     006000500
20595306              50.6736    HTRNR     006000600
*
* PRESSURIZER LIQUID LEVEL
20595400   PRLIQLEV   SUM        1.        0.0         1
20595401   0.0        .224       VOIDF     415010000
20595402              .403       VOIDF     415020000
20595403              .403       VOIDF     415030000
20595404              .207       VOIDF     415040000
20595405              .207       VOIDF     415050000
20595406              .1705      VOIDF     415060000
20595407              .1705      VOIDF     415070000
20595408              .118       VOIDF     415080000
*
* HPIS VOLYMETRIC FLOW RATE
20595800   HPISVOLF   DIV        1000.     0.0         0
20595801   RHO        625010000 MFLOWJ     630000000
*
* MASS BALANCE, INTEGRATED FORM BREAK TIME
20555900   TRIP50     TRIPUNIT  1.         0.0         1
20555901   510
*
20556000   MSBAL1     SUM        1.        0.0         1
20556001   0.0        1.         MFLOWJ    630000000
20556002              -1.        MFLOWJ    805000000
20556003              1.         MFLOWJ    901000000
*
20556100   MSBAL2     MULT       1.        0.0         1
20556101   CNTRLVAR   559
20556102   CNTRLVAR   560
*
20595900   MASSBAL    INTEGRAL  1.         0.0         0
20595901   CNTRLVAR   561
*
* PRIMARY COOLANT ENERGY BALANCE (P*V IS CONSERVED)
20556200   HPISEGY    MULT       1.        0.0         1
20556201   MFLOWJ     630000000
20556202   UF         625010000
*
20556300   PUMPENGY   DIV        2.        0.0         1
20556301   RHO        135010000
20556302   PMPHEAD    135
*
* CORE HEATING OF FLUID
20556400   COREHTFL   SUM        1.        0.0         1
20556401   0.         12.23457   HTRNR     230000101
20556402              12.23457   HTRNR     230000201
20556403              12.23457   HTRNR     230000301
20556404              12.23457   HTRNR     230000401
20556405              12.23457   HTRNR     230000501
20556406              16.52433   HTRNR     230000601
*
* PUMP SEAL WATER HEAT FLOW
20556500   PMPSWHF    MULT       1.        0.0         1
20556501   MFLOWJ     901000000
20556502   UF         910010000
*
* SS PRESSURE HEAT FLOW
20556600   SSPRHF     MULT       1.        0.0         1
20556601   MFLOWJ     435000000
20556602   UF         405010000
*
20596000   PRIENBAL   SUM        1.        0.0         1
20596001   0.0        -1.        CNTRLVAR  953       * SG
20596002              -1.        CNTRLVAR  982       * EXTERNALS
20596003              1.         CNTRLVAR  562       * HPIS
20596004              -1.        CNTRLVAR  940       * BREAK
20596005              1.         CNTRLVAR  564       * CORE
20596006              1.         CNTRLVAR  565       * PUMP SEAL WATER
20596007              -1.        CNTRLVAR  566       * SS PRESSURIZER
*
* PRIMARY HEAT LOSSES TO SURROUNDINGS
*
20555100   STR-HTL1   SUM        -1.       0.0         1
20555101   0.0        1.3716     HTRNR     100100100 * 100
20555102              1.4579     HTRNR     100100200 * 105
20555103              1.0085     HTRNR     100100300 * 110
20555104              .8309      HTRNR     100100400 * 115.1
20555105              .7229      HTRNR     100200100 * 115.2
20555106              1.4776     HTRNR     100400100 * 115.3
20555107              1.4776     HTRNR     100400200 * 115.10
20555108              .5585      HTRNR     100200200 * 115.11
20555109              .6147      HTRNR     100100500 * 115.12
20555110              .4988      HTRNR     100100600 * 115.13
20555111              .6781      HTRNR     100100700 * 120
20555112              .6806      HTRNR     100300100 * 125
20555113              .3101      HTRNR     100300200 * 130
20555114              .3406      HTRNR     100300300 * 140
20555115              .9557      HTRNR     100300400 * 145
20555116              .6806      HTRNR     100300500 * 155
20555117              .3101      HTRNR     100300600 * 160
20555118              .3488      HTRNR     100300700 * 170 / = 14.3236 M2
*
20555200   STR-HTL2   SUM        -1.       0.0         1
20555201   0.0        .4431      HTRNR     100100800 * 150
```

```
20555202             .4988    HTRNR      100100900 * 175.1
20555203             .5469    HTRNR      100101000 * 175.2
20555204             .6254    HTRNR      100101100 * 180
20555205            1.3035    HTRNR      100101200 * 185
20555206             .6687    HTRNR      335000100 * 335
20555207             .6228    HTRNR      335000200 * 340
20555208             .8690    HTRNR      335000300 * 345
20555209            1.0578    HTRNR      350100100 * 350
20555210            3.6545    HTRNR      375000200 * 380
20555211             .1312    HTRNR      315000100 * 315.1
20555212             .1704    HTRNR      315000200 * 315.2
20555213            1.9589    HTRNR      315300100 * 315.3
20555214            1.9589    HTRNR      315300200 * 315.4
20555215            1.9589    HTRNR      315300300 * 315.5
20555216            1.9589    HTRNR      315300400 * 315.6
20555217             .4174    HTRNR      315300500 * 315.7
20555218            1.8025    HTRNR      315100100 * 315.8
20555219             .7639    HTRNR      315200100 * 315.9
20555220             .5385    HTRNR      315400100 * 315.10/ = 21.950
*
20555300   STR-HTL3  SUM      -1.        0.0        1
20555301   0.0       .7816    HTRNR      300000100 * 300
20555302             .6228    HTRNR      300000200 * 305
20555303            1.2705    HTRNR      300000300 * 310
20555304            3.0792    HTRNR      375000100 * 370
20555305           -1.6800    HTRNR      220000101 * 220
20555306            1.7045    HTRNR      252000100 * 252
20555307             .7120    HTRNR      255000100 * 255 / =9.8506 M2
*
20598200   STR-HTL   SUM      1.         0.0        1
20598201   0.0       1.       CNTRLVAR   551
20598202             1.       CNTRLVAR   552
20598203             1.       CNTRLVAR   553  * T.AREA =46.1242 M2
*
*************************************************************
*************************************************************
*
*                BOUNDARY CONDITION CONTROL
*
*************************************************************
*
*   MAIN STEAM CONTROL VALVE                                **
*
5500000    MSFCV   TMDPJUN
5500101    530010000  535000000  0.002573
5500200    1    501
5500201    -1.   0.0  27.80  0.0
5500202    0.0   0.0  27.80  0.0   * FLOW RATE FROM NUREG/CR-0247
5500203    3.    0.0  23.4   0.0   * PRESSURE RISE 5.57 - 6.90 MPA
5500204    6.0   0.0  15.1   0.0   * 5% CHANGE RATE ASSUMED
5500205    9.    0.0   9.3   0.0
5500206    13.6  0.0   6.2   0.0
5500207    13.6  0.0  .181   0.0   * LEAKAGE
5500208    94.8  0.0  .181   0.0
5500209    94.8  0.0   2.85  0.0   * VALVE OPEN AT 89 S
5500210   104.8  0.0   2.85  0.0   * VALVE CLOSE AT 99 S
5500211   104.8  0.0  .181   0.0   * LEAKAGE
5500212    500.  0.0  .173   0.0   * FROM EXP. SCONDARY PRESSURE
5500213   1000.  0.0  .150   0.0   * LINEAR P-DEPENDENCE ASSUMED
5500214   1500.  0.0  .136   0.0   *  .120 KG/S AT 4.5 MPA
5500215   2370.  0.0  .113   0.0
*
*************************************************************
*  FEED WATER VALVE
*
```

```
5600000    FWVLV      TMDPJUN
5600101    545000000  510000000  0.05
5600200    1          501
5600201    -1.        27.80      0.0       0.0
5600202    0.0        27.80      0.0       0.0
5600203    .7         0.0        0.0       0.0
5600208    3000.      0.0        0.0       0.0
*
*************************************************************
* AUX. FEEDWATER
*
5540000    AUXFTANK   TMDPVOL
5540101    3.0        10.0       0.0  0.0  0.0  0.0  3.33E-5  1.0   11
5540200    1
5540201    0.0        315.0      0.0
*
5480000    AUXFJUN    TMDPJUN
5480101    554000000  510000000  .1
5480200    1          510
5480201    -1.        0.0        0.0       0.0
5480202    73.3       0.0        0.0       0.0
5480203    73.4       .50364     0.0       0.0
5480204    1856.      .50364     0.0       0.0
5480205    1857.0     0.0        0.0       0.0
*
*************************************************************
* SS VOLUME STATES
*
1000200   3    14.8896E6    577.73
1050200   3    14.8832E6    577.73
1100200   3    14.8606E6    577.72
1151201   3    14.8607E6    577.71    0.0  0.0  0.0    1
1151202   3    14.8624E6    577.71    0.0  0.0  0.0    2
1151203   3    14.7834E6    577.68    0.0  0.0  0.0    3
1151204   3    14.7603E6    573.52    0.0  0.0  0.0    4
1151205   3    14.7365E6    569.98    0.0  0.0  0.0    5
1151206   3    14.7195E6    566.28    0.0  0.0  0.0    6
1151207   3    14.7116E6    563.09    0.0  0.0  0.0    7
1151208   3    14.7046E6    560.77    0.0  0.0  0.0    8
1151209   3    14.6967E6    558.68    0.0  0.0  0.0    9
1151210   3    14.6968E6    558.68    0.0  0.0  0.0    10
1151211   3    14.6191E6    558.66    0.0  0.0  0.0    11
1151212   3    14.6097E6    558.65    0.0  0.0  0.0    12
1151213   3    14.6046E6    558.65    0.0  0.0  0.0    13
1200200   3    14.6010E6    558.65
1250200   3    14.5885E6    558.64
1300200   3    14.5670E6    558.63
1350200   3    14.8202E6    558.78
1400200   3    15.0825E6    558.78
1450200   3    15.0878E6    558.79
1500200   3    15.0603E6    558.82
1550200   3    14.5884E6    558.64
1600200   3    14.5679E6    558.63
1650200   3    14.8239E6    558.78
1700200   3    15.0869E6    558.87
1751201   3    15.0542E6    558.81    0.0  0.0  0.0  1
1751202   3    15.0473E6    558.81    0.0  0.0  0.0  2
1800200   3    15.0436E6    558.81
1850200   3    15.0417E6    558.81
2000200   3    15.0400E6    558.82
2050200   3    15.0190E6    558.80
2101201   3    15.0171E6    558.80    0.0  0.0  0.0    1
2101202   3    15.0231E6    558.81    0.0  0.0  0.0    2
2101203   3    15.0292E6    558.81    0.0  0.0  0.0    3
2101204   3    15.0335E6    558.82    0.0  0.0  0.0    4
```

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2150200   3    15.0437E6    558.82
2200200   3    15.0464E6    558.82
2250200   3    15.0329E6    558.82
2301201   3    15.0042E6    559.98    0.0  0.0  0.0  1
2301202   3    14.9994E6    566.20    0.0  0.0  0.0  2
2301203   3    14.9918E6    571.49    0.0  0.0  0.0  3
2301204   3    14.9870E6    576.31    0.0  0.0  0.0  4
2301205   3    14.9793E6    579.37    0.0  0.0  0.0  5
2301206   3    14.9737E6    580.13    0.0  0.0  0.0  6
2351201   3    14.9879E6    558.81    0.0  0.0  0.0  1
2351202   3    14.9764E6    558.81    0.0  0.0  0.0  2
2351203   3    14.9640E6    558.81    0.0  0.0  0.0  3
2400200   3    14.9512E6    579.53
2450200   3    14.9318E6    578.71
2460200   3    14.9465E6    578.71
2500200   3    14.9329E6    557.75
2550200   3    14.9278E6    557.75
2900200   3    15.0404E6    558.81
2950200   3    14.9358E6    577.75
3000200   3    14.9358E6    556.69
3050200   3    14.9358E6    556.82
3100200   3    14.9358E6    556.93
3151201   3    14.9354E6    558.00   0.0  0.0  0.0  1
3151202   3    14.9331E6    558.00   0.0  0.0  0.0  2
3151203   3    14.9299E6    558.00   0.0  0.0  0.0  3
3151204   3    14.9223E6    558.00   0.0  0.0  0.0  4
3151205   3    14.9160E6    558.00   0.0  0.0  0.0  5
3151206   3    14.9223E6    558.00   0.0  0.0  0.0  6
3151207   3    14.9299E6    558.00   0.0  0.0  0.0  7
3151208   3    14.9380E6    558.00   0.0  0.0  0.0  8
3151209   3    14.9402E6    558.00   0.0  0.0  0.0  9
3151210   3    14.9357E6    558.00   0.0  0.0  0.0  10
3350200   3    15.0404E6    558.70
3400200   3    15.0404E6    558.58
3450200   3    15.0404E6    558.40
3500200   3    15.0404E6    558.00
3700200   3    14.9382E6    557.15
3800200   3    15.0428E6    557.73
4000200   3    14.9131E6    577.85
4050200   3    14.9092E6    577.24
4151201   2    14.9071E6    0.0      0.0 0.0 0.0  1
4151202   2    14.9052E6    0.0      0.0 0.0 0.0  2
4151203   2    14.9028E6    0.0      0.0 0.0 0.0  3
4151204   2    14.9011E6    .05661   0.0 0.0 0.0  4
4151205   2    14.9006E6    1.       0.0 0.0 0.0  5
4151206   2    14.9004E6    1.       0.0 0.0 0.0  6
4151207   2    14.9002E6    1.       0.0 0.0 0.0  7
4151208   2    14.9001E6    1.       0.0 0.0 0.0  8
4200200   2    14.8999E6      1.
5000200   2    5.57031E6    1.
5050200   2    5.57233E6    .0144
5100200   3    5.57631E6    534.87
5151201   3    5.58077E6    534.93     0.0         0.0  0.0       1
5151202   3    5.58619E6    534.99     0.0         0.0  0.0       2
5151203   3    5.59167E6    535.05     0.0         0.0  0.0       3
5171201   2    5.59162E6    .044        0.0        0.0    0.0       1
5171202   2    5.58571E6    .095        0.0        0.0    0.0       2
5171203   2    5.57814E6    .164        0.0        0.0    0.0       3
5191201   2    5.57236E6    .189        0.0        0.0   0.0        1
5191202   2    5.57141E6    .194        0.0        0.0   0.0        2
5200200   2    5.57045E6    .348
5250200   2    5.57011E6    1.0
5260200   2    5.57011E6    1.0
5301201   2    5.56987E6    1.0        0.0  0.0  0.0  1
5301202   2    5.42908E6    1.0        0.0  0.0  0.0  2
```

```
5350200   2   2.03274E6    1.0
8000200   3   15.0012E6    477.00
*
************************************************************
* SS JUNCTION STATES
*
1001201   483.3   0.0     0.0
1002201   483.3   0.0     0.0
1051201   483.3   0.0     0.0
1101201   483.3   0.0     0.0
1151301   483.3   0.0     0.0     2
1151302   483.3   0.0     0.0     4
1151303   483.3   0.0     0.0     7
1151304   483.3   0.0     0.0     9
1151305   483.3   0.0     0.0     12
1201201   483.3   0.0     0.0
1202201   241.6    0.0     0.0
1203201   241.6    0.0     0.0
1251201   241.6    0.0     0.0
1252201   0.0     0.0     0.0
1350201   1       241.6    0.0     0.0
1350202   1       241.6    0.0     0.0
1451201   241.6    0.0     0.0
1452201   241.6    0.0     0.0
1501201   241.6    0.0     0.0
1502201   483.3   0.0     0.0
1551201   241.6    0.0     0.0
1650201   1       241.6    0.0     0.0
1650202   1       241.6    0.0     0.0
1701201   0.0     0.0     0.0
1751301   483.3   0.0     0.0     1
1801201   483.3   0.0     0.0
1851201   483.3   0.0      0.0
1852201   483.3   0.0      0.0
2051201   445.1   0.0     0.0
2101301   445.1   0.0     0.0     2
2101302   445.1   0.0     0.0     3
2151201   445.1   0.0     0.0
2152201   1.E-5   0.0     0.0
2153201   445.1   0.0     0.0
2251201   427.7   0.0     0.0
*                                 226 CORE BYPASS / 3.6 %
2301301   427.7   0.0     0.0     5
2351301   17.4     0.0     0.0     2
2401201   427.7   0.0     0.0
2402201   17.4     0.0     0.0
2451201   445.1   0.0     0.0
2461201    1.E-5  0.0     0.0
2501201   -15.95   0.0     0.0
2502201   0.0     0.0     0.0
2901201   -15.95   0.0     0.0
*                                 291 INLET ANN. TO DOWNCOMER
2951201   461.1    0.0     0.0
*                                 296 INLET ANN. TO UP / 6.6 %
3001201   -6.28   0.0     0.0
3002201   -6.28   0.0     0.0
3051201   -6.28   0.0     0.0
3101201   -6.28  0.0    0.0
3102201   0.0    0.0    0.0
3151301   0.0  0.0  0.0  9
3351201   6.28    0.0     0.0
3352201   6.28    0.0     0.0
3401201   6.28    0.0     0.0
3451201   -6.28 0.0  0.0
3452201   0.0   0.0  0.0
```

```
*                                                  372  RABV / 1.3 %
4001201  0.0  0.0  0.0
4002201  0.0  0.0  0.0
4100201  1  0.0  0.0  0.0
4151301  0.0  0.0  0.0  7
4201201  0.0  0.0  0.0
*                                                  435  SS SYSTEM PRESSURE
5001201   0.0     0.0     0.0
5101201   102.9   0.0       0.0
5102201    130.7   0.0    0.0
5151301    130.7  0.0     0.0  1
5151302    130.7  0.0     0.0  2
5160201  1  130.7  0.0    0.0
5171301   1.260   1.608   0.0  1
5171302   2.010   2.829   0.0  2
5180201  0  3.001  4.176  0.0
5191301   3.489   4.073   0.0  1
5201201   0.0     27.80   0.0
5202201   102.9   0.0       0.0
5203201   102.9   27.80   0.0
5251201   0.0     27.80   0.0
5261201    0.0     0.0     0.0
5262201    0.0     0.0     0.0
5301301   0.0     27.8    0.0  1
*                                                  548  AUX FEED
*                                                  550  MAIN STEAM VALVE
5550201   1       0.0       27.8                     0.0
*                                                  560  FEED WATER VALVE
*                                                  571  SG SS LEVEL
*                                                  591  SG SS PRESSURE
*                                                  630  HPIS INJECTION
8001201   0.0      0.0      0.0
8050201   1        0.0      0.0                      0.0
*                                                  901 PUMP COOLANT INJECTION
*
*
************************************************************
* SS CONTROL FOR THE CORE FLOW BYPASS / 3.6 %
*
20522400   CBPERR     SUM        1.       0.0         1
20522401   0.         1.         MFLOWJ   226000000
20522402              -.036      MFLOWJ   185010000
*
20522500   CBPREG     MULT       1.       0.0         1
20522501   CNTRLVAR   224
20522502   CNTRLVAR   512
*
20522600   CBPV       INTEGRAL   -.10     .214        0    3   .01   .99
20522601   CNTRLVAR   225
*
************************************************************
* SS CONTROL FOR INLET ANN. TO UPPER PLENUM FLOW / 6.6 %
*
20529400   IAUPERR    SUM        1.       0.0         0
20529401   0.         1.         MFLOWJ   296000000
20529402              1.         MFLOWJ   297000000
20529403              -.066      MFLOWJ   185010000
*
20529500   IAUPREG    MULT       1.       0.0         0
20529501   CNTRLVAR   294
20529502   CNTRLVAR   512
*
20529600   IAUPV      INTEGRAL   -.06     .218        0    3   .01   .99
20529601   CNTRLVAR   295
*
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************************************************************
* SS CONTROL FOR THE RABV LEAKAGE / 1.3 %
*
20537000   RABVERR    SUM        1.       0.0         0
20537001   0.         1.         MFLOWJ   372000000
20537002              -.013      MFLOWJ   185010000
*
20537100   RABVREG    MULT       1.       0.0         0
20537101   CNTRLVAR   370
20537102   CNTRLVAR   512
*
20537200   RABVV      INTEGRAL   -.03     .079        0    3   .01   .99
20537201   CNTRLVAR   371
*
************************************************************
* SS CONTROL FOR INLET ANN. TO DOWNCOMER FLOW
*
20528900   IADCERR    SUM        1.       0.0         0
20528901   -483.3     1.         MFLOWJ   185010000
*
20529000   IADCREG    MULT       1.       0.0         0
20529001   CNTRLVAR   289
20529002   CNTRLVAR   512
*
20529100   IADCV      INTEGRAL   -.06     .384        0    3   .01   .99
20529101   CNTRLVAR   290
*
************************************************************
* SS CONTROL FOR VALVE 516, RECIRCULATION RATIO = 4.7
*
20521400   ERR516     SUM        1.       0.0         0
20521401   0.         1.         MFLOWJ   516000000
20521402              -4.7       MFLOWJ   560000000
*
20521500   REG516     MULT       1.       0.0         0
20521501   CNTRLVAR   214
20521502   CNTRLVAR   512
*
20521600   V516       INTEGRAL   -.1      .739        0    3   .01   .99
20521601   CNTRLVAR   215
*
************************************************************
* SS CONTROL FOR FEED WATER ENTHALPHY
*
20560100   SPRDERR    SUM        1.0      0.0         0
20560101   0.         -1.        MFLOWJ   560000000
20560102              .914014    VAPGEN   500010000
20560103              .914014    VAPGEN   505010000
20560104              .389795    VAPGEN   510010000
20560105              .164951    VAPGEN   515010000
20560106              .164951    VAPGEN   515020000
20560107              .164951    VAPGEN   515030000
20560108              .515823    VAPGEN   517010000
20560109              .515823    VAPGEN   517020000
20560110              .515823    VAPGEN   517030000
20560111              .515823    VAPGEN   519010000
20560112              .200114    VAPGEN   519020000
20560113              .200114    VAPGEN   520010000
20560114              .685800    VAPGEN   525010000
20560115              .163678    VAPGEN   526010000
20560116              .608844    VAPGEN   530010000
*20560117              1.16218    VAPGEN   530020000
*
20560200   SENTHO     SUM        1.0      0.0         1
20560201   0.0        1.0        UG       517030000
```

```
20560202              -1.        UF         517030000
*
20560300   SSX1       MULT       -1.        0.0       0
20560301   CNTRLVAR   601
20560302   CNTRLVAR   602
20560303   CNTRLVAR   512
*
20560400   SSX2       MULT       1.         1.        1    1    1.
20560401   MFLOWJ     560000000
*
20560500   SSX3       DIV        1.         0.0       0
20560501   CNTRLVAR   604        CNTRLVAR   603
*
20560600   FOWENTH    INTEGRAL   .10   .980E6   0  3   .800E6   1.00E6
20560601   CNTRLVAR   605
*
****************************************************************
* STEAM GENERATOR SS PRESSURE
*
5900000    . SGSSPR    TMDPVOL
5900101     .1       1.0  0.0  0.0  0.0  0.0
5900102     4.E-5      0.0       00
5900200     2
5900201     0.0        5.57E6    1.
5900202     10000.     5.57E6    1.
*
5910000     SGSSPRJ    VALVE
5910101     530000000  590000000 0.0  0.0  0.0        0100
5910201     1          0.0       0.0       0.0
5910300     TRPVLV
5910301     646
*
****************************************************************
* SG STEADY STATE LEVEL HOLDING
*
5700000     SGLHOLDV   TMDPVOL
5700101     .1         1.        0.0  0.0  0.0  0.0
5700102     4.E-5      0.0       00
5700200     2          0         P         505010000
5700201     4.E6       4.E6      .5
5700202     7.E6       7.E6      .5
*
5710000     SGLHOLDJ   TMDPJUN
5710101     505010000  570000000           .1
5710200     1          0         CNTRLVAR  513
5710201     -10.       -10.      0.0       0.0
5710202     10.        10.       0.0       0.0
*
20551100    SGLEVER1   SUM       50.       0.0        0
20551101    -.22       1.        CNTRLVAR  949
*
20551200    TRP-501    TRIPUNIT  1.        0.0        1
20551201    -501
*
20551300    SGLEVER2   MULT      1.        0.0        0
20551301    CNTRLVAR   511
20551302    CNTRLVAR   512
*
****************************************************************
* SS SYSTEM PRESSURE
*
4300000     PRVOL      TMDPVOL
4300101     .362       .224      0.0  0.0  0.0        .224
4300102     4.E-5      0.0       11
4300200     3          0         P         415010000
4300201     .1E6       .1E6      576.
4300202     16.E6      16.E6     576.
*
4350000     PRVALVE    VALVE
4350101     405010000  430000000 0.0       .093       .093       0100
4350201     1          0.0       0.0       0.0
4350300     TRPVLV
4350301     646
*
****************************************************************
** END OF FILE                                                 **
*
```

```
*    *** LFBR2 ***
*   RESTART OF LOFT CALCULATION L3-6 FROM SS RUN
*
= LOBI RESTART
100   RESTART   STDY-ST
101   RUN
103  2196
105  100.  120.
*
0000201     200.     1.0E-6     .20       00001    25   4000  4000
501         TIME     0          GE        NULL 0   1000.        L
*
20299700   TEMP     501
20299701   -1.        305.
20299702   0.0        305.
*
*
* SG HEAT TRANSFER RATE
20595300 . SGHTTRANS SUM      -1.        0.0         1
20595301   0.0         42.0327   HTRNR      006000100
20595302               42.0327   HTRNR      006000200
20595303               42.0327   HTRNR      006000300
20595304                8.7237   HTRNR      006000400
20595305                8.7237   HTRNR      006000500
20595306               42.0327   HTRNR      006000600
20595307               42.0327   HTRNR      006000700
20595308               42.0327   HTRNR      006000800
*
*****************************************************************
* STEAM GENERATOR BOILING SECTION
*
5170000   BILSCT                  PIPE
5170001   3
5170101   0.363105  3
5170201   0.0       2
5170301   0.7102    3
5170401   0.0       3
5170601   90.0      3
5170701   0.7102    3
5170801   4.E-5     0.020     3
5170901   0.0       0.0       1
5170902   0.0       0.0       2
5171001   00        3
5171101   0000      2
5171300   0
*
5370000   BILSCT                  PIPE
5370001   3
5370101   0.363105  3
5370201   0.0       2
5370301   0.7102    3
5370401   0.0       3
5370601   90.0      3
5370701   0.7102    3
5370801   4.E-5     0.020     3
5370901   0.0       0.0       1
5370902   0.0       0.0       2
5371001   00        3
5371101   0000      2
5371300   0
*
*****************************************************************
* STEAM GENERATOR RISER                                          *
*
5190000   RISER                   PIPE
5190001   2
5190101   0.72631   1
5190102   0.27871   2
5190201   0.0       1
5190301   0.7102    1
5190302   0.718     2
5190401   0.0       2
5190601   90.0      1
5190602   90.0      2
5190701   0.518     1
5190702   0.718     2
5190801   4.E-6     0.5967    1
5190802   4.E-5     0.0       2
5190901   0.0       0.0       1
5191001   00        2
5191101   0000      1
5191300   0
*
*****************************************************************
* SG DOWNCOMER TO BOILING SECTION, VALVE FOR RECIRCULATION RATIO
*
5160000     DWNBOIL   VALVE
5160101     515010000 517000000  .116     1.        1.       0100
5160201     1         65.35      0.0      0.0
5160300     SRVVLV
5160301     216
*
5360000     DWNBOIL   VALVE
5360101     515010000 537000000  .116     1.        1.       0100
5360201     1         65.35      0.0      0.0
5360300     SRVVLV
5360301     216
*
*
*****************************************************************
* SG BOILING SECTION TO RISER
*
5180000   BOILRSR             SNGLJUN
5180101   517010000 519000000 0.0       0.0       0.0       0000
*
5280000   BOILRSR             SNGLJUN
5280101   537010000 519000000 0.0       0.0       0.0       0000
*
*
*****************************************************************
*
* STEAM GENERATOR TUBES                                          *
*
10060000  8          6        2        1        0.0051064
10060100  0          1
10060101  5          0.006348984
10060201  6          5
10060301  0.0        5
10060401  550.0      6
10060601  517010000 0       1  1  1310.32   1
10060602  517020000 0       1  1  1310.32   2
10060603  517030000 0       1  1  1310.32   3
10060604  519010000 0       1  1   271.95   4
10060605  519010000 0       1  1   271.95   5
10060606  537030000 0       1  1  1310.32   6
10060607  537020000 0       1  1  1310.32   7
10060608  537010000 0       1  1  1310.32   8
10060501  115040000 0       1  1  1310.32   1
10060502  115050000 0       1  1  1310.32   2
10060503  115060000 0       1  1  1310.32   3
10060504  115060000 0       1  1   271.95   4
10060505  115070000 0       1  1   271.95   5
10060506  115070000 0       1  1  1310.32   6
10060507  115080000 0       1  1  1310.32   7
10060508  115090000 0       1  1  1310.32   8
10060701  0          0       0      0       8
10060801  0          0       0      0       8
10060901  0          0       0    . 0       8
*
5171201   2    5.59162E6   .044     0.0     0.0    0.0     1
5171202   2    5.58571E6   .095     0.0     0.0    0.0     2
5171203   2    5.57814E6   .164     0.0     0.0    0.0     3
5191201   2    5.57236E6   .189     0.0     0.0    0.0     1
5371201   2    5.59162E6   .000     0.0     0.0    0.0     1
5371202   2    5.58571E6   .044     0.0     0.0    0.0     2
5371203   2    5.57814E6   .095     0.0     0.0    0.0     3
*
5191202   2    5.57141E6   .194     0.0     0.0    0.0     2
*
5171301    0.403    0.822   0.0  1
5171302    0.605    1.257   0.0  2
5180201  0   2.3741  4.1876  0.0
5191301    3.050   4.162   0.0  1
5371301    0.403    0.822   0.0  1
5371302    0.606    1.257   0.0  2
5280201  0   2.3741  4.1876  0.0
*
*****************************************************************
* SS CONTROL FOR VALVE 516, RECIRCULATION RATIO = 4.7
*
20521400   ERR516    SUM       1.       0.0       0
20521401   0.        1.        MFLOWJ   516000000
20521402             1.        MFLOWJ   536000000
20521403             -4.7      MFLOWJ   560000000
*
*
20521600   V516      INTEGRAL  -.01     .187      0   3   .01    .99
20521601   CNTRLVAR  215
*****************************************************************
*  FEED WATER VALVE
*
5600000   FWVLV      TMDPJUN
5600101   545000000  510000000 0.05
5600200   1          513
5600201   -1.        27.80     0.0      0.0
5600202   0.0        27.80     0.0      0.0
5600203   .7         0.0       0.0      0.0
5600208   3000.      0.0       0.0      0.0
*
*****************************************************************
* SS CONTROL FOR FEED WATER ENTHALPHY
*
20560100   SPRDERR   SUM       1.0      0.0         0
20560101   0.        -1.       MFLOWJ   560000000
20560102             .914014   VAPGEN   500010000
20560103             .914014   VAPGEN   505010000
20560104             .389795   VAPGEN   510010000
20560105             .164951   VAPGEN   515010000
20560106             .164951   VAPGEN   515020000
20560107             .164951   VAPGEN   515030000
20560108             .257877   VAPGEN   517010000
20560109             .257877   VAPGEN   517020000
20560110             .257877   VAPGEN   517030000
20560111             .515823   VAPGEN   519010000
20560112             .200114   VAPGEN   519020000
```

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20560113              .200114   VAPGEN    520010000
20560114              .685800   VAPGEN    525010000
20560115              .163678   VAPGEN    526010000
20560116              .608844   VAPGEN    530010000
20560117              .257877   VAPGEN    537010000
20560118              .257877   VAPGEN    537020000
20560119              .257877   VAPGEN    537030000
*
20560600   FDWENTH    INTEGRAL  .05   .980E6  0  3  .850E6   1.10E6
20560601   CNTRLVAR   605
*
*  TOTAL SG DOWNCOMER MASS FLOW
20594800   SGDCFLW    SUM       1.0       0.0        0
20594801   0.         1.        MFLOWJ    516000000
20594802              1.        MFLOWJ    536000000
.  END OF FILE
```

```
    *** LFCR3 ***
*   RESTART OF LOFT CALCULATION L3-6 FROM SS RUN
*
* LOBI RESTART
100   RESTART   TRANSNT
101   RUN
103     0
105  100.  120.
*
0000201     280.     1.0E-5     .20      00001    25   4000  4000
*
*
******************************************************************
* PRIMARY COOLANT PUMP 1     TRIP-511                            *
*
1350000   PCP1       PUMP
1350101   0.0366     0.0      0.099     0.0      90.0     0.319
1350102   0
1350108   130010000  0.0      0.0       0.0      0100
1350109   140000000  0.0      0.05      0.05     0100
1350301   0    0     0    -1  -1   511  0
1350302   369.0      0.911    0.3155    96.0     500.6    1.431
1350303   613.6      0.0      207.4     0.004    19.598   0.0
1350308   .212465    0.0      -25.      29.5     6.28
1350310   0.0        0.0      0.0
*
******************************************************************
*
* SINGLE PHASE HEAD CURVES                                       *
******************************************************************
*
* HEAD CURVE NO. 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
******************************************************************
* HEAD CURVE NO. 2                                               *
*
1351200   1                 2
1351201   0.000000E+00      -6.700000E-01
1351202   2.000000E-01      -5.000000E-01
1351203   4.000000E-01      -2.600000E-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
******************************************************************
* HEAD CURVE NO. 3                                               *
*
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
******************************************************************
* HEAD CURVE NO. 4                                               *
*
1351400   1                 4
1351401   -1.000000E+00     2.472200E+00
1351402   -8.229700E-01     1.996800E+00
1351403   -6.333200E-01     1.689700E+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
******************************************************************
* HEAD CURVE NO. 5                                               *
*
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
******************************************************************
* HEAD CURVE NO. 6                                               *
*
1351600   1                 6
1351601   0.000000E+00      9.342790E-01
1351602   9.109900E-02      9.229000E-01
1351603   1.865090E-01      8.968000E-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
******************************************************************
* HEAD CURVE NO. 7                                               *
*
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
******************************************************************
* HEAD CURVE NO. 8                                               *
*
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
*
******************************************************************
* SINGLE PHASE TORQUE DATA                                       *
*
******************************************************************
* TORQUE CURVE NO. 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
******************************************************************
* TORQUE CURVE NO. 2                                             *
*
1352000   2                 2
1352001   0.000000E+00      -6.700000E-01
1352002   4.000000E-01      -2.600000E-01
1352003   6.000000E-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
******************************************************************
* TORQUE CURVE NO. 3                                             *
*
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
******************************************************************
* TORQUE CURVE NO. 4                                             *
*
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   -4.565300E-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
******************************************************************
* TORQUE CURVE NO. 5                                             *
*
1352300   2                 5
1352301   0.000000E+00      -4.500000E-01
1352302   4.000000E-01      -2.500000E-01
1352303   6.000000E-01      0.000000E+00
1352304   1.000000E+00      3.569000E-01
******************************************************************
* TORQUE CURVE NO. 6                                             *
*
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   4.686690E-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
******************************************************************
* TORQUE CURVE NO. 7                                             *
*
1352500   2                 7
1352501   -1.000000E+00     -1.000000E+00
1352502   -3.000000E-01     -9.000000E-01
1352503   -1.000000E-01     -5.000000E-01
```

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1352504   0.000000E+00        -4.500000E-01
*****************************************************************
* FOR TORQUE CURVE NO. 8                                        *
*
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
*
*****************************************************************
* TWO - PHASE MULTIPLIER DATA                                   *
*
*****************************************************************
* HEAD CURVE                                                    *
*
1353000   0
1353001   0.000000E+00        0.000000E+00
1353002   1.000000E-01        7.000000E-02
1353003   2.000000E-01        1.800000E-01
1353004   3.000000E-01        3.400000E-01
1353005   3.500000E-01        6.000000E-01
1353006   3.700000E-01        7.000000E-01
1353007   4.000000E-01        7.200000E-01
1353008   5.000000E-01        7.500000E-01
1353009   6.000000E-01        7.700000E-01
1353010   7.000000E-01        7.700000E-01
1353011   8.000000E-01        7.400000E-01
1353012   9.000000E-01        6.100000E-01
1353013   9.500000E-01        4.000000E-01
1353014   1.000000E+00        0.000000E+00
*****************************************************************
* TORQUE CURVE                                                  *
*
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        7.600000E-01
1353108   6.000000E-01        7.500000E-01
1353109   7.000000E-01        7.600000E-01
 353110   8.000000E-01        7.600000E-01
1353111   9.000000E-01        5.000000E-01
1353112   1.000000E+00        0.000000E+00
*
*****************************************************************
* PUMP 2-PHASE DIFFERENCE DATA                                  *
*
*****************************************************************
* HEAD CURVE NO. 1                                              *
*
1354100   1                   1
1354101   0.000000E+00        1.403600E+00
1354102   1.906100E-01        1.363600E+00
1354103   3.896300E-01        1.318600E+00
1354104   5.939600E-01        1.232800E+00
1354105   7.902000E-01        1.133600E+00
1354106   1.000000E+00        1.000000E+00
*****************************************************************
.: HEAD CURVE NO. 2                                             *
*
1354200   1                   2
1354201   0.000000E+00        -6.70000E-01
1354202   2.000000E-01        -5.00000E-01
1354203   4.000000E-01        -2.50000E-01
1354204   5.755400E-01        0.000000E+00
1354205   7.443200E-01        2.583000E-01
1354206   7.734800E-01        3.778000E-01
1354207   8.631300E-01        6.326000E-01
1354208   1.000000E+00        1.000000E+00
*****************************************************************
* HEAD CURVE NO. 3                                              *
*
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
*****************************************************************
* HEAD CURVE NO. 4                                              *
*
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
*****************************************************************
* HEAD CURVE NO. 5                                              *
*
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
*****************************************************************
* HEAD CURVE NO. 6                                              *
*
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
*****************************************************************
* HEAD CURVE NO. 7                                              *
*
1354700   1                   7
1354701   -1.000000E+00       0.000000E+00
1354702   0.000000E+00        0.000000E+00
*****************************************************************
* HEAD CURVE NO. 8                                              *
*
1354800   1                   8
1354801   -1.000000E+00       0.000000E+00
1354802   0.000000E+00        0.000000E+00
*****************************************************************
* TORQUE CURVE NO. 1                                            *
*
1354900   2                   1
1354901   0.000000E+00        6.032000E-01
1354902   1.930000E-01        6.325000E-01
1354903   3.930000E-01        7.369000E-01
1354904   5.955200E-01        8.331000E-01
1354905   7.978200E-01        9.229000E-01
1354906   1.000000E+00        1.000000E+00
*****************************************************************
* TORQUE CURVE NO. 2                                            *
*
1355000   2                   2
1355001   0.000000E+00        -6.700000E-01
1355002   4.000000E-01        -2.500000E-01
1355003   5.000000E-01        1.500000E-01
1355004   7.372550E-01        5.265860E-01
1355005   7.680490E-01        6.065940E-01
1355006   8.672300E-01        7.436600E-01
1355007   1.000000E+00        1.000000E+00
*****************************************************************
* TORQUE CURVE NO. 3                                            *
*
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
*****************************************************************
* TORQUE CURVE NO. 4                                            *
*
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
*****************************************************************
* TORQUE CURVE NO. 5                                            *
*
1355300   2                   5
1355301   0.000000E+00        -4.500000E-01
1355302   4.000000E-01        -2.500000E-01
1355303   6.000000E-01        0.000000E+00
1355304   1.000000E+00        3.569000E-01
*****************************************************************
* TORQUE CURVE NO. 6                                            *
*
1355400   2                   6
1355401   0.000000E+00        1.233610E+00
1355402   9.064300E-02        1.196500E+00
1355403   1.885690E-01        1.109600E+00
```
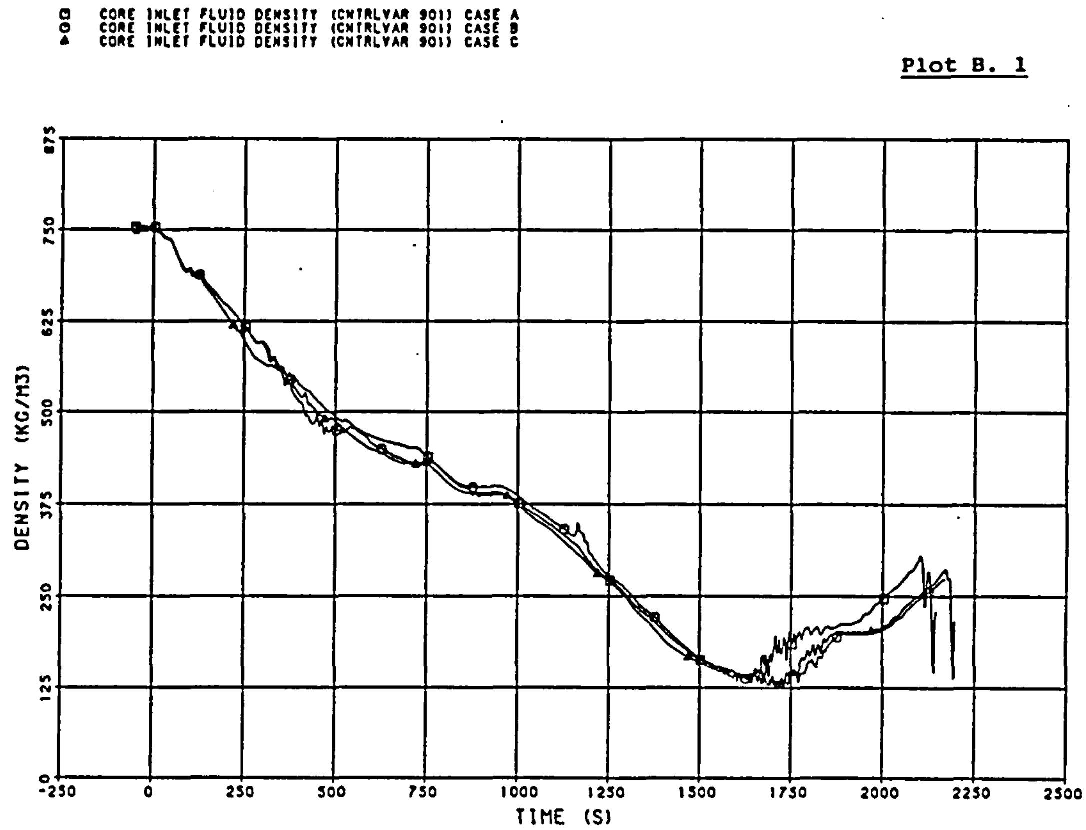
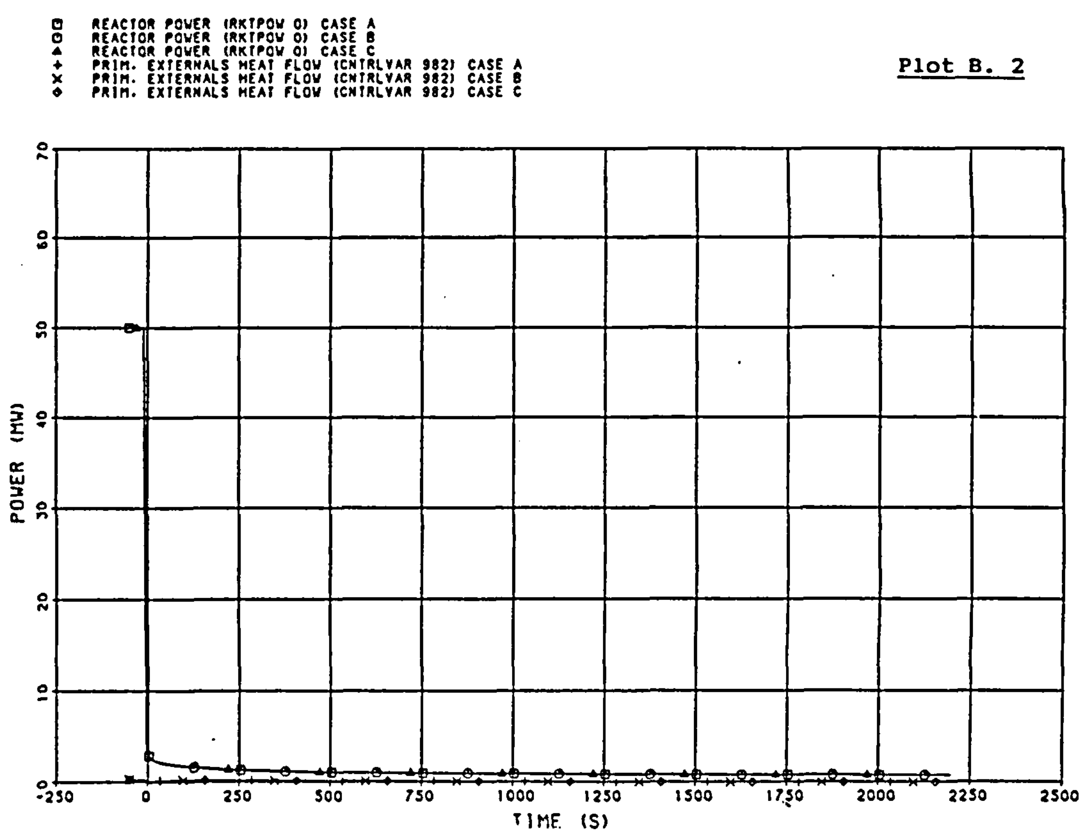

```
1355404   2.734700E-01         1.041600E+00
1355405   4.586690E-01         8.958000E-01
1355406   5.744800E-01         7.807000E-01
1355407   7.381600E-01         6.134000E-01
1355408   7.685200E-01         5.849000E-01
1355409   8.700570E-01         4.877000E-01
1355410   1.000000E+00         3.568000E-01
**************************************************************
* TORQUE CURVE NO. 7                                         *
*
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         -4.600000E-01
**************************************************************
* TORQUE CURVE NO. 8                                         *
*
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
*
1350200   3     14.8195E6     560.35
1350201   1         241.6       0.0        0.0
1350202   1         241.6       0.0        0.0
.   END OF FILE
```

Plot B. 1

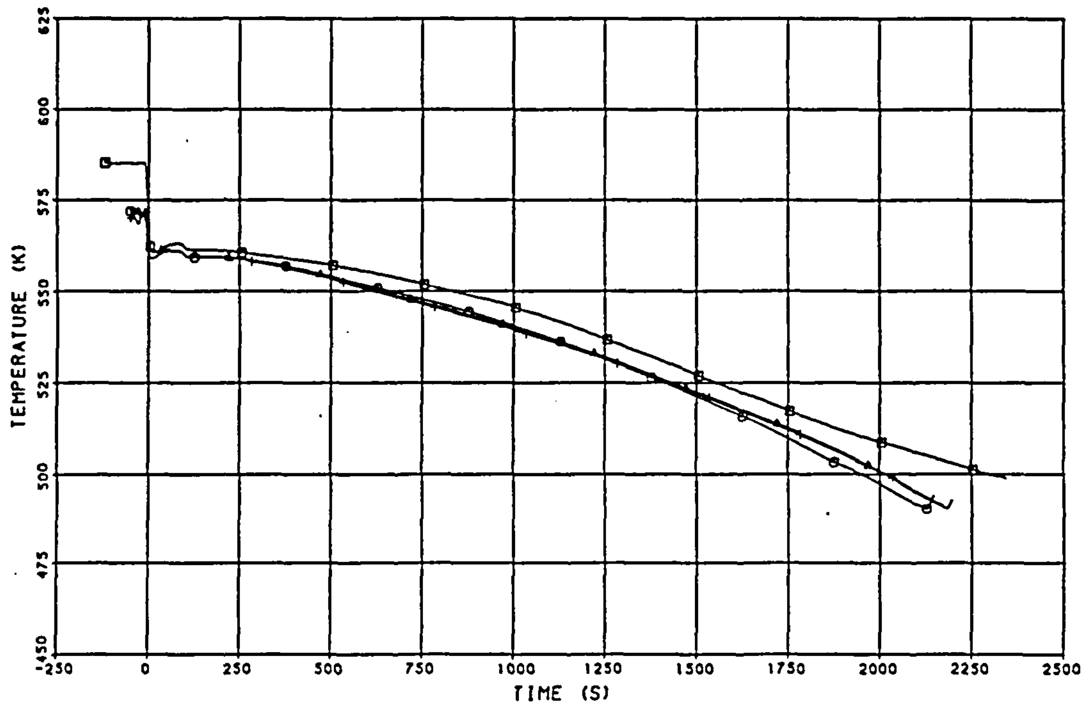


Plot B. 2



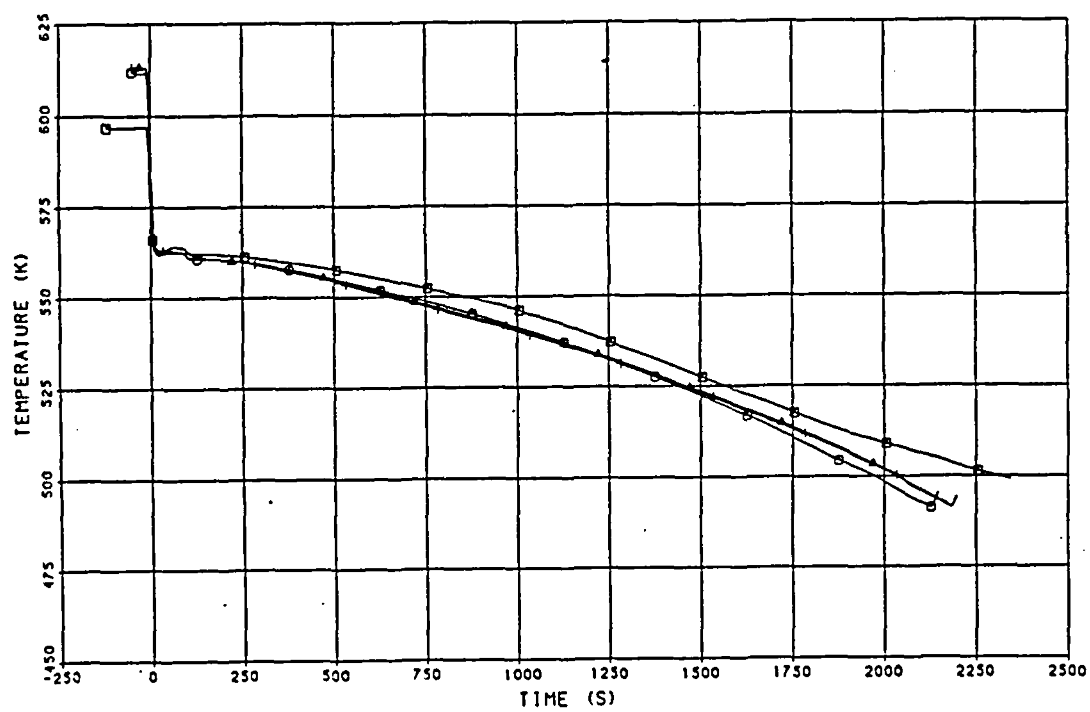
□ CORE CLAD TEMPERATURE VOL. 1 (TE-2G14-011 ...) EXP.
○ CORE CLAD TEMPERATURE VOL. 1 (CNTRLVAR 903) CASE A
▲ CORE CLAD TEMPERATURE VOL. 1 (CNTRLVAR 903) CASE B
+ CORE CLAD TEMPERATURE VOL. 1 (CNTRLVAR 903) CASE C

Plot B. 3

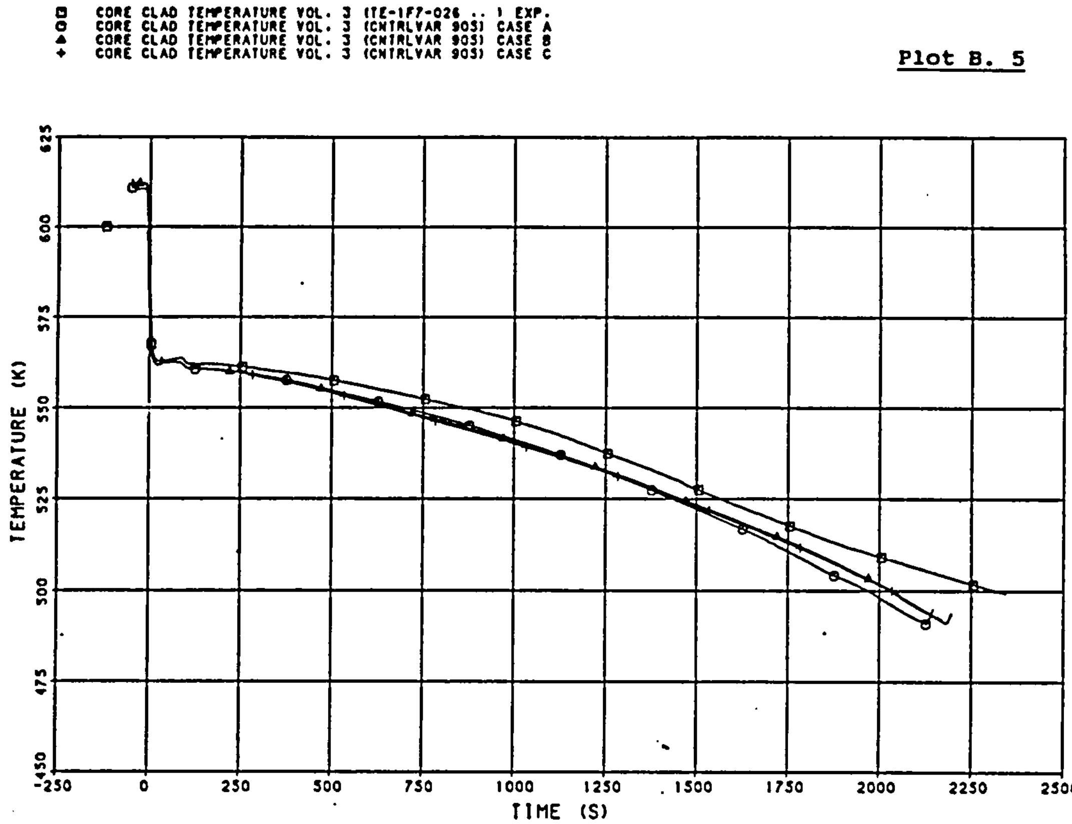


□ CORE CLAD TEMPERATURE VOL. 2 (TE-1F7-015 ...) EXP.
○ CORE CLAD TEMPERATURE VOL. 2 (CNTRLVAR 904) CASE A
▲ CORE CLAD TEMPERATURE VOL. 2 (CNTRLVAR 904) CASE B
+ CORE CLAD TEMPERATURE VOL. 2 (CNTRLVAR 904) CASE C

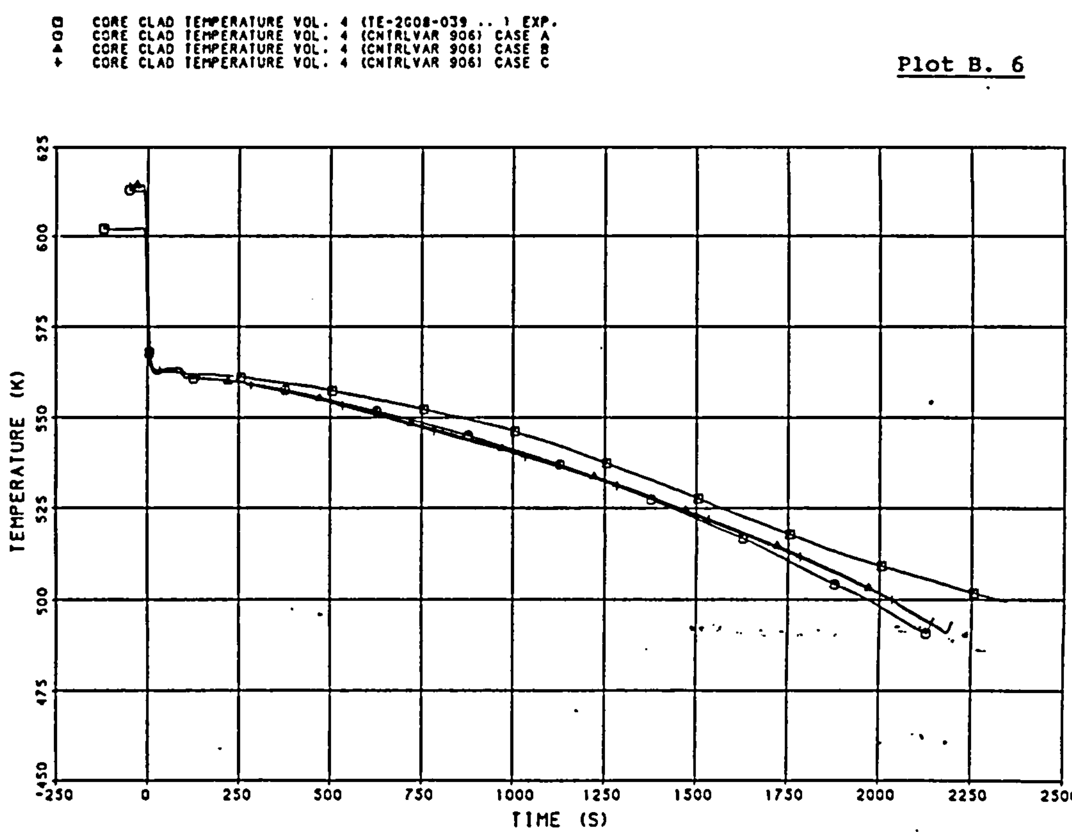
Plot B. 4



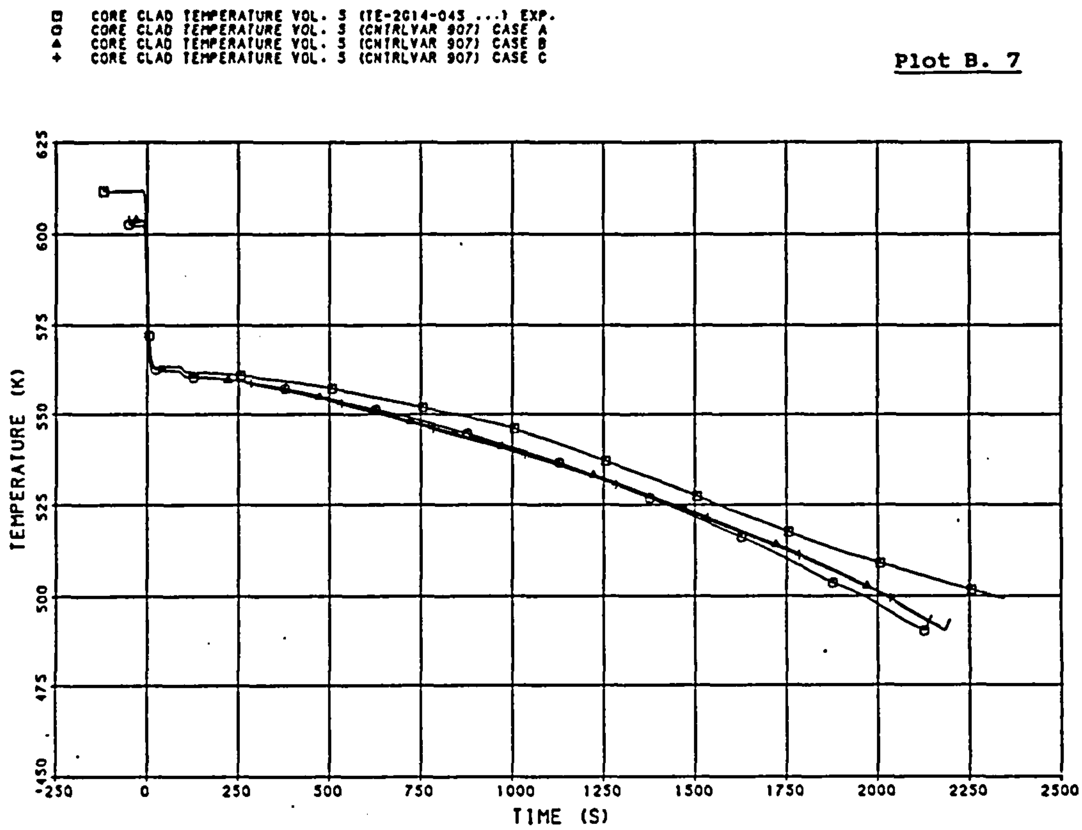
Plot B. 5



Plot B. 6



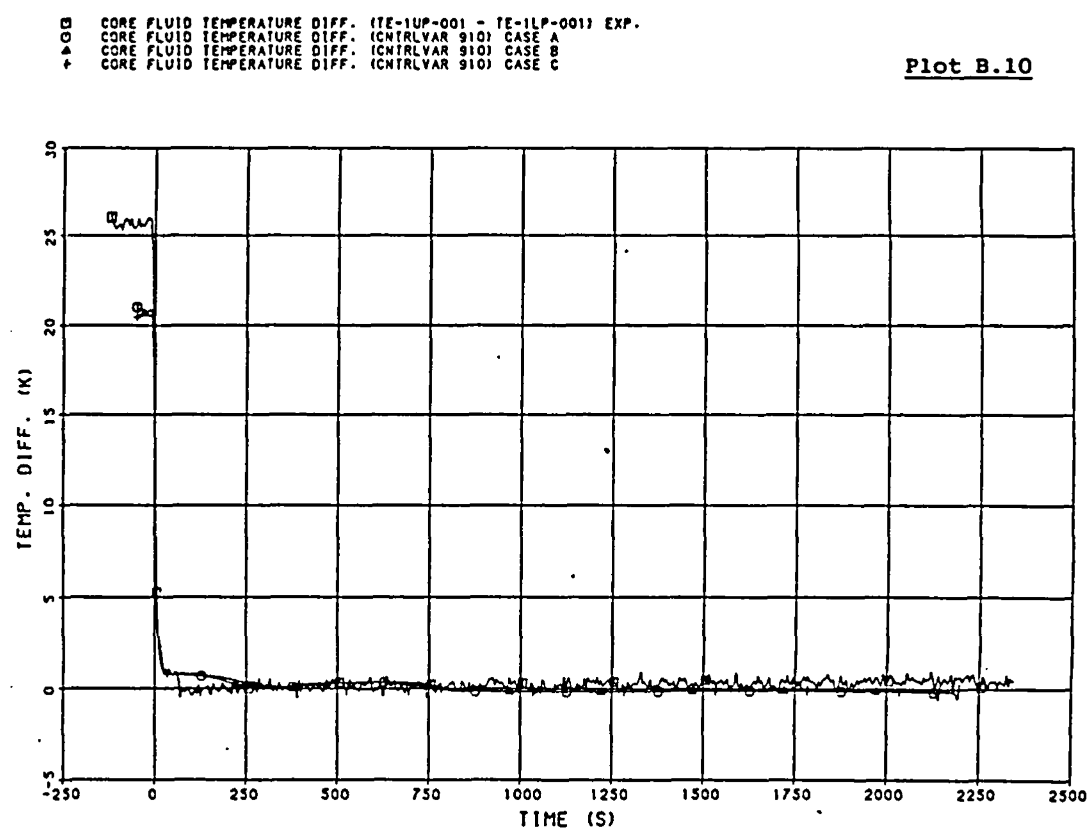
Plot B. 7



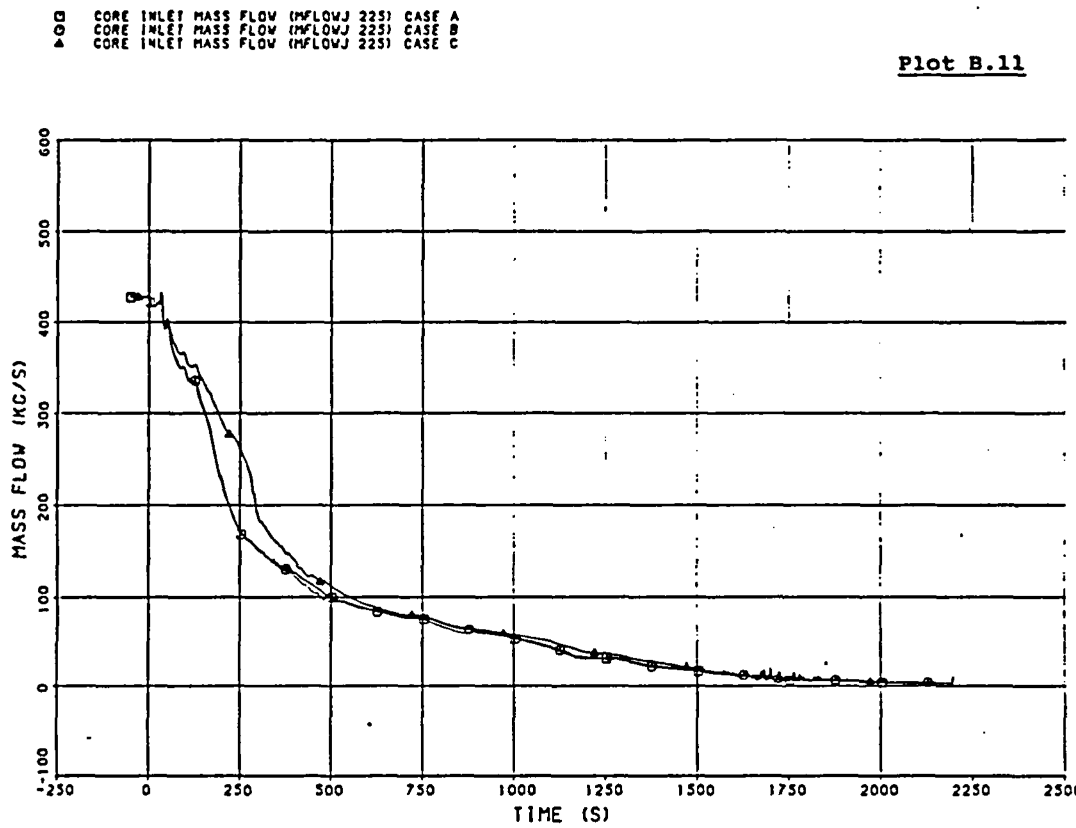
Plot B. 8

Plot B. 9

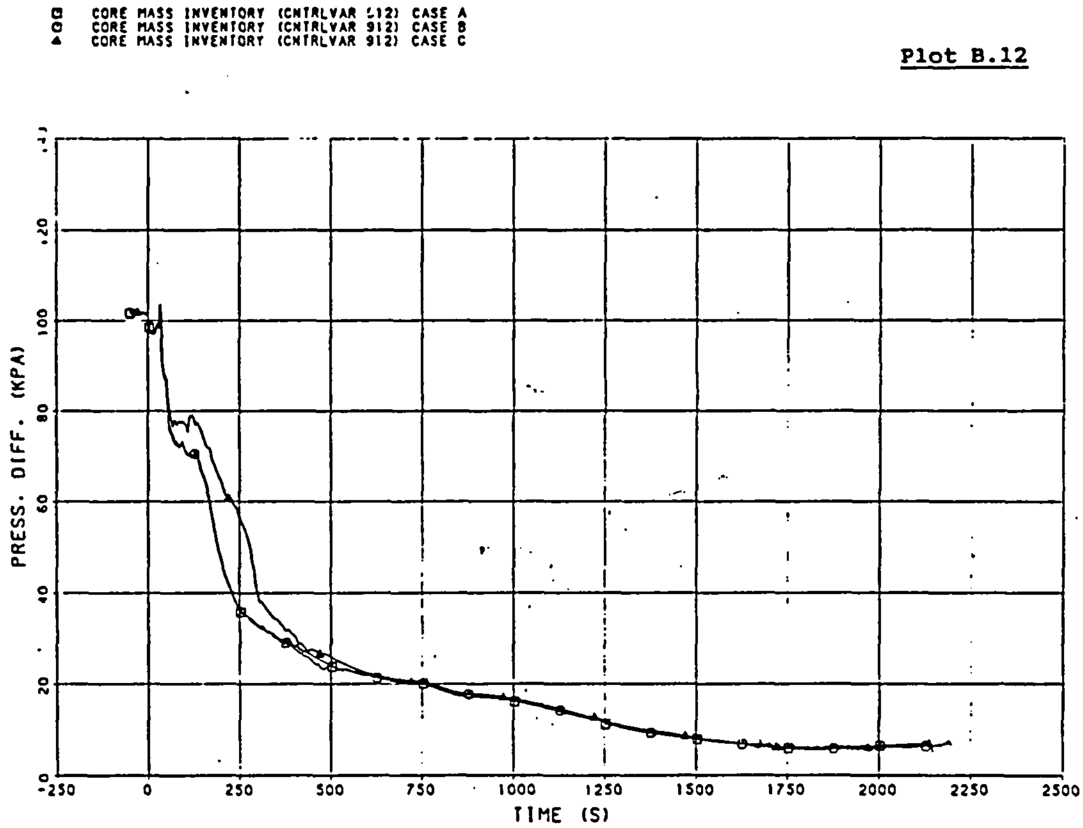
Plot B.10



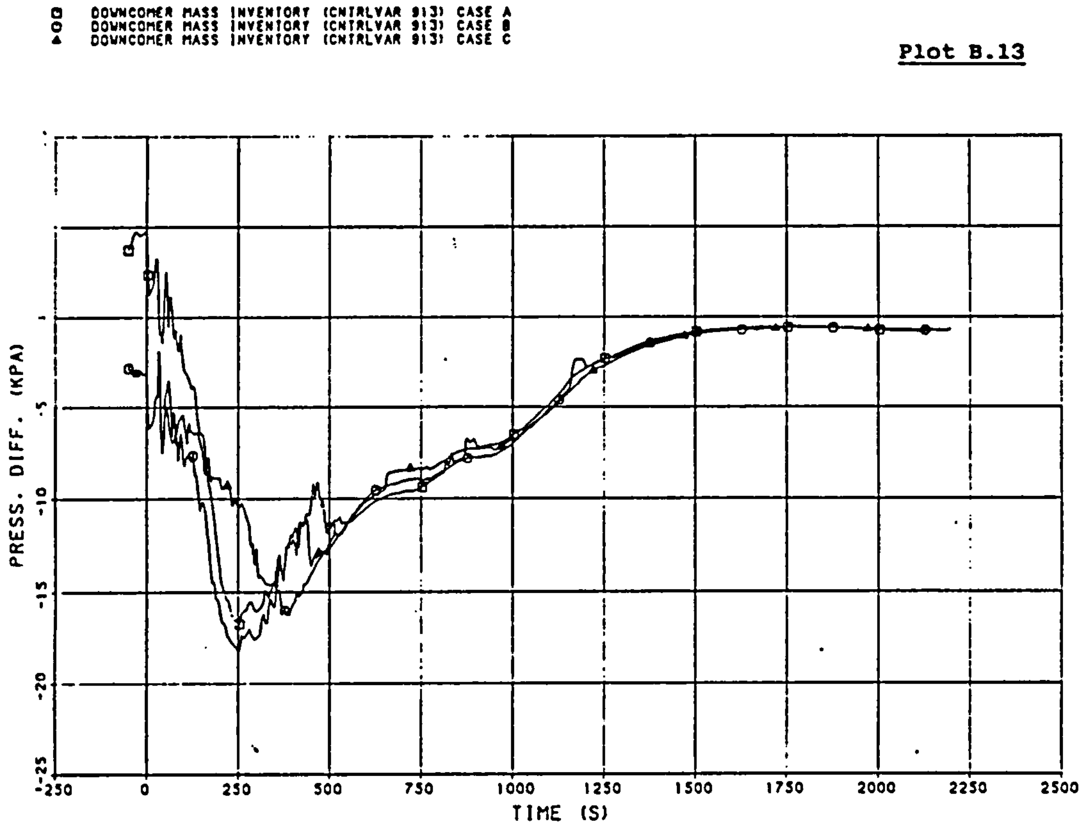
Plot B.11



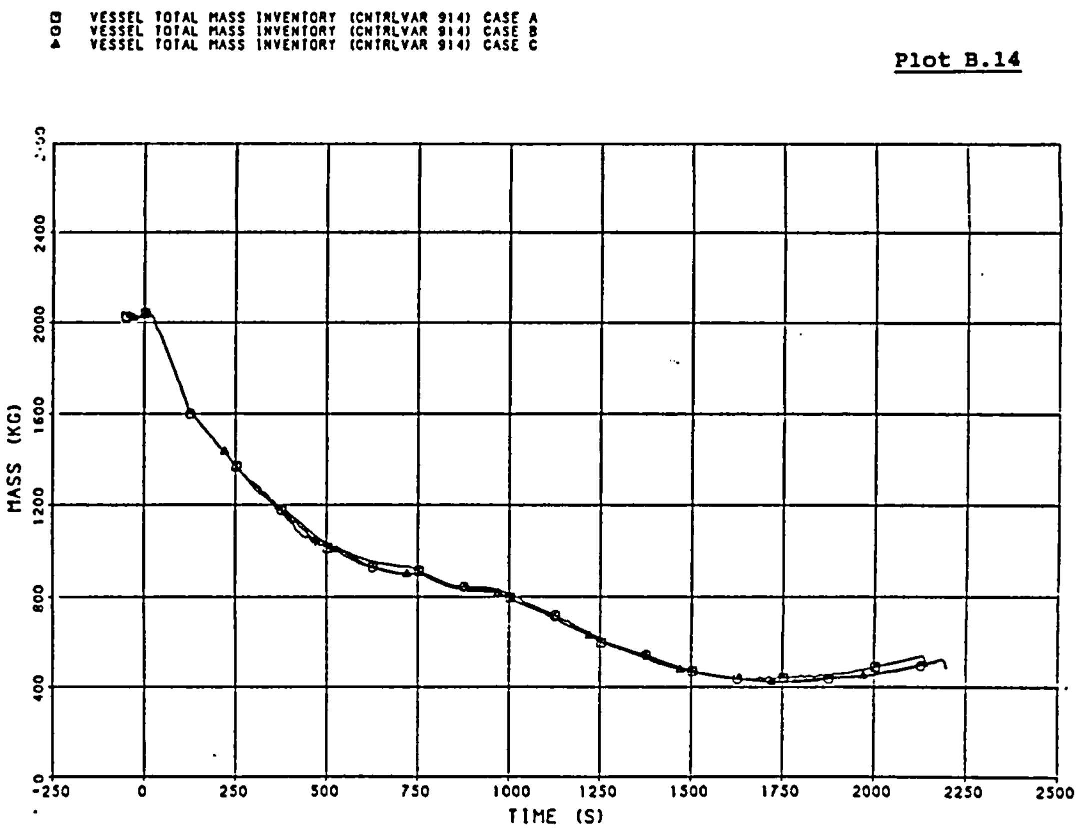
Plot B.12



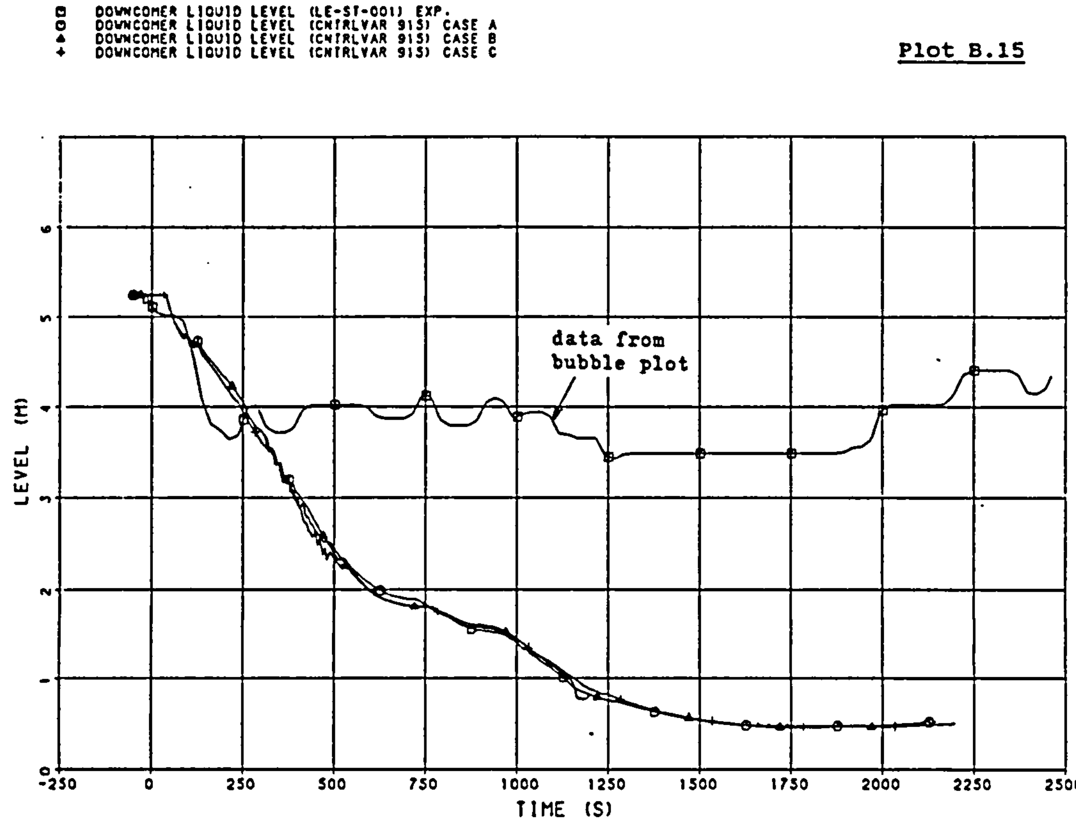
Plot B.13



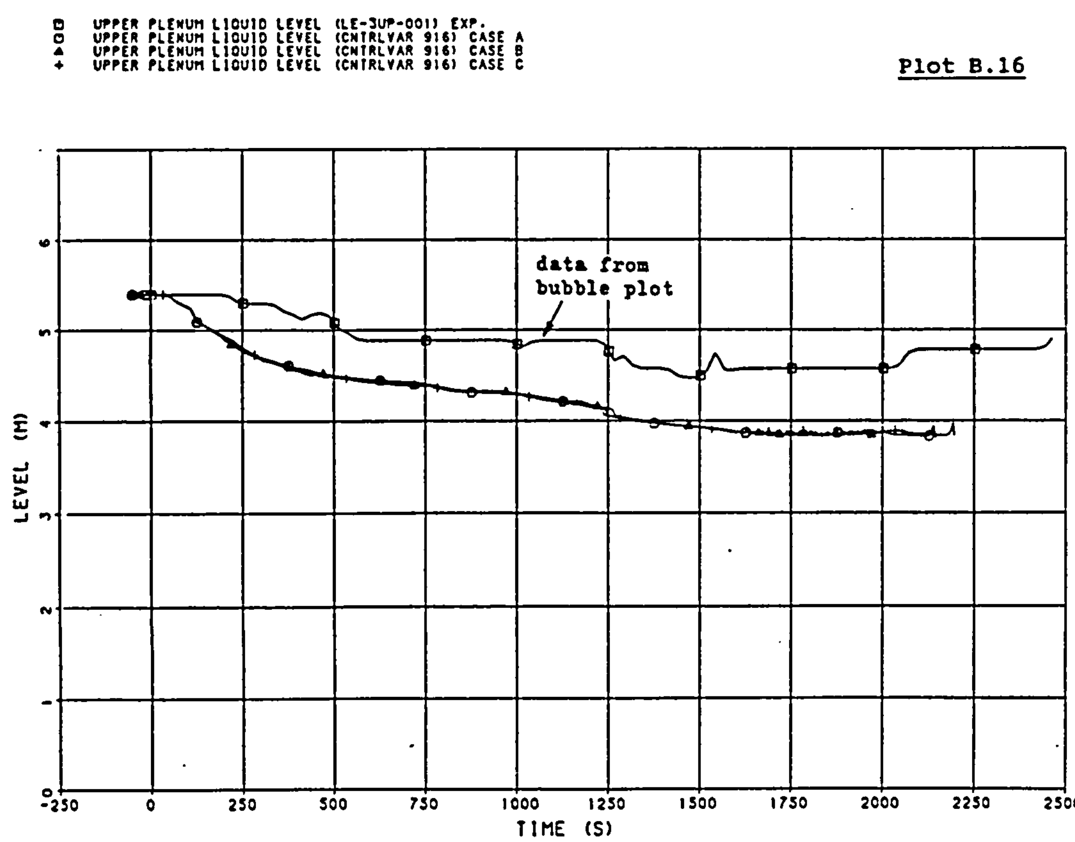
Plot B.14



Plot B.15

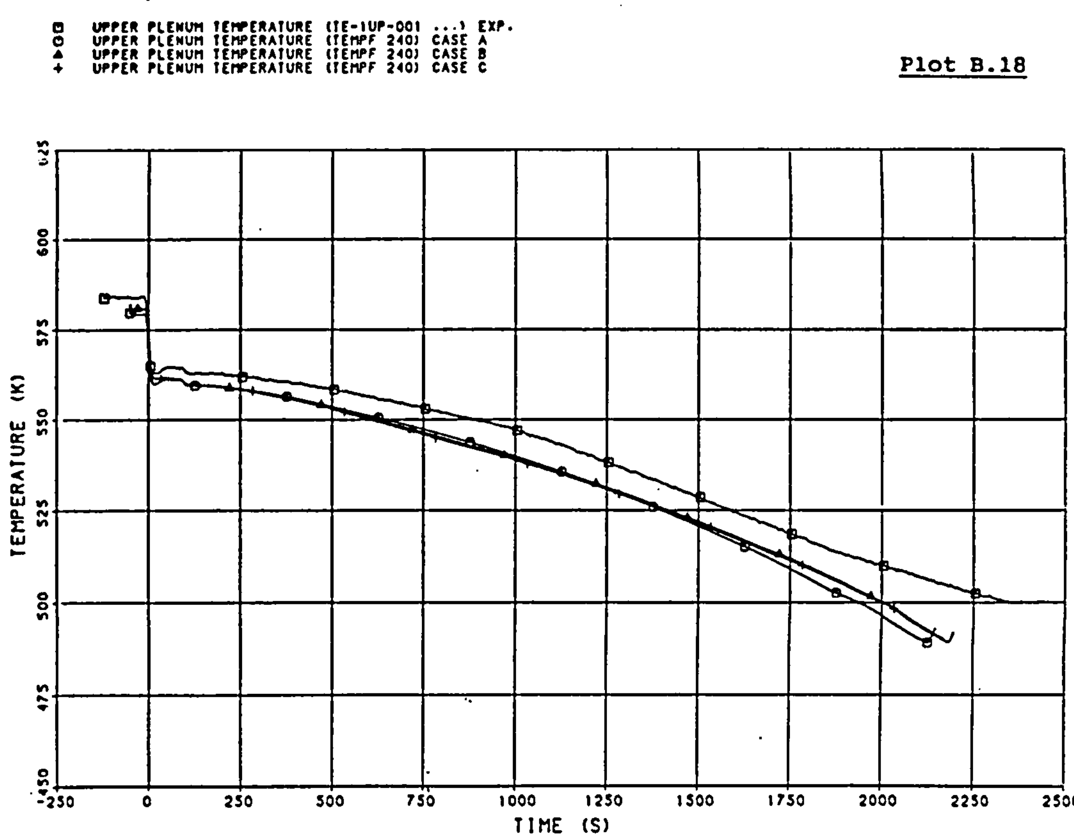


Plot B.16

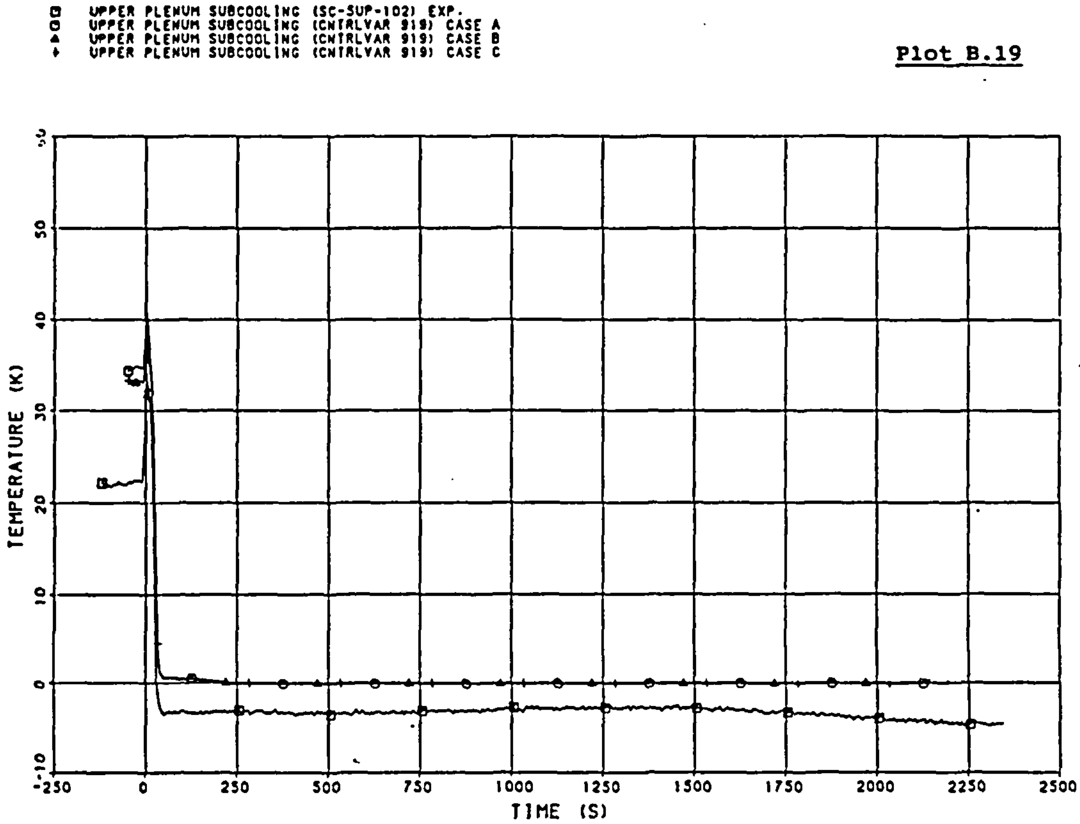


Plot B.17

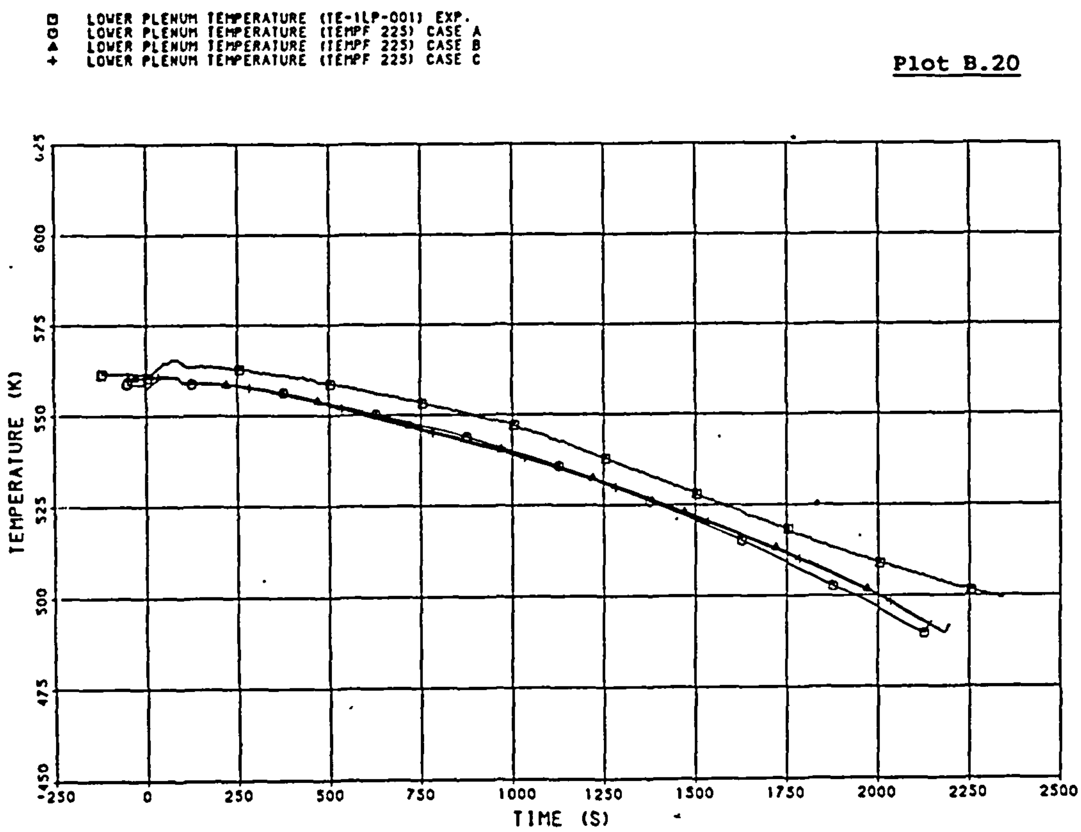
Plot B.18



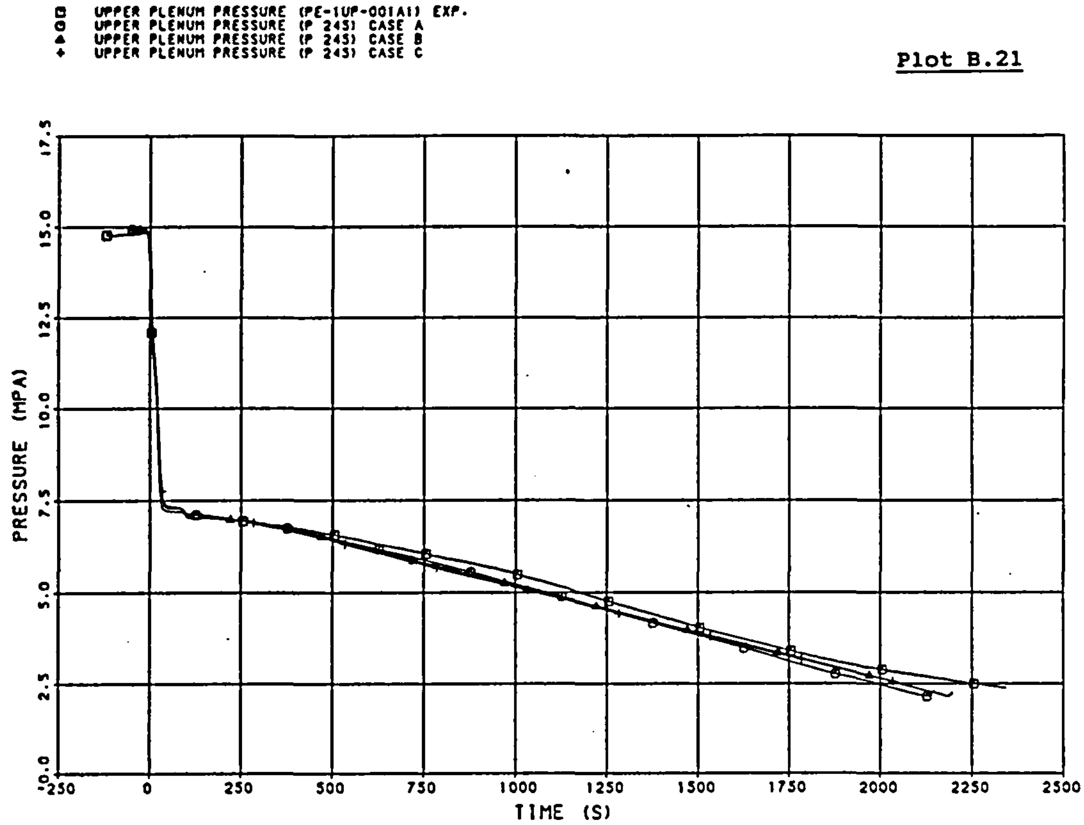
Plot B.19



Plot B.20



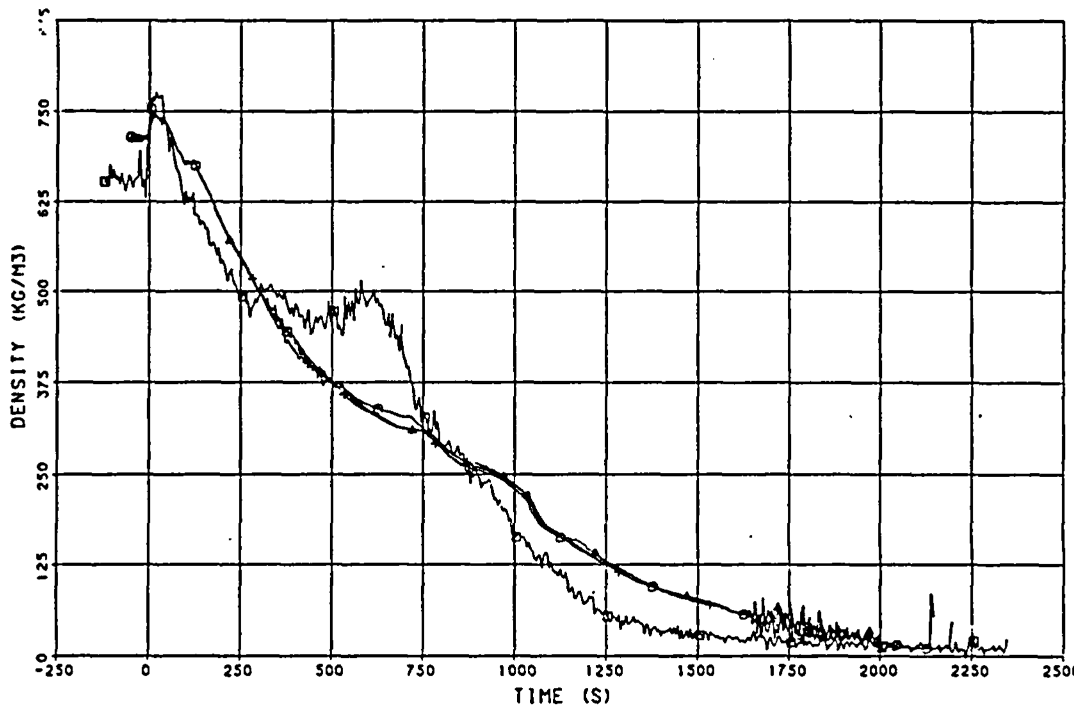
Plot B.21



Plot B.22

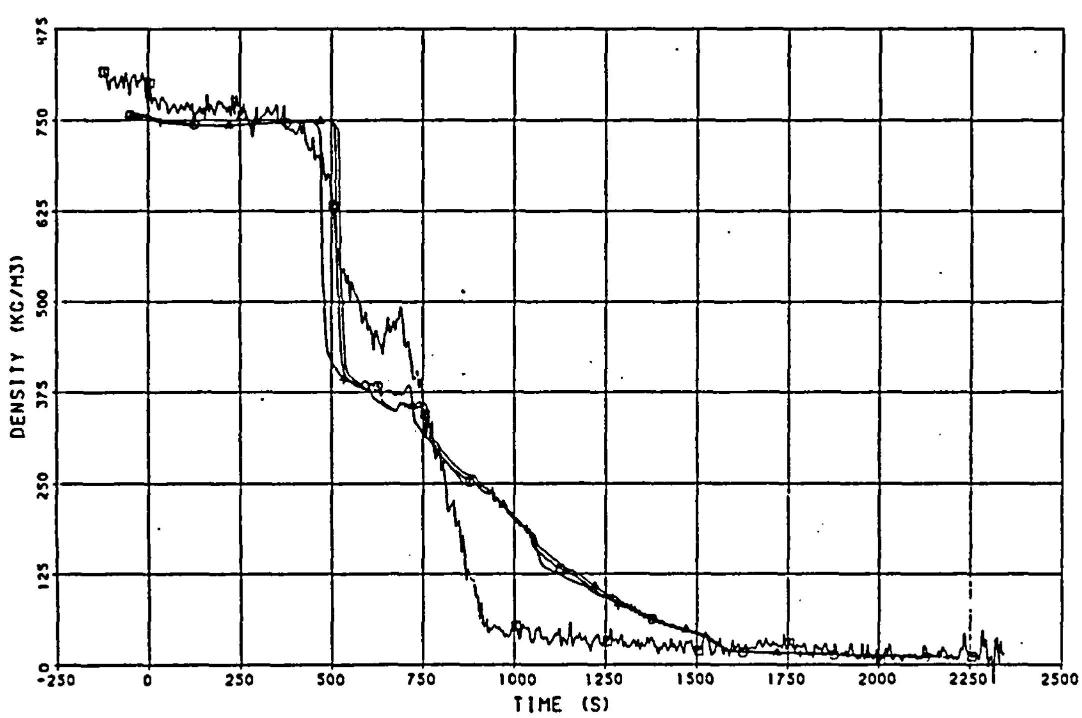
□ I.L. HOT LEG FLUID DENSITY (DE-PC-205) EXP.
○ I.L. HOT LEG FLUID DENSITY (RHO 105) CASE A
△ I.L. HOT LEG FLUID DENSITY (RHO 105) CASE B
+ I.L. HOT LEG FLUID DENSITY (RHO 105) CASE C

Plot B.23

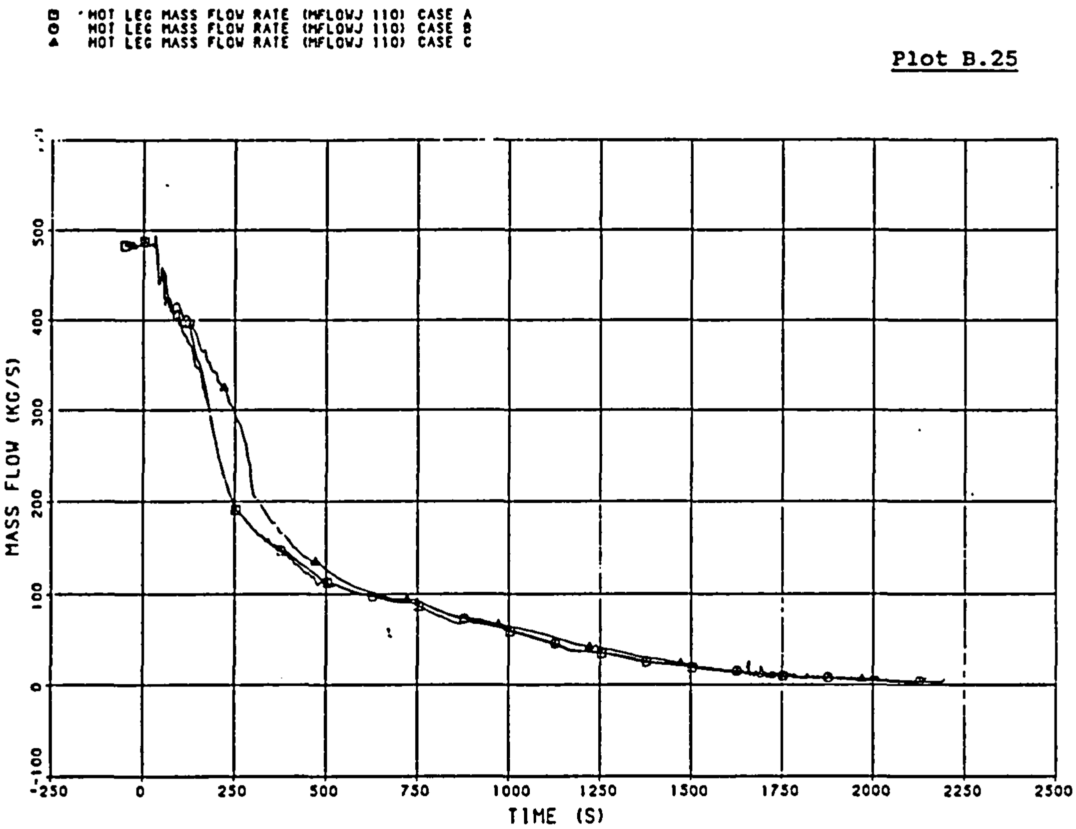


□ B.L. HOT LEG FLUID DENSITY (DE-BL-002B) EXP.
○ B.L. HOT LEG FLUID DENSITY (RHO 305) CASE A
△ B.L. HOT LEG FLUID DENSITY (RHO 305) CASE B
+ B.L. HOT LEG FLUID DENSITY (RHO 305) CASE C

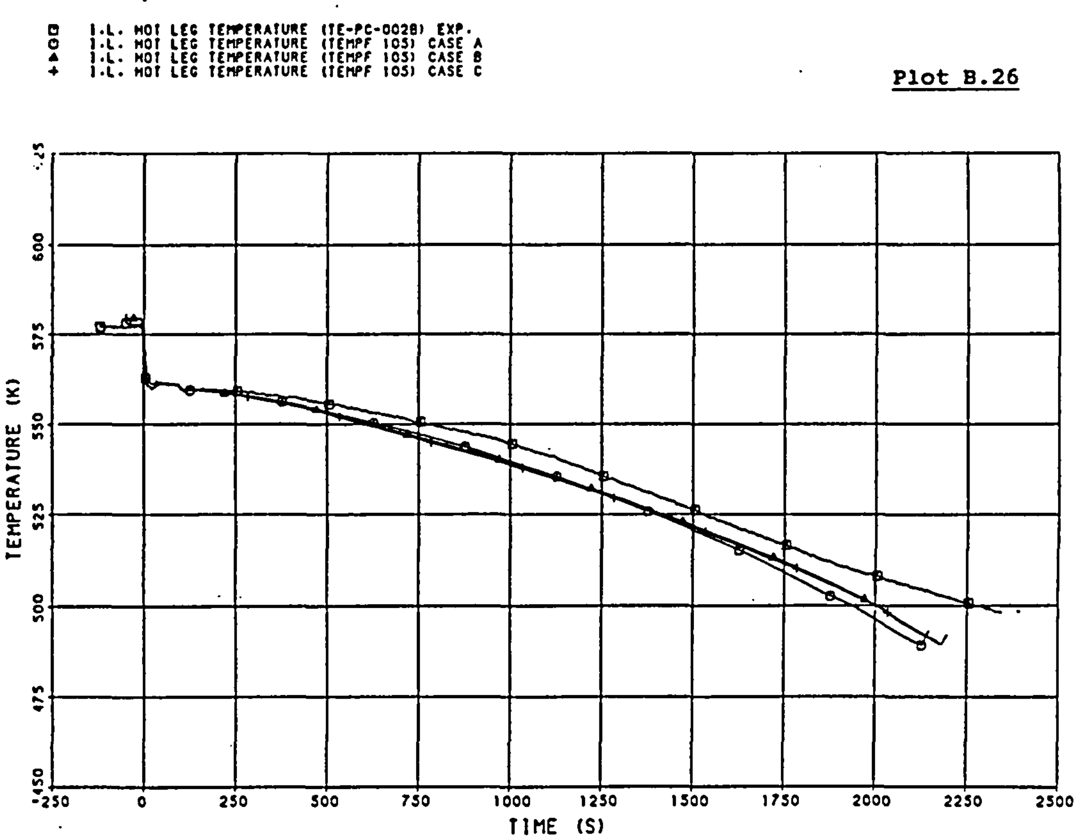
Plot B.24



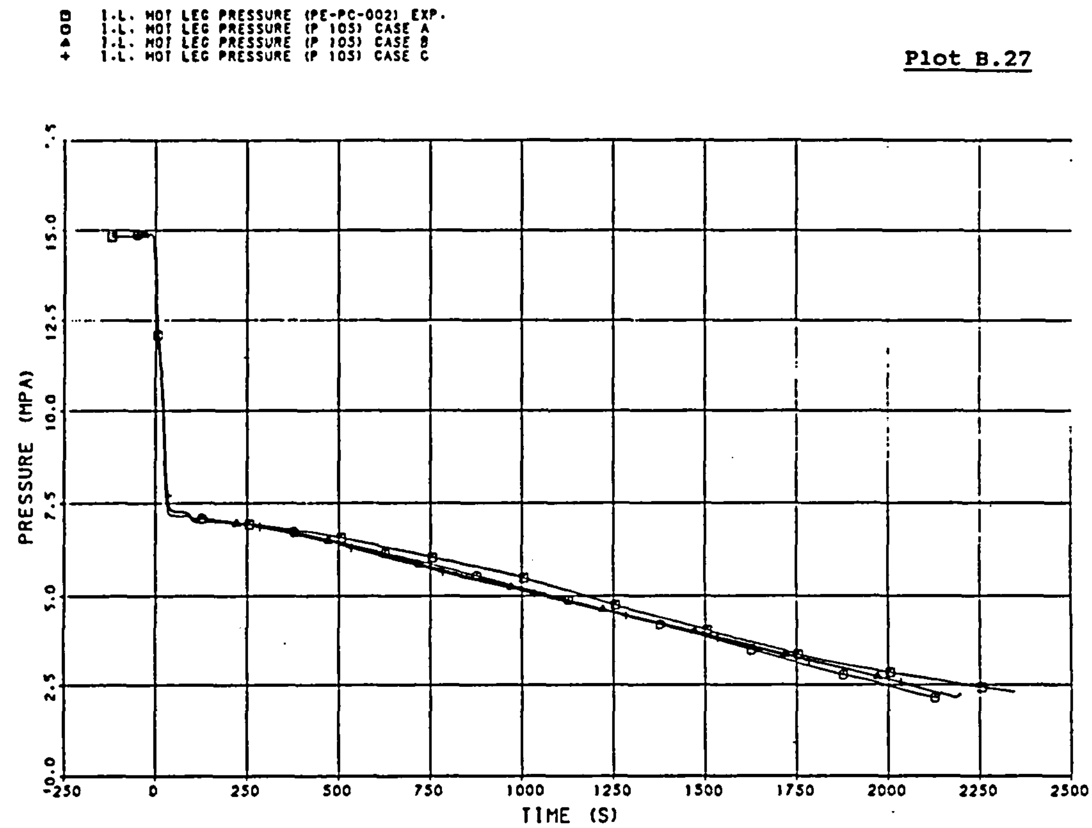
Plot B.25



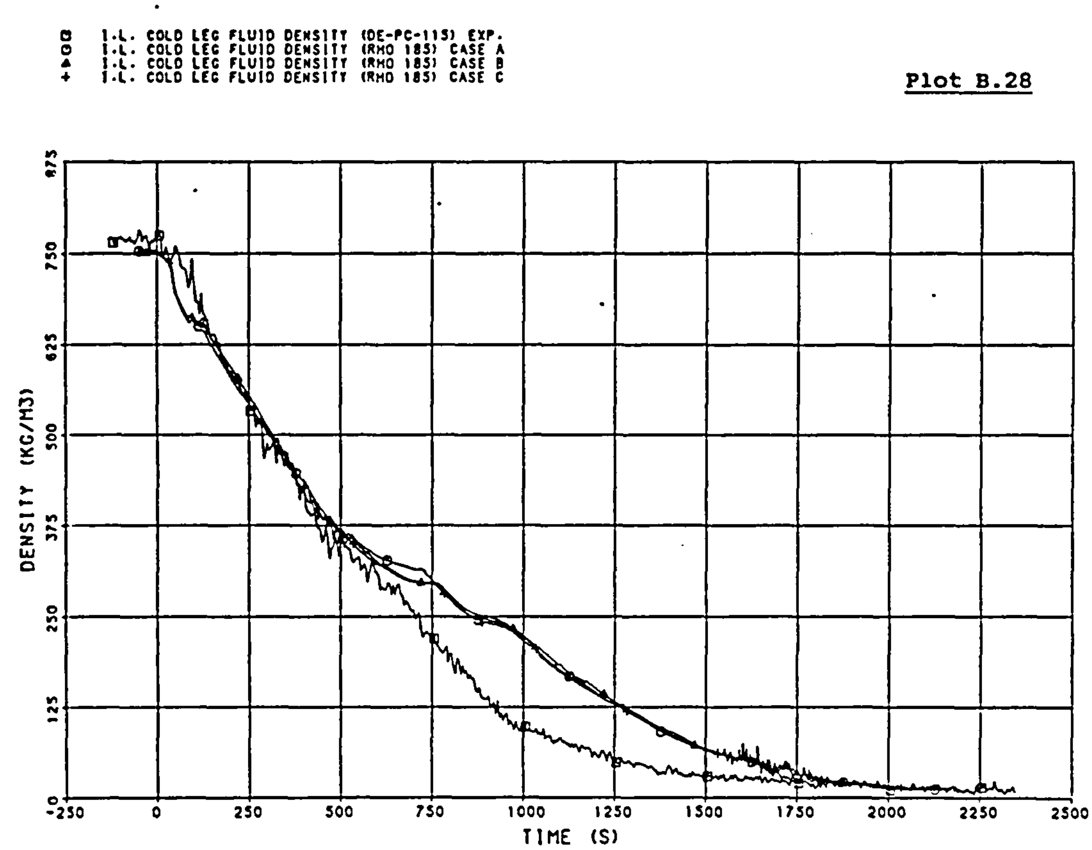
Plot B.26



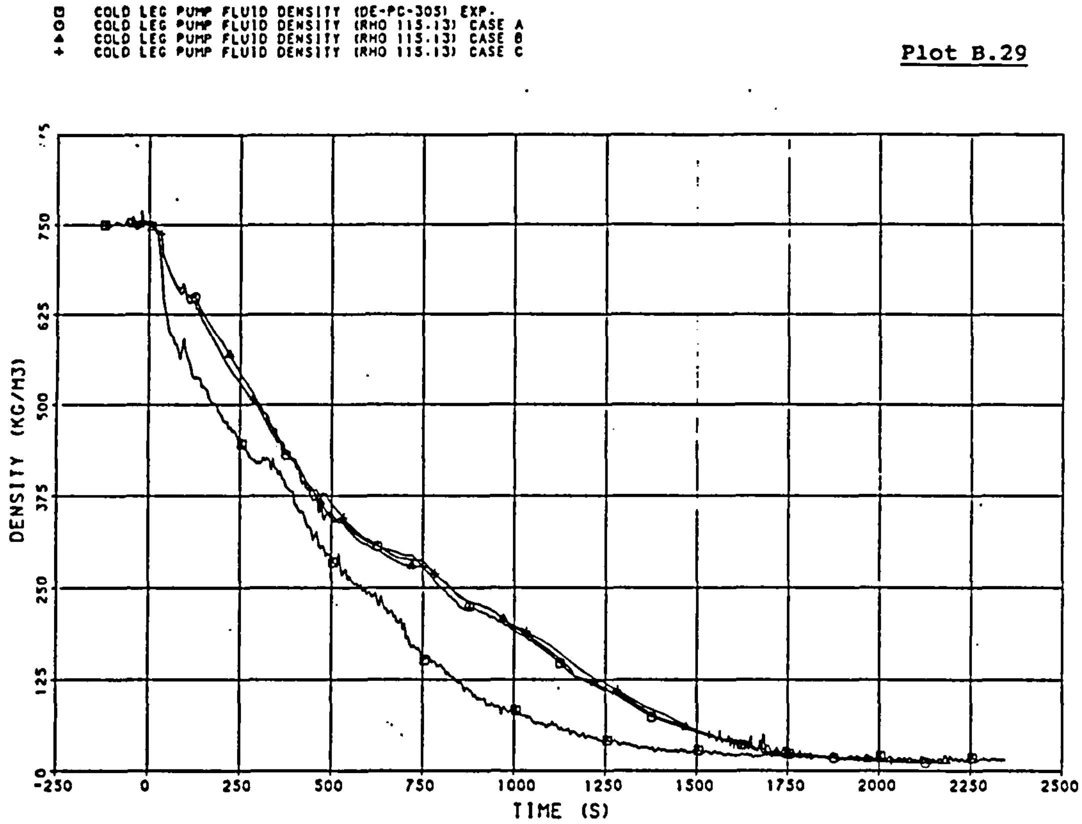
Plot B.27



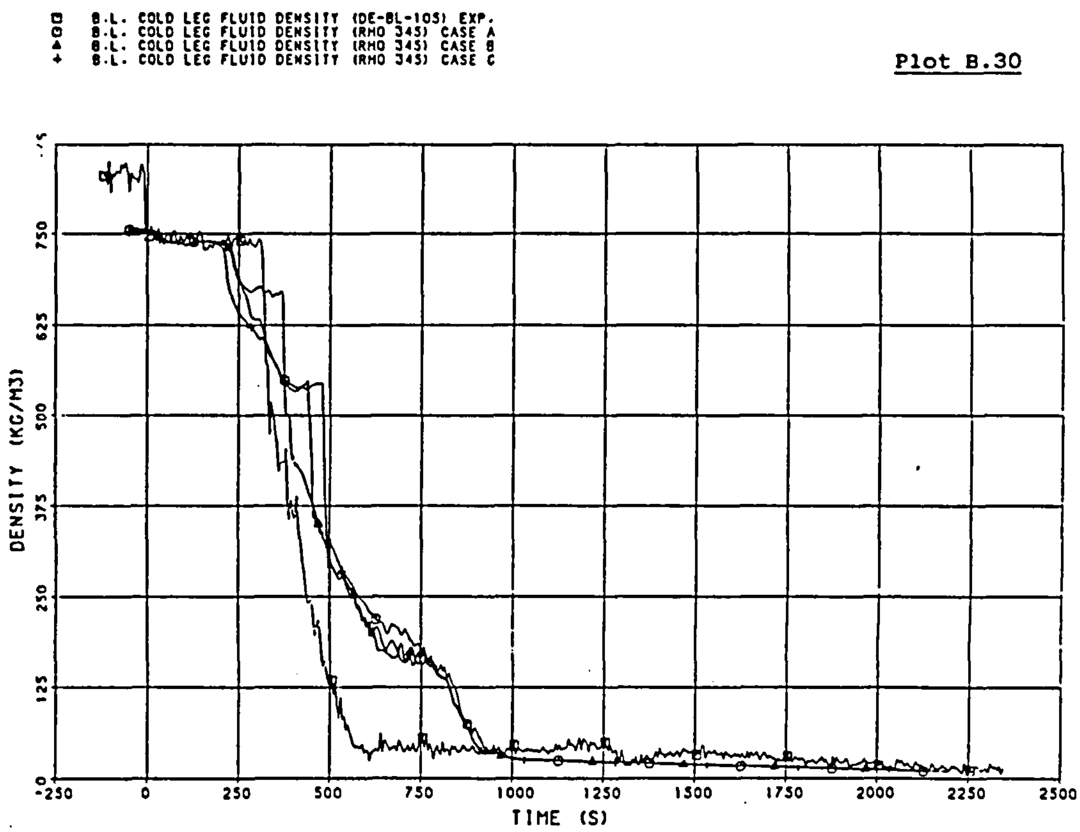
Plot B.28



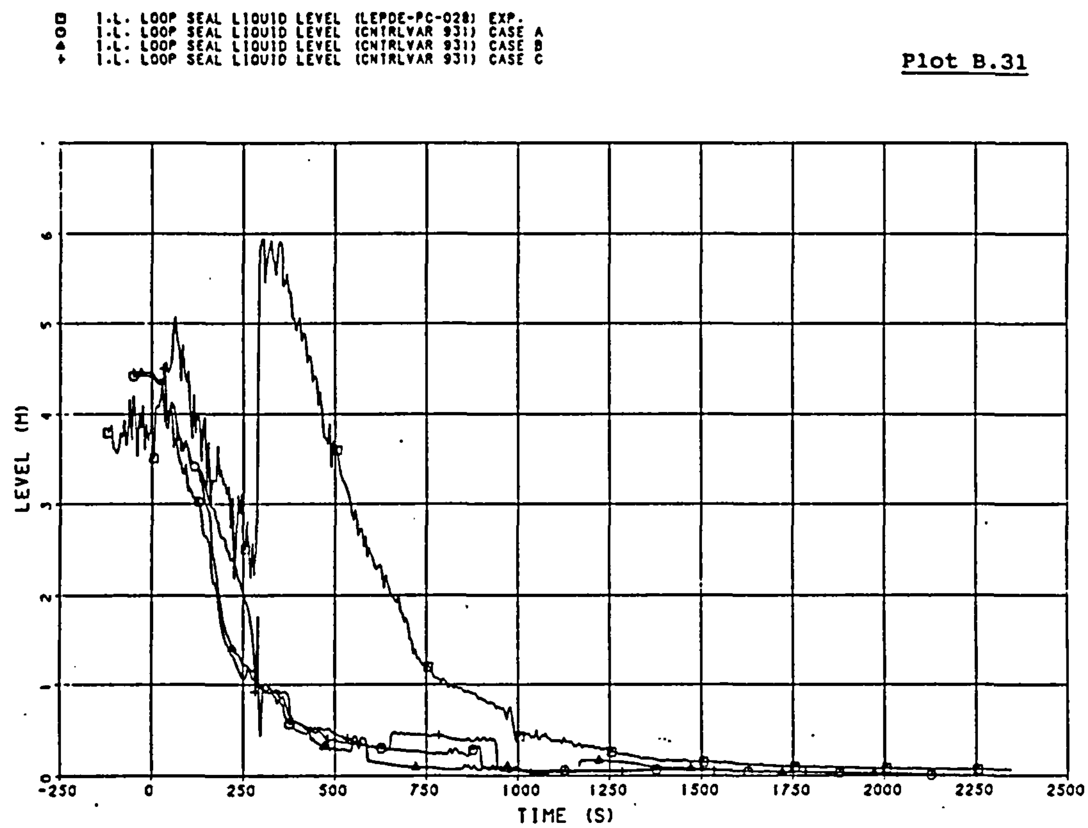
Plot B.29



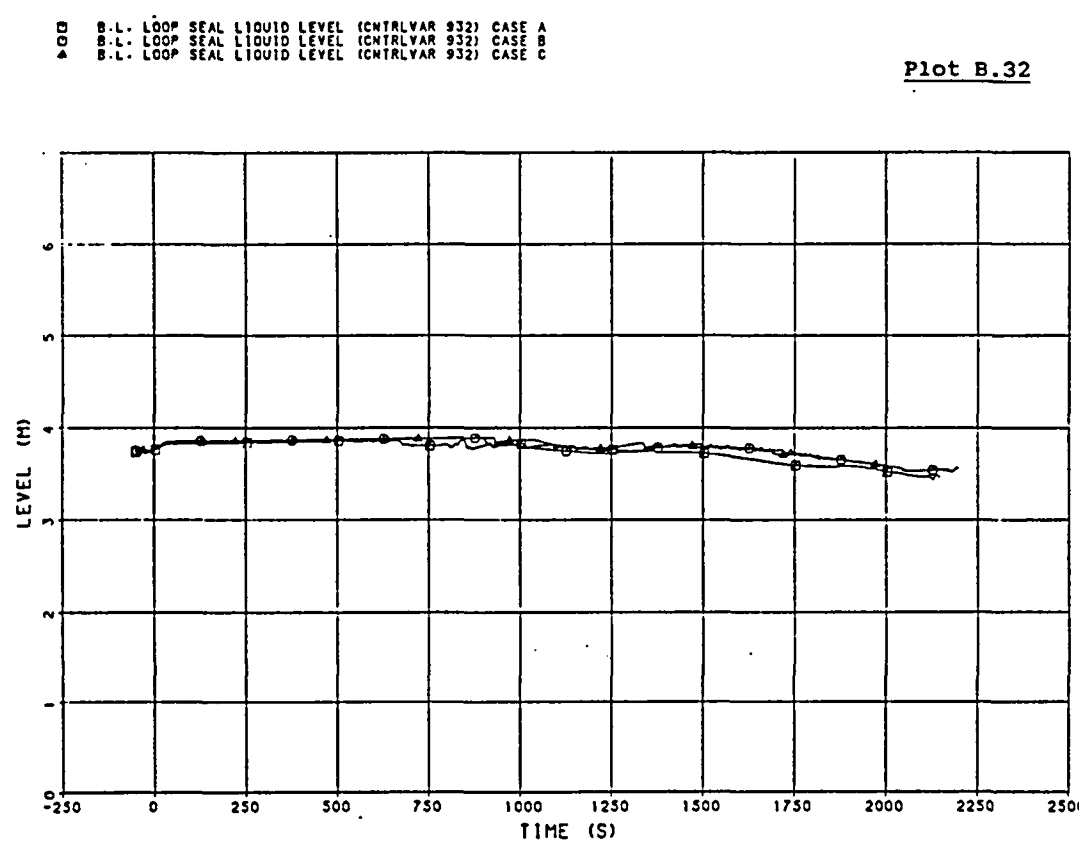
Plot B.30



Plot B.31

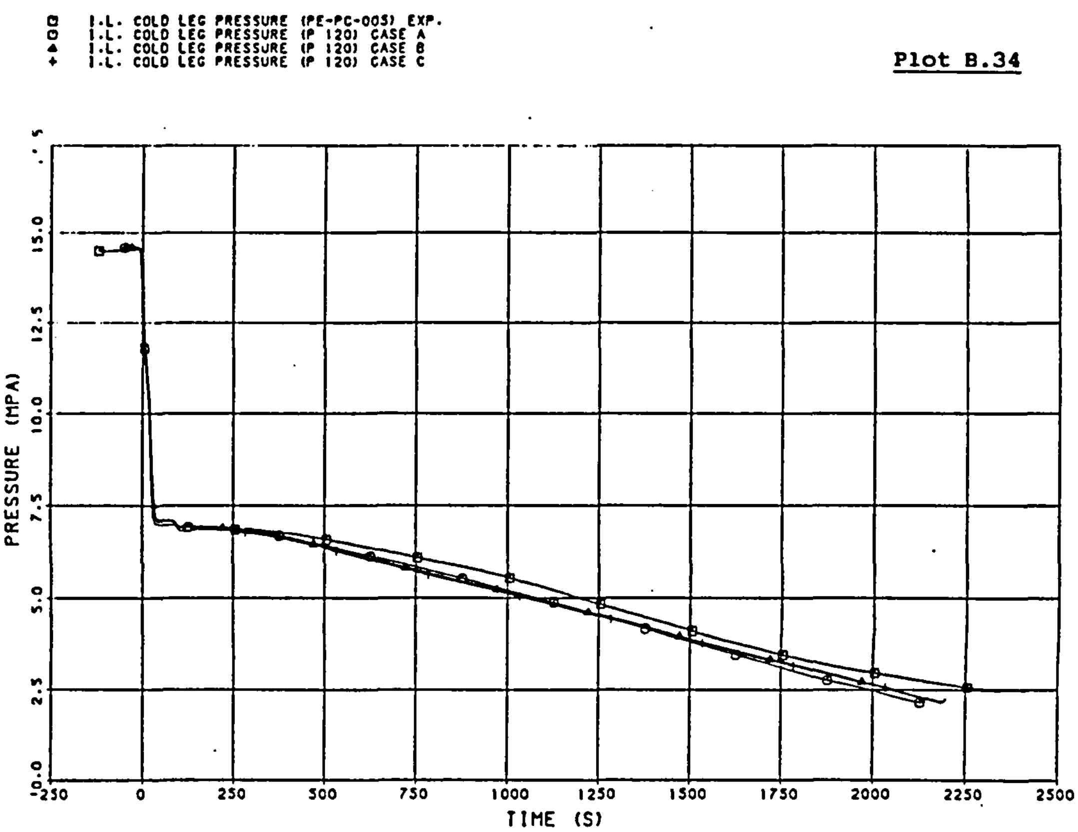


Plot B.32

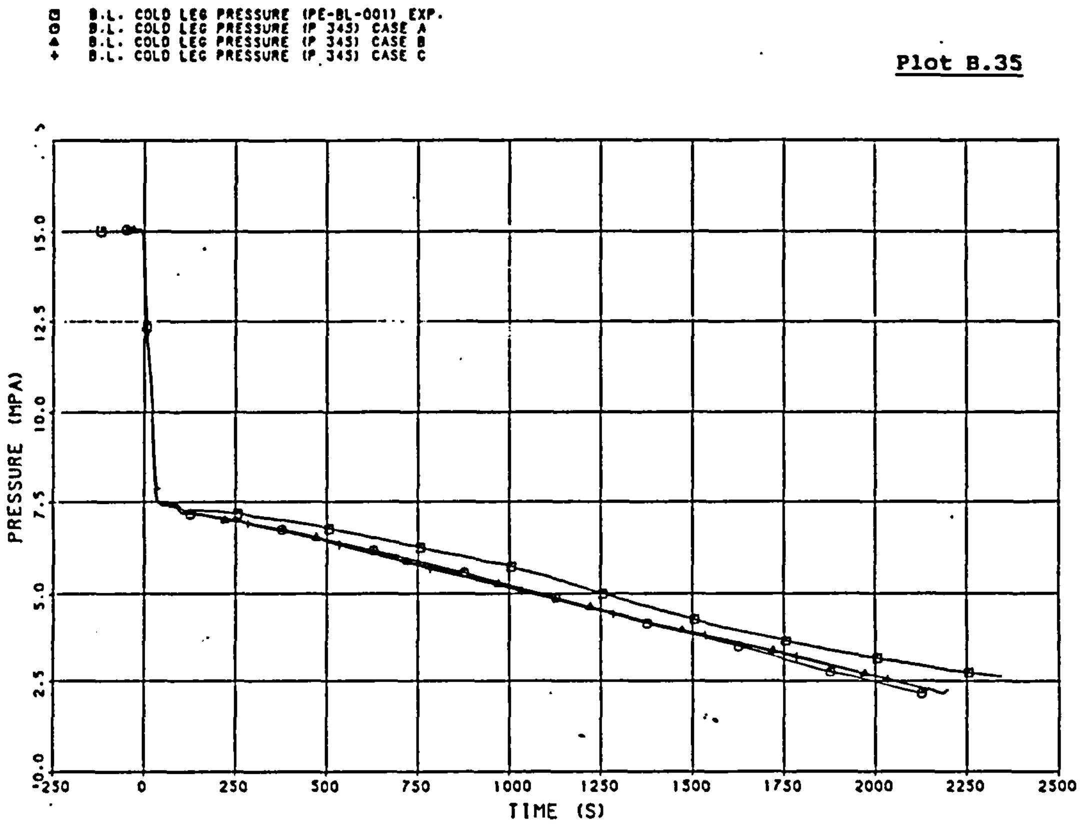


Plot B.33

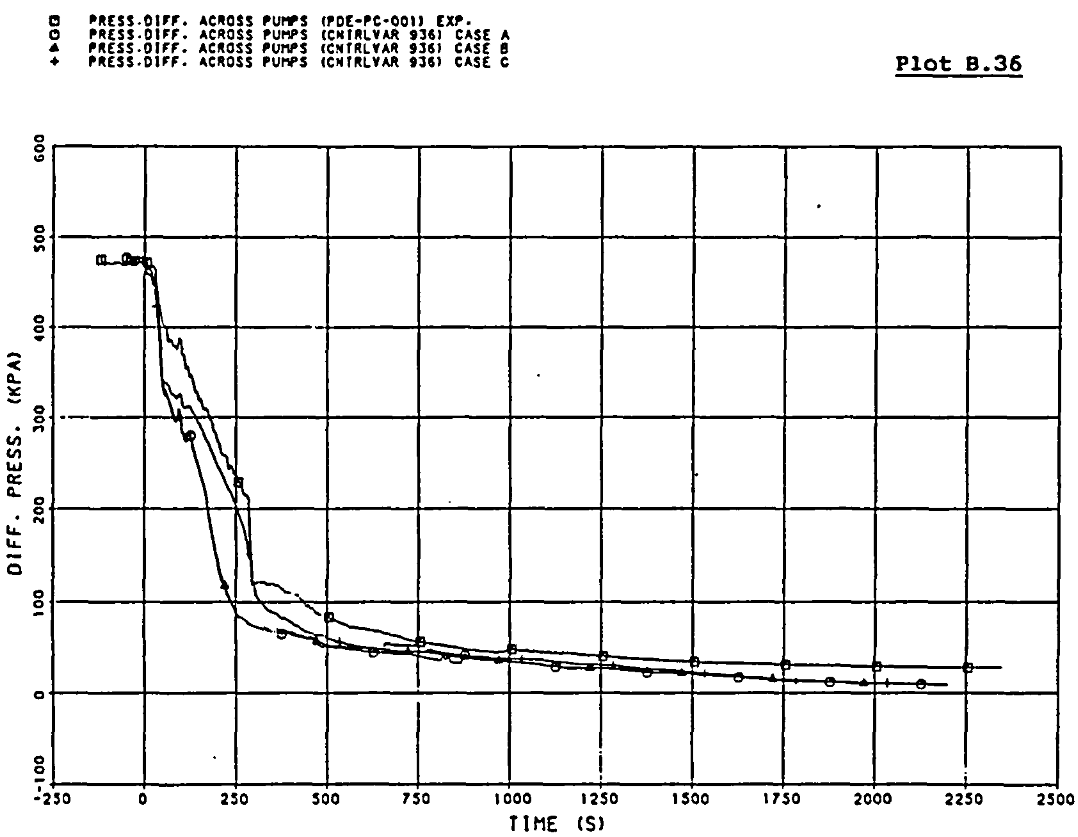
Plot B.34



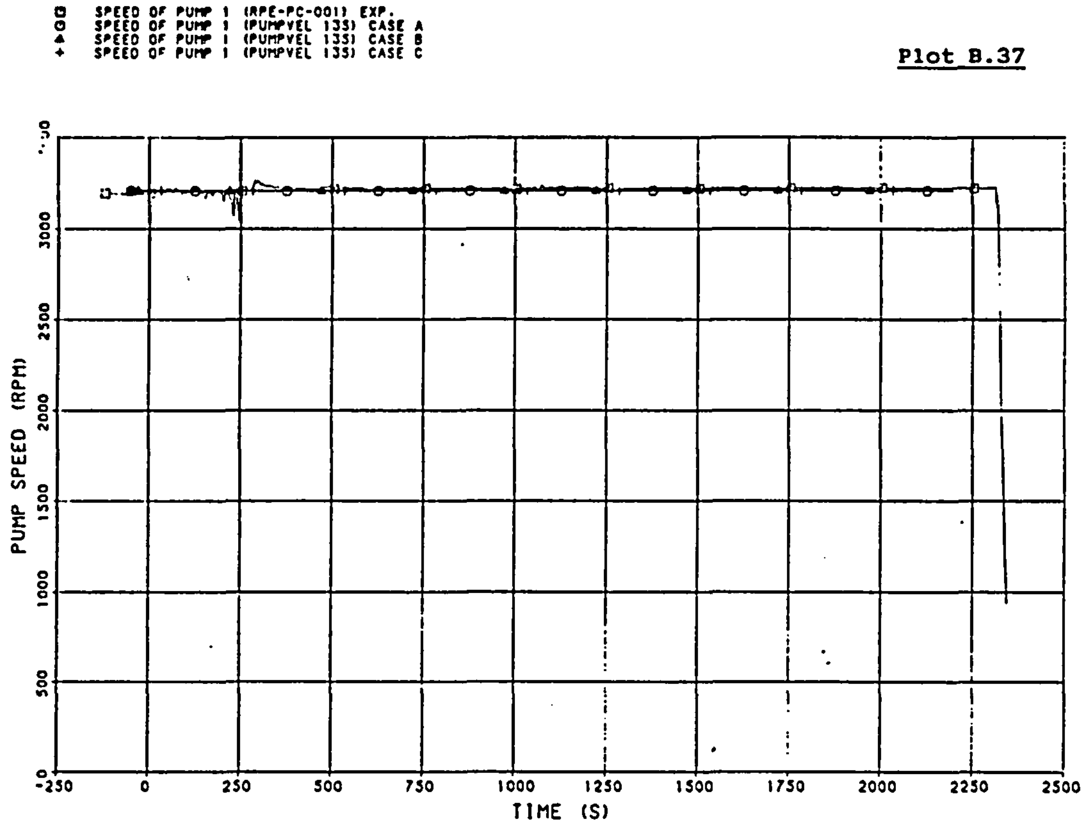
Plot B.35



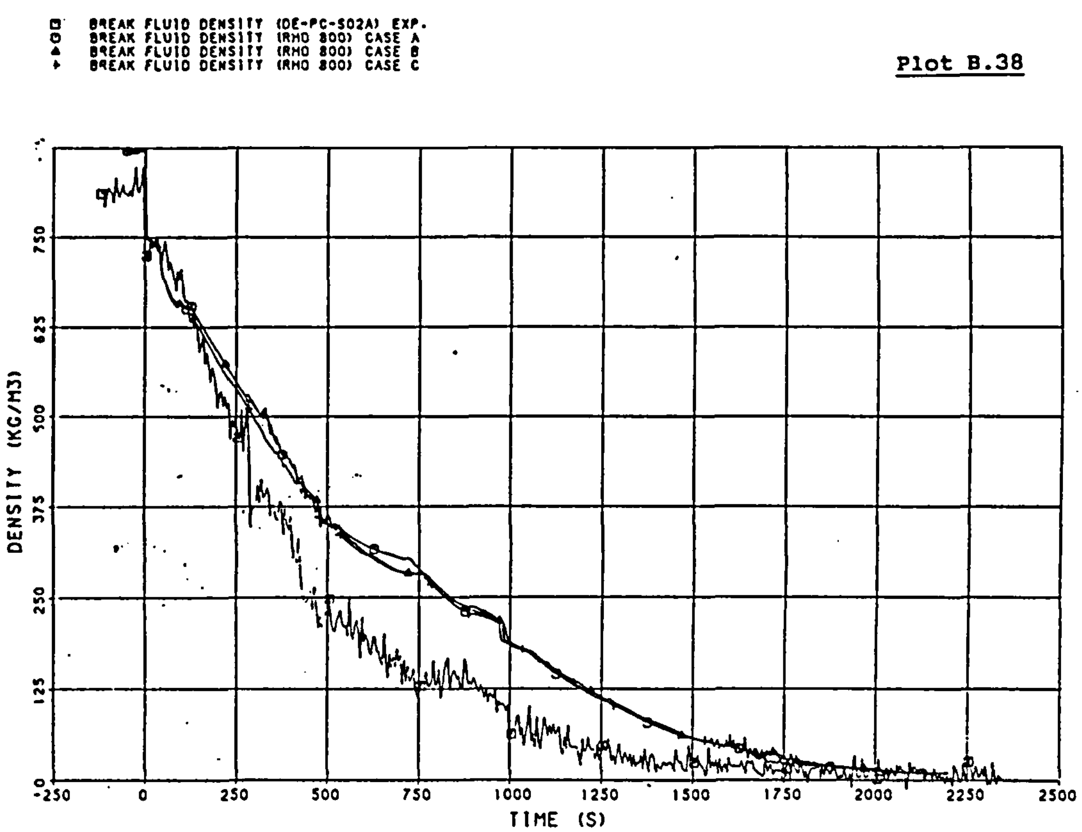
Plot B.36



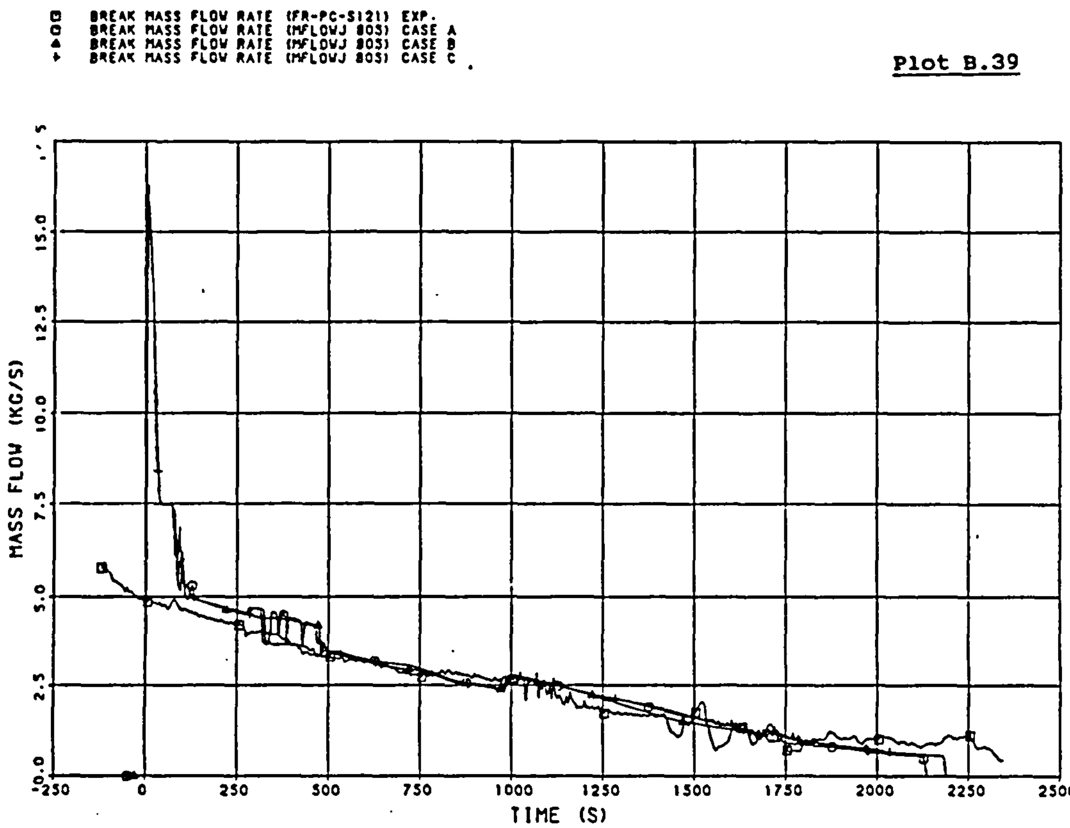
Plot B.37



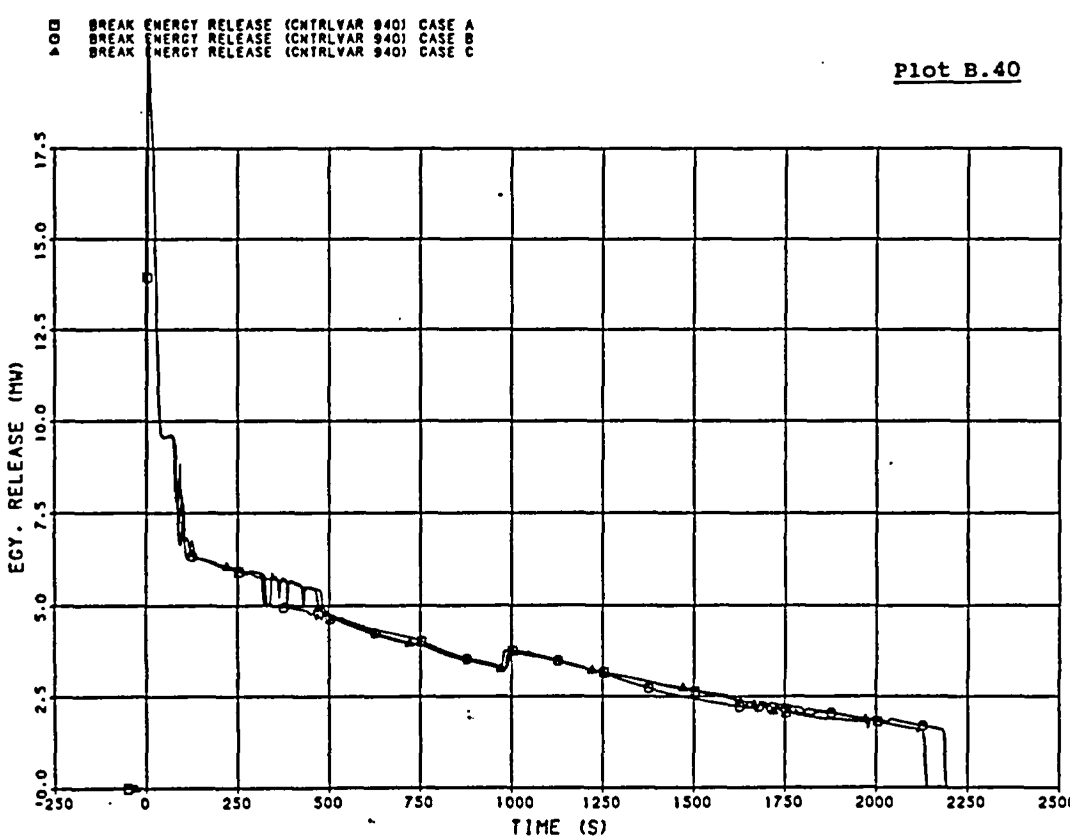
Plot B.38



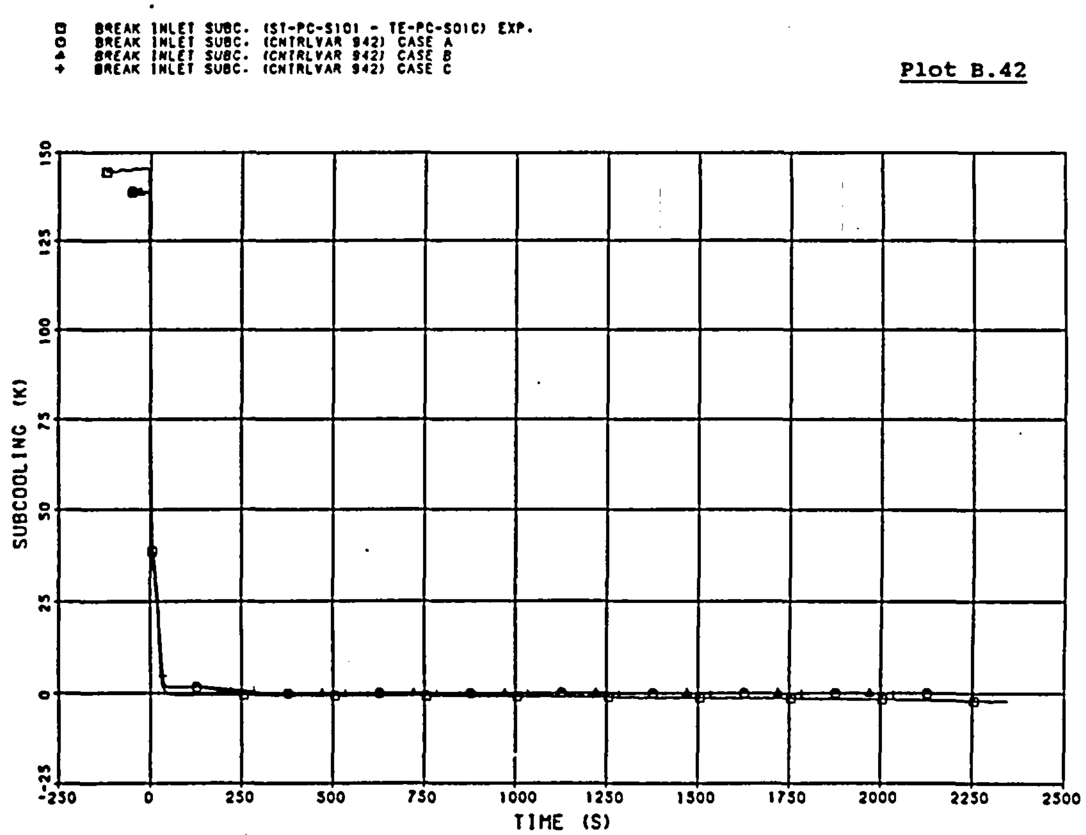
Plot B.39



Plot B.40



Plot B.41

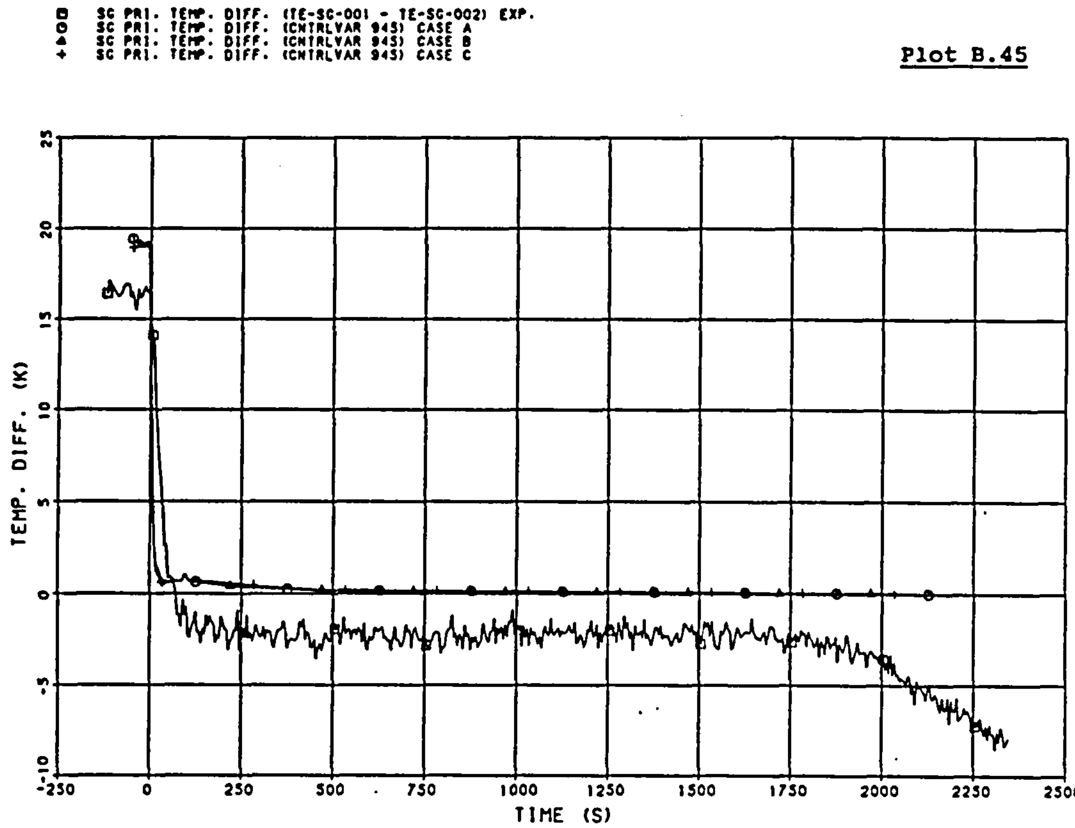


Plot B.42

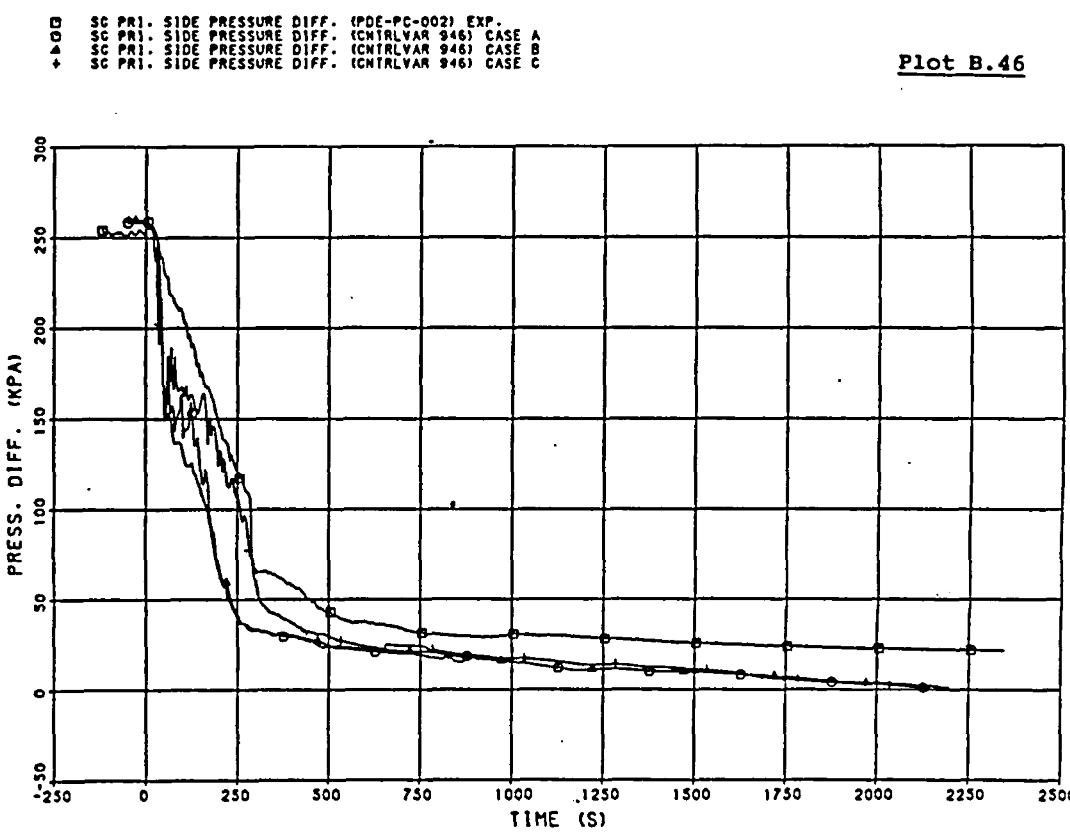
Plot B.43

Plot B.44

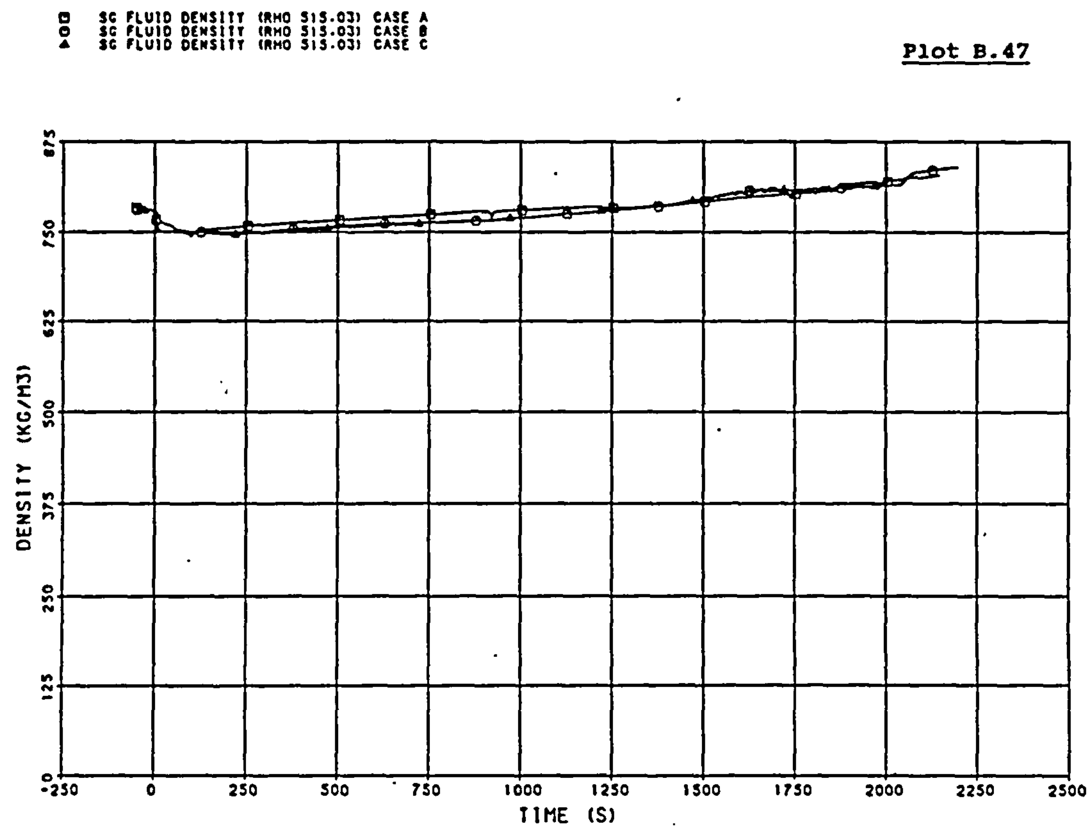
Plot B.45



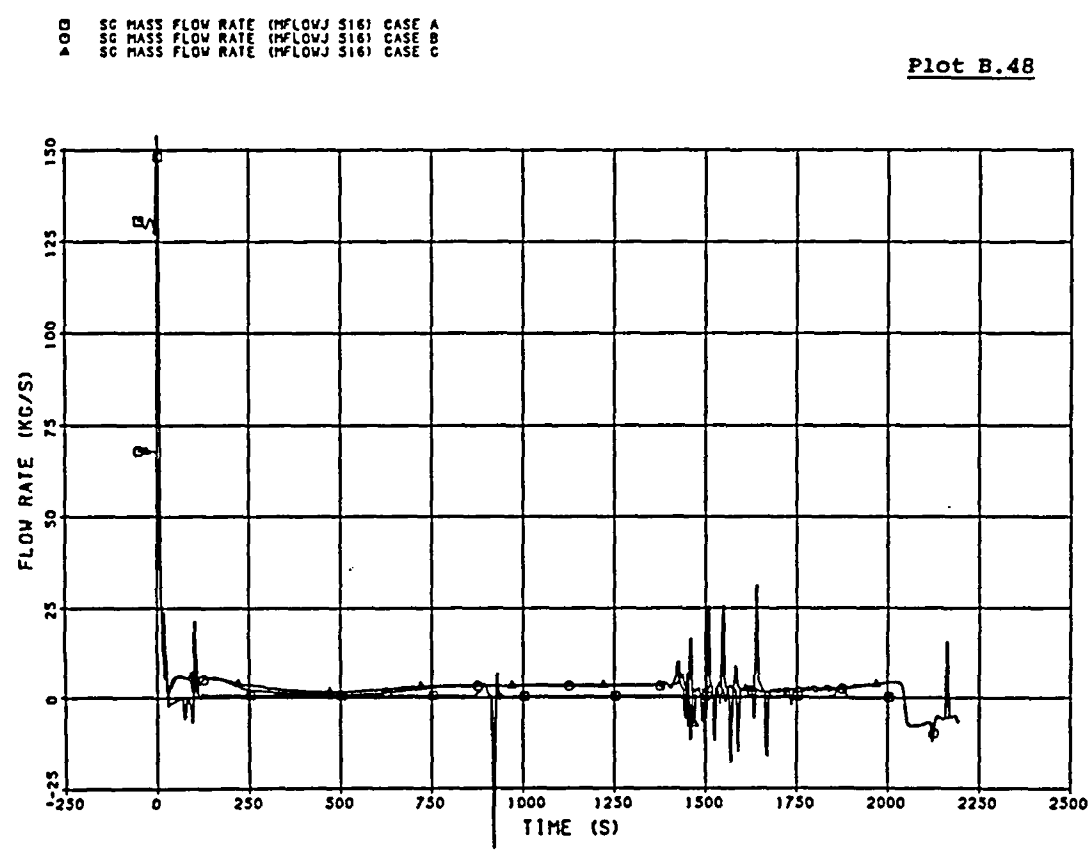
Plot B.46



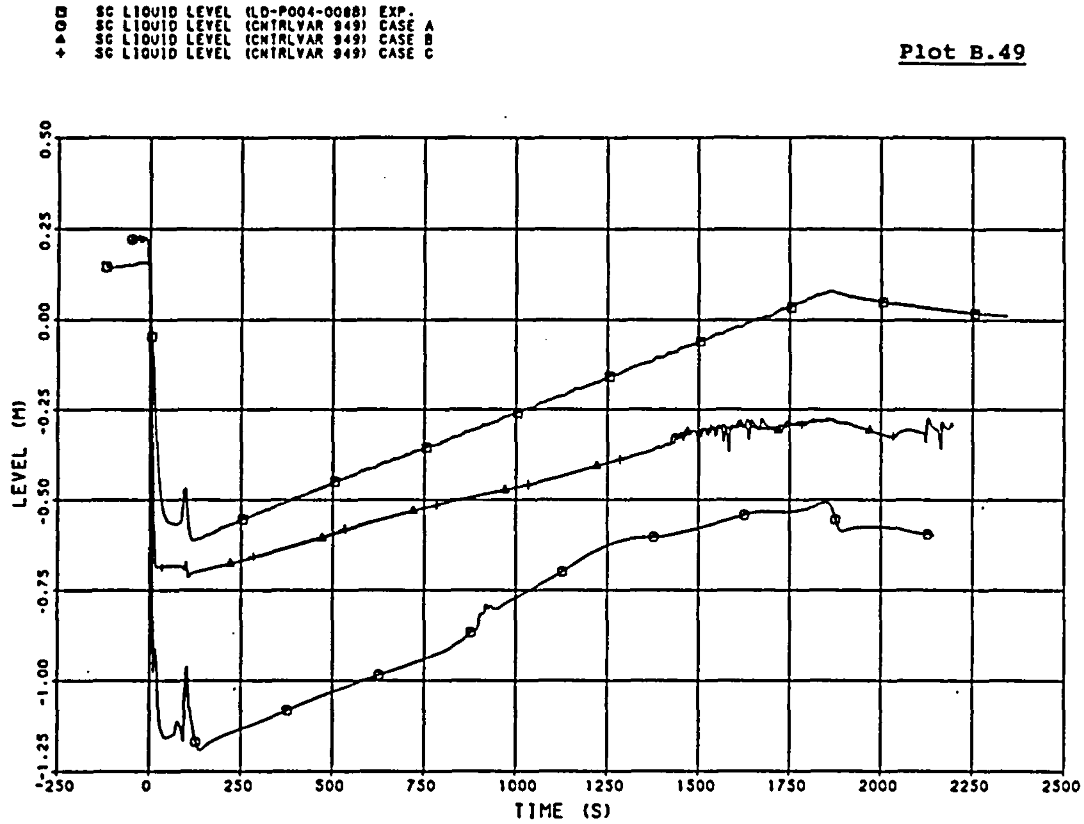
Plot B.47



Plot B.48

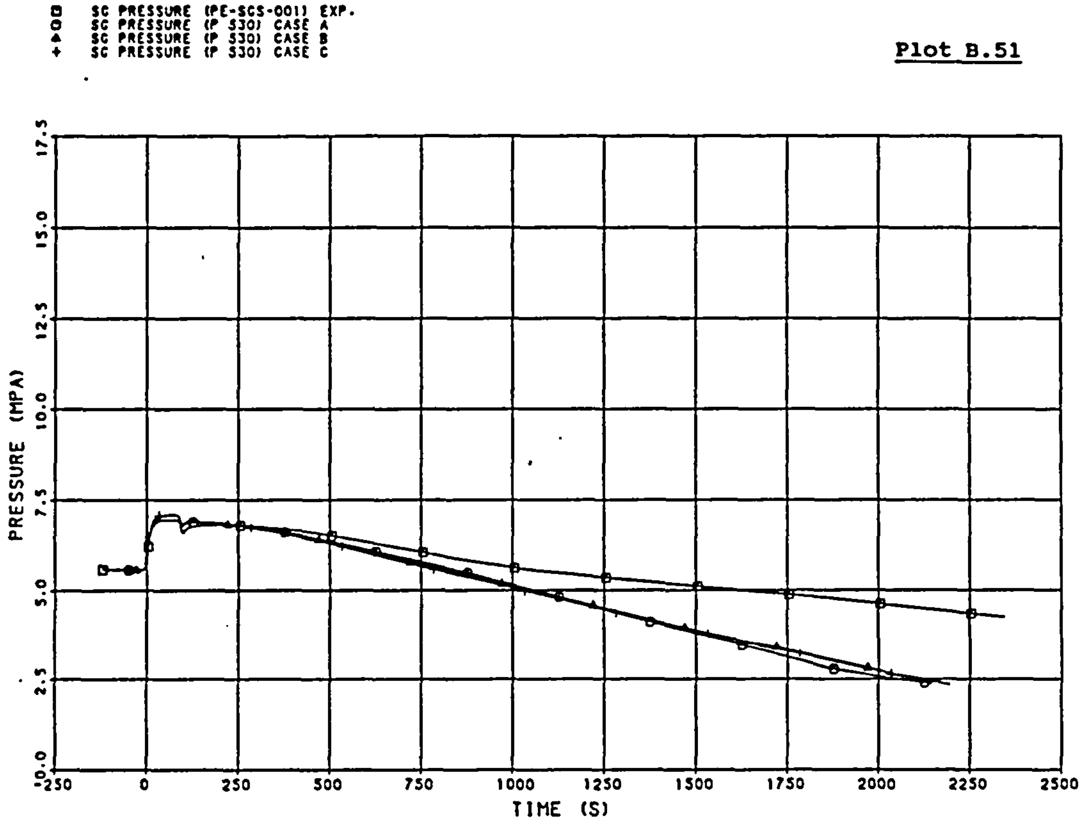


Plot B.49

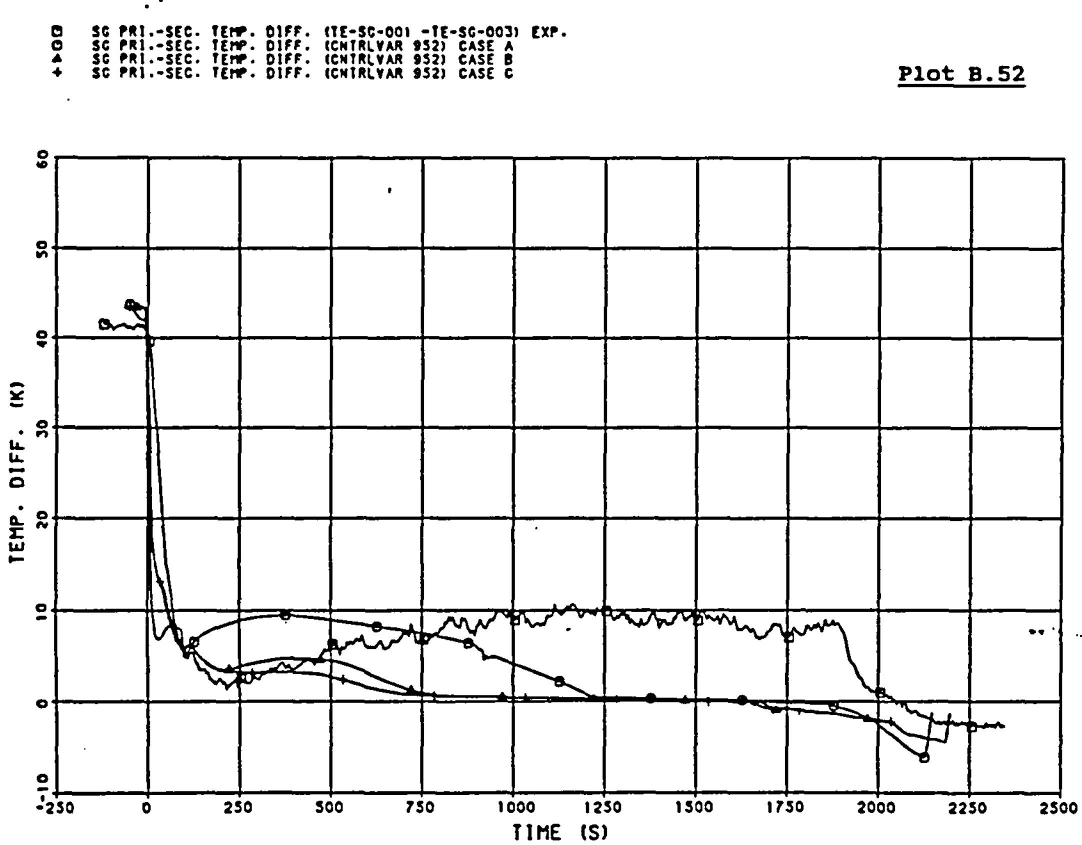


Plot B.50

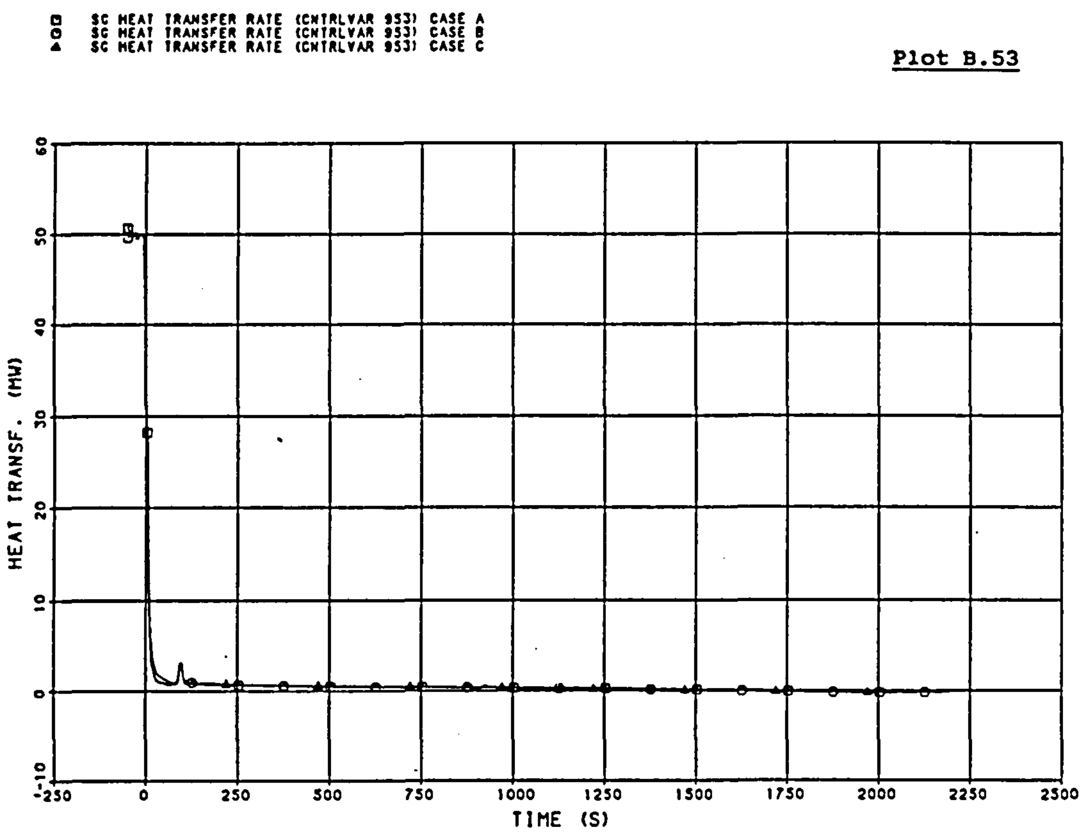
Plot B.51



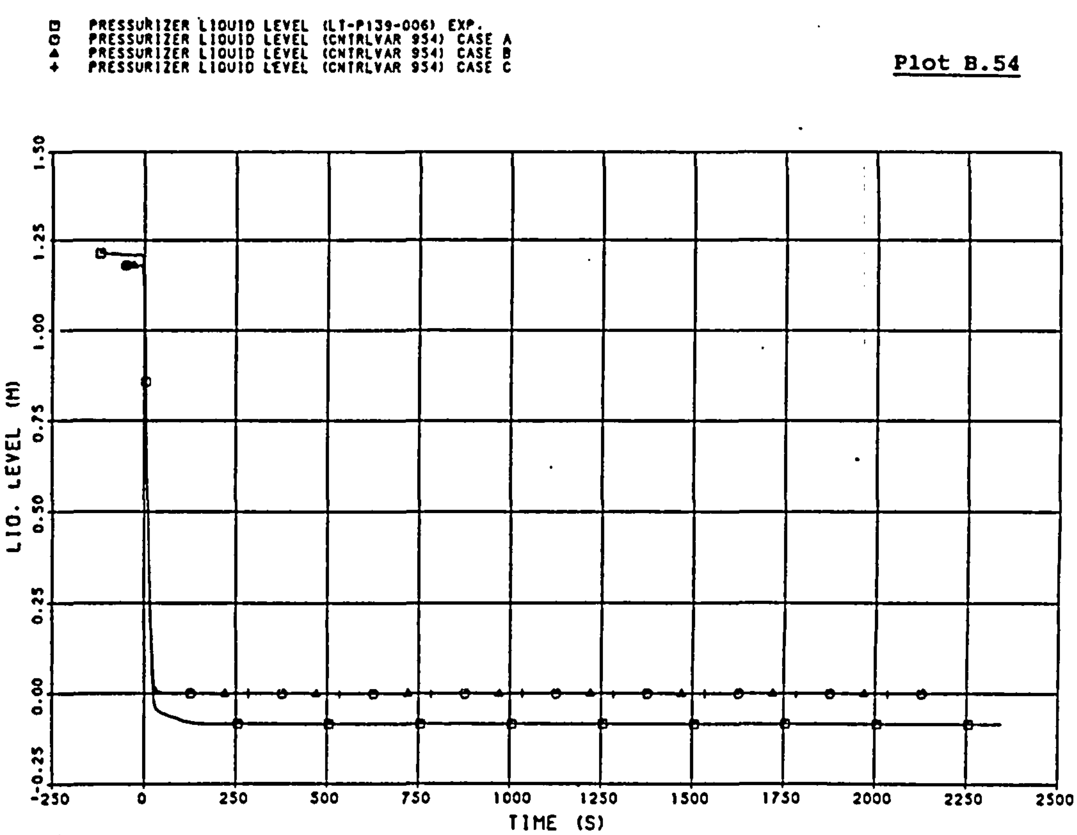
Plot B.52



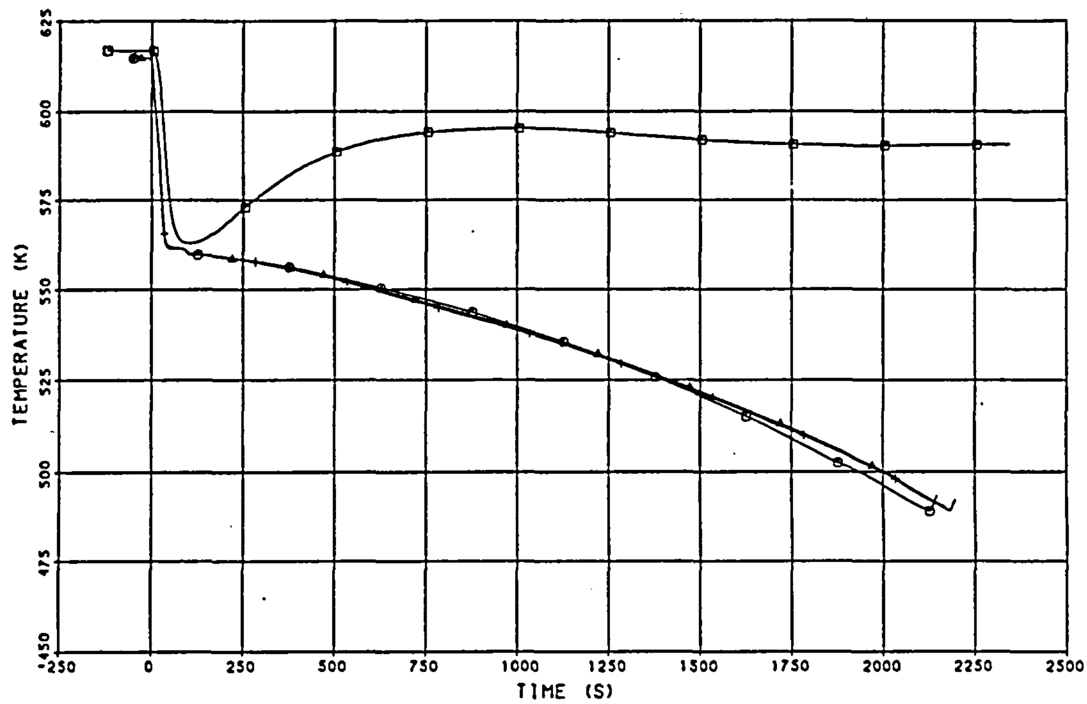
Plot B.53



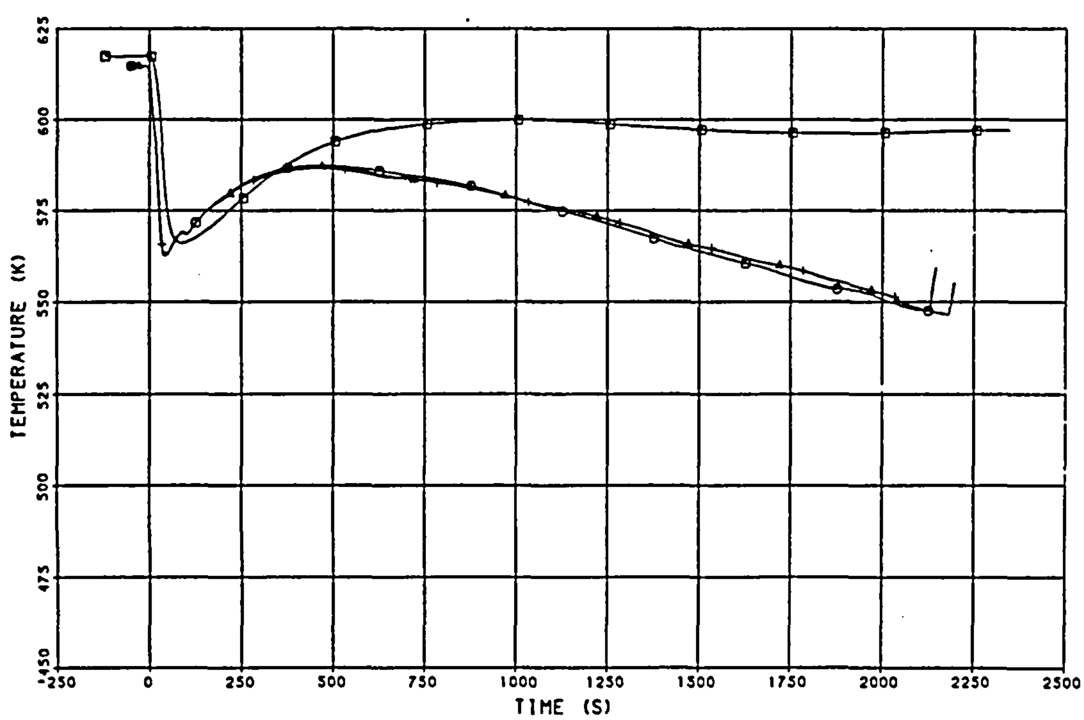
Plot B.54



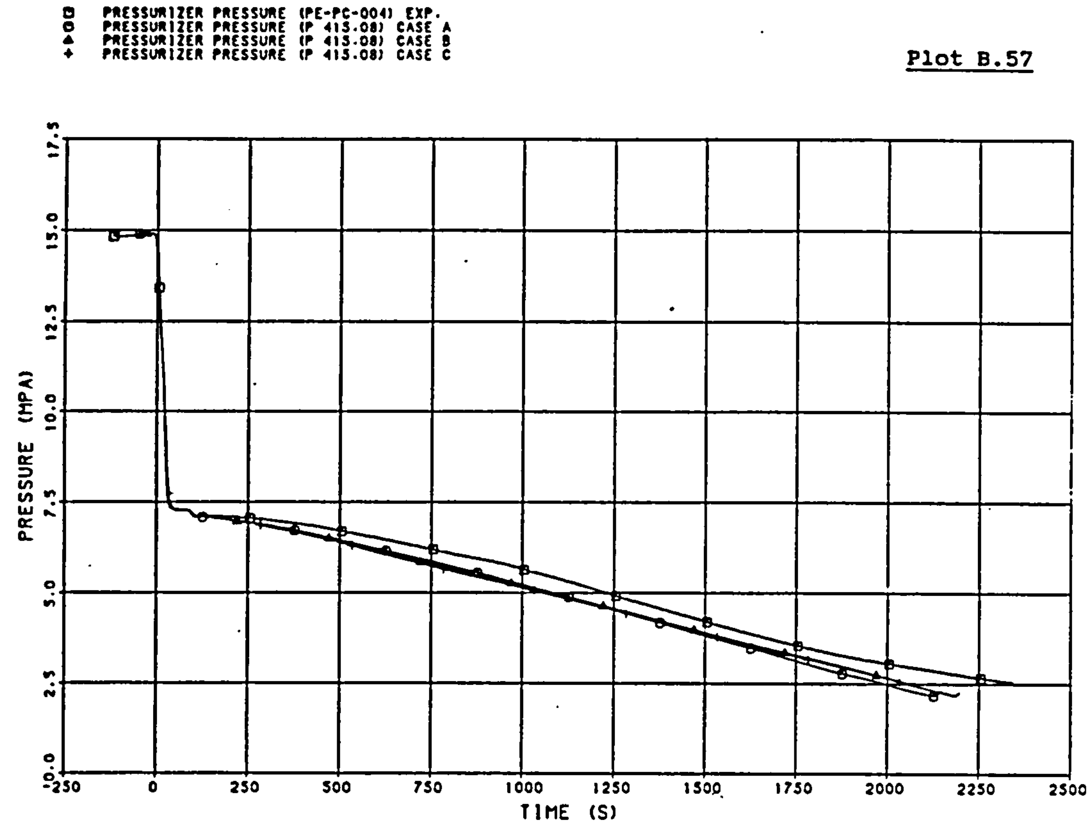
Plot B.55



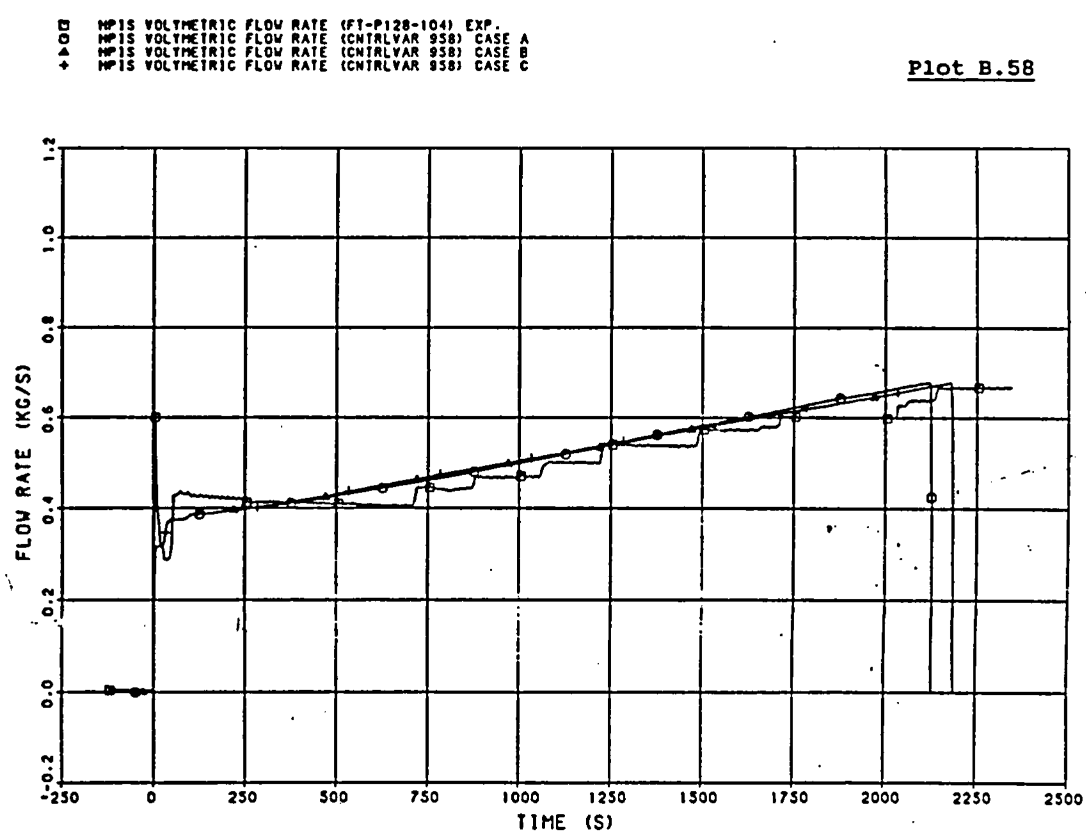
Plot B.56



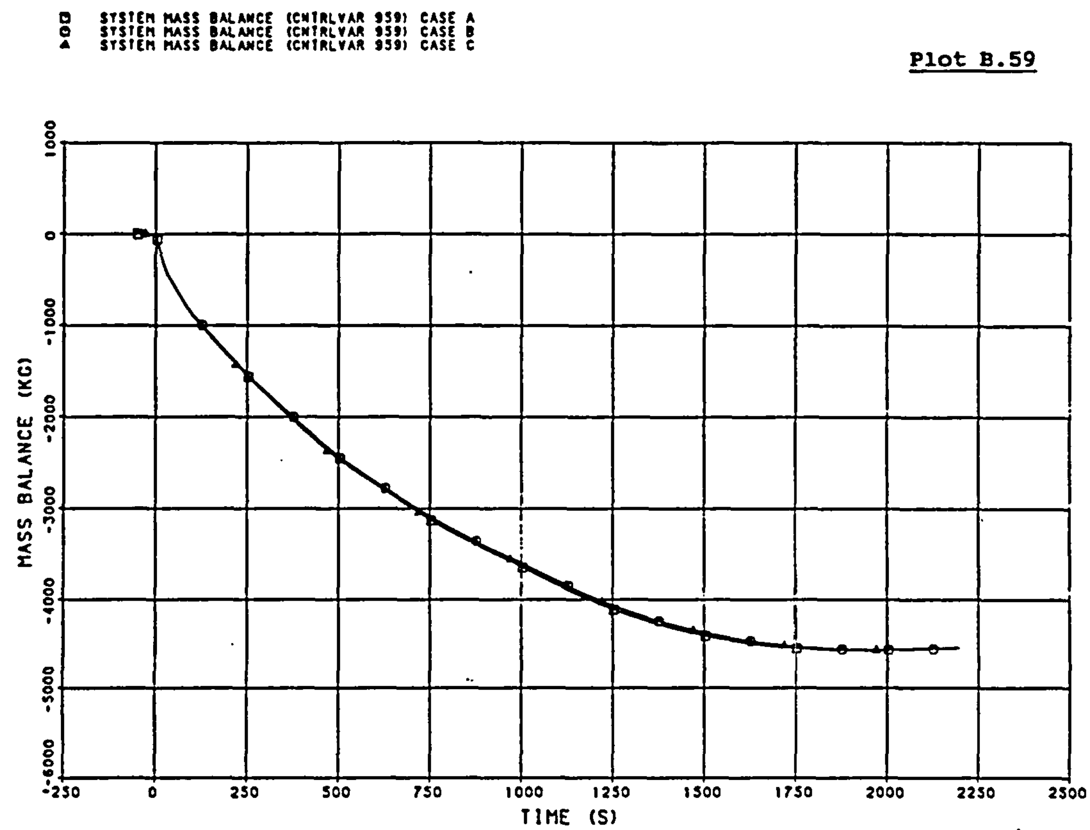
Plot B.57



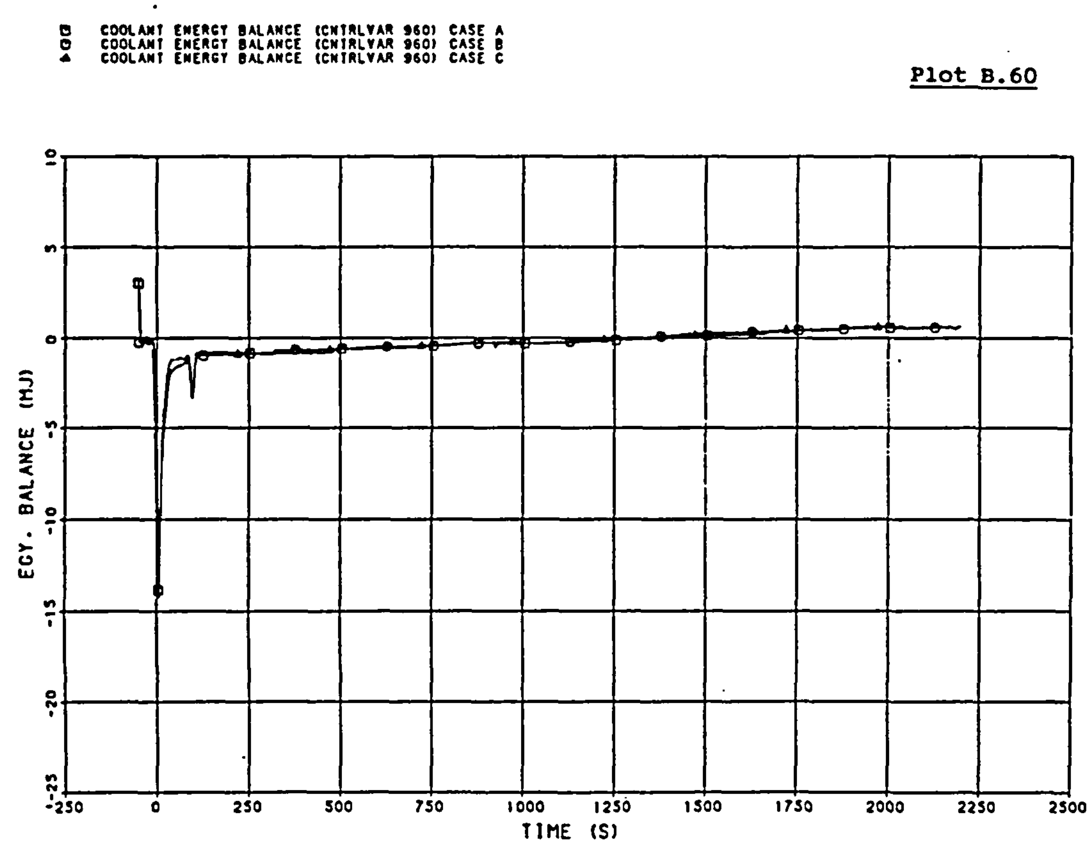
Plot B.58



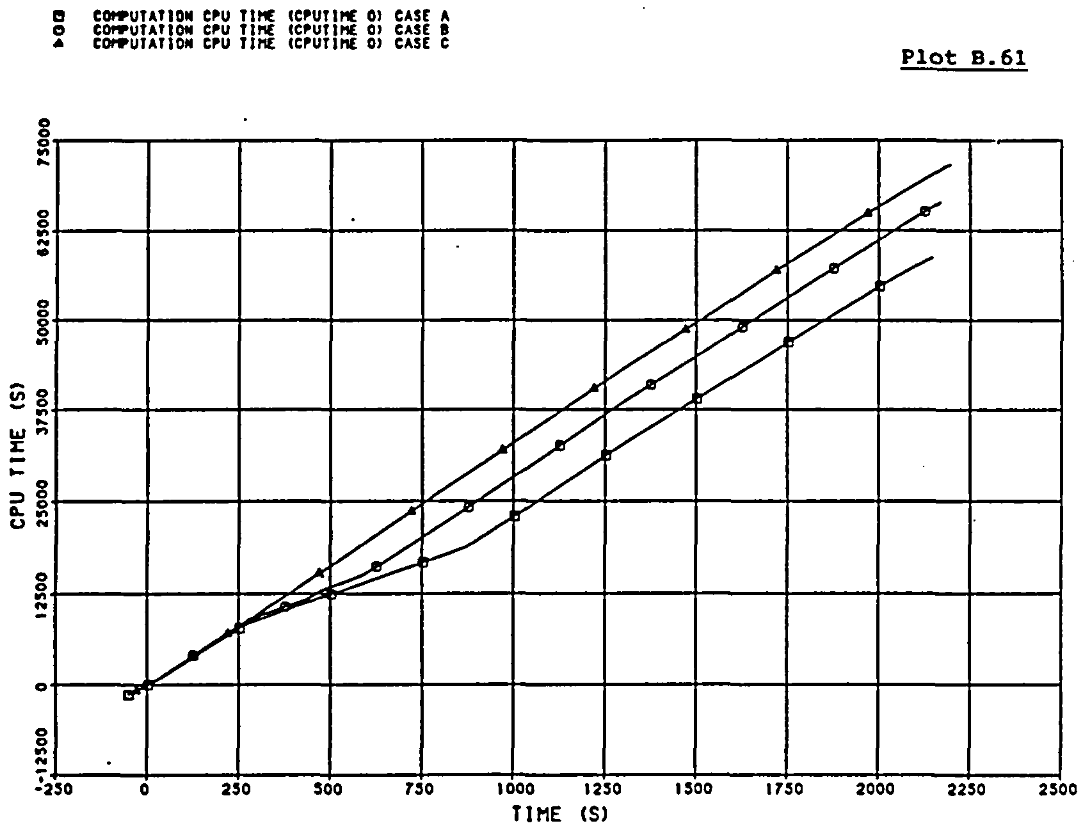
Plot B.59



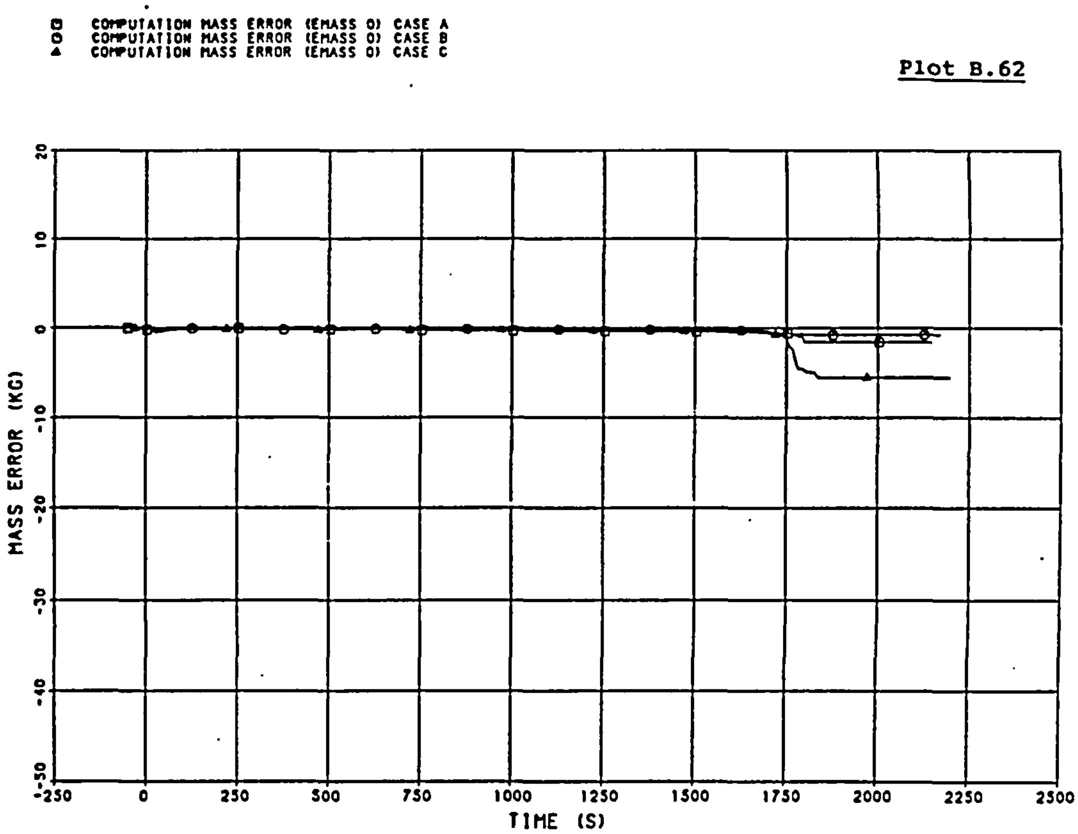
Plot B.60



Plot B.61



Plot B.62



Case A

CALCULATION-TO-EXPERIMENT DATA UNCERTAINTY ANALYSIS FOR NRC/ICAP.

FIRST LINE : DIFFERENCE BETWEEN CALCULATED AND (AVERAGED) EXPERIMENTAL DATA AT END OF THE INTERVAL
SECOND LINE : MEAN DIFFERENCE OVER THE INTERVAL
THIRD LINE : MEAN SIGMA OVER THE INTERVAL (ROOT MEAN SQUARE OF THE DIFFERENCE)

- CODES -	- - - - TIME INTERVAL - - - -						
CALC. EXP.	0.0 - 20.00	- 80.00	- 200.0	- 500.0	- 1000.	- 1500.	- 2000.
C 3A - C 3X	-1.32	-2.01	-1.82	-3.28	-5.42	-5.90	-11.4
	-2.39	-1.47	-1.90	-2.19	-4.20	-5.44	-7.87
	2.69	1.52	1.90	2.24	4.24	5.44	8.04
C 4A - C 4X	-.770	-1.27	-1.37	-2.65	-4.96	-5.24	-10.7
	4.44	-1.14	-1.30	-1.83	-3.73	-4.89	-7.15
	5.56	1.18	1.30	1.88	3.79	4.89	7.32
C 5A - C 5X	-.240	-1.20	-1.55	-2.84	-5.34	-5.39	-10.9
	2.76	-.607	-1.42	-2.02	-3.99	-5.31	-7.34
	4.24	.701	1.42	2.06	4.05	5.31	7.52
C 6A - C 6X	-.570	-1.09	-1.14	-2.60	-5.24	-5.67	-11.1
	3.76	-.817	-1.18	-1.83	-3.87	-5.22	-7.53
	5.87	.851	1.19	1.88	3.94	5.22	7.69
C 7A - C 7X	-1.98	-1.22	-1.50	-2.91	-5.42	-5.89	-11.4
	-2.13	-1.42	-1.38	-2.00	-4.00	-5.44	-7.82
	2.18	1.43	1.38	2.05	4.07	5.44	7.98
C 8A - C 8X	-1.90	-1.46	-1.51	-3.05	-5.45	-6.29	-11.9
	-2.30	-1.53	-1.49	-2.20	-4.18	-5.74	-8.25
	2.36	1.53	1.49	2.25	4.24	5.74	8.41
C 9A - C 9X	-3.60	-3.51	-4.32	-5.82	-8.01	-8.73	-14.1
	-3.09	-3.70	-3.84	-4.55	-6.51	-7.98	-10.4
	3.15	3.71	3.84	4.58	6.55	7.98	10.5
C AA - C AX	-.431	.993	.556	.890E-01	-.632E-01	-.535	-.437
	.647	.176	.698	.116	-.238E-01	-.356	-.456
	1.35	.470	.733	.198	.310	.398	.489
V 5A - V 5X	-2.80	-4.93	-4.64	-5.82	-8.28	-8.52	-13.4
	-3.08	-3.99	-5.04	-4.90	-6.81	-8.20	-10.1
	3.08	4.07	5.04	4.91	6.85	8.20	10.2
V 6A - V 6X	-3.06	-3.03	-3.84	-5.13	-7.44	-8.02	-13.5
	-1.54	-3.14	-3.38	-4.03	-5.96	-7.38	-9.79
	2.13	3.15	3.38	4.05	6.00	7.38	9.92
V 7A - V 7X	6.59	3.61	3.25	3.45	2.79	2.76	3.99
	7.12	5.43	3.60	3.22	3.14	2.77	3.32
	7.13	5.90	3.61	3.22	3.14	2.77	3.34
V 8A - V 8X	-3.14	-4.86	-4.47	-5.46	-7.11	-7.23	-12.6
	-3.00	-3.90	-4.72	-4.77	-6.25	-7.00	-9.17
	3.01	3.94	4.73	4.79	6.26	7.00	9.29
V 9A - V 9X	.601	.960E-01	.135E-01	-.107	-.285	-.231	-.419
	.740	.292	.626E-01	-.369E-01	-.186	-.247	-.287
	.753	.425	.658E-01	.518E-01	.194	.247	.293
V AA - V AX	.479	-.267E-01	-.107	-.252	-.437	-.301	-.517
	.618	.178	-.566E-01	-.176	-.341	-.367	-.378
	.633	.354	.610E-01	.182	.345	.370	.384
HL1A - HL1X	-31.5	29.0	48.6	-72.4	43.7	42.0	-2.43
	-18.0	2.13	56.1	-15.3	-48.9	58.2	23.8
	19.2	22.6	56.6	49.3	80.2	58.8	28.1
HL2A - HL2X	-29.2	-12.0	-31.2	94.1	155.	18.1	8.95
	-27.5	-21.3	-21.5	6.24	20.0	68.2	-4.46
	27.7	22.0	22.2	31.1	111.	78.2	8.91
HL4A - HL4X	-.510	0.	-.570	-1.93	-5.16	-5.64	-11.6
	.651	-.995E-01	-.262	-1.39	-3.49	-5.09	-7.65
	1.51	.212	.343	1.48	3.58	5.09	7.84
HL5A - HL5X	.580	.806E-01	.219E-01	-.114	-.287	-.201	-.359
	.695	.291	.598E-01	-.558E-01	-.203	-.235	-.244
	.706	.421	.635E-01	.705E-01	.208	.236	.249
CL1A - CL1X	-2.62	-60.3	6.02	15.5	131.	42.7	1.18
	-13.7	-38.7	-16.6	17.5	70.6	75.7	11.3
	16.3	45.7	26.4	20.2	79.1	79.5	15.8
CL2A - CL2X	744.	662.	586.	353.	190.	52.8	12.5
	749.	700.	631.	460.	269.	114.	26.5
	749.	700.	631.	466.	273.	121.	29.0
CL3A - CL3X	-5.17	-2.03	4.34	167.	-7.43	-15.1	-6.18
	-.318	-5.87	-1.11	94.9	114.	-13.7	-11.6
	2.11	7.38	7.02	176.	136.	15.4	12.4
CL4A - CL4X	.252	-.916	-1.72	-3.15	-.385	-.837E-01	-.686E-01
	.441	-.666	-1.10	-3.47	-1.33	-.217	-.575E-01
	.475	.825	1.13	3.73	1.54	.241	.685E-01
CL6A - CL6X	-.360	-2.37	-1.80	-2.49	-5.23	-5.81	-11.2
	-.409	-1.30	-2.25	-2.00	-3.74	-5.22	-7.64
	.503	1.54	2.25	2.02	3.82	5.22	7.81
CL7A - CL7X	.568	.105	.467E-01	-.164	-.357	-.298	-.490
	.597	.279	.734E-01	-.672E-01	-.265	-.321	-.359
	.710	.402	.749E-01	.964E-01	.271	.322	.364

- CODES - CALC. EXP.	- - - - TIME INTERVAL - - - - 0.0 - 20.00	- 80.00	- 200.0	- 500.0	- 1000.	- 1500.	- 2000.
CL8A - CL8X	.468 .617 .631	-.873E-01 .135 .348	-.187 -.122 .125	-.316 -.245 .248	-.534 -.395 .399	-.476 -.489 .489	-.669 -.533 .536
CL9A - CL9X	-8.48 -1.60 3.03	-76.0 -43.6 51.6	-133. -88.5 90.4	-32.1 -71.8 84.4	-13.3 -17.6 18.8	-13.4 -14.0 14.0	-18.6 -16.7 16.8
CLAA - CLAX	17.8 14.7 14.8	1.60 -.792 8.93	10.2 7.26 10.3	-14.9 -4.67 33.8	7.60 -11.8 12.3	-13.9 -12.5 13.1	-16.3 -13.6 13.7
BR1A - BR1X	10.2 44.8 58.3	-32.0 -23.3 30.7	79.3 14.1 32.2	180. 101. 107.	127. 123. 126.	26.3 71.8 75.6	-2.32 13.9 18.0
BR2A - BR2X	8.81 7.26 8.22	1.17 3.54 3.93	.404 .630 .766	.111E-01 .298 .384	-.236E-01 .204E-01 .179	-.471E-01 .279 .315	-.334 -.596E-01 .306
BR4A - BR4X	-.370 -10.6 15.3	-1.82 -1.15 1.34	-1.52 -1.85 1.86	-2.02 -1.55 1.57	-4.42 -3.12 3.21	-5.26 -4.77 4.77	-11.3 -7.43 7.63
BR5A - BR5X	4.43 15.6 19.7	2.14 3.12 3.68	.956 1.82 1.85	.542 .551 .561	.804 .672 .680	1.24 1.05 1.05	1.71 1.37 1.38
BR6A - BR6X	.551 .781 .809	.344E-01 .232 .384	-.584E-01 -.374E-02 .267E-01	-.127 -.100 .103	-.293 -.213 .219	-.262 -.271 .271	-.474 -.333 .339
SP1A - SP1X	-9.06 -9.22 9.42	-.510 -3.54 4.34	-.930 -.581 .682	-3.46 -1.83 1.98	-6.33 -4.50 4.60	-6.72 -6.56 6.57	-13.0 -9.20 9.35
SP2A - SP2X	-7.42 -6.67 7.10	1.82 -1.79 3.22	1.99 2.34 2.38	1.97 2.57 2.60	1.84 2.39 2.42	1.60 2.26 2.27	3.67 2.60 2.65
SP3A - SP3X	-4.49 -1.64 1.79	-70.5 -41.1 48.9	-77.5 -56.4 57.5	-18.5 -42.9 48.8	-15.7 -14.2 14.3	-16.2 -17.1 17.1	-20.0 -18.2 18.2
SS3A - SS3X	-.620 -.528 .577	-.548 -.599 .600	-.578 -.562 .564	-.576 -.577 .577	-.513 -.566 .566	-.515 -.489 .489	-.626 -.572 .574
SS4A - SS4X	15.0 11.4 11.8	-.940 5.88 7.91	-6.73 -3.64 4.09	-6.19 -7.55 7.57	-1.52 -4.17 4.48	2.00 1.53 1.96	-9.52 -1.72 3.63
SS5A - SS5X	.101 -.210E-01 .647E-01	.130 .125 .128	.433E-01 .103 .112	-.165 -.662E-01 .902E-01	-.476 -.288 .300	-1.33 -.882 .918	-2.06 -1.75 1.77
S 1A - S 1X	-24.1 -20.6 21.2	.429 -9.41 12.2	5.81 3.06 3.70	3.03 5.75 5.83	-5.19 -.296 2.55	-9.63 -8.09 8.22	-3.34 -7.57 7.77
P 1A - P 1X	.816E-01 .446E-01 .550E-01	.676E-01 .619E-01 .626E-01	.840E-01 .801E-01 .803E-01	.836E-01 .839E-01 .839E-01	.844E-01 .838E-01 .838E-01	.839E-01 .840E-01 .840E-01	.839E-01 .842E-01 .842E-01
P 2A - P 2X	-20.1 -12.0 12.9	-2.15 -14.0 16.8	-9.29 -4.86 5.28	-34.9 -23.1 24.2	-55.6 -46.5 46.8	-71.5 -63.4 63.5	-93.9 -82.0 82.2
P 3A - P 3X	-19.8 -13.3 14.0	2.07 -12.2 15.9	5.16 4.12 4.29	-6.62 -.194 3.53	-21.6 -14.4 15.0	-33.5 -27.6 27.8	-45.5 -39.4 39.5
P 4A - P 4X	.337 .300 .308	-.152E-01 .179 .344	-.985E-01 -.417E-01 .474E-01	-.266 -.178 .185	-.442 -.347 .351	-.387 -.405 .405	-.575 -.442 .446
EC1A - EC1X	-.570E-03 -.135 .161	-.557E-01 .201E-03 .538E-01	-.259E-01 -.386E-01 .393E-01	.198E-01 -.454E-02 .134E-01	.284E-01 .282E-01 .299E-01	.718E-02 .215E-01 .245E-01	.606E-01 .322E-01 .348E-01

Case B

CALCULATION-TO-EXPERIMENT DATA UNCERTAINTY ANALYSIS FOR NRC/ICAP.

FIRST LINE : DIFFERENCE BETWEEN CALCULATED AND (AVERAGED) EXPERIMENTAL DATA AT END OF THE INTERVAL
SECOND LINE : MEAN DIFFERENCE OVER THE INTERVAL
THIRD LINE : MEAN SIGMA OVER THE INTERVAL (ROOT MEAN SQUARE OF THE DIFFERENCE)

- CODES -	- - - - TIME INTERVAL - - - -						
CALC. EXP.	0.0 - 20.00	- 80.00	- 200.0	- 500.0	- 1000.	- 1500.	- 2000.
C 3B - C 3X	.600E-01	-1.98	-1.86	-3.43	-5.95	-4.71	-7.84
	-.206	-.957	-1.81	-2.29	-4.92	-5.16	-5.33
	1.22	1.22	1.81	2.34	4.97	5.17	5.40
C 4B - C 4X	.600	-1.25	-1.42	-2.81	-5.50	-4.05	-7.13
	6.57	-.639	-1.22	-1.94	-4.46	-4.62	-4.62
	8.25	.924	1.22	1.99	4.53	4.64	4.70
C 5B - C 5X	1.12	-1.18	-1.61	-2.99	-5.87	-4.20	-7.34
	4.86	-.105	-1.34	-2.12	-4.72	-5.03	-4.81
	5.92	.746	1.34	2.17	4.79	5.05	4.89
C 6B - C 6X	.790	-1.09	-1.20	-2.77	-5.78	-4.49	-7.51
	5.82	-.320	-1.11	-1.94	-4.61	-4.95	-4.99
	7.41	.708	1.11	1.99	4.69	4.96	5.06
C 7B - C 7X	-.600	-1.22	-1.56	-3.06	-5.96	-4.71	-7.85
	-.300E-01	-.923	-1.30	-2.11	-4.73	-5.16	-5.29
	.639	.964	1.31	2.16	4.81	5.17	5.37
C 8B - C 8X	-.500	-1.45	-1.56	-3.21	-5.98	-5.10	-8.38
	-.199	-1.01	-1.41	-2.31	-4.91	-5.46	-5.70
	.684	1.07	1.41	2.35	4.99	5.48	5.77
C 9B - C 9X	-2.24	-3.50	-4.37	-5.99	-8.54	-7.54	-10.5
	-.975	-3.21	-3.76	-4.65	-7.24	-7.70	-7.84
	1.32	3.25	3.77	4.68	7.29	7.71	7.89
C AB - C AX	-.343	.977	.558	.849E-01	-.641E-01	-.535	-.424
	.546	.190	.693	.101	-.483E-01	-.357	-.446
	1.27	.462	.730	.189	.289	.400	.480
V 5B - V 5X	-1.61	-4.91	-4.72	-6.00	-8.82	-7.43	-9.73
	-1.22	-3.56	-4.96	-5.01	-7.54	-7.94	-7.55
	1.25	3.75	4.96	5.03	7.59	7.95	7.59
V 6B - V 6X	-1.64	-3.02	-3.89	-5.30	-7.98	-6.83	-9.81
	.539	-2.63	-3.30	-4.13	-6.69	-7.10	-7.21
	1.74	2.70	3.30	4.16	6.74	7.12	7.27
V 7B - V 7X	5.16	3.60	3.24	3.46	2.78	2.76	3.98
	5.25	5.11	3.59	3.22	3.14	2.77	3.32
	5.27	5.45	3.60	3.22	3.14	2.77	3.34
V 8B -. V 8X	-1.80	-4.83	-4.52	-5.62	-7.64	-6.04	-8.94
	-.817	-3.40	-4.64	-4.86	-6.96	-6.73	-6.61
	.959	3.53	4.64	4.88	6.98	6.75	6.66
V 9B - V 9X	.592	.954E-01	.750E-02	-.123	-.330	-.154	-.246
	.781	.310	.698E-01	-.474E-01	-.251	-.230	-.146
	.798	.433	.745E-01	.617E-01	.259	.236	.149
V AB - V AX	.469	-.270E-01	-.113	-.268	-.481	-.224	-.345
	.658	.196	-.494E-01	-.186	-.406	-.349	-.237
	.678	.359	.574E-01	.192	.410	.360	.240
HL1B - HL1X	-34.4	28.0	47.4	-76.3	50.2	42.6	13.0
	-22.0	-.245	54.9	-15.5	-50.1	63.0	25.9
	22.9	22.3	55.5	48.5	86.0	63.6	29.1
HL2B - HL2X	-32.1	-14.9	-32.1	92.8	159.	19.7	10.2
	-30.3	-24.3	-23.2	5.79	15.7	73.0	-3.06
	30.5	24.9	23.8	31.2	116.	83.3	8.61
HL4B - HL4X	.990	.200E-01	-.620	-2.10	-5.70	-4.45	-7.90
	2.68	.433	-.181	-1.50	-4.23	-4.81	-5.08
	3.08	.574	.327	1.59	4.32	4.83	5.17
HL5B - HL5X	.570	.794E-01	.137E-01	-.130	-.332	-.123	-.186
	.735	.306	.621E-01	-.666E-01	-.268	-.218	-.103
	.751	.428	.671E-01	.810E-01	.274	.226	.106
CL1B - CL1X	-4.96	-61.0	8.69	7.68	137.	44.4	3.77
	-17.1	-39.5	-17.5	18.0	68.7	79.8	14.7
	19.4	45.6	27.7	21.8	80.4	83.8	18.8
CL2B - CL2X	742.	661.	586.	344.	195.	54.8	14.3
	745.	699.	630.	461.	270.	117.	28.5
	745.	700.	630.	467.	273.	124.	30.8
CL3B - CL3X	-9.09	-2.67	3.23	175.	-8.19	-14.7	-5.21
	-3.96	-7.95	-1.65	68.7	101.	-13.6	-11.1
	4.56	8.85	7.08	121.	123.	15.3	11.8
CL4B - CL4X	.285	-.640	-1.57	-3.26	-.370	-.698E-01	-.585E-01
	.479	-.469	-.805	-3.46	-1.44	-.178	-.618E-01
	.512	.624	.873	3.73	1.63	.215	.629E-01
CL6B - CL6X	.820	-2.36	-1.99	-2.67	-5.77	-4.42	-7.63
	1.43	-.885	-2.17	-2.12	-4.48	-4.95	-5.10
	1.48	1.46	2.18	2.14	4.57	4.97	5.18
CL7B - CL7X	.557	.107	.385E-01	-.180	-.402	-.221	-.317
	.736	.300	.819E-01	-.792E-01	-.332	-.305	-.21
	.755	.412	.848E-01	.107	.339	.310	[illegible]

- CODES - CALC. EXP.	0.0 - 20.00	- 80.00	- 200.0	- 500.0	- 1000.	- 1500.	- 2000.
			- - - - TIME INTERVAL - - - -				
CL8B - CL8X	.451	-.937E-01	-.195	-.333	-.579	-.399	-.497
	.650	.146	-.120	-.257	-.460	-.471	-.392
	.669	.347	.124	.260	.465	.474	.393
CL9B - CL9X	-13.6	-81.2	-130.	-31.6	-12.9	-12.9	-18.3
	-7.58	-50.0	-90.4	-71.6	-14.9	-13.5	-16.2
	7.86	55.7	91.9	83.8	16.2	13.5	16.3
CLAB - CLAX	17.8	1.60	10.2	-14.9	7.60	-13.9	-16.3
	14.7	-.792	7.26	-4.67	-11.8	-12.5	-13.6
	14.8	8.93	10.3	33.8	12.3	13.1	13.7
BR1B - BR1X	7.85	-33.7	80.3	164.	131.	26.7	.810
	42.3	-24.5	13.0	102.	121.	75.1	16.6
	57.0	31.0	32.3	109.	122.	79.1	19.6
BR2B - BR2X	8.59	2.04	.398	.232	-.575E-01	-.187	-.260
	7.08	3.51	.572	.353	-.187E-01	.206	-.207E-01
	8.02	3.86	.688	.506	.149	.254	.285
BR4B - BR4X	.810	-1.83	-1.61	-2.19	-4.94	-4.02	-7.63
	-9.29	-.737	-1.78	-1.68	-3.85	-4.46	-4.86
	14.8	1.25	1.78	1.70	3.95	4.48	4.96
BR5B - BR5X	3.19	1.91	.975	.535	.803	1.24	1.72
	14.5	2.82	1.78	.548	.679	1.05	1.37
	19.3	3.25	1.82	.558	.686	1.05	1.38
BR6B - BR6X	.543	.850E-02	-.660E-01	-.143	-.335	-.182	-.300
	.821	.245	.415E-03	-.113	-.277	-.252	-.192
	.855	.390	.330E-01	.117	.283	.257	.196
SP1B - SP1X	-7.52	-.480	-.980	-3.63	-6.87	-5.52	-9.36
	-7.33	-3.01	-.489	-1.94	-5.24	-6.29	-6.63
	7.58	3.66	.602	2.09	5.34	6.30	6.70
SP2B - SP2X	-6.99	1.83	2.02	1.96	1.84	1.60	3.67
	-6.88	-1.66	2.35	2.58	2.40	2.26	2.60
	7.13	3.05	2.39	2.61	2.42	2.27	2.65
SP3B - SP3X	-3.15	-76.9	-80.3	-18.2	-15.5	-15.9	-19.4
	-.689	-51.5	-71.3	-41.9	-13.0	-16.9	-17.5
	.954	57.6	71.5	48.0	13.2	16.9	17.6
SS3B - SS3X	-.341	-.117	-.106	-.141	-.207	-.297	-.370
	-.177	-.152	-.111	-.125	-.169	-.234	-.321
	.249	.162	.115	.125	.170	.235	.323
SS4B - SS4X	8.56	.540	-2.00	-1.86	1.63	3.26	-6.27
	4.93	3.50	-1.35	-2.84	.574	2.77	1.33
	5.64	4.37	1.46	2.87	1.55	2.84	3.04
SS5B - SS5X	.147	.128	.306E-01	-.182	-.517	-1.24	-1.90
	.815E-01	.131	.108	-.794E-01	-.351	-.857	-1.58
	.837E-01	.131	.121	.102	.362	.883	1.60
S 1B - S 1X	-16.1	-1.02	1.03	-1.46	-8.88	-9.70	-2.94
	-12.3	-6.51	.862	.921	-5.78	-9.06	-8.05
	13.1	8.02	1.09	1.25	6.27	9.08	8.27
P 1B - P 1X	.837E-01	.672E-01	.839E-01	.836E-01	.844E-01	.839E-01	.839E-01
	.568E-01	.619E-01	.800E-01	.838E-01	.838E-01	.840E-01	.842E-01
	.636E-01	.627E-01	.801E-01	.838E-01	.838E-01	.840E-01	.842E-01
P 2B - P 2X	-20.1	-2.14	-9.35	-35.1	-56.2	-70.3	-90.2
	-11.8	-13.8	-4.77	-23.2	-47.2	-63.1	-79.4
	12.7	15.6	5.22	24.3	47.6	63.2	79.6
P 3B - P 3X	-19.7	1.74	4.76	-6.88	-21.5	-32.2	-44.0
	-13.0	-12.1	3.96	-.489	-15.1	-26.7	-37.6
	13.7	15.8	4.13	3.52	15.6	26.8	37.8
P 4B - P 4X	.341	-.144E-01	-.105	-.281	-.486	-.310	-.402
	.349	.200	-.329E-01	-.189	-.412	-.388	-.301
	.353	.349	.439E-01	.196	.417	.391	.303
EC1B - EC1X	-.670E-03	-.558E-01	-.255E-01	.209E-01	.310E-01	.259E-02	.504E-01
	-.135	-.107E-02	-.392E-01	-.392E-02	.320E-01	.205E-01	.239E-01
	.161	.532E-01	.399E-01	.134E-01	.336E-01	.237E-01	.267E-01

Case C

CALCULATION-TO-EXPERIMENT DATA UNCERTAINTY ANALYSIS FOR NRC/ICAP.

FIRST LINE : DIFFERENCE BETWEEN CALCULATED AND (AVERAGED) EXPERIMENTAL DATA AT END OF THE INTERVAL
SECOND LINE : MEAN DIFFERENCE OVER THE INTERVAL
THIRD LINE : MEAN SIGMA OVER THE INTERVAL (ROOT MEAN SQUARE OF THE DIFFERENCE)

- CODES -		- - - - TIME INTERVAL - - - -						
CALC.	EXP.	0.0 - 20.00	- 80.00	- 200.0	- 500.0	- 1000.	- 1500.	- 2000.
C 3C	C 3X	.100E-01	-2.01	-1.99	-3.94	-6.52	-5.17	-8.11
		-.260	-.947	-1.92	-2.59	-5.44	-5.73	-5.80
		1.21	1.21	1.92	2.67	5.48	5.74	5.86
C 4C	C 4X	.550	-1.27	-1.49	-3.32	-6.06	-4.52	-7.43
		6.51	-.630	-1.31	-2.24	-4.98	-5.19	-5.08
		8.22	.911	1.31	2.32	5.04	5.21	5.15
C 5C	C 5X	1.07	-1.19	-1.66	-3.50	-6.44	-4.67	-7.60
		4.80	-.908E-01	-1.41	-2.42	-5.24	-5.61	-5.27
		5.89	.733	1.42	2.49	5.30	5.63	5.34
C 6C	C 6X	.750	-1.08	-1.23	-3.28	-6.35	-4.96	-7.77
		5.77	-.299	-1.16	-2.23	-5.13	-5.52	-5.46
		7.39	.683	1.17	2.31	5.20	5.54	5.52
C 7C	C 7X	-.650	-1.18	-1.58	-3.57	-6.52	-5.17	-8.11
		-.812E-01	-.896	-1.36	-2.40	-5.25	-5.74	-5.75
		.666	.929	1.36	2.47	5.32	5.75	5.82
C 8C	C 8X	-.550	-1.46	-1.47	-3.69	-6.54	-5.56	-8.66
		-.247	-.986	-1.42	-2.55	-5.42	-6.02	-6.16
		.699	1.04	1.43	2.63	5.49	6.03	6.22
C 9C	C 9X	-2.29	-3.47	-4.31	-6.45	-9.09	-7.98	-10.8
		-1.03	-3.17	-3.77	-4.88	-7.75	-8.24	-8.30
		1.38	3.21	3.78	4.93	7.80	8.25	8.35
C AC	C AX	-.352	1.00	.744	.767E-01	-.650E-01	-.537	-.425
		.549	.207	.788	.187	-.554E-01	-.357	-.449
		1.27	.486	.814	.278	.295	.399	.482
V 5C	V 5X	-1.64	-4.96	-5.06	-6.50	-9.37	-7.87	-10.0
		-1.19	-3.56	-5.16	-5.41	-8.06	-8.44	-8.02
		1.22	3.75	5.16	5.42	8.11	8.46	8.05
V 6C	V 6X	-1.69	-3.00	-3.81	-5.76	-8.53	-7.27	-10.1
		.495	-2.60	-3.31	-4.35	-7.20	-7.65	-7.68
		1.76	2.67	3.31	4.40	7.26	7.66	7.73
V 7C	V 7X	5.17	3.74	3.36	3.45	2.78	2.75	3.98
		5.28	5.13	3.70	3.24	3.14	2.77	3.32
		5.31	5.47	3.70	3.24	3.14	2.77	3.34
V 8C	V 8X	-1.85	-4.85	-4.63	-6.08	-8.19	-6.48	-9.23
		-.869	-3.39	-4.74	-5.16	-7.46	-7.27	-7.07
		1.01	3.52	4.74	5.19	7.48	7.29	7.11
V 9C	V 9X	.587	.113	.232E-01	-.167	-.375	-.183	-.261
		.779	.316	.777E-01	-.689E-01	-.297	-.270	-.173
		.798	.434	.812E-01	.902E-01	.303	.276	.175
V AC	V AX	.464	-.570E-02	-.805E-01	-.310	-.526	-.253	-.360
		.656	.204	-.323E-01	-.200	-.451	-.390	-.264
		.678	.358	.401E-01	.213	.455	.400	.266
HL1C	HL1X	-34.3	28.2	49.1	-73.5	47.7	38.2	10.5
		-21.9	.208	55.4	-18.6	-53.6	58.1	23.7
		22.8	22.7	56.0	52.9	87.6	58.6	27.3
HL2C	HL2X	-32.1	-14.9	-32.3	-239.	157.	17.0	9.98
		-30.3	-24.3	-23.3	-19.9	-.940	66.5	-3.62
		30.5	24.9	24.0	65.0	121.	76.2	8.36
HL4C	HL4X	.940	.600E-01	-.600	-2.57	-6.25	-4.90	-8.20
		2.64	.464	-.173	-1.76	-4.74	-5.36	-5.55
		3.05	.575	.320	1.89	4.82	5.38	5.62
HL5C	HL5X	.565	.103	.187E-01	-.176	-.378	-.153	-.201
		.733	.313	.705E-01	-.926E-01	-.314	-.259	-.130
		.750	.429	.752E-01	.111	.319	.267	.132
CL1C	CL1X	-4.92	-65.0	-8.92	11.0	133.	43.5	4.39
		-17.2	-41.1	-26.3	8.58	65.2	76.2	15.2
		19.4	47.7	32.3	16.0	77.2	79.4	19.4
CL2C	CL2X	742.	657.	568.	364.	197.	55.7	14.1
		745.	698.	621.	457.	275.	123.	28.1
		745.	699.	621.	461.	278.	130.	30.4
CL3C	CL3X	-9.04	-2.75	-.470	202.	-6.53	-14.8	-5.27
		-3.95	-7.96	-2.07	57.5	104.	-13.7	-11.2
		4.55	8.88	6.87	145.	126.	15.4	11.9
CL4C	CL4X	.285	-.787	-.605	-3.08	-.381	-.835E-01	-.594E-01
		.479	-.509	-.549	-3.18	-1.22	-.228	-.623E-01
		.513	.661	.585	3.61	1.47	.254	.636E-01
CL6C	CL6X	.790	-2.41	-2.39	-3.17	-6.32	-4.83	-7.96
		1.45	-.880	-2.39	-2.54	-4.99	-5.42	-5.58
		1.50	1.46	2.39	2.56	5.07	5.44	5.64
CL7C	CL7X	.552	.975E-01	-.170E-01	-.232	-.449	-.252	-.332
		.734	.299	.526E-01	-.131	-.380	-.348	-.246
		.765	.411	.627E-01	.147	.386	.353	.247

- CODES - CALC. - EXP.	- - - - TIME INTERVAL - - - - 0.0 - 20.00	- 80.00	- 200.0	- 500.0	- 1000.	- 1500.	- 2000.
CL8C - CL8X	.446	-.715E-01	-.153	-.375	-.524	-.428	-.512
	.648	.155	-.981E-01	-.266	-.505	-.512	-.419
	.670	.345	.101	.275	.509	.515	.420
CL9C - CL9X	-13.6	-52.5	-27.4	-23.1	-10.1	-11.1	-18.2
	-7.63	-40.5	-38.9	-27.5	-11.5	-9.95	-15.9
	7.90	44.2	40.7	28.9	13.1	8.97	16.0
CLAC - CLAX	17.8	1.60	10.2	-14.9	7.60	-13.9	-16.3
	14.7	-.792	7.26	-4.67	-11.8	-12.5	-13.6
	14.8	8.93	10.3	33.8	12.3	13.1	13.7
BR1C - BR1X	7.89	-38.3	65.8	167.	128.	27.2	1.27
	42.2	-25.6	4.87	88.4	117.	73.2	17.1
	57.0	32.5	27.8	95.8	119.	76.7	20.3
BR2C - BR2X	8.59	2.31	.427	.243	-.606E-01	-.245E-01	-.252
	7.08	3.54	.653	.500	-.481E-01	.286	.529E-02
	8.01	3.89	.774	.522	.159	.325	.288
BR4C - BR4X	.780	-1.88	-1.95	-2.65	-5.49	-4.52	-7.92
	-9.27	-.734	-1.98	-2.02	-4.36	-5.03	-5.33
	14.8	1.25	1.98	2.05	4.45	5.04	5.41
BR5C - BR5X	3.18	2.09	1.70	.546	.804	1.24	1.72
	14.5	2.89	2.15	.766	.685	1.05	1.37
	19.3	3.29	2.17	.863	.693	1.05	1.38
BR6C - BR6X	.538	.228E-01	-.263E-01	-.186	-.381	-.215	-.314
	.819	.253	.193E-01	-.125	-.322	-.294	-.219
	.855	.390	.312E-01	.136	.327	.298	.222
SP1C - SP1X	-7.56	-.450	-1.01	-4.12	-7.43	-5.98	-9.65
	-7.37	-2.98	-.525	-2.24	-5.75	-6.84	-7.10
	7.62	3.65	.630	2.41	5.85	6.85	7.15
SP2C - SP2X	-6.99	1.83	2.14	1.99	1.85	1.61	3.67
	-6.82	-1.66	2.41	2.65	2.41	2.28	2.60
	7.07	3.06	2.45	2.67	2.43	2.29	2.65
SP3C - SP3X	-3.18	-28.7	-22.4	-12.9	-13.7	-14.6	-19.4
	-.721	-39.9	-25.9	-17.3	-11.0	-14.5	-17.3
	.990	44.9	28.1	17.8	11.2	14.5	17.4
SS3C - SS3X	-.341	-.117	-.105	-.138	-.208	-.268	-.369
	-.181	-.153	-.111	-.122	-.169	-.236	-.319
	.250	.162	.115	.123	.170	.236	.321
SS4C - SS4X	8.50	.360	-1.91	-.590	1.08	2.83	-6.65
	4.91	3.19	-1.35	-1.95	.694	2.21	.819
	5.62	4.18	1.43	2.00	1.07	2.29	2.82
SS5C - SS5X	.145	.132	.223E-01	-.227	-.563	-1.27	-1.92
	.635E-01	.134	.101	-.109	-.396	-.899	-1.61
	.680E-01	.134	.115	.132	.406	.923	1.63
S 1C - S 1X	-16.1	-.806	.912	-3.23	-8.88	-9.72	-2.86
	-12.3	-6.17	.821	-.264	-6.42	-9.05	-8.00
	13.1	7.82	1.01	1.24	6.66	9.07	8.22
P 1C - P 1X	.826E-01	.671E-01	.839E-01	.836E-01	.844E-01	.839E-01	.839E-01
	.559E-01	.618E-01	.800E-01	.838E-01	.838E-01	.840E-01	.842E-01
	.626E-01	.626E-01	.801E-01	.838E-01	.838E-01	.840E-01	.842E-01
P 2C - P 2X	-20.1	-2.03	-9.24	-35.6	-56.7	-70.8	-90.5
	-11.8	-13.8	-4.73	-23.4	-47.7	-63.7	-79.9
	12.8	16.6	5.18	24.6	48.1	63.8	80.1
P 3C - P 3X	-19.8	1.90	4.92	-7.42	-21.7	-32.0	-43.7
	-13.0	-12.0	3.99	-.836	-15.4	-26.7	-37.6
	13.8	15.7	4.15	3.76	15.8	26.9	37.7
P 4C - P 4X	.336	-.280E-02	-.931E-01	-.327	-.531	-.339	-.417
	.345	.205	-.287E-01	-.212	-.458	-.428	-.328
	.349	.348	.397E-01	.223	.462	.432	.329
EC1C - EC1X	-.670E-03	-.565E-01	-.275E-01	.234E-01	.336E-01	.430E-02	.513E-01
	-.135	-.148E-02	-.400E-01	-.318E-02	.346E-01	.228E-01	.255E-01
	.161	.533E-01	.407E-01	.146E-01	.361E-01	.258E-01	.280E-01

STUDSVIK
THIS TAPE CONTAINS DATA FROM THE ICAP PREDICTION CALCULATION
WITH THE RELAP5/MOD2/36.04 FOR THE LOFT EXPERIMENT NO. L3-6.

CONTENTS, FILE	1.	THIS DESCRIPTIVE TEXT
	2.	INPUT CASE A, STEADY STATE
	3.	- " - B, - " - , UPDATES
	4.	- " - C, - " - , UPDATES TO A + B
	5.	DATA, EXPERIMENT
	6.	-"- , CASE A
	7.	-"- , CASE B
	8.	-"- , CASE C

I. COMPUTER

NAME	CYBER 170-810
WORD SIZE	60

II. TAPE FORMAT

NUMBER OF TRACKS	9
PACKING DENSITY	1600 BPI
RECORD SIZE	80
BLOCKING FACTOR	64
CODED	EBCDIC
CONTROL WORDS	NO

III. DATA FORMAT, FOR EACH OF THE FILES 5 THROUGH 8

TITLE RECORD(S), (FORMAT I5,A75)
- FIELD 1, THE NUMBER OF DATA CHANNELS ON THE FILE
- FIELD 2, PROBLEM IDENTIFICATION
  UP TO FIVE ADDITIONAL IDENTIFICATION RECORDS
  MAY BE ADDED BY 'C' IN COLUMN 1 OF FIELD 1

DATA SET RECORD 1, (FORMAT 2I5,A60)
- FIELD 1, NUMBER OF DATA POINTS
- FIELD 2, THE ENGINEERING UNIT CODE (EUC) FOR THE
  VARIABLE
- FIELD 3, IDENTIFYING TEXT OF THE DATA

REMAINING DATA SET RECORDS FORMAT 5(E16.9)

EACH DATA CHANNEL SUBMITTED IS GIVEN THROUGH TWO DATA
SETS, THE FIRST OF WHICH IS THE TIME DATA SET.
THE TWO SETS HAVE THE SAME NUMBER OF DATA POINTS.
THE TIME DATA SET IS IDENTIFIED BY EUC=77 (FIELD 2)
AND THE IDENTIFYING TEXT 'TIME' (FIELD 3).

NRC FORM 335
(2-89)
NRCM 1102,
3201, 3202

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

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John Eriksson

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Sweden

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

10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

The LOFT small break experiment L3-6 has been analyzed as part of Sweden's contribution to the International Thermal-Hydraulic Code Assessment and Applications Program (ICAP).

Three calculations, of which two were sensitivity studies, were carried out. The following quantities were varied:

- the content of secondary side fluid and the feed water valve closure
- the two-phase characteristics of the main pumps

All three predictions agreed reasonably well with most of the measured data. The sensitivity calculations resulted only in marginal improvements.

The predicted and measured data are compared on plots and their differences are quantified over intervals in real time.

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

RELAP5/MOD2/ Cycle 36.04 Against LOFT Small Break Experiment L3-6

13. AVAILABILITY STATEMENT
Unlimited

14. SECURITY CLASSIFICATION
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Unclassified

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