Docket File
52-003

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 4, 1996

APPLICANT: Westinghouse Electric Corporation

PROJECT: AP600

SUBJECT: SUMMARY OF MEETING TO DISCUSS STATUS OF AP600 NOTRUMP LEVEL SWELL AND BENCHMARK VALIDATION CALCULATIONS

The subject meeting was held on September 26, 1996, at the Rockville, Maryland, offices of Westinghouse Electric Corporation between representatives of Westinghouse and Nuclear Regulatory Commission staff and consultants. The purpose of the meeting was to discuss the status of verification and validation (V&V) results concerning the NOTRUMP level swell model, separate effects test comparisons, and benchmark calculations. In addition, the anticipated documentation and submittal schedules were discussed.

Highlights from the meeting included:

- Chapter 2 of the final NOTRUMP V&V report will provide a complete description of the model improvements added to the code

- Several coding changes have been recently made to NOTRUMP. These changes involve a refinement to the levelizing horizontal drift flux model; a replacement of the vertical drift correlation with one developed by EPRI; and that some previously identified coding changes will not be included in the final version (specifically the horizontal stratified flow model and possibly the birthing logic model.
  - Westinghouse noted that they saw no need to perform the benchmarks for the models that are no longer being used in the NOTRUMP code.
  - Westinghouse will be revising the response to request for additional information 440.477 concerning the horizontal drift flux leveling model.

- Westinghouse committed to provide explanation in the final V&V report as to why any previously agreed to benchmarks had been dropped.

- The GE level swell simulation was rerun with a corrected value for the vessel diameter with no impact on the results.

- In discussion on the integral system test comparisons, Westinghouse committed to provide some discussion on the noding philosophy in the final V&V report.

- For the ADS 1-3 test comparisons, Westinghouse will be using a discharge coefficient of 0.6 for the valves and orifices. Westinghouse stated that this same coefficient will be used for the plant calculations.

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A PDR

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Attachment 1 is the list of meeting attendees. Attachment 2 is a copy of the presentation handouts with the proprietary material removed. Westinghouse stated that an application for withholding and associated affidavit for the proprietary material included in the handouts has already been submitted to the staff via separate correspondence.

original signed by:
William C. Huffman, Project Manager
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Docket No. 52-003

Attachments: As stated

cc w/attachment:
See next page

<u>DISTRIBUTION w/attachments</u>:

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DTJackson		

<u>DISTRIBUTION w/o attachments</u>:

WRussell/FMiraglia, 0-12 G18	RZimmerman, 0-12 G18	AThadani, 0-12 G18
EJordan, T-4 D18	ACRS (11)	JMoore, 0-15 B18
WDean, 0-17 G21	RLandry, 0-8 E23	TCollins, 0-8 E23
ALevin, 0-8 E23	GHolahan, 0-8 E2	PBoehnert, T-2 E26
TCollins, 0-8 E23		

DOCUMENT NAME: A:9-26MTG.SUM (9J AP600 DISK)
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DATE	10/31/96		11/1/96		11/4/96					

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Westinghouse Electric Corporation Docket No. 52-003

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**WESTINGHOUSE - NRC MEETING
ON STATUS OF AP600
NOTRUMP LEVEL SWELL AND BENCHMARKING
VALIDATION CALCULATIONS**

SEPTEMBER 26, 1996

MEETING ATTENDEES

NAME	ORGANIZATION
John Butler	Westinghouse
Larry Hochreiter	Westinghouse
Earl Novendstern	Westinghouse
Bob Osterrieder	Westinghouse
Phil Meyer	Westinghouse
Brian McIntrye	Westinghouse (Part Time)
Ralph Landry	NRC
Bill Huffman	NRC
Paul Boehnert	NRC
Novak Zuber	ACRS Consultant
Jack Wheeler	DOE
Chuck Thompson	DOE
Tom Fernandez	EPRI

Attachment 1

HANDOUT MATERIAL

FROM SEPTEMBER 26, 1996, MEETING ON STATUS OF AP600

NOTRUMP LEVEL SWELL AND BENCHMARKING VALIDATION CALCULATIONS

Attachment 2

AP600 NOTRUMP LEVEL SWELL AND BENCHMARKS MEETING

INTRODUCTION

Bob Osterrieder
Supervisory Engineer

Westinghouse Electric

AGENDA

1) Introduction
    - Outline of Final NOTRUMP V&V Report
    - Schedule and Status of Work Supporting Report

2) NOTRUMP Level Swell Comparisons

3) NOTRUMP Comparisons to ADS 1-3 Tests

4) NOTRUMP Comparison to CMT 500 Series Tests

5) Benchmarks
    - Vertical Flooding
    - Horizontal Flooding

6) Integral Tests / Plant Simulation Status

7) Conclusions / Discussion

NOTRUMP Final Verification and Validation Report Table of Contents

NOTRUMP FINAL V&V SCHEDULE AND STATUS

CODING CHANGES

- Refined Levelizing Horizontal Drift Flux model.

- Replaced TRAC vertical drift flux correlation with EPRI vertical drift flux correlation.

- Determined that some of the previously identified coding changes will not be used in final calculations (Horizontally Stratified Flow Model; possibly Birthing logic).

- Detailed writeups and calculation notes are being developed for each change.

- Expect writeups to be submitted to NRC in early December.

NOTRUMP FINAL V&V SCHEDULE AND STATUS

EXAMINATION OF LEVEL SWELL BEHAVIOR

- All simulations complete (GE, ACHILLES, G2)
- New GE simulations performed with revised vessel diameter.
- Conclusions did not change for new GE simulations.
- In process of developing writeups for ACHILLES tests and summary section tying all together.
- Expect submittal to NRC by mid October.

NOTRUMP FINAL V&V SCHEDULE AND STATUS

MODEL VERIFICATION AND VALIDATION APPROACH
(BENCHMARKS)

- Determined that some coding changes will not be used so related benchmarks were removed from list (Horizontally Stratified Flow Model; possibly Birthing logic).

- All planned benchmarks complete.

- In process of developing writeups and calculation notes.

- Expect submittal to NRC by mid October.

NOTRUMP FINAL V&V SCHEDULE AND STATUS

SEPARATE EFFECTS TEST SIMULATIONS

- All CMT and ADS test simulations complete.
- Draft writeups complete except for two 300 series tests.
- Results to be discussed today.
- Expect submittal to NRC by end of October.

NOTRUMP FINAL V&V SCHEDULE AND STATUS

INTEGRAL SYSTEMS TEST SIMULATIONS

- Finalizing input models based on:

  Completed consistency review of SPES, OSU, and Plant models.

  Completed correction of input problems identified in documentation reviews and RAIs.

  Completed review of ADS, CMT test simulations and PRHR noding study

- Performing preliminary calculations.

- Expect to do final calculations from mid-October to early December.

NOTRUMP FINAL V&V SCHEDULE AND STATUS

FINAL NOTRUMP V&V REPORT

- Expect submittal of complete NOTRUMP Final V&V Report including all sections previously discussed in late December.

NOTRUMP ASSESSMENT

TWO-PHASE LEVEL SWELL TESTS

ADS 1-3 TESTS

CMT 500 SERIES NATURAL CIRCULATION TESTS

L.E. HOCHREITER
NUCLEAR SAFETY ANALYSIS

THE SMALL BREAK LOCA AP600 PIRT IDENTIFIES SEVERAL KEY THERMAL-HYDRAULIC PHENOMENA WHICH ARE ADDRESSED BY NOTRUMP ANALYSIS OF :

- DIFFERENT LEVEL SWELL EXPERIMENTS ; BOTH TRANSIENT AND QUASI-STEADY STATE BUNDLE UNCOVERY TESTS

- AP600 PIRT ALSO INDICATES THE IMPORTANCE OF THE ADS 1-3 FLOW BEHAVIOR

- THE CMT NATURAL CIRCULATION BEHAVIOR IS ALSO A HIGHLY RANKED PIRT ITEM

- ANALYSIS OF THE LEVEL SWELL TESTS, AP600 ADS 1-3 TESTS AND THE AP600 CMT TESTS WILL VALIDATE THE NOTRUMP CODE AND ITS ABILITY TO PREDICT THESE PIRT PHENOMENA

NOTRUMP LEVEL SWELL COMPARISONS

SUMMARY

. NOTRUMP HAS BEEN COMPARED TO

G - 2 CORE UNCOVERY TESTS

15 psia > P < 800 psia

GENERAL ELECTRIC SMALL VESSEL

BLOW DOWN TESTS,

1000 psia INITIAL PRESSURE

ACHILLES CORE UNCOVERY TESTS

1.2 and 2.0 bars

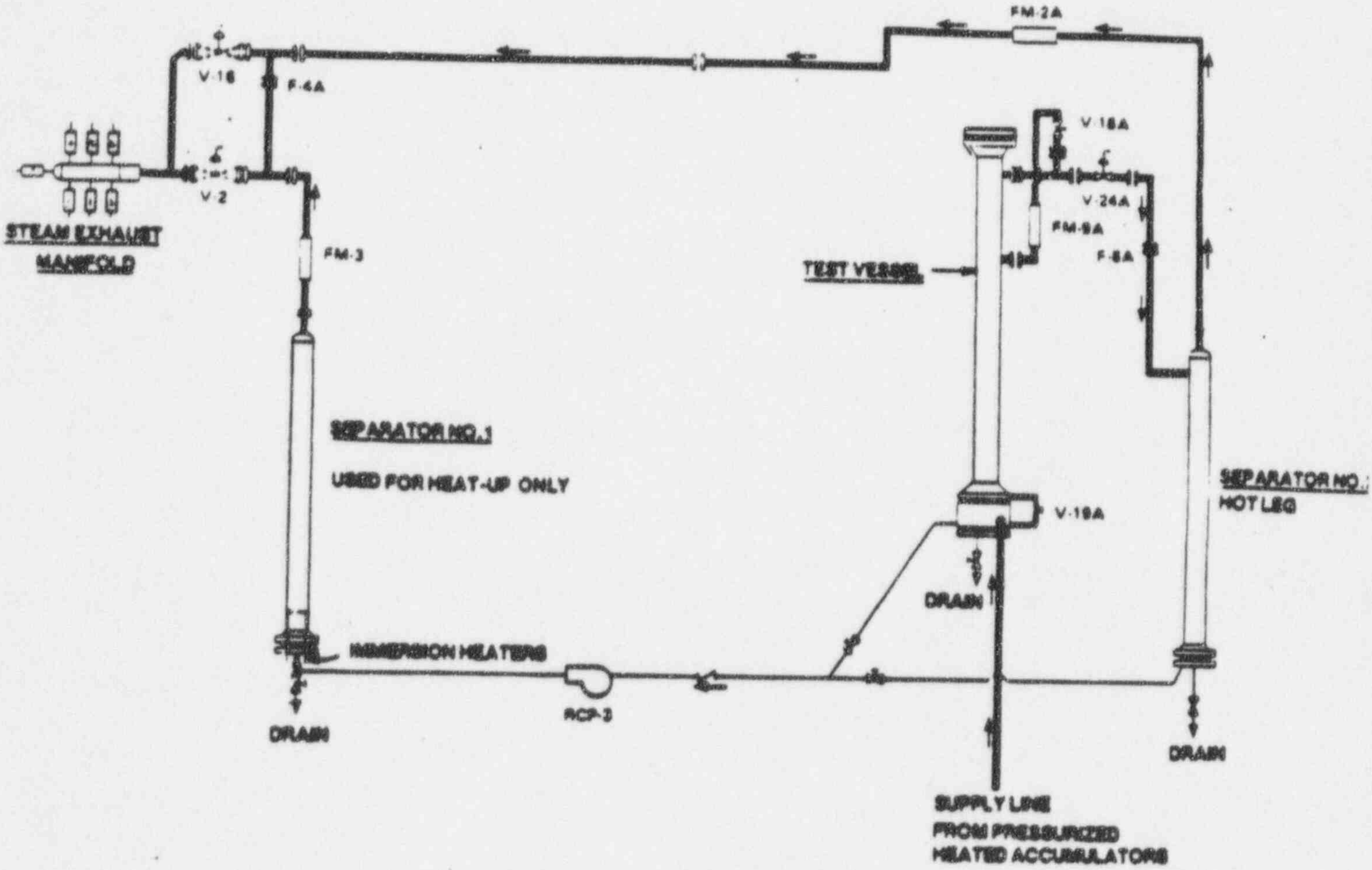


Figure 2-1. G-2 Loop Test Facility Core Uncovery Flow Diagram

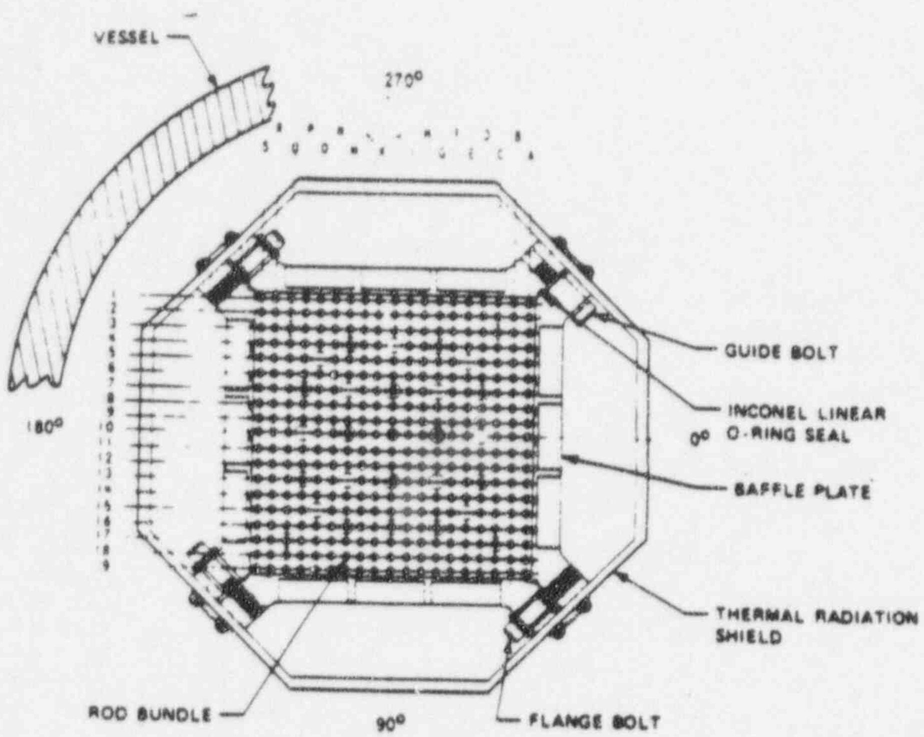


Figure E-1. G-2 Loop Bundle, Baffle, and Thermal Shield

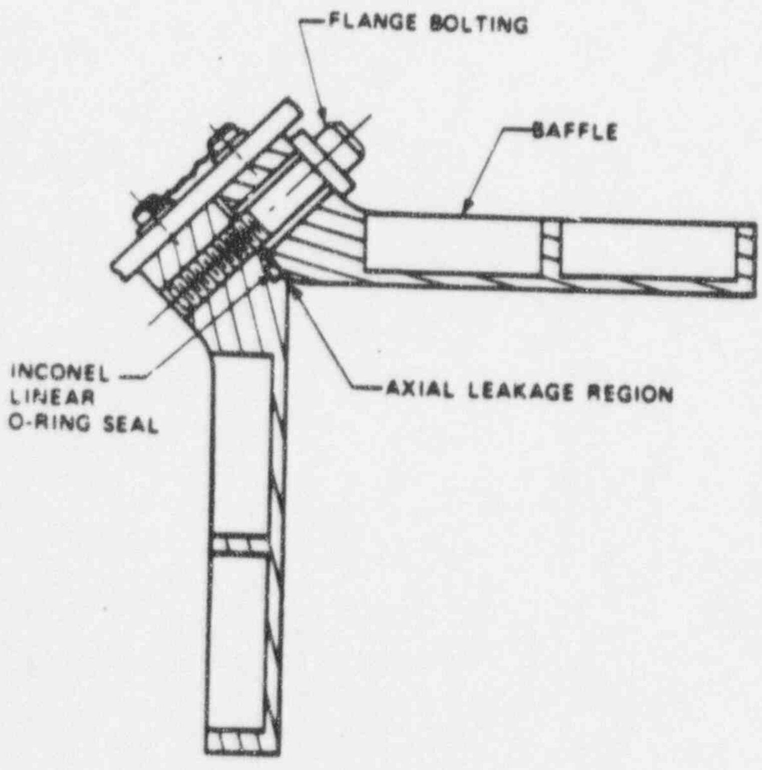
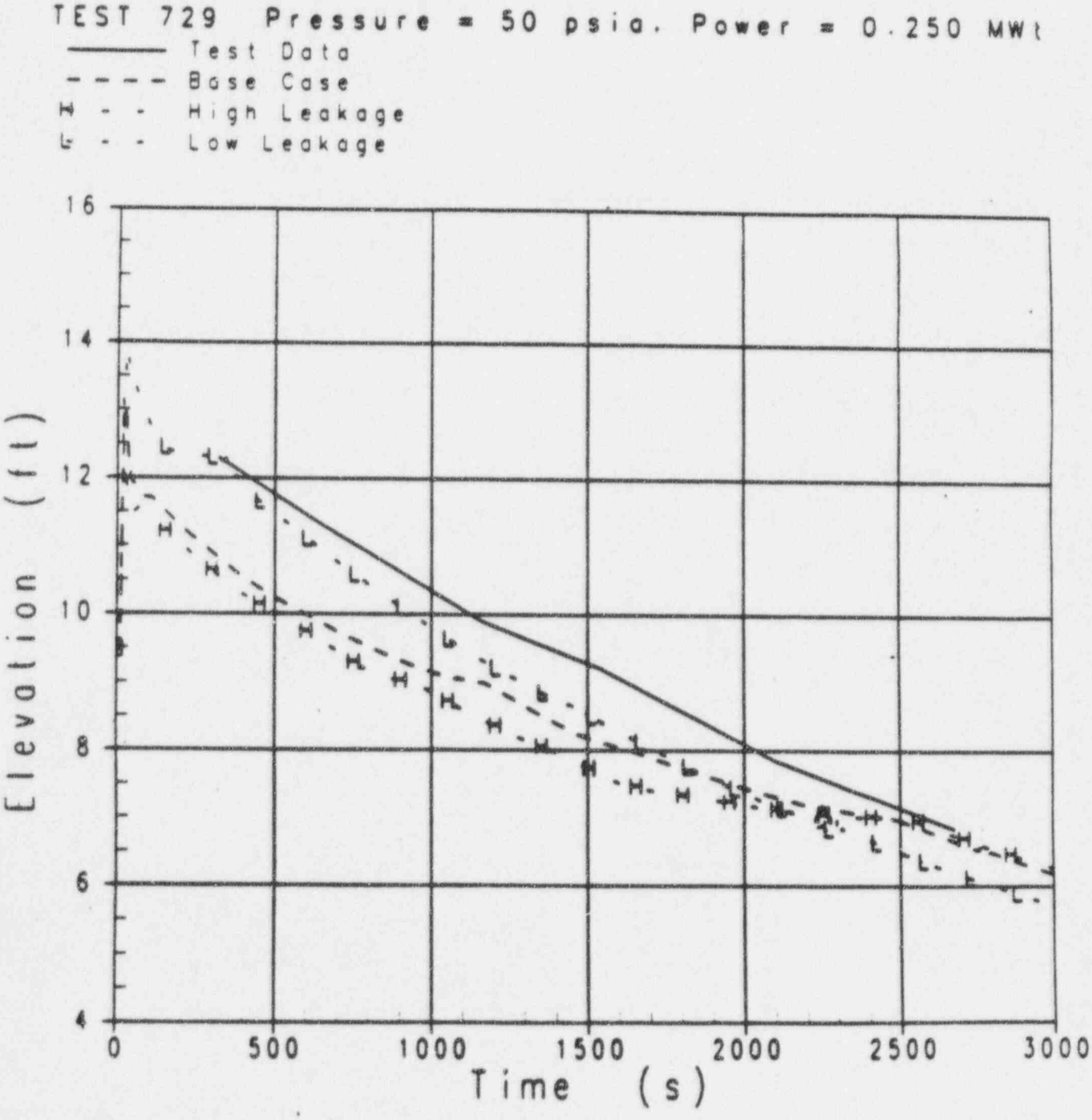


Figure E-2. G-2 Loop Axial Seal Region

TABLE 4.2-3 G2 LOOP CORE UNCOVERY TEST PARAMETERS			
Run Number	Pressure psia	Bundle Power (MW)	Initial Bundle Water Level in.
715	779	0.603	114
716	775	0.252	138
717 *	796	0.905 *	102
718 *	799	1.258 *	90
719	394	0.267	138
720	395	0.615	114
721 *	394	0.914 *	102
722 *	395	1.264 *	84
723 R	395	0.614 R	114
724	96	0.252	126
725	96	0.599	96
726 *	96	0.857 *	84
727 *	97	1.247 *	78
728	50	0.596	84
729	50	0.250	114
730 *	50	0.894 *	66
731 *	50	1.244 *	54
732	15.1	0.254	102
733	15.8	0.600	72
734 *	16.1	0.900 *	60
735 *	16.7	1.249 *	54
736 R	15.3	0.253	102

* ALL CASES WITH A POWER LEVEL ABOVE 0.6 ARE OUTSIDE THE PLANT RANGE OF CONDITION.

R REPEAT TEST



PRELIMINARY

G2-

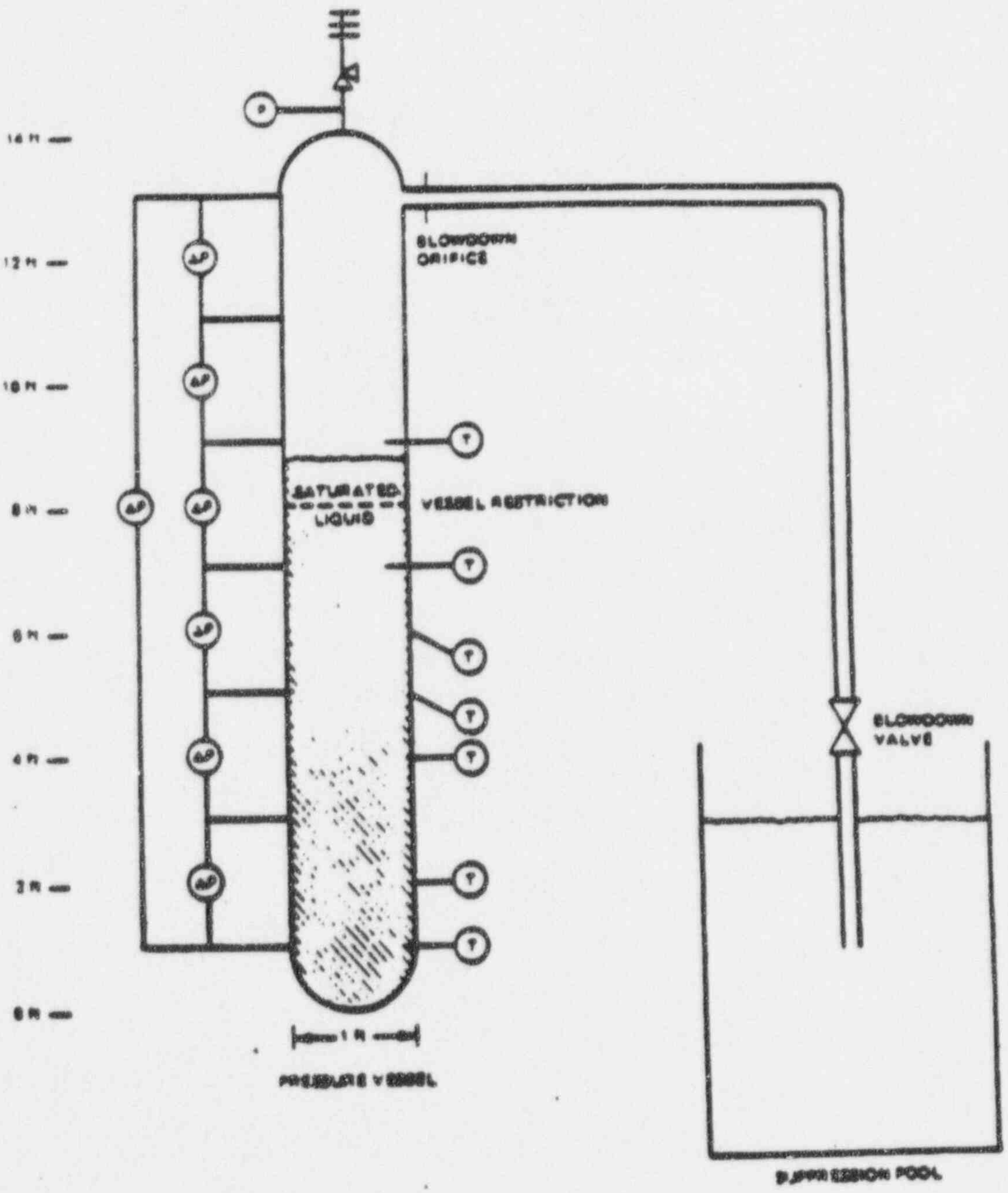


Figure 5.2-2 Small Blowdown Vessel Instrumentation

TABLE 5.2-1
SUMMARY OF TEST PARAMETERS FOR
SMALL BLOWDOWN VESSEL STEAM BLOWDOWN TESTS

Test No.	Orifice Size (in.)	Restriction Plate (9/16 in. diameter holes)	Initial Conditions	
			Pressure (psia)	Level (ft.)
8-21-1	3/8	109 holes	1015	8.89
8-25-1	1/2	109 holes	1020	8.82
8-28-1	1	109 holes	1015	8.76
9-1-1	3/8	77 holes	1014	8.75
9-15-1	3/8	55 holes	1015	8.74
1004-3	3/8	No plate	1011	10.4
1004-2	7/8	No plate	1011	10.5

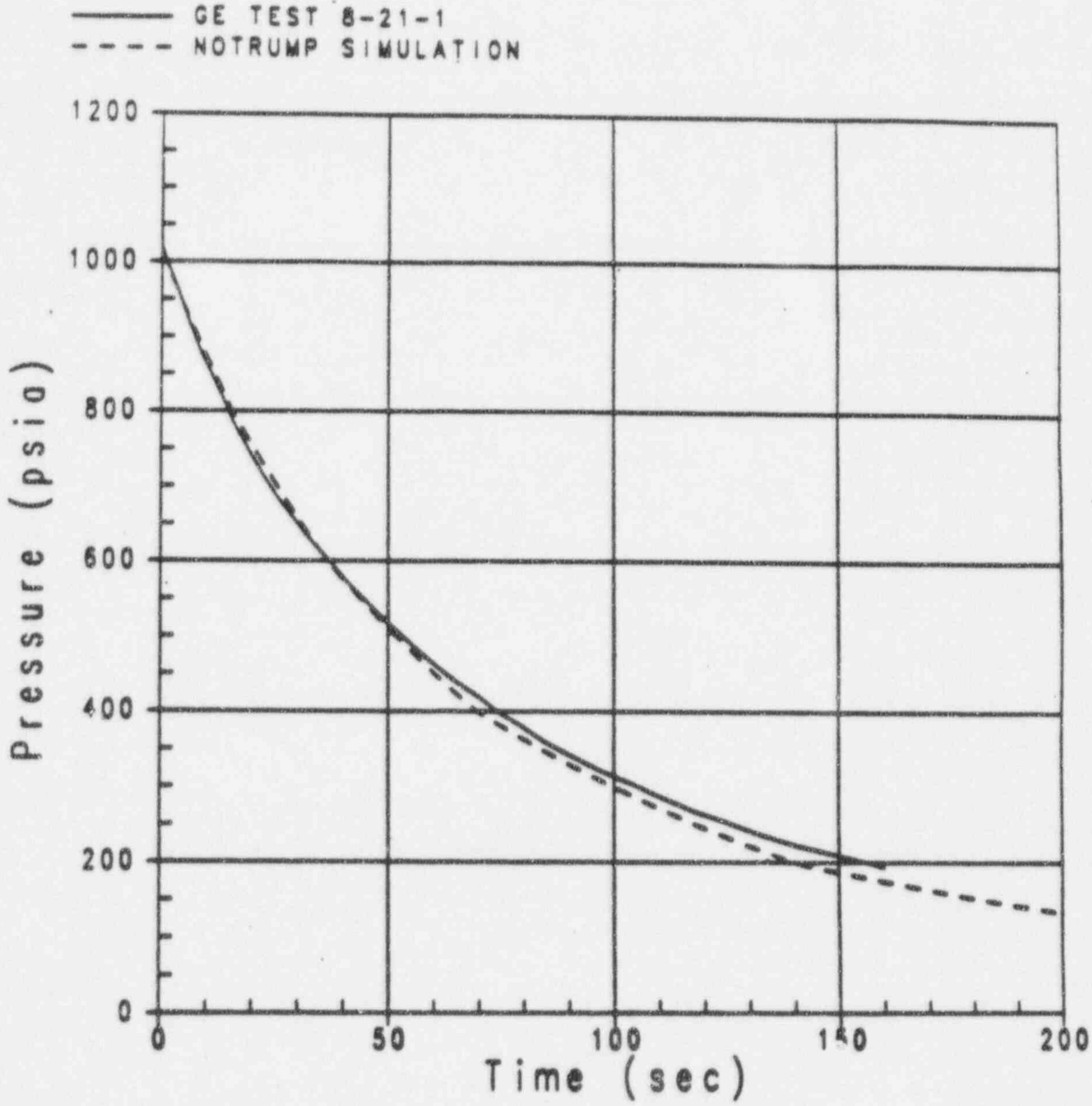


Figure 5.4-1 Vessel Pressure for GE Test 8-21-1 with 3/8-in. Break

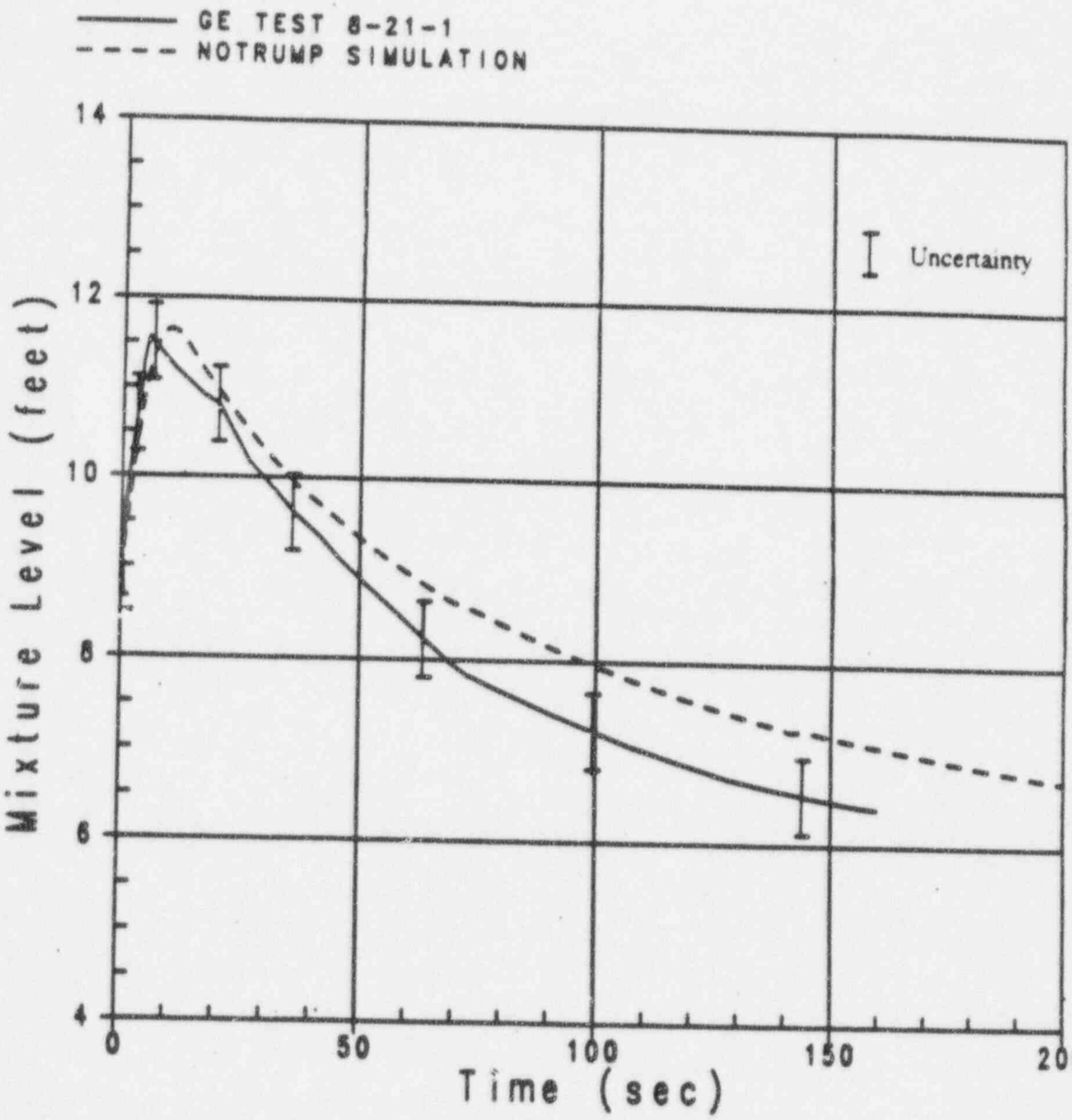
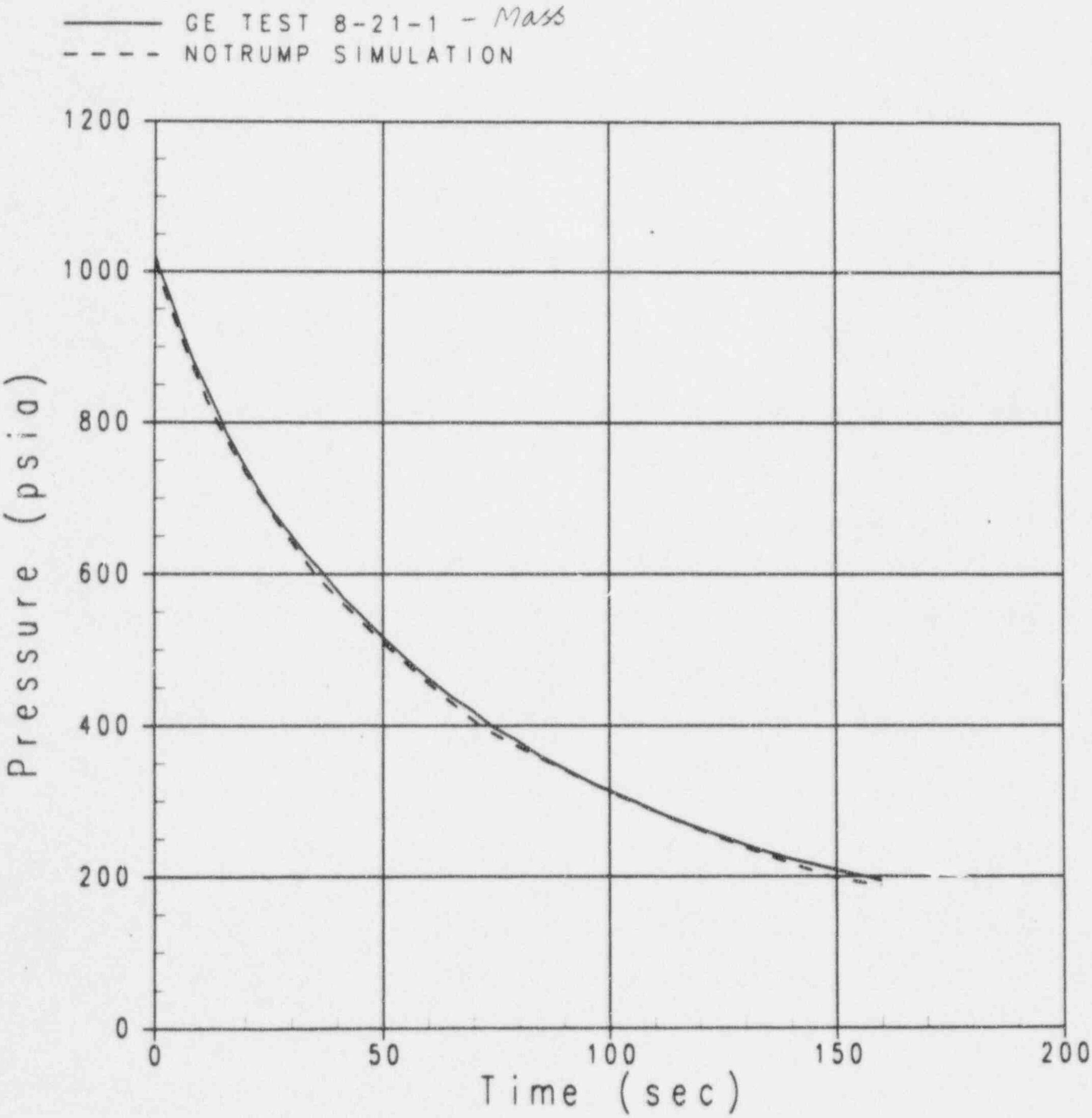
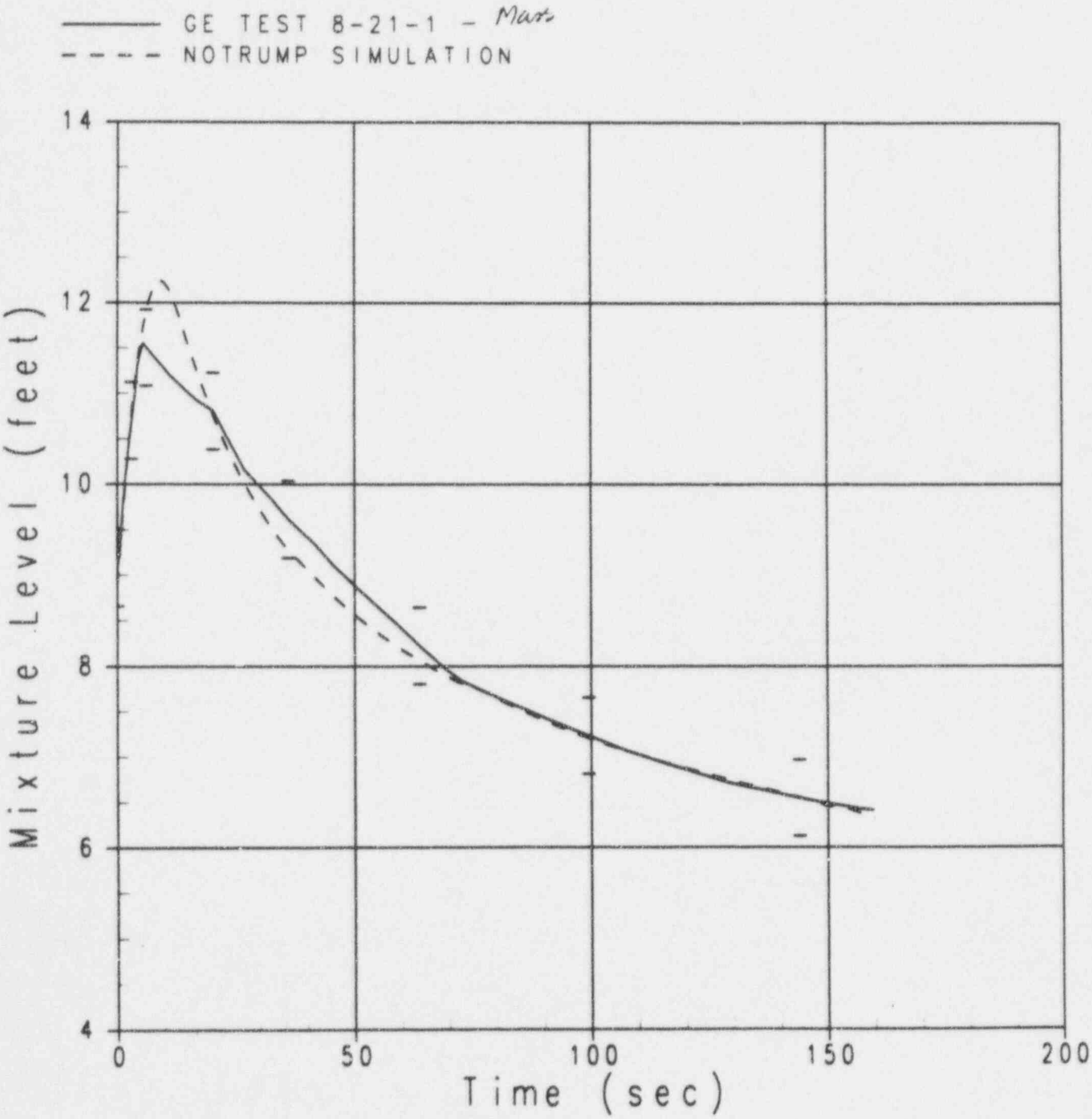


Figure 5.4-2 Vessel Mixture Level for GE Test 8-21-1, 3/8-in. Break



GE TEST 8-21-1 - Mass
NOTRUMP SIMULATION
Pressure (psia)
Time (sec)
0
200
400
600
800
1000
1200
0
50
100
150
200


GE TEST 8-21-1 - Max
NOTRUMP SIMULATION
Mixture Level (feet)
Time (sec)
14
12
10
8
6
4
0
50
100
150
200

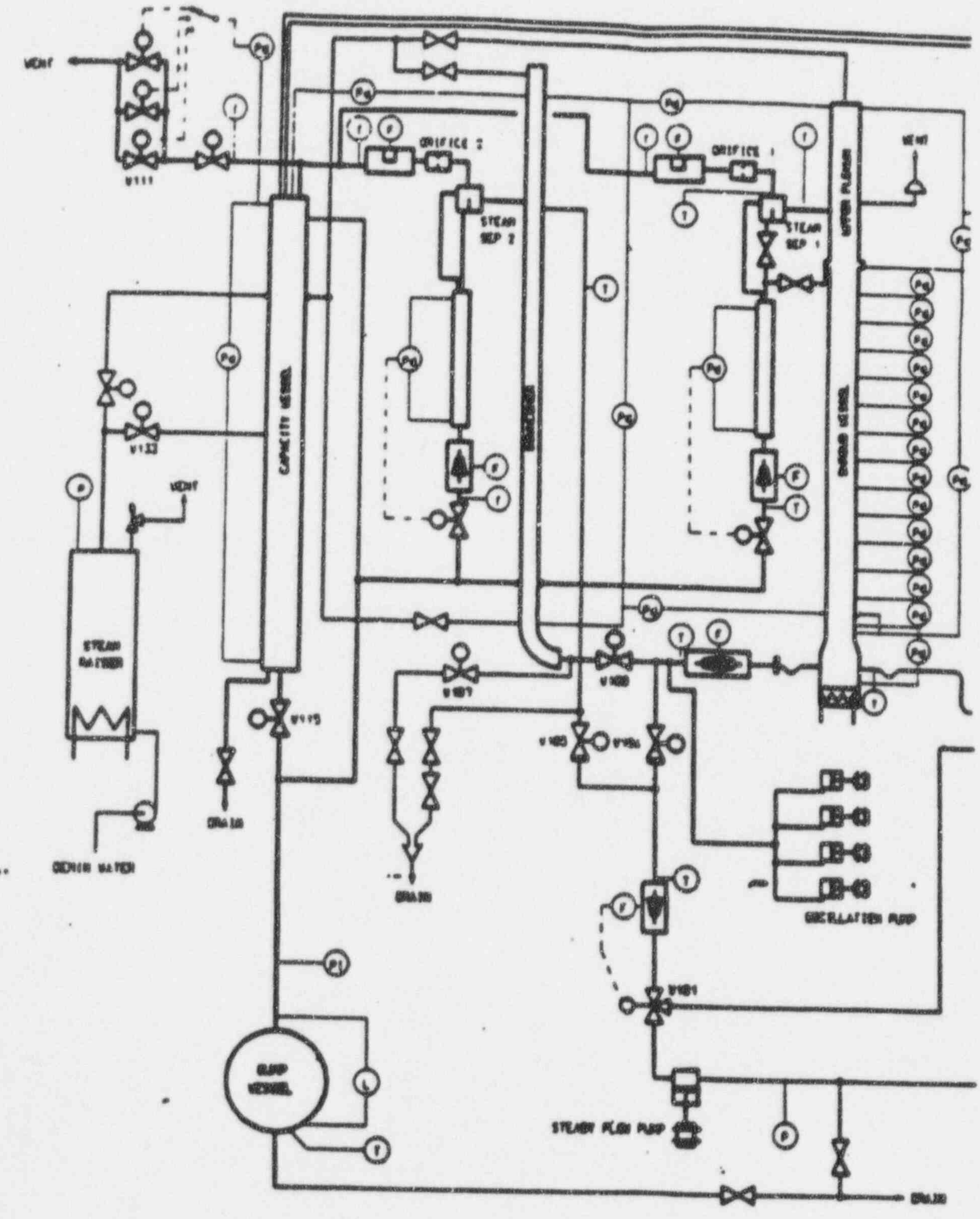


Figure 4.3-1 Achilles Flow Schematic

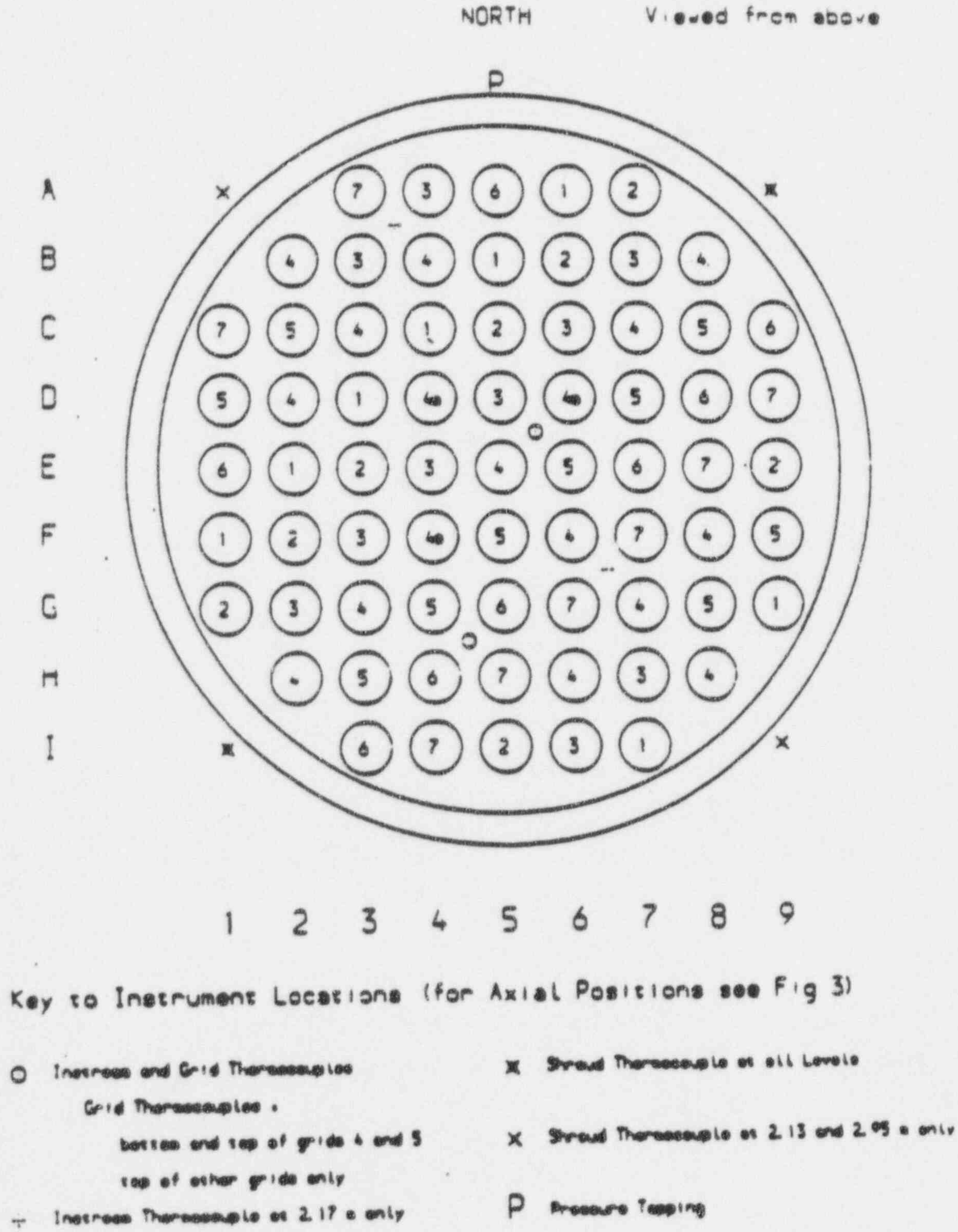


Figure 4.3-2 Cross-Section Through Test Section

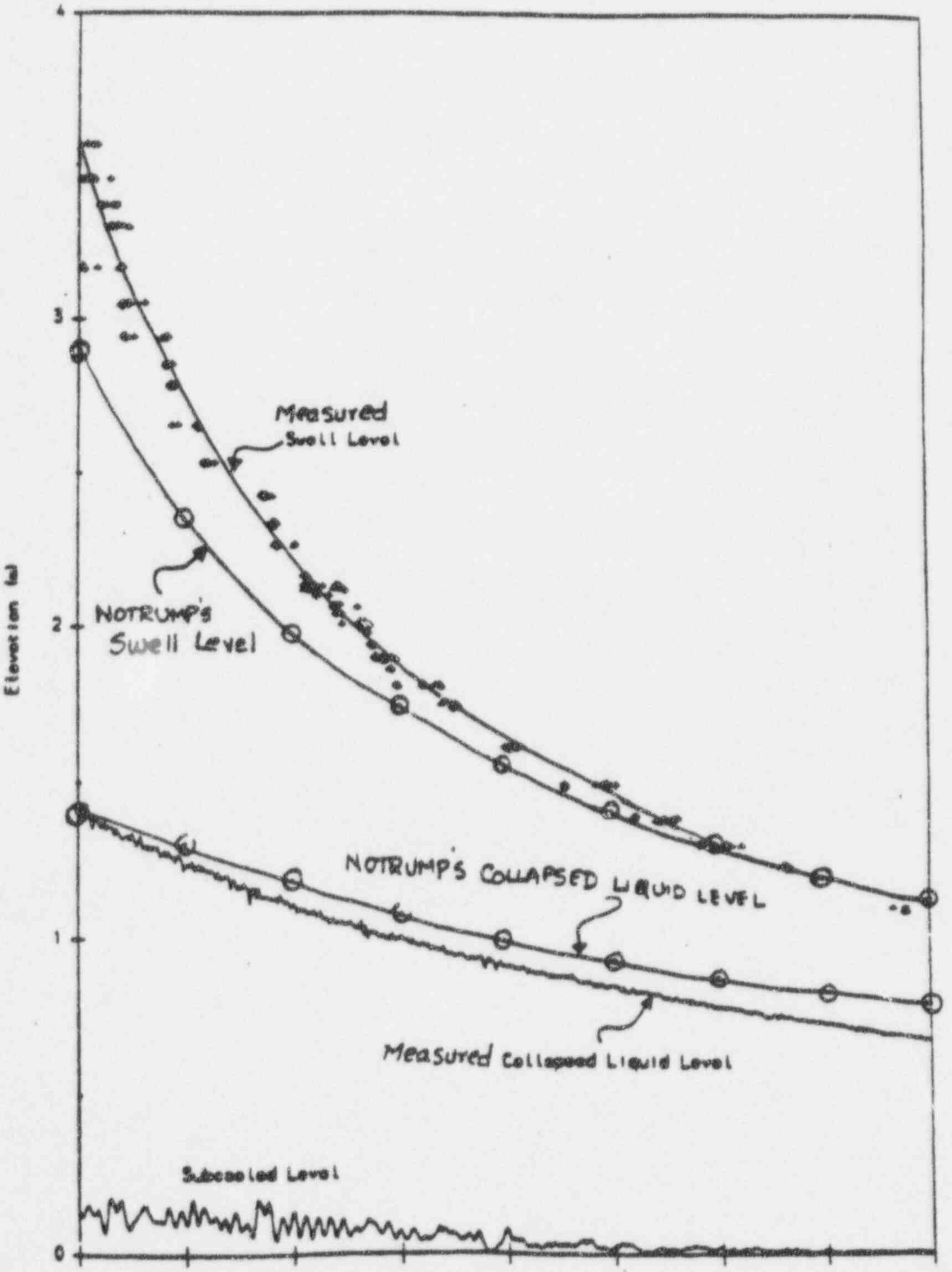


Figure 4.3-6 NOTRUMP Comparisons of Level Swell and Collapsed Level for Boildown Transient at 1.2 bar and 80 kw for Test A1L066

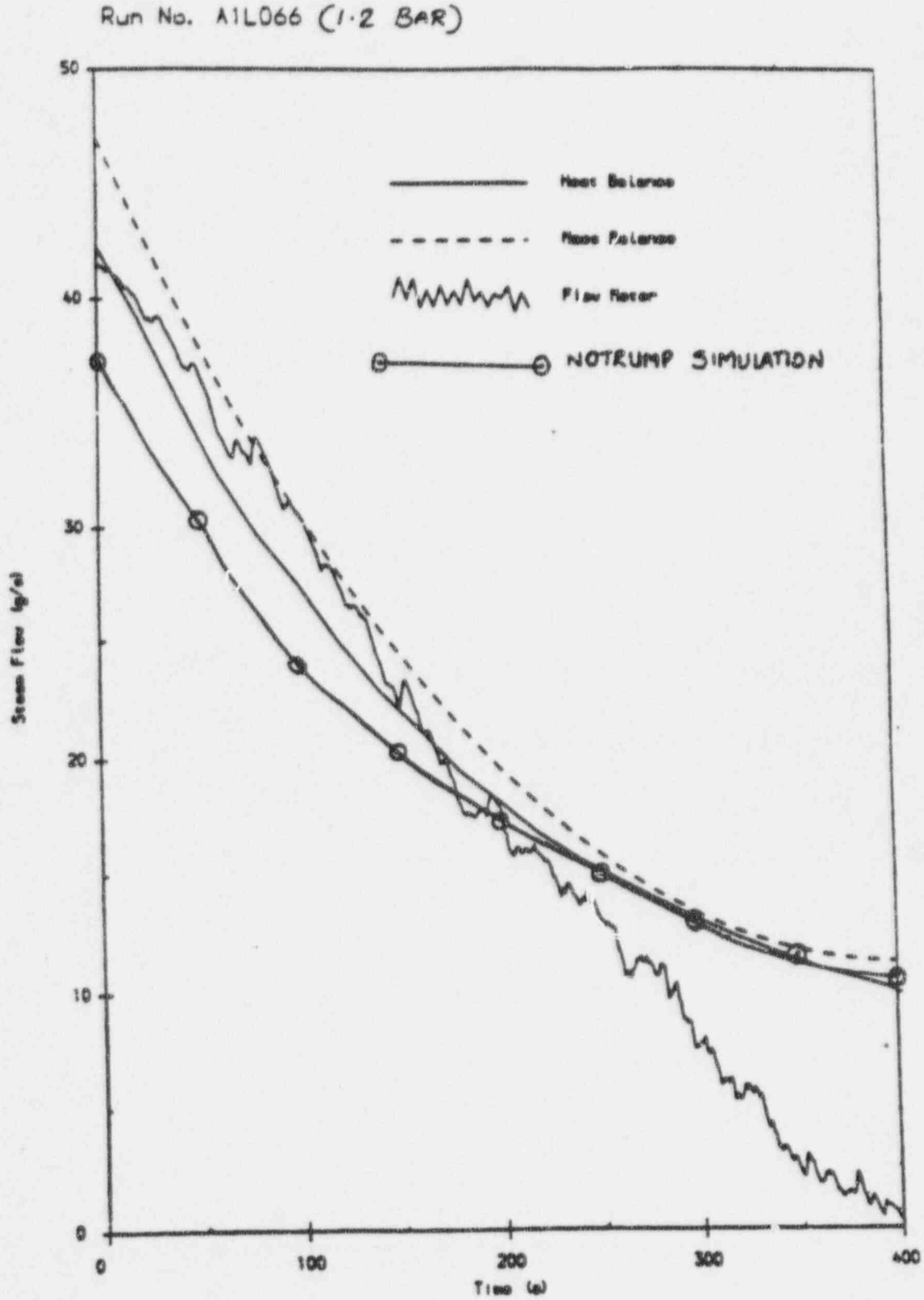


Figure 4.3-7 NOTRUMP Comparisons to Measured Steam Flow Rate at Test Section Exit for Test A1L066

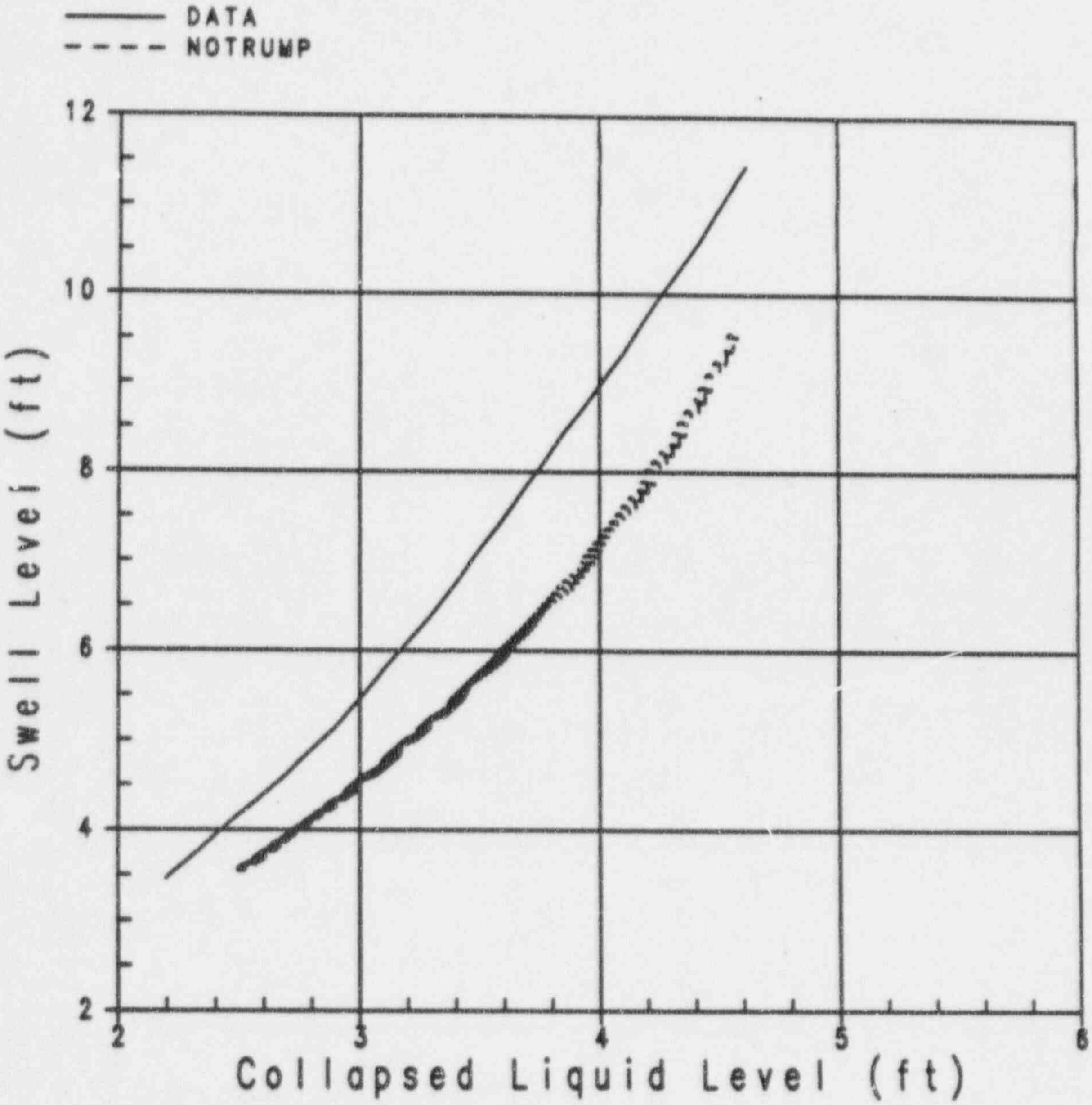


Figure 4.3-8 Comparisons of NOTRUMP and Test Data Level Swell and Collapsed Levels for Test A1L066

SAMPLE RESULTS

G -2 TESTS HAD LEAKAGE, UNCERTAINTY IN LEAKAGE WAS ESTIMATED AND USED IN ANALYSIS

RESULTS ARE CONSERVATIVE

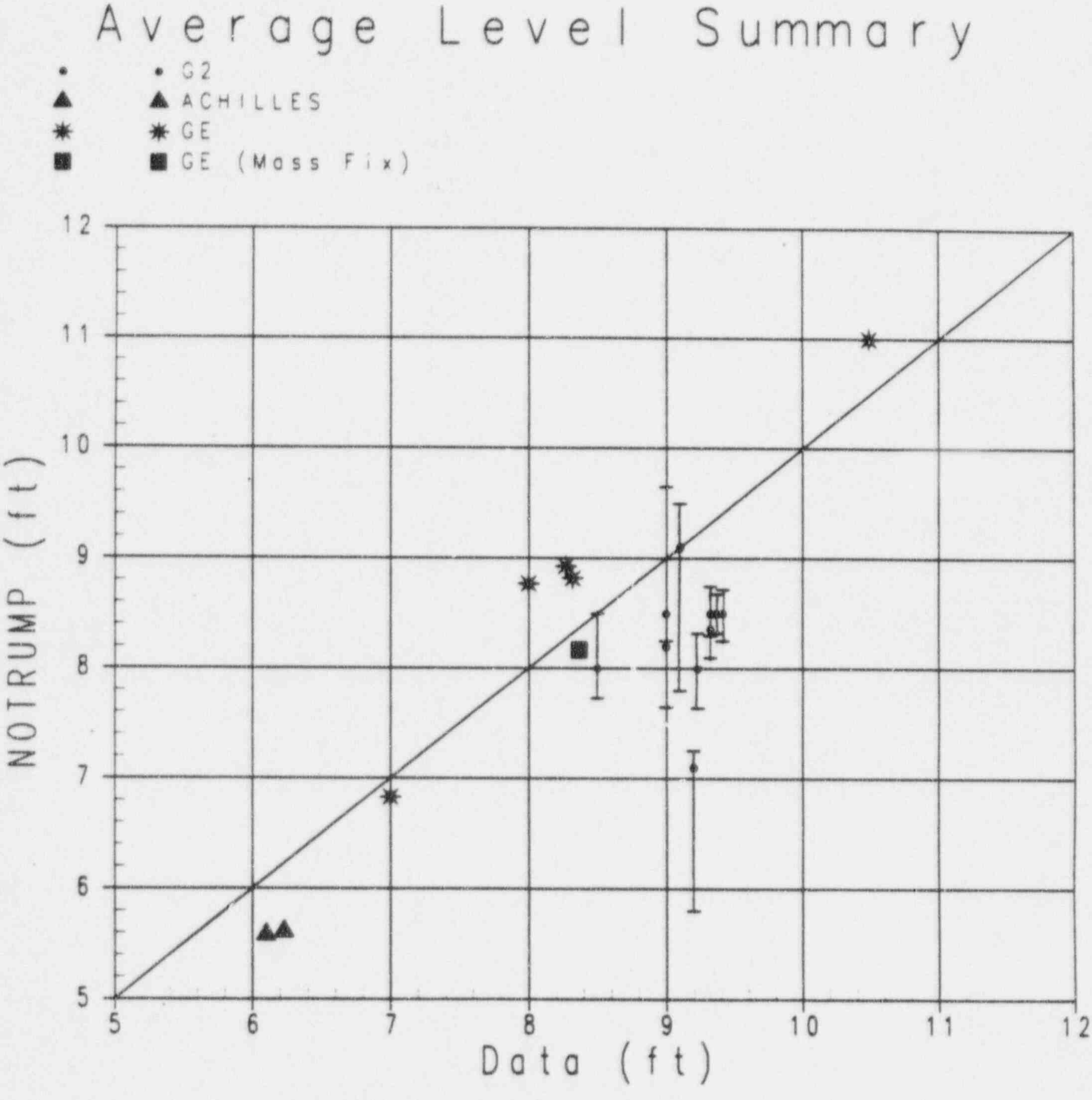
G.E. VESSEL TESTS HAD A SMALL AMOUNT OF MASS ENTRAINED OUT THE BREAK

ACCOUNTING FOR THE ENTRAINMENT IMPROVES RESULTS

RESULTS CONSISTENT WITH TRAC

ACHILLES TEST ZERO TIME FOUND FROM DATA

RESULTS ARE CONSERVATIVE



Average Level Summary
G2
ACHILLES
GE
GE (Mass Fix)
NOTRUMP (ft)
Data (ft)
5
6
7
8
9
10
11
12

SUMMARY OF LEVEL SWELL RESULTS

COMPOSITE PLOT INDICATES THAT NOTRUMP UNDER-ESTIMATES THE TWO-PHASE LEVEL SWELL FOR A GIVEN INVENTORY.

NOTRUMP USES A CONSERVATIVE DECAY HEAT (ANS 1971 + 20 %) IN THE PLANT CALCULATIONS, WHICH CAN LEAD TO EARLIER UNCOVERY

THEREFORE, NOTRUMP CONSERVATIVELY PREDICTS THE KEY LEVEL SWELL PHENOMENA IDENTIFIED IN THE AP600 PIRT FOR A CORE UNCOVERY SITUATION

NOTRUMP COMPARISONS TO ADS 1-3 TESTS

NOTROMP COMPARISONS TO ADS 1-3 TESTS

- EIGHT ADS 1-3 TESTS WERE SELECTED FOR NOTRUMP ANALYSIS
- SELECTED TESTS COVERS THE RANGE OF CONDITIONS FOR ADS
- NOTRUMP MODEL FOR ADS IS CONSISTENT WITH MODEL FOR INTEGRAL SYSTEMS TESTS AND AP600 PLANT
- COMPARISONS WERE MADE OF THE ADS FLOW, PRESSURE DROPS, AND CHOKING LOCATIONS
- A RECOMMENDED DISCHARGE COEFFICIENT OF 0.6 WAS USED TO ACCOUNT FOR THE VENA CONTRA AREA OF THE VALVES AND ORIFICES

CONCLUSIONS OF ADS COMPARISONS

- NOTRUMP ACCURATELY PREDICTS THE ADS 1-3 FLOWS

- NOTRUMP TENDS TO UNDER PREDICT THE UPSTREAM VALVE, VL1-2 (A & M) PRESSURE DROP FOR SOME TESTS.

- NOTRUMP TENDS TO OVER PREDICT THE ADS 1-3 VALVE PACKAGE PRESSURE DROP

- NOTRUMP DOES PREDICT THE TOTAL PRESSURE DROP CORRECTLY SUCH THAT THE FLOW AND TOTAL PRESSURE DROP PREDICTIONS ARE IN AGREEMENT.

- CONSISTENT ADS 1-3 MODELING IS USED IN THE PLANT, OSU, AND SPES-2

- NOTRUMP WILL CAPTURE THE KEY PIRT ADS 1-3 PHENOMENA

NOTRUMP COMPARISONS TO CMT 500 SERIES TESTS

NOTRUMP COMPARISONS TO THE 500 SERIES CMT TESTS

- NOTRUMP MODELING OF THE CMT TESTS HAS BEEN IMPROVED TO REDUCE THE NUMERICAL THERMAL DIFFUSION IN THE STEAM/WATER RESEVIOR BY USE OF PRESSURE AND ENTHALPY BOUNDARY CONDITIONS.

- ADDITIONAL TESTS WERE ANALYZED

- NODDING FOR THE CMT IS STILL COARSE (FOUR AXIAL NODES)

- SELECTION OF THE TOP NODE SIZE IS BASED ON TEST OBSERVATIONS AND CONSIDERATION OF THE CMT DIFFUSER

- IT IS RECOGNIZED THAT NOTRUMP WILL SMEAR THE CMT AXIAL FLUID TEMPERATURE GRADIENT, QUESTION IS " WILL THIS INFLUENCE THE CALCULATED CMT CIRCULATION FLOW"

CONCLUSIONS OF 500 SERIES CMT COMPARISONS

- NOTRUMP DOES ACCURATELY PREDICT THE CMT CIRCULATING FLOW

- NUMERICAL THERMAL DIFFUSION DOES OCCUR IN THE NOTRUMP CALCULATION BUT DOES NOT APPEAR TO INFLUENCE THE CMT CIRCULATING FLOW PREDICTION

- " MISSING " THE DETAILED CMT FLUID TEMPERATURE DISTRIBUTION DOES NOT SIGNIFICANTLY EFFECT THE ACCURACY OF THE PREDICTIONS

- THE SAME CMT MODELING IS USED FOR THE PLANT, OSU, AND SPES-2

- NOTRUMP WILL CAPTURE THE KEY PIRT PHENOMENA ASSOCIATED WITH CMT RECIRCULATION

CONCLUSIONS

- NOTRUMP ANALYSIS OF THE LEVEL SWELL, ADS 1-3 AND CMT SEPARATE EFFECTS TESTS INDICATE THAT

    THE CODE AGREEMENT WITH THE DATA IS USUALLY "EXCELLENT" OR "REASONABLE" IN MOST CASES AS DEFINED USING THE ICAP DEFINITIONS

    THE AREAS WHERE THE CODE IS "POOR" AGREEMENT WITH THE DATA (CMT AXIAL TEMPERATURE DISTRIBUTION) DOES NOT EFFECT THE KEY RESULTS

    NOTRUMP VALIDATION WILL ADDRESS THE KEY PHENOMENA IDENTIFIED IN THE AP600 SMALL-BREAK LOCA PIRT GIVING INCREASED CONFIDENCE IN THE PLANT CALCULATIONS

NOTRUMP BENCHMARKS - STATUS

P. E. Meyer

September 26, 1996

Question 440.468

Re: NOTRUMP PVR FOR OSU TESTS, LTCT-GSR-001

Please provide benchmark calculations to transient level swell separate effects tests to demonstrate that the SIMARC methodology, the modified drift-flux correlations, and the changes to the distribution parameter accurately simulate transient two-phase level swell. Compare the NOTRUMP calculated void distribution and two-phase level with the test data. Candidate tests include: GE level swell, Westinghouse 336 rod bundle uncovery tests, and the CSE top and bottom blowdown test data (Please see RAI 440.515 for references). Also, compare the code to counter current flow data to demonstrate that the new methodology properly treats flooding phenomena.

Question 440.468

Re: NOTRUMP PVR FOR OSU TESTS, LTCT-GSR-001
Please provide benchmark calculations to transient level swell separate effects tests to demonstrate that the SIMARC methodology, the modified drift-flux correlations, and the changes to the distribution parameter accurately simulate transient two-phase level swell. Compare the NOTRUMP calculated void distribution and two-phase level with the test data. Candidate tests include: GE level swell, Westinghouse 336 rod bundle uncovery tests, and the CSE top and bottom blowdown test data (Please see RAI 440.515 for references). Also, compare the code to counter current flow data to demonstrate that the new methodology properly treats flooding phenomena.

Response:

To demonstrate that the SIMARC methodology, the modified drift-flux correlations, and the changes to the distribution parameter accurately simulate transient two-phse level swell, Westinghouse will perform analyses of the G-2 level swell experiments given in EPRI report EPRI-NP-1692 (see the response to RAI 440.515 for details).

To investigate flooding phenomena, calculations will be performed which will be similar to those performed using WCOBRA/TRAC in Reference 440.468-1. These calculations will demonstrate that the SIMARC methodology, the modified drift-flux correlations, and the changes to the distribution parameter properly treat flooding phenomena. They will basically be computations of vertical CCFL. This work is currently scheduled for completion and transmittal to the NRC by the end of March, 1996.

References

440.468-1 Westinghouse Code Qualification Document for Best Estimate Loss of Coolant Accident Analysis. Volume 3, Hydrodynamics, Components, and Integral Validation, Section 15-1-2 (CCFL in a Vertical Channel), WCAP-12945-P

(1) SIMARC Drift-Flux Models

The NOTRUMP code uses a drift-flux model to calculate phase separation within a node. Use of the void propagation approach in the drift velocity models has been found to exhibit nonphysical behavior in cases of low-void fraction nodes above high-void fraction nodes. In this case, liquid could be levitated above vapor, or a high-phase flow from a node would be predicted when the node had little of that phase to actually support the predicted flow. The design of the ECCS for the AP600 led to low-pressure and low-flow conditions for an SBLOCA, which amplified these problems.

A methodology developed through the Westinghouse Simulators Department, the SIMulator Advanced Real-time Code (SIMARC), was adapted to the NOTRUMP drift-flux model. The SIMARC drift-flux methodology, although simplified in its simulator version, has been modified for use in NOTRUMP. The basis of the methodology as applied is that the net fluxes at a transition from concurrent upflow or downflow to countercurrent flow can be determined. Determination of the transition fluxes is by either mass or volumetric fluxes, based on the code structure. Experience has shown that the methodology works best when applied on a volumetric flow basis. Westinghouse has found that the SIMARC methodology can help solve drift-flux difficulties such as a liquid node above a gas node.

Before it reviewed the SIMARC methodology, the staff's opinion was that either a flux-weighted void fraction approach or a void propagation approach should be used. Although a flux-weighted approach may be nonphysical (i.e., the mathematical model yields a condition that is physically impossible), it smoothes numerical problems and gives a well-behaved solution. Westinghouse has pointed out that the SIMARC approach is more physical because it is based on transitions from concurrent upflow or downflow to countercurrent flow, and it is simpler to apply. Similarly, although the void propagation approach is physically sound, it has difficulties with cases of liquid nodes above gas nodes. The SIMARC approach is both physically based and able to deal with this case.

The staff finds application of the SIMARC drift-flux technology acceptable for analysis of the AP600 SBLOCA pending final confirmation of the model through the benchmark and assessment of the code to be provided in the NOTRUMP FV&V report. This is SDSER Confirmatory Item 21.6.2.4-1.

(1) SIMARC Drift-Flux Model

Before it reviewed the SIMARC methodology, the staff's opinion was that either a flux-weighted void fraction approach or a void propagation approach should be used. Although a flux-weighted approach may be nonphysical (i.e., the mathematical model yields a condition that is physically impossible), it smoothes numerical problems and gives a well-behaved solution. Westinghouse has pointed out that the SIMARC approach is more physical because it is based on transitions from concurrent upflow or downflow to countercurrent flow, and it is simpler to apply. Similarly, although the void propagation approach is physically sound, it has difficulties with cases of liquid nodes above gas nodes. The SIMARC approach is both physically based and able to deal with this case.

The staff finds application of the SIMARC drift-flux technology acceptable for analysis of the AP600 SBLOCA pending final confirmation of the model through the benchmark and assessment of the code to be provided in the NOTRUMP FV&V report. This is SDSER Confirmatory Item 21.6.2.4-1.

AP600

Question 440.477

Re: NOTRUMP PVR for OSU tests: NOTRUMP Levelizing Model

Please provide the new levelizing drift velocity correlation referred to in Section 4.12 and provide benchmark justifying its validity.

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(11) Modified Horizontal Flow Drift — Flux Levelizing Model

The NOTRUMP drift-flux model, using the SIMARC drift-flux technology, has been modified to define a drift velocity whose magnitude and direction are based on the collapsed levels at each end of a horizontal flow link. The form of the correlation, Westinghouse has stated in response to RAI 440.477, was developed heuristically. The staff is of the opinion that models developed by use of heuristic methods must be justified and fully evaluated since heuristic methods, by nature, lack strong technical bases. However, Westinghouse notes that the appropriate dimensions and effects are incorporated.

The levelizing model is intended to provide a potential for countercurrent flow in which liquid flows toward the end of a link with the lower collapsed level. This would tend to bring the levels to the same point. Primary use of the levelizing model in the AP600 SBLOCA analysis is in the horizontal links at the top of the steam generator U-tubes, at the top of the hot leg-to-PRHR line, and in the PRHR horizontal links.

The staff has requested a benchmark calculation to assess the capabilities of the model changes in RAI 440.477. The benchmark calculations are scheduled for submittal later in the NOTRUMP review process and will be included in the NOTRUMP FV&V report. Acceptance of the model changes and additions must await submittal and staff review of the benchmark calculations. This is SDSER Open Item 21.6.2.4-9.

Horizontal Flow Drift Flux Model (Levelizing Model) (11)

- **Difficulties Addressed**
  - Deficiencies Of Original Horizontal Stratified Flow Model At Low Pressure
  - Possible Problems With Revised Horizontal Flow Model
  - Can Replace Other Models Used For Horizontal Flow

- **Description Of Model**
  - Levelizing Drift Velocity Correlation
  - Uses SIMARC Drift Flux Methodology

- **Coding Impact**
  - Modular (DFLEVL)
  - Drift Velocity Correlation Input Option

- **Impact On Results**
  - More Natural Way To Model Horizontal Flow
  - Alternative To Original And Revised Horizontal Stratified Flow Models

CONCLUSIONS

Significant progress is being made on tasks supporting Final NOTRUMP V&V Report

Separate effects tests have been completed and integral system models are being updated to be consistant with separate effects test models

INTEGRAL FACILITY TESTS

Oregon State University Facility Simulations to Include:

- Test SB9	2 in CL/CMT Balance Line Break
- Test SB10	DEG CMT Balance Line Break
- Test SB12	DEG DVI Line Break
- Test SB13	2 in DVI Line Break
- Test SB14	Inadvertant ADS-1 Open
- Test SB18	2 in Cold Leg Break
- Test SB23	0.5 in Cold Leg Break

SPES-2 Facility Simulations to Include:

- Test 1	1 in Cold Leg Break
- Test 3	2 in Cold Leg Break
- Test 5	2 in DVI Line Break
- Test 6	DEG DVI Line Break
- Test 7	2 in CL/CMT Balance Line Break
- Test 8	DEG CL/CMT Balance Line Break

NOTRUMP SIMULATIONS

OF AP600 INTEGRAL SYSTEMS TESTS

Bob Osterrieder

September 26, 1996