Westinghouse Electric Corporation
Energy Systems
Box 355
Pittsburgh Pennsylvania 15230-0355

AW-94-596

April 12, 1994

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: MR. R. W. BORCHARDT

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

SUBJECT: INFORMATION ON TEST CONDITIONS FOR AP600 TESTING PERFORMED AT THE SPES-2 AND OSU TEST FACILITIES

Dear Mr. Borchardt:

The application for withholding is submitted by Westinghouse Electric Corporation ("Westinghouse") pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10CFR Section 2.790, Affidavit AW-94-596 accompanies this application for withholding setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-94-596 and should be addressed to the undersigned.

Very truly yours,

N. J. Liparulo, Manager
Nuclear Safety And Regulatory Activities

/nja

cc: Kevin Bohrer NRC 12H5

1536A

AW-94-596

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Brian A. McIntyre, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Corporation ("Westinghouse") and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

Brian A. McIntyre, Manager
Advanced Plant Safety & Licensing

Sworn to and subscribed
before me this 15 day
of April, 1994

Rose Marie Payne
Notary Public

Notarial Seal
Rose Marie Payne, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Nov. 4, 1996
Member, Pennsylvania Association of Notaries

1537A

(1) I am Manager, Advanced Plant Safety and Licensing, in the Advanced Technology Business Area, of the Westinghouse Electric Corporation and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rulemaking proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Energy Systems Business Unit.

(2) I am making this Affidavit in conformance with the provisions of 10CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by the Westinghouse Energy Systems Business Unit in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information which is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10CFR Section 2.790, it is to be received in confidence by the Commission.

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) Enclosed is Letter NTD-NRC-94-4070, April 12, 1994, being transmitted by Westinghouse Electric Corporation (W) letter and Application for Withholding Proprietary Information from Public Disclosure, N. J. Liparulo (W), to Mr. R. W. Borchardt, Office of NRR. The proprietary information as submitted for use by Westinghouse Electric Corporation is in response to questions concerning the AP600 plant and the associated design certification application and is expected to be applicable in other licensee submittals in response to certain NRC requirements for justification of licensing advanced nuclear power plant designs.

This information is part of that which will enable Westinghouse to:

(a) Demonstrate the design and safety of the AP600 Passive Safety Systems.

(b) Establish applicable verification testing methods.

(c) Design Advanced Nuclear Power Plants that meet NRC requirements.

(d) Establish technical and licensing approaches for the AP600 that will ultimately result in a certified design.

(e) Assist customers in obtaining NRC approval for future plants.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for advanced plant licenses.

(b) Westinghouse can sell support and defense of the technology to its customers in the licensing process.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar advanced nuclear power designs and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended for developing analytical methods and receiving NRC approval for those methods.

Further the deponent sayeth not.

Attachment 1 to Westinghouse Letter NTD-94-4070

Information in support of Westinghouse Response to RAI 952.37 - RAI 952.41

Question 952.37

Supply the calculated hole size of the various orifice plates for the OSU/APEX facility, including the respective desired pressure drop and the location to be installed. The staff understands that all orifices may not be installed prior to preoperational testing. Is that correct?

Response:

Table 952.37-1 summarizes all orifice plates used in the OSU test facility. The K value and flow rate are also included.

All orifice plates, with the exception of the ADS stage 1,2,3 and 4 orifice plates, have been installed in the facility for preoperational testing. These orifice plates will be adjusted, if necessary, to provide the proper line resistance during preoperational testing.

The orifice plates used in ADS stages 1 through 4 simulate the flow area. Pressure drop information on these plates will obtained during hot pre-operational testing.

Table 952.37-2 summarizes break area calculations for the OSU test facility.

Attachment 1 to Westinghouse Letter NTD-94-4070 (continued)

Table 952.37-1
AP600 OSU Test Facility Orifice Plate Summary

Component		OSU Test Facility Design	OSU Test Facility Orif. ID	Remark
1. CMT To DVI Line No. 1:				
(a) CMT-DVI Tee (Node A - Node I)				DWG LKL 920200 Sheet 2
	ID, in	1.120		
	Initial Pres. psia	38.300		
	No. of orifice	1.000	ORI-555	Orifice is between node J and node K
	K_orifice	35.620		Note 1: Line resistance of both DVI lines are balanced in AP600 and test
	Orifice ID, in	0.547		
	Flow Rate, lbm/sec	1.146		
(b) DVI Tee - DVI Nozzle(inclusive)				DWG LKL 920200 Sheet 2
	ID, in	1.120		Node I to Node M
	Initial Pres. psia	38.300		
	No. of orifice	1.000	ORI-253	
	K_orifice	0.899		
	Orifice ID, in	1.270		
	Flow Rate, lbm/sec	1.146		
2. CMT02 To DVI Line No. 2:				DWG LKL 920201 Sheet 2
(a) CMT-DVI Tee				Node CM1 - CM10
	ID, in	1.120		
	Initial Pres. psia	38.300		
	No. of orifice	1.000	ORI-556	Located between node CMT1 and CMT2
	K_orifice	36.620		
	Orifice ID, in	0.547		
	Flow Rate, lbm/sec	1.146		
(b) DVI Tee - DVI Nozzle(inclusive)				Node CM10 - CM13
	ID, in	1.120		
	Initial Pres. psia	38.300		
	No. of orifice	1.000	ORI-254	
	K_orifice	2.023		
	Orifice ID, in	0.843		
	Flow Rate, lbm/sec	1.146		

Table 952.37-1 (continued)
AP600 OSU Test Facility Orifice Plate Summary

Component	OSU Test Facility Design	OSU Test Facility Orif. ID	Remark
3. CMT01 - Cold Leg Balance Line No.1:			DWG LKL 920200 sheet 4, node CL1 - CL11
ID, in	1.120		
Initial Temp. F	444.680		
Initial Pres. psia	400.390		
No. of orifice	1.000	ORI-553	Located between node CL5 and node CL6
K_orifice	3.150		Note 1: Line resistance of both DVI lines
Orifice ID, in	0.812		are balanced in AP600 and test
Flow Rate, lbm/sec	0.530		
4. CMT02 - Cold Leg Balance Line No.2:			DWG LKL 920201 sheet 3 node CT1-CT12
ID, in	1.120		
Initial Temp. F	444.680		
Initial Pres. psia	400.390		
No. of orifice	1.000	ORI-554	Located between node CT5 and node CT6
K_orifice	3.465		
Orifice ID, in	0.765		
Flow Rate, lbm/sec	0.530		
5. ACC 01 - DVI #1 Injection Line:			DWG LKL 920200 Sheet 5. Node A1-A11
ID, in	1.120		
Initial Pres. psia	19.200		
No. of orifice	1.000	ORI-451	Located between node A3 and Node A4
K_orifice	17.320		
Orifice ID, in	0.616		
Flow Rate, lbm/sec	3.130		
6. ACC 02 - DVI #2 Injection Line:			DWG LKL 920201 sheet 4. Node AC1-AC8
ID, in	1.120		
Initial Pres. psia	19.200		
No. of orifice	1.000	ORI-452	Located between node AC1 and AC2
K_orifice	16.360		
Orifice ID, in	0.624		
Flow Rate, lbm/sec	3.130		

Attachment 1 to Westinghouse Letter NTD-94-4070 (continued)

Table 952.37-1 (continued)
AP600 OSU Test Facility Orifice Plate Summary

Component		OSU Test Facility		Remark
		Design	Orif. ID	
7. IRWST To DVI Line No. 1:				DWG LKL 920200 sheet 3
(a) IRWST - Sump Tee:				Node I4 - Node T4
	ID, in	2.250		
	Initial Temp. F	ambient		
	Initial Pres. psia	NA		
	No. of orifice	1.000	ORI-751	Located between node I3 and I4
	K_orifice	2.200		
	Orifice ID, in	1.687		
	Flow Rate, lbm/sec	0.770		
(b) Sump Tee DVI Tee:				Node T4-Node T1
	ID, in	1.120		
	Initial Temp. F	ambient		
	Initial Pres. psia	NA		
	No. of orifice	1.000	ORI-753	Located between Node T1 and Node T2
	K_orifice	19.000		
	Orifice ID, in	0.609		
	Flow Rate, lbm/sec	0.770		
8. IRWST To DVI Line No. 2:				DWG LKL 920201 sheet 6
(a) IRWST - Sump Tee:				Node ST9 to Nose SN1
	ID, in	1.500		
	Initial Temp. F	ambient		
	Initial Pres. psia	NA		
	No. of orifice	1.000	ORI-752	Located between Node ST8 and Node ST9
	K_orifice	10.900		
	Orifice ID, in	0.906		
	Flow Rate, lbm/sec	0.771		
(b) Sump Tee - DVI Tee:				Node SN1 - Node ST1
	ID, in	1.120		
	Initial Temp. F	ambient		
	Initial Pres. psia	NA		
	No. of orifice	1.000	ORI-754	
	K_orifice	12.680		
	Orifice ID, in	0.656		
	Flow Rate, lbm/sec	0.771		

Table 952.37-1 (continued)
AP600 OSU Test Facility Orifice Plate Summary

Component	OSU Test Facility		Remark
	Design	Orif. ID	
9. Sump Recir At DVI Line No. 2:			DWG LKL 920201 Sheet 6
(a) Sump Tee - Sump (SN1-SN9a):			(double check valve line)
ID, in	0.870		two sump recirculation lines.
Initial Temp. F	ambient		
Initial Pres. psia	17.250		
No. of orifice	1.000	ORI-912	Between node SN9a and primary sump nozzle
K_orifice	13.400		
Orifice ID, in	0.500		
Flow Rate, lbm/sec	0.154		
(b) Sump Recir. Parallel Line:			MOV line nominal value for the test to model
(SN4a - SN9b, normally closed)			
ID, in	1.000		
Initial Temp. F	ambient		
Initial Pres. psia	NA		
No. of orifice	1.000	ORI-910	Between node SN9b & primary sump tank nozzle
K_orifice	3.200		
Orifice ID, in	0.734		
Flow Rate, lbm/sec	0.154		This is max. recir flow at beginning of
			recirculation operation. Actual flow when
			this line is in use is not known at this
10. Sump Recir At DVI Line No.1:			DWG LKL 920200 sheet 3
(a) IRWST/Sump Tee - Sump (T4-S6b):			Double check valve line
ID, in	Note 1		Note 1: Line size varies from
Initial Temp. F	ambient		2.250 in. to 1.000 in.
Initial Pres. psia	17.250		They are predetermined in other
No. of orifice	1.000	ORI-909	recirculation line calc.
K_orifice	27.270		
Orifice ID, in	0.510		
Flow Rate, lbm/sec	0.154		
(b) Sump to sump branch:			Located between node S6b and sump tank nozzle
(S2a - S6a, normally closed)			
ID, in	2.250		
Initial Temp. F	ambient		
Initial Pres. psia	NA		
No. of orifice	1.000	ORI-911	Located between Node S6a and sump tank nozzle
K_orifice	2.633		This is max. recir flow at beginning of
Orifice ID, in	1.631		recirculation operation. Actual flow when
Flow Rate, lbm/sec	0.154		this line is in use is not known at this time

Table 952.37-1 (continued)
AP600 OSU Test Facility Orifice Plate Summary

Component		OSU Test Facility		Remark
		Design	Orif. ID	
11.PRHR Hx Outlet				DWG LKL 930101 sheet 1
	ID, in	1.260		Node PRHRA to Node PRHRL
	Initial Temp. F	170.000		
	Initial Pres. psia	NA		
	No. of orifice	1.000	ORI-855	Located between node PRHRC and PRHRD
	K_orifice	Note 1		Note 1: Orifice plate is not required. A
	Orifice ID, in	1.260		space is used to fill the gap.
	Flow Rate, lbm/sec	1.210		
12.PRHR Inlet Loop				DWG LKL 930101 sheet 1
(a) H.L. To PRHR Tee				Node COM1 - COM4
	ID, in	1.610		
	Initial Temp. F	450.000		
	Initial Pres. psia	385.000		
	No. of orifice	0.000		
	K_orifice	NA		
	Orifice ID, in	NA		
	Flow Rate, lbm/sec	1.210		
(b) PRHR TEE To Hx Inlet Nozzle				Node COM4 - PRHR12
	ID, in	1.260		
	Initial Temp. F	NA		
	Initial Pres. psia	NA		
	No. of orifice	1.000	ORI-854	Located between Node PRHR1 and node PRHR2
	K_orifice	Note 1		Note 1: Orifice plate is not required. A
	Orifice ID, in	1.260		spacer is used to fill the gap.
	Flow Rate, lbm/sec	1.210		
13.CMT01 - Pressurizer Balance Line #1				DWG LKL 920200 sheet 7
				Node PZA1 - Node PZA8
	ID, in	0.430		
	Initial Temp. F	NA		
	Initial Pres. psia	400.000		
	No. of orifice	1.000	ORI-551	Located between node PZA2 and PZA3
	K_orifice	Note 1		Note 1: Orifice plate is not required
	Orifice ID, in	0.423		when no break is on the line.
	Flow Rate, lbm/sec	2.448		A spacer is used to fill the gap.
14.CMT01 - Pressurizer Balance Line #2				

Table 952.37-1 (continued)
AP600 OSU Test Facility Orifice Plate Summary

Component		OSU Test Facility		Remark
		Design	Orif. ID	
15.RNS Pump Discharge Branch Line #1				DWG LKL 920200 sheet 6
(To DVI #1)				Node R6 - Node R1
	ID, in	0.875		
	Initial Temp. F	ambient		
	Initial Pres. psia	ambient		Orifice plate is between Node R3 and Node R4
	No. of orifice	1.000	ORI-853	Note: Orifice plate is sized to balance
	K_orifice	1.380		flow between two parallel branch lines.
	Orifice ID, in	0.700		
	Flow Rate, lbm/sec	1.454		
16.RNS Pump Discharge Branch Line #2				Node R8 - Node NR1
(To DVI #2)				
	ID, in	0.875		
	Initial Temp. F	NA		
	Initial Pres. psia	NA		
	No. of orifice	1.000	ORI-857	Located between Node NR5 and node NR6
	K_orifice	Note 1		Note 1: Orifice plate is not required. A
	Orifice ID, in	0.875		spacer is used to fill the gap.
	Flow Rate, lbm/sec	1.454		
17.Pressurizer - ADS 1-3 Header				DWG LKL 920202 Sheet 1 Rev. 5
				Node ADS1 - ADS5
	ID, in	NA		
	Initial Temp. F	NA		
	Initial Pres. psia	NA		
	No. of orifice	1.000	ORI-653	Located between Node ADS3 and ADS4
	K_orifice	Note 1		Note 1: Orifice plate is not required. A
	Orifice ID, in	2.350		spacer is used to fill the gap.
	Flow Rate, lbm/sec	NA		

Table 952.37-1 (continued)
AP600 OSU Test Facility Orifice Plate Summary

Component	OSU Test Facility Design	OSU Test Facility Orif. ID	Remark
18.ADS 1-3 Separator Liquid Drain Line			DWG LKL 920202 sheet 1 Rev. 5
			Node ADSL1 - ADS16C
ID, in	Note 1		Note 1. line size varies, see drawing.
Initial Temp. F	213.000		
Initial Pres. psia	15.000		
No. of orifice	1.000	ORI-659	Located between node ADSL4 and node ADSL5
K_orifice	23.280		
Orifice ID, in	1.090		
Flow Rate, lbm/sec	5.263		
19. 5" ADS4 Separator Liquid Line			DWG LKL 930101 sheet 2 Rev. 3
(No break case and all other cases)			Node SEP1 to SEP5 to primary sump tank.
ID, in	note 1		Note 1: line size varies. See DWG
Flow Conditions:			
Initial Temp. F	251.600		
Initial Pres. psia	30.690		
No. of orifice	1.000	ORI-603	Located at node SEP5
K_orifice	5.464		
Orifice ID, in	2.390		
Flow Rate, lbm/sec	2.297		
20. 8" ADS4 Separator Liquid Line			DWG LKL 930101 sheet 2 Rev. 3
(No break case on the line)			Node SEP1 to SEP5 to primary sump tank.
ID, in	note 1		Note 1: Line size varies. See DWG.
Initial Temp. F	251.600		
Initial Pres. psia	30.690		
No. of orifice	1.000	ORI-602A	Located at node SEP1A
K_orifice	5.464		
Orifice ID, in	2.390		
Flow Rate, lbm/sec	2.297		
21. 8" ADS4 Separator Liquid Line			DWG LKL 930101 sheet 2 Rev. 3
(DEG PZR/CMT break case)			Node SEP1 to SEP5 to primary sump tank.
ID, in	note 1		Note 1: Line size varies. See DWG.
Initial Temp. F	216.300		
Initial Pres. psia	16.000		
No. of orifice	1.000	ORI-602B	Located at node SEP1A
K_orifice	218.200		
Orifice ID, in	1.156		
Flow Rate, lbm/sec	2.170		

Table 952.37-1 (continued)
AP600 OSU Test Facility Orifice Plate Summary

Component		OSU Test Facility		Remark
		Design	Orif. ID	
22. Large Break Separator Liquid Line				DWG LKL 930400 sheet 1 Rev. 2
(for all break cases)				Node A to Node E
	ID, in	Note 1		Note 1: Line size varies. See DWG.
	Initial Temp. F	216.300		
	Initial Pres. psia	16.000		
	No. of orifice	1.000	ORI-905	Located at node E
	K_orifice	9.330		
	Orifice ID, in	1.281		
	Flow Rate, lbm/sec	20.970		

Table 952.37-1 (continued)
AP600 OSU Test Facility Orifice Plate Summary

The following orifice plates are designed to model ADS flow area, not for line resistance fine tuning.

Line Identification	Orifice No.	Remark
(a) ADS 1-3 Simulating Double Ended DVI Line break and single train of ADS1-3	ORI-655-1	Between node ADS9 - ADS9a (ADS stage 1)
(DWG LKL 920202 sheet 1 Rev. 5)	ORI-656-1	Between node ADS7 and ADS8 (2nd Stage ADS)
	ORI-657-1	Between node ADS5 and ADS10 (3rd Stage ADS)
(b) ADS 1-3 simulating Double Ended DVI line break and TWO TRAIN of ADS 1-3	ORI-655-2	Between node ADS9 - ADS9a (ADS stage 1)
(DWG LKL 920202 sheet 1 Rev. 5)	ORI-656-2	Between node ADS7 and ADS8 (2nd Stage ADS)
	ORI-657-2	Between node ADS5 and ADS10 (3rd Stage ADS)
(c) ADS4 on hot leg #1 (CMT side) (8" ADS4 separator side) (With no failure on the ADS4 line)	ORI-651	Downstream of ADS4 valve, RCS-615 (DWG LKL 930502 sheet 1 Rev. 0)
(d) ADS4 on hot leg #2 (Pressurizer side) (5" ADS4 separator side) (With no failure on the ADS4 line)	ORI-652	Downstream of ADS4 valve, RCS-616 (DWG LKL 930502 sheet 1 Rev. 0)

Table 952.37-2
AP600 OSU Test Facility Break Area Calculations

Break Area Calculations

P_{AP600} = [ ] (a,c) psia P_{APEX} = 350

		AP600	APEX
I.	Hot Leg	[ ] (a,c)	
	Wall Thickness (L) in.		0.5213
	Break Diameter (D) in.		0.3208
	Break Area (A) in^2		0.0808
	(L/D)		1.625
II.	Cold Leg		
	Wall Thickness (L) in.		0.4106
	Break Diameter (D) in.		0.3208
	Break Area (A) in^2		0.0808
	(L/D)		1.28
III.	ADS Throat Area - DEDVI		
	1st Stage ADS		
	Single Line:	[ ] (a,c)	
	Throat Diameter in.		0.2886
	Minimum Area in^2		0.6540
	Two Lines Combined:		
	Throat Diameter		0.4082
	Minimum Area in^2		0.1308
	2nd and 3rd Stage ADS		
	Single Line:		
	Throat Diameter in.		0.6234
	Minimum Area in^2		0.3052
	Two Lines Combined:		
	Throat Diameter in.		0.8816
	Maximum Throat Area in^2		0.6104
VI.	Fourth Stage ADS - (Fluid Property Similitude)		
	Single Line:	[ ] (a,c)	
	Throat Diameter in		1.004
	Maximum Throat Area in^2		0.7917

Question 952.38

Identify any valves in the OSU/APEX facility that may have significant flow losses as a result of their design. Provide an estimate of the expected pressure drop.

Response:

The valves for the Core Makeup Tank, ADS Stages 1 through 4, IRWST, accumulators and sump recirculation are full port ball valves and therefore do not introduce significant flow losses. Standard check valves have been implemented in the injection lines. The pressure drop in these lines, as well as all other primary system piping, are being measured as part of preoperational testing. Line resistances will be calculated using the flow test results. Control valves used in the feedwater lines, BAMS and condensate return system will be throttled to model scaled AP600 processes.

Question 952.39

Provide the valve opening and closing rates for the motor-operated valves used in the OSU/APEX facility.

Response:

All injection lines, ADS Stages 1 through 4, Core Makeup Tank and sump recirculation line valves have opening and closing times of less than 1 second.

Question 952.40

Provide the planned power to each radial zone of the core heater rods of the OSU/APEX facility. If specific measurements or design requirements have been made of the axial power profile, provide these values.

Response:

The OSU test facility simulated core region is comprised of 24 rods in the high power region and 24 rods in the low power region. Each rod has a heated length of 3 feet and a maximum power of 15 kw. The following additional information is provided:

Table 952.40-1 AP600 OSU Test Facility Core Decay Power Simulation
Table 952.40-2 AP600 OSU Test Facility Axial Power Fractions for 1/4 Length Scale Core
Figure 952.40-1 AP600 OSU Test Facility Radial Power Distribution in Model Core
Figure 952.40-2 AP600 OSU Test Facility Core Power Decay Simulation
Figure 952.40-3 AP600 OSU Test Facility Axial Linear Power Profile (Normalized) for the Model Core

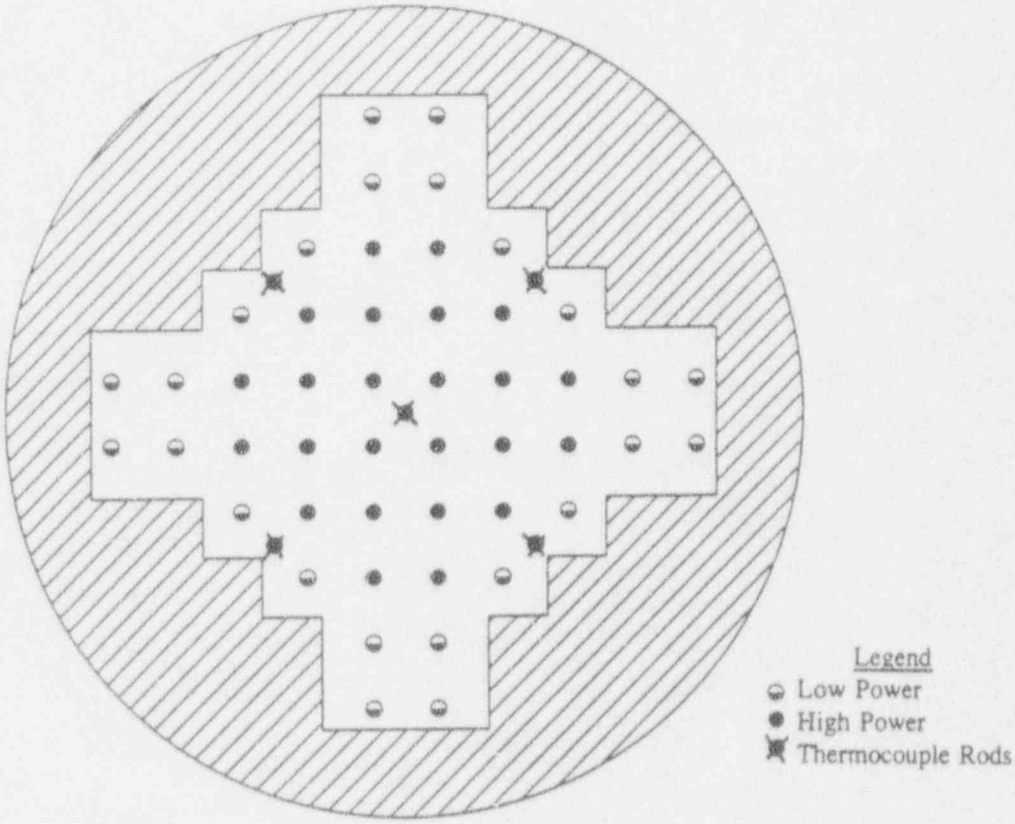
Table 952.40-1
AP600 OSU Test Facility Core Decay Power Simulation

DECAY TIME (SEC)	MODEL POWER (KW)	HIGH POWER ZONE	LOW POWER ZONE	MODEL Int. (KJ)	IDEAL Int. Energy (KJ)
0.5	700.0	350.0	350.0	175.0	316.0
0.75	700.0	350.0	350.0	350.0	627.8
1	700.0	350.0	350.0	525.0	931.7
2	700.0	350.0	350.0	1225.0	2088.0
3	700.0	350.0	350.0	1925.0	3170.8
4	700.0	350.0	350.0	2625.0	4202.4
5	700.0	350.0	350.0	3325.0	5194.6
7.5	700.0	350.0	350.0	5075.0	7553.4
10	700.0	350.0	350.0	6825.0	9778.8
20	700.0	350.0	350.0	13825.0	17949.9
30	700.0	350.0	350.0	20825.0	25316.4
40	700.0	350.0	350.0	27825.0	32186.9
50	700.0	350.0	350.0	34825.0	38703.1
75	650.0	350.0	300.0	51700.0	53970.7
100	574.7	335.0	239.7	67008.3	68174.1
200	479.3	313.9	165.3	119704.1	119704.2
300	439.7	288.0	151.7	165653.0	165653.1
400	411.7	269.7	142.0	208223.4	208223.5
500	389.8	255.3	134.5	248298.4	248298.6
750	350.0	229.2	120.7	340771.4	340771.5
1000	322.1	211.0	111.1	424785.1	424785.2
2000	260.2	170.4	89.8	715964.4	715964.5
3000	229.4	150.3	79.1	960778.8	960779.0
4000	209.9	137.5	72.4	1180434.1	1180434.2
5000	195.9	128.3	67.6	1383350.8	1383350.9
7500	173.0	113.3	59.7	1844560.0	1844560.1
10000	158.7	103.9	54.7	2259173.4	2259173.5
20000	129.2	84.6	44.6	3698382.5	3698382.7
30000	114.7	75.1	39.6	4917833.7	4917833.8
40000	105.8	69.3	36.5	6020217.6	6020217.7
50000	99.5	65.2	34.3	7046661.7	7046661.8
75000	89.7	58.7	30.9	9411755.2	9411755.3
100000	83.7	54.8	28.9	11579554.3	11579554.4

Table 952.40-2
AP600 OSU Test Facility
Axial Power Fractions for 1/4 Length Scale Core

Axial Power Fractions for 1/4 Length Scale Core		
Integration Band (ft)		Fraction of Total Rod Power
2.5 - 3.0		0.19363
2.0 - 2.5		0.24293
1.5 - 2.0		0.22485
1.0 - 1.5		0.17981
0.5 - 1.0		0.11724
0 - 0.5		0.04154
	Total	1.00000

Figure 952.40-1
AP600 OSU Test Facility
Radial Power Distribution in Model Core



Attachment 1 to Westinghouse Letter NTD-94-4070 (continued)

Figure 952.40-2
AP600 OSU Test Facility
Core Power Decay Simulation

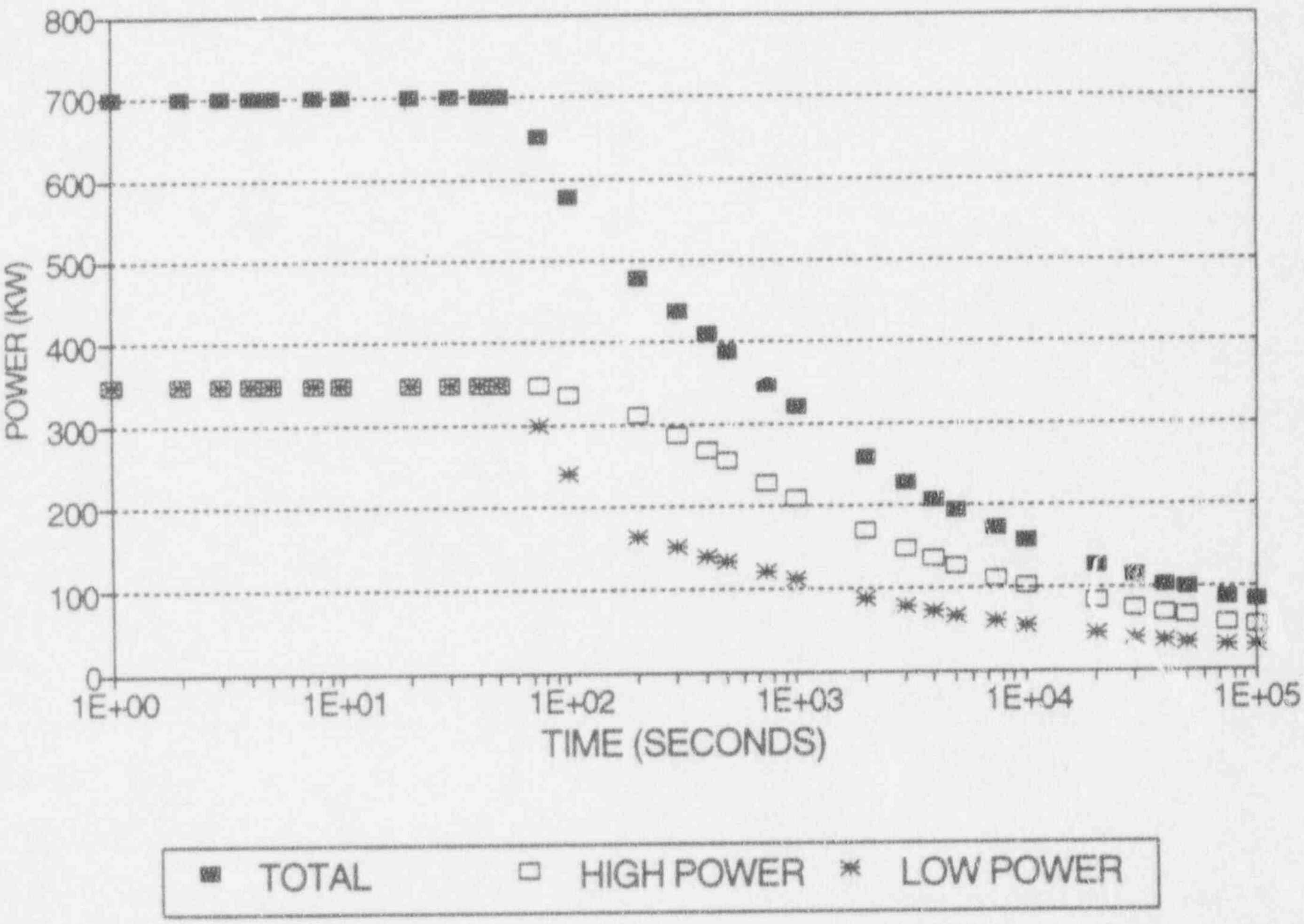
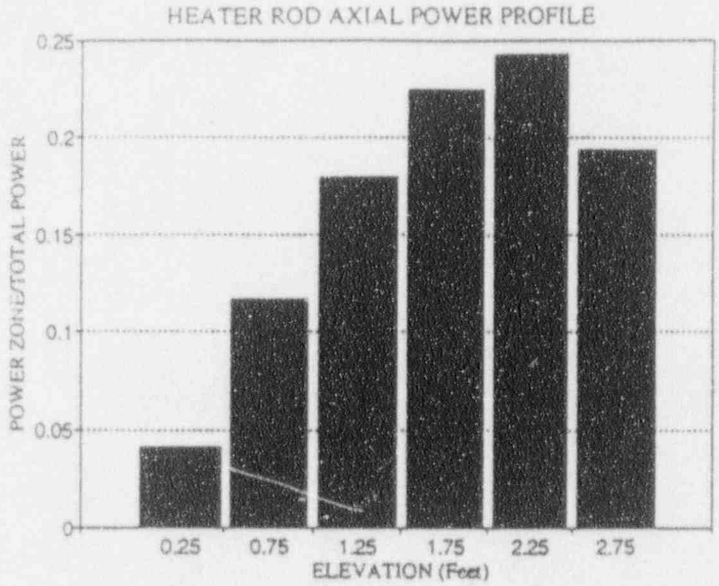
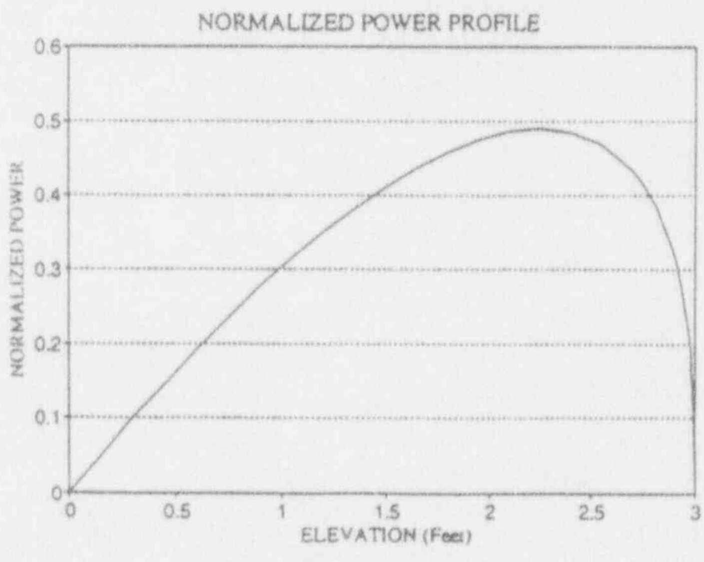


Figure 952.40-3
AP600 OSU Test Facility
Axial Linear Power Profile (Normalized) for the Model Core





Question 952.41

Provide Drawings LKL 930104 (referenced in Note 5 on LKL 920200, sheet 4) and LKL 930105 (referenced in Note 7 on LKL 920200, sheet 2).

Response:

The following draft drawings are provided as Enclosure 1 to Westinghouse letter NTD-94-4070, dated March 31, 1994:

LKL920200 Sheet 3, Revision 7, AP600 Long Term Cooling Test Model Isometric-0 Deg Side
LKL920201 Sheet 6, Revision 5, AP600 Long Term Cooling Test Model Isometric-180 Deg Side
LKL930112 Sheets 1-2, Revision 0, CMT/CL Balance Line Small Break LOCA
LKL930104 Sheets 1-4, Revision 1, CMT/CL Balance Line DEG Break LOCA
LKL930105 Sheets 1-2, Revision 1, DVI #1 Line Small Break LOCA
LKL930106 Sheets 1-3, Revision 2, DEG DVI Break Piping Arrangement
LKL940110 Sheets 1-3, Revision 0, PZR/CMT Line DEG Break Pipe Arrangement
LKL930108 Sheets 1-2, Revision 1, Hot Leg Small Break Piping Arrangement
LKL930108 Sheet 3, Revision 2, Hot Leg Small Break Piping Arrangement
LKL930501 Sheet 1, Revision 0, Cold Leg Small Break Pipe Arrangement
LKL930107 Sheet 1, Revision 2, Cold Leg Break Spool

Attachment 2 to Westinghouse Letter NTD-94-4070

Information in support of Westinghouse Response to RAI 952.49

Initial and Boundary Condition Data for AP600 Testing
at the SPES-2 Test Facility

Question 952.49 - **Provide the following information on the SPES-2 test conditions:**

a. Break Geometry

a.1. **Target break mass flow at specified conditions.**

Response
Figure 952.49-1 provides the break flow for a SPES-2 "2 inch cold leg break" test as calculated by the NOTRUMP computer code. Figures 952.49-2 and 952.49-3 identify the the break spool piece configuration and location.

a.2. **Scaling criteria for break area.**

Response
The scaling criteria used for SPES-2 is to divide the simulated plant break area by the scaling factor of 395.

a.3. **Break length-to-diameter ratio.**

Response
The break L/D ratio has been based on the wall thickness of the AP600 cold leg piping, which is 2.56 inches. For example, a "2-inch" break would have an L/D of approximately 1.3 (see Figure 952.49-4). This criteria will not apply to the DVI and CL to CMT balance line DEG breaks since they are full guillotine breaks of the piping..

a.4. **Break geometry, e.g., beveled orifice, etc.**

Response
The break orifice will use a rounded inlet with a radius equal to the break diameter. The L/D portion of the break will start after the inlet rounding and where the flow area is a constant. Figure 952.49-4 illustrates the break geometry.

b. Core power decay

b.1. Basis for core power decay, viz. exposure, fuel makeup, steady-state conditions.

Response

The basis for the SPES-2 core power decay is to simulate the heat flux vs. time from the AP600 fuel rods; including stored energy and fission product decay heat. This core power decay vs. time has been determined based on AP600 LOFTRAN analyses. The fission product decay heat vs. time is based on the ANS 1979 decay heat standard plus two sigma uncertainty. The SPES-2 heat loss compensation value (150 kw) is based on pre-operational testing and is added to the SPES-2 core power decay. Table 952.49-1 provides the SPES-2 decay heat simulation as a function of time after trip with the exception of the compensation for the SPES-2 heat losses. Because of the limitations of the SPES-2 heater rod control system, the AP600 core power vs. time is simulated as follows:

- SPES-2 core power is maintained at 102% for 5.75 seconds after the reactor trip setpoint is reached.

- The SPES-2 power is reduced in a single step to 20% (maximum power of the continuous low power heated rod power control system) and maintained until 12.38 seconds after reactor trip. At this time the integrated SPES-2 heated rod power is equivalent to 1/395 of the AP600 nuclear fuel heat input.

- The SPES-2 power level is maintained at 20% (the maximum power level) until 14.5 seconds. At this time the AP600 core power fraction of full power is 0.169; where 0.169 (4.89 MW) + 150 kw = 0.2 (4.89) and 150 kw is equal to the heat loss compensation.

- From 14.5 seconds until the actuation of the first stage of ADS, the SPES-2 power decay is that identified in Table 952.49-1plus 150 kw (the heat loss compensation).

- When the first stage of ADS is actuated, the SPES-2 heat loss compensation is stopped and the power decay is as show on Table 952.49-1.

b.2. Scaling basis, e.g., how should stored energy be considered.

Response

The observed SPES-2 facility total heat capacity including both primary and secondary side metal and water is approximately 4700 Btu/°F. This compares with an ideal scaled heat capacity of 2700 BTU/°F (AP600 heat capacity/395). This additional heat capacity is due entirely to metal heat since the SPES-2 primary and secondary water volumes are scaled (1/395 of AP600). On the basis of pre-test analyses, the fourth stage ADS flow area was made 2.6 times larger than scaled.

c. **Trace heating**

Should trace heating be used and if so using what scaling basis. Description of control logic

Response

The SPES-2 facility uses trace heating for both the cold leg-to-CMT and pressurizer-to-CMT balance lines to achieve preset temperatures. Power to the trace heaters is turned off following receipt of an "S" signal and thus no scaling basis is required.

d. **Initial conditions**

d.1. **Pressurizer level (Based on what? Scaled gas volume? Scaled liquid volume? Height?)**

Response

The initial pressurizer level is provided in Table 952.49-2. This level is based on both scaled gas volume and scaled liquid volume, with level adjustments to obtain correct liquid volume.

d.2. **Initial thermodynamic conditions in primary and secondary, e.g., pressure and temperature.**

Response

Initial thermodynamic conditions for the primary and secondary systems are identified in Table 952.49-2. The initial conditions are established to preserve primary system initial conditions (pressure, temperatures, flow). The secondary system pressure of 4.9 MPa (abs) was determined simply to obtain the proper primary conditions. This pressure was determined by pre-test analysis such that when the "core outlet" temperature was 315°C (600°F) and core power was 4.9916 MWt (102%), T_{cold} was 276°C (529°F). This pressure is lower than AP600 due to the fact that the SPES-2 steam generator tube area is less than the scaled AP600 area.

d.3. **Initial flow conditions.**

Response

The initial primary system flow conditions are identified in Table 952.49-2. This flow is scaled from the AP600.

d.4. **Secondary water level or mass level?**

Response

The initial steam generator narrow range water level is identified in Table 952.49-2. This initial level corresponds to a reference elevation of 12.8 meters (see Figure 952.49-5, SPES-2 SG Measurement Arrangement). At this level, the secondary water mass is approximately 160 kg per SG.

d.5. **Pressurizer heater level.**

Response

The pressurizer internal heaters are shut off if the pressurizer level is $\leq$ 2 meters. The heaters are also shut off on an "S" signal. The presssurizer heaters are not used for heat loss compensation.

d.6. Tank water levels, e.g., IRWST

Response
Initial water levels for the IRWST, CMTs and Accumulators are provided in Table 952.49-2. These levels are prototypic based on the full height scale of the test facility, i.e., 1 to 1 height relationship.

d.7. Back pressure setpoints for breaks.

Response
All breaks and the ADS vent to atmospheric pressure.

e. **Boundary conditions**

e.1. Trip points and time delays for all equipment, e.g., pressurizer heaters, S-valves (CMT, IRWST, PRHR and isolation valves), ADS, scram, turbine stop valve, secondary SRVs and PORVs, pumps, accumulators.

Response
The trip setpoints and time delays are identified in Table 952.49-3.

e.2. Pump coastdown curves

Response
The SPES-2 pumps are turned off 16.2 seconds after the S-signal. The pumps coast down to 0 rpm in 5-8 seconds.

e.3. Pressurizer heater controls

Response
The pressurizer internal heaters are shut off if the pressurizer level is $\leq$ 2 meters. The heaters are also shut off on an "S" signal. The external pressurizer heaters are not used for heat loss compensation.

e.4. Secondary valve closure controls

Response
This information is provided in Table 952.49-3.

e.5. Core power control.

Response
This information is provided in the response to item b.1.

f. ADS

f.1. Basis for design

Response

The basis for the ADS flow area is the same as that for the break, that is, the minimum plant area is divided by the scale factor of 395. The ADS valve opening times are described in Table 952.49-4.

f.2. **Scaling requirements for ADS orifices including target mass flows at specified conditions**

Response

The orifices that will be used for the ADS valve simulations will be sharp edged abrupt orifices with no inlet rounding. Table 952.49-5 provides the AP600 minimum and maximum valve areas and resistances. Table 952.49-6 provides the required saturated steam critical flow rates for the AP600 ADS control valves.

g. SRVs & PORVs

Target mass flows at specified conditions.

Response

SPES-2 SG PORV Simulation

- The SPES-2 steam generator PORV line contains a square edged orifice with a 5.2 mm diameter orifice
- Design flow is 0.24 kg/s at 7.8 MPa SG pressure

For the small break LOCA simulations, the SPES-2 steam generator PORV opening setpoint is 7.0 MPa. SPES-2 steam generator PORV reclosure occurs at 6.5 MPa. This pressure range (6.5 - 7.0) assures that T_{cold} during natural circulation will remain at approximately $T_{no\ load}$ (547 °F).

SPES-2 SG Safety Valve

- 10 MPa set pressure
- SV's are 3x4 inch with a 34 mm diameter flow area

The SPES-2 steam generator safety valves are set for equipment protection only. Their use is not anticipated.

Table 952.49-1
SPES-2 Power Decay Curve

Time from trip (seconds)	Fractional Power
0.0	1.02
5.75	1.02
5.76	0.2
12.38	0.2
15.00	0.1542
17.5	0.1300
20.82	0.1121
22.5	0.0917
25.0	0.0868
27.5	0.0823
30.0	0.0782
35.0	0.0710
40.0	0.0648
45.0	0.0604
50.0	0.0573
70.0	0.0479
100.0	0.0403
200.0	0.0317
500.0	0.0259
1000.0	0.0222
2000.0	0.0183
3000.0	0.0162
4000.0	0.0148

Table 952.49-2
SPES-2 Test Initial Condition Criteria

PRIMARY CIRCUIT

	Value/Tolerance	Units	
Heat rod power	4.9916 ± 0.1	MW	
Pressurizer pressure	15.51 ± 0.2	MPa abs	
Pressurizer level	3.78 ± 0.38	m	(~ 56% level)
Average HL/Core outlet temperature	315.5 ± 3	°C	
Core inlet temperature	276.4 ± 2	°C	
Core flowrate	23.25 ± 0.25	kg/s	
Cold leg flowrate	5.86 ± 0.10	kg/s	
DC-UH bypass flowrate	0.18 ± 0.05	kg/s	
Accumulator water level	2.33 ± 0.10	m	
Accumulator water temperature	20 ± 5	°C	
Accumulator pressure	4.9 ± 0.1	MPa abs	
IRWST level	8.5 ± 0.1	m	
IRWST water temperature	20 ± 5	°C	
PRHR supply line temperature	175 ± 25	°C	
Average UH temperature	296 ± 5	°C	
Pressurizer to CMT BL temperature	340 +25/-0	°C	
CL to CMT BL temperature	276 ± 5	°C	
CMT level	Full (0.61 kPa)		
CMT temperature	20 ± 5	°C	

SECONDARY CIRCUIT

	Value/Tolerance	Units	
SG's narrow range level	1.48 ± 0.15	m	(~60% NR)
SG's main feedwater temperature	226 ± 7	°C	
SG's pressure	4.9 ± 0.2	MPa abs	

Table 952.49-3
SPES-2 Test Setpoints for Cold Leg Break Matrix Tests

Actuation signals, setpoints, trips and boundary conditions to be used for SPES-2 tests are reported here.

Reactor Trip and "S" Signal Trip Setpoints

Reactor trip "R" when PR pressure P-027P = 12.41 MPa abs
Signal "S" when PR pressure P-027P = 11.72 MPa abs

Type of operation	Signal	Delay Time (s)	Actuation Time (s)
SCRAM	R	5.75	(Table 952.49-1)
MSIV closure	R	2.0	2.0
MFWIV closure	S	2.0	2.0
PCP trip	S	16.2	--
CMTIV open	S	2.0	2.0
SFW start (+)	S	2.0	--
CMT balance line heat tracing off	S	manual actuation	--
PRHR IV open (++)	S	2.0	2.0
PZR Int. Heaters off	S	--	--

(+) SFW flowrate values are specified below.

(++) Passive RHR activation: also by Protection System when either SG's low narrow range level is at 5.6% of span corresponding to measured levels L-A20S/L-B20S = 0.15 m = 0.492 ft, plus a delay time of 60 s.

Startup FW isolation: the SFW will be stopped by two different trips:

a) by low T_{cold} trip at 514°F = 268°C measured in any one of the four cold legs (T-A012P/T-B012P/T-A011P/T-B012P).
b) by high SG narrow range level at 79% of span corresponding to measured levels L-A20S = 2.1 m = 6.89 ft. In this case the SFW will be stopped only for the SG in which the narrow range level reaches the trip of 2.1 m, while it will continue to feed the other SG. The SFW should restart if/when the normal SG narrow range level is restored.

Normal RHR: For Matrix Tests 2 and 4, the NRHR begins to inject when primary pressure is lower than 1.1 MPa abs with a flowrate temperature T-A02E/T-B02E = 20$\pm$5°C. The NRHR pump flowrate vs. primary system pressure is:

Primary pressure (MPa abs)	Total Flowrate (kg/s)	F-A00E/F-B00E (kg/s)
1.1	0	0
1.0	0.11	0.055
0.86	0.17	0.085
0.69	0.21	0.105
0.5	0.25	0.125
0.34	0.28	0.140
0.2	0.30	0.150
0.1	0.32	0.160

Table 952.49-3 (continued)
SPES-2 Test Setpoints for Cold Leg Break Matrix Tests

ADS logic actuation versus CMT's measured levels (L-A40E/L-B40E) plus time delay:

ADS Stage	Orifice Dia (mm)	CMT Volume (%)	L-A40E/L-B40E (m)	Valve Open Signal Delay Time(s)	Valve Actuation Time(s)
First	4.370	67	4.152	30	2 sec.
Second	9.346	67	4.152	125	2 sec.
Third	9.346	67	4.152	245	2 sec.
(+)Fourth (A)	20.681	20	1.192	60	2 sec.
(+)Fourth (B)	14.624	20	1.192	60	2 sec.

(+) For matrix tests 5 and 6 (DVI line breaks) the fourth stage ADS actuation setpoints are:
fourth (A) - both 20% CMT volume (1.192m) plus 60 seconds, but at least 360 seconds after 67% CMT A or B volume is reached.
fourth (B) - both 20% CMT volume (1.192m) plus 60 seconds, but at least 360 seconds after 67% CMT A or B volume is reached

For matrix test 6 (DEG DVI break) ADS Stage 1area = 3.09 mm, ADS Stage 3 area = 6.609 mm and ADS Stage 4 (B) area = 20.681 mm.

CVCS: For Matrix Tests 2 and 4, the CVCS begins to inject following the "S" signal and PZR level falls to 10%. The CVCS pump is stopped if PZR level increases to 20%.
The CVCS fluid temperature is 20±5°C; the CVCS pump flowrate vs. primary system pressure is:

Primary Pressure (MPa abs)	Flowrate (F-001A) (kg/s)*
15.5	0.034
13.8	0.040
10.3	0.050
6.9	0.060
3.4	0.070
0.1	0.080

* Test flow rates based on 1/395th scale

SFW: For Matrix Tests 2 and 4, the SFW begins to inject at "S" signal plus a delay time of 2 s. The SFW temperature is T-A20A/T-B20A = 30°C (86°F). The SFW characteristics are:

SG Secondary Pressure (MPa abs)	Total Flowrate (kg/s)	F-A20A/F-B20A (kg/s)
7.48	0.064	0.032
7.0	0.084	0.042
6.0	0.112	0.056
4.8	0.150	0.075

Table 952.49-3 (continued)
SPES-2 Test Setpoints for Cold Leg Break Matrix Tests

Other Setpoints

Pressurizer PORV (ADS 1st stage) opening setpoint	16.2 MPa abs
Steam Generator PORV opening setpoint	7.0 MPa abs
Setpoint for PR internal heaters trip	2.0 m
Primary circuit safety valve opening setpoint	20.0 MPa abs
Secondary circuit safety valve opening setpoint	10.0 MPa abs
SPES-2 core temperature limit	590°C
CMT secondary side PORV opening setpoint	6.7 MPa abs

Table 952.49-4
SPES-2 ADS Valve Opening Time Logic

ADS Stage	AP600 ADS Isolation Valve		AP600 ADS Control Valve		SPES-2 Valve
Stage 1 actuation on CMT level of 67% ET - elapsed time					
1	0 to 100% open	0 to 20 sec. ET	0 to 100% open	20 to 40 sec. ET	30 seconds ET
2	0 to 100% open	60 to 90 sec. ET	0 to 100% open	90 to 160 sec. ET	125 seconds ET
3	0 to 100% open	180 to 210 sec. ET	0 to 100% open	210 to 280 sec. ET	245 seconds ET
Stage 4 actuation on CMT level of 20%					
4A	0 to 100% open	0 to 30 sec. ET	0 to 100% open	30 to 45 sec. ET	60 seconds ET
4B	0 to 100% open	30 to 60 sec. ET	0 to 100% open	60 to 75 sec. ET	

Table 952.49-5
Limiting AP600 ADS Valve Parameters

ADS Stage	Valve Body	Flow Area (in^2)		Resistance (L/D)	
		Minimum	Maximum	Minimum	Maximum
Stage 1 Isolation	gate				
Stage 1 Control	globe				
Stage 2/3 Isolation	gate				
Stage 2/3 Control (globe)	globe				
Stage 2/3 Control (gate)	gate				
Stage 4 Isolation	gate				
Stage 4 Control (squib)	squib				
Stage 4 Control (gate)	gate				

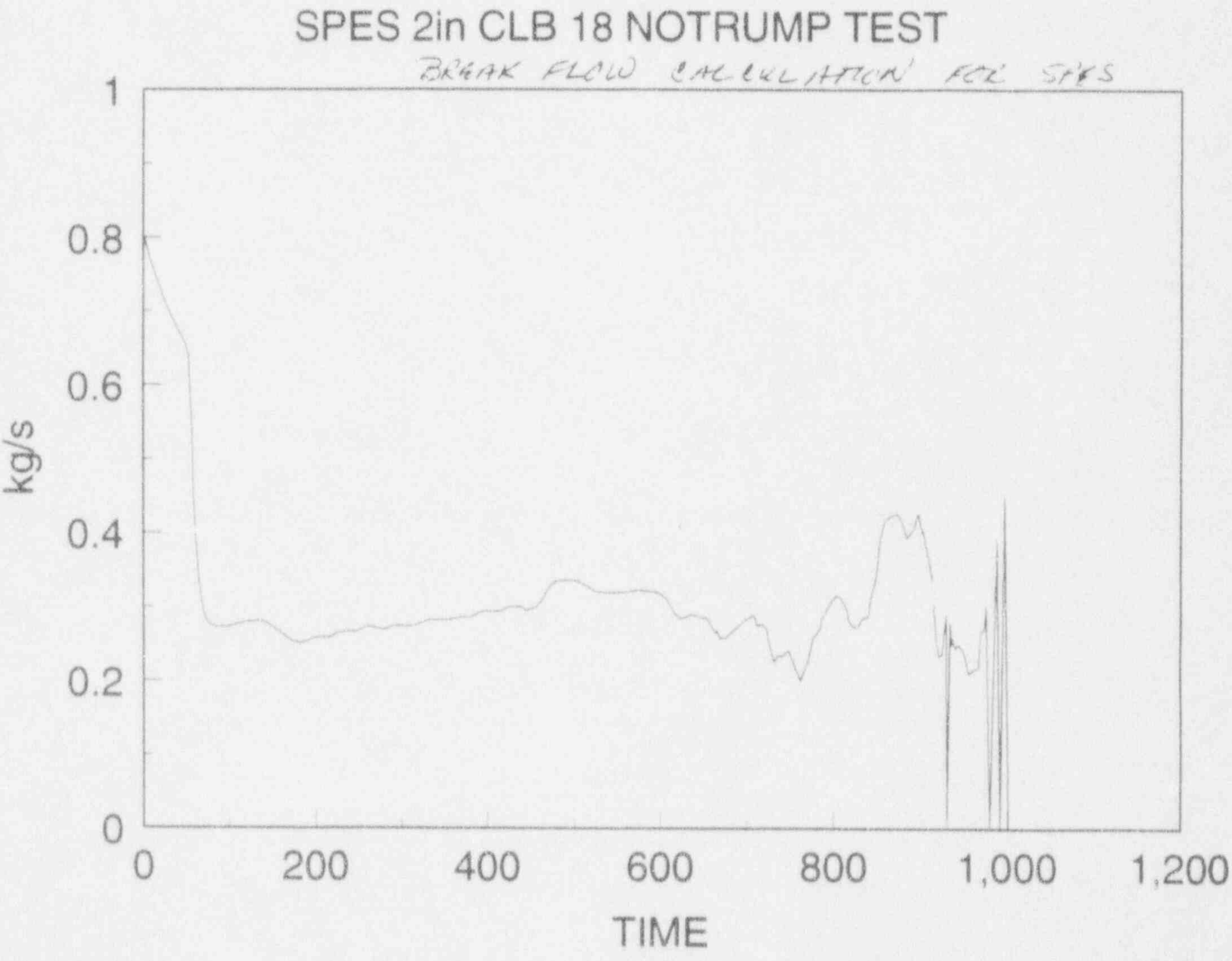
(a,c)

Table 952.49-6
Required Critical Flows (saturated steam) for ADS Control Valves

ADS Stage	Minimum Flow Area (in^2)	Inlet Pressure (psia)	Flow Rate (lb/sec)
Stage 1 Control			
Stage 2/3 Control			
Stage 4 Control			

(a,c)

Figure 952.49-1
Calculated Break Flow vs. Time for SPES-2 2 inch Cold Leg Break



Attachment 2 to Westinghouse Letter NTD-94-4070 (continued)

Figure 952.49-2
SPES-2 Break Spool Piece Configuration

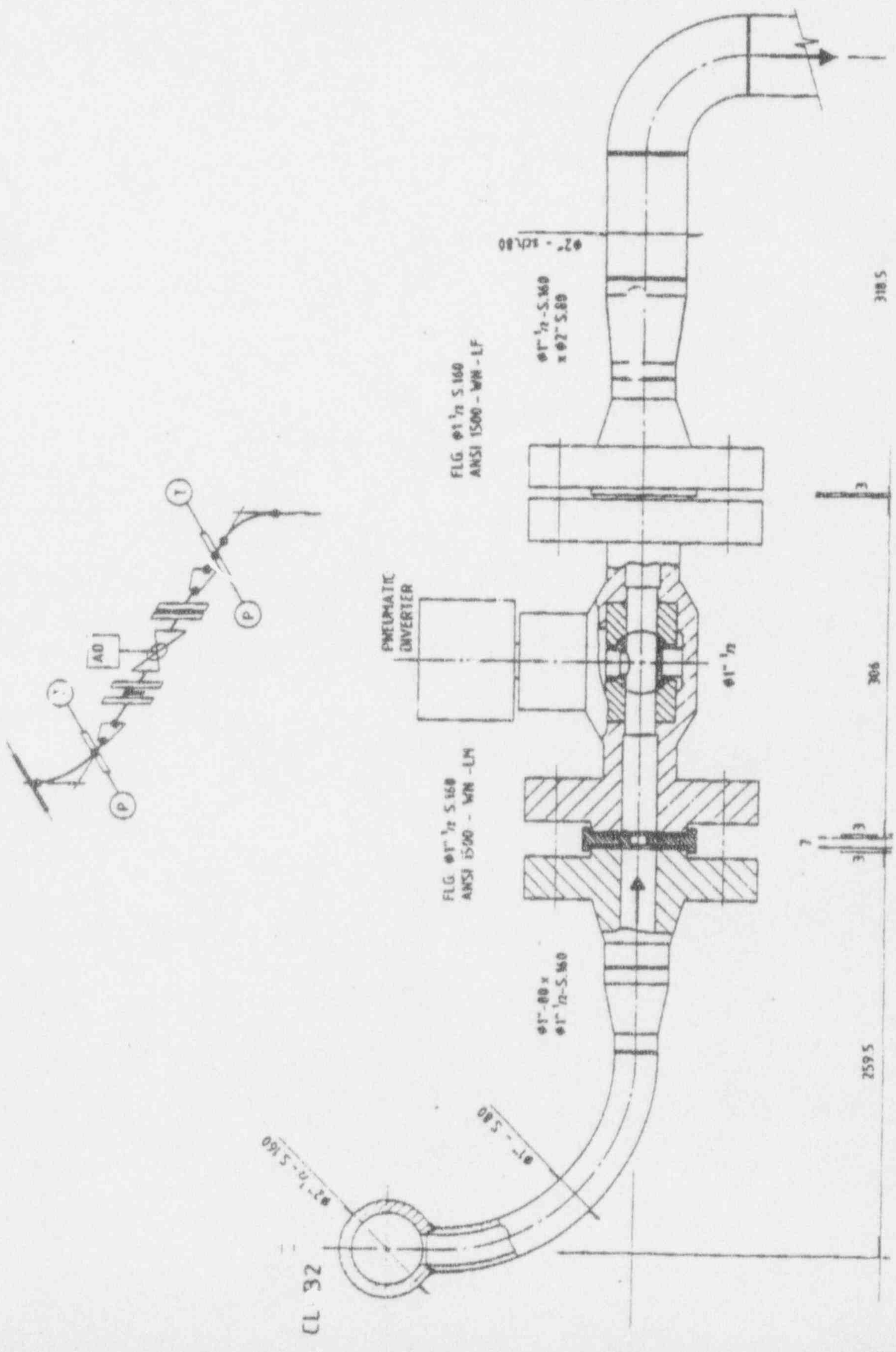
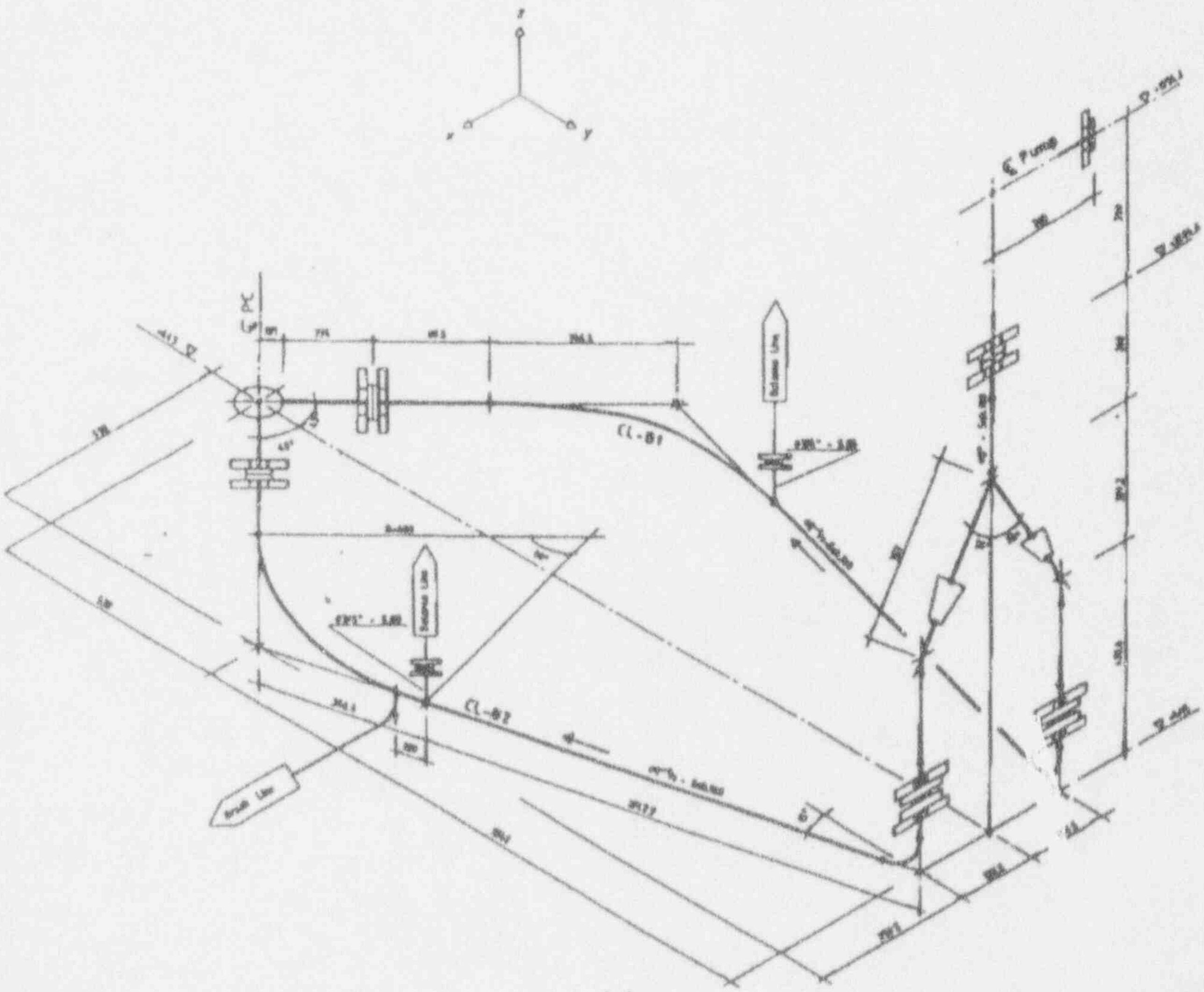


Figure 952.49-3
SPES-2 Break Spool Piece Location



Attachment 2 to Westinghouse Letter NTD-94-4070 (continued)

Figure 952.49-4
SPES-2 Break Simulation for "2-inch" Break

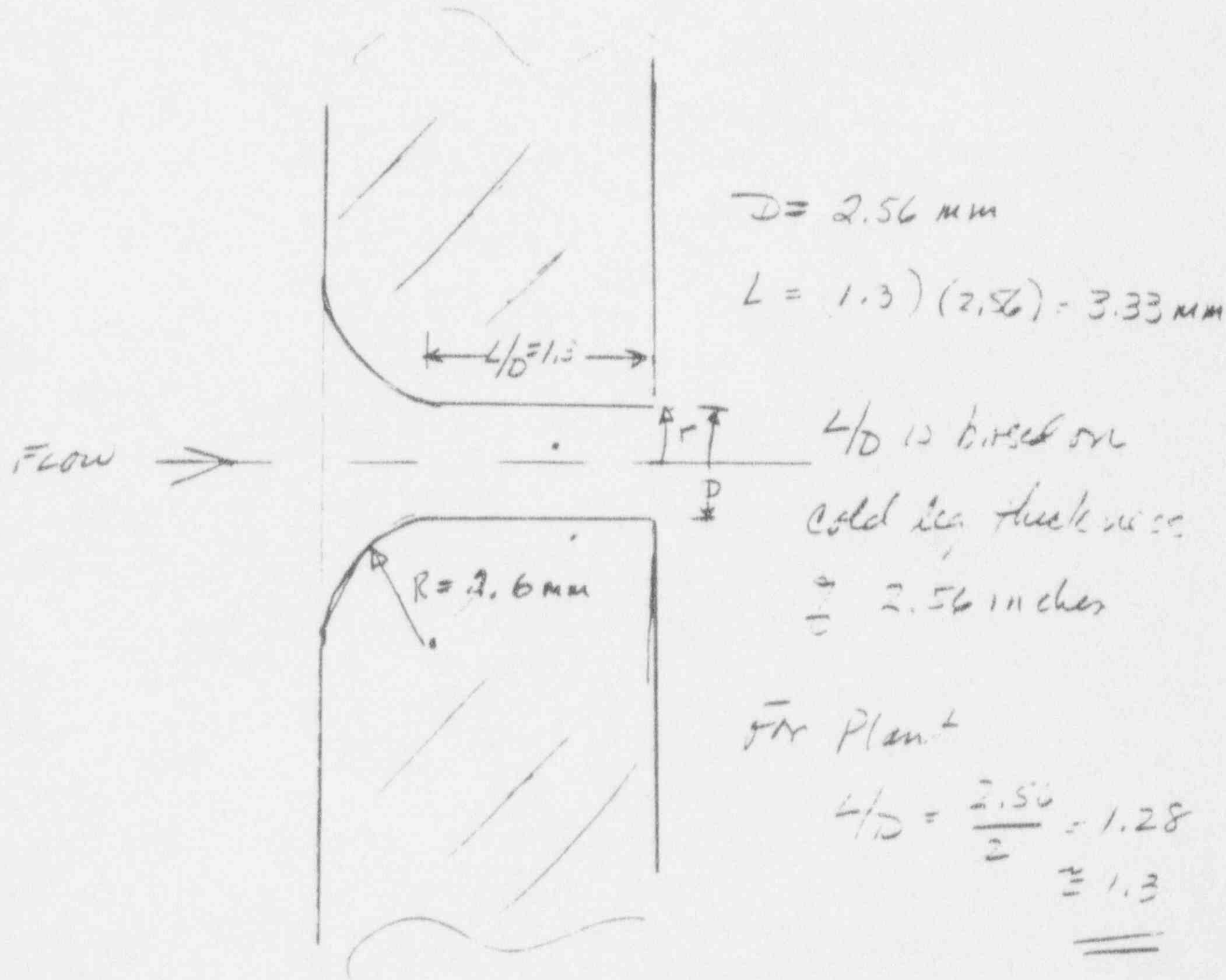
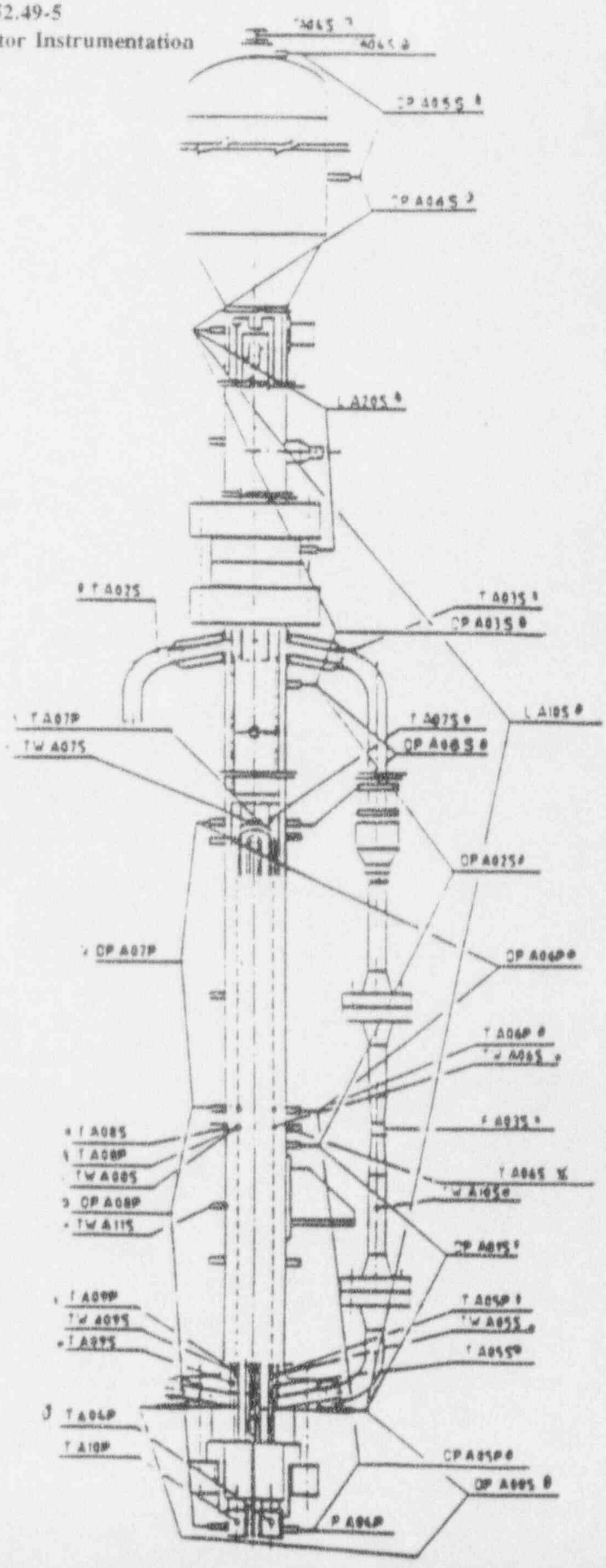


Figure 952.49-5
SPES-2 Steam Generator Instrumentation

MEASUREMENT TAG	PRESS TAP	TAP ELEVATION (mm)
P A04P		+ 3582
P A04S		+ 19172
DP A05P	P1	+ 3582
	P2	+ 8707
DP A06P	P2	+ 12487
	P1	+ 8707
DP A07P	P2	+ 8707
	P1	+ 12487
DP A08P	P1	+ 8707
	P2	+ 3582
DP A01S	P1	+ 4137
	P2	+ 8107
DP A02S	P1	+ 8107
	P2	+ 14807
DP A03S	P1	+ 14807
	P2	+ 17807
DP A04S	P1	+ 17807
	P2	+ 18482
DP A05S	P1	+ 18482
	P2	+ 19172
DP A00S		+ 4137
DP A08S	P1	+ 12487
	P2	+ 14807
L A20S	P1	+ 15147
	P2	+ 17807
L A10S	P1	+ 4137
	P2	+ 15147
T A02S		+ 14717
T A03S		+ 14717
T A04P		+ 3582
T A04S		+ 19764
T A05P		+ 4292
TW A05S		+ 4292
T A05S		+ 4287
T A06P		+ 8392
TW A06S		+ 8392
T A06S		+ 8387
T A07P		+ 12377
TW A07S		+ 12377
T A07S		+ 12387
T A08P		+ 8392
TW A08S		+ 8392
T A08S		+ 8387
T A09P		+ 4292
TW A09S		+ 4292
T A09S		+ 4287
T A10P		+ 3582
TW A10S		+ 6779
TW A11S		+ 6779
F A01S	P1	+ 5292
	P2	+ 5287

DP = P1 - P2



Attachment 3 to Westinghouse Letter NTD-94-4070

Westinghouse Responses to Questions Concerning the First SPES-2 Experiment

Question 952.50

What basis was used for determining the quantity of fuel rod stored heat used to program the SPES-2 heater rods? Provide the quantity and distribution of AP600 fuel rod stored heat that was simulated.

Response
The SPES-2 tests start from full volume scaled power to achieve the desired primary and secondary conditions. The SPES heater rods have a uniform axial power distribution. When modeling the power decay, the stored energy effects of the fuel rods, the delayed neutron effects, and the decay power effects are simulated. The approach used is to have the power supply match the calculated heat flux from the Westinghouse LOFTRAN code for an AP600 plant transient. By matching the heat flux from the nuclear rod calculation, the effects of stored energy, delayed neutron heating, and decay power were simulated. The decay power is based on the ANS 1979 plus two sigma uncertainty. Table 952.49-1 (Attachment 2 to Westinghouse letter NTD-NRC-94-4070, dated March 31, 1994) provides the power simulated in the first test without the heat loss compensation. To compensate for the heat loss in the SPES facility, it was determined from pre-test analysis and confirmed from the hot pre-operational tests that the best simulation of the AP600 would occur if the core power was increased by 150 kw from 14.5 seconds to the first stage activation of ADS. The SPES-2 power versus time control approach is given in the response to RAI 952.49, item b.1 (Attachment 2 to Westinghouse letter NTD-NRC-94-4070).

Question 952.51

How much mass was simulated in the SPES-2 secondary?

Response
See the response to RAI 952.49, item d.4 (Attachment 2 to Westinghouse letter NTD-NRC-94-4070).

Question 952.52

Define the basis for determining the pressurizer water level.

Response
See the response to RAI 952.49, item d.1 (Attachment 2 to Westinghouse letter NTD-NRC-94-4070).

Question 952.53

How were the secondary conditions determined for the first SPES-2 test?

Response
See the response to 952.49, item d.2 (Attachment 2 to Westinghouse letter NTD-NRC-94-4070).

Question 952.54

Provide the scaling rationales for designing the experiment and the SPES-2 facility so that a similar scaling rationale can be used to define the ROSA/AP600 experiments.

Response

The scaling rational for designing the SPES facility and the experiments has been previously transmitted to the staff as WCAP-13277, Revision 1 (Westinghouse letter ET-NRC-93-3883, dated May 11, 1993).

Question 952.55

How is heating by delayed neutrons simulated in the SPES-2 power decay?

Response

See response to RAI 952.50 (Attachment 3 to Westinghouse letter NTD-NRC-94-4070).

Question 952.56

What is the basis for the heat loss compensation programmed into the SPES-2 heater rods? What is the relationship between the heat loss compensation assigned to the SPES-2 heater rods and the heat loss compensation from the trace heaters?

Response

See the response to RAI 952.50 (Attachment 3 to Westinghouse letter NTD-NRC-94-4070).

Question 952.57

What are the closing setpoints for the secondary safety relief valves (SRVs) and the pilot-operated relief valves (PORVs)?

Response

See the response to RAI 952.49, item g (Attachment 2 to Westinghouse letter NTD-NRC-94-4070).

Question 952.58

How is the pump speed ramped to zero rpm?

Response

See the response to RAI 952.49, item e.2 (Attachment 2 to Westinghouse letter NTD-NRC-94-4070).

Question 952.59

Are the pressurizer heater rods used to compensate for heat loss from the SPES-2 pressurizer?

Response

See the response to RAI 952.49, item e.3 (Attachment 2 to Westinghouse letter NTD-NRC-94-4070).

Nonproprietary Copy (Drawings Excluded)

Enclosure to Westinghouse Letter NTD-94-4070

AP600 OSU Test Facility Drawings

LKL920200 Sheet 3, Revision 7, AP600 Long Term Cooling Test Model Isometric-0 Deg Side
LKL920201 Sheet 6, Revision 5, AP600 Long Term Cooling Test Model Isometric-180 Deg Side
LKL930112 Sheets 1-2, Revision 0, CMT/CL Balance Line Small Break LOCA
LKL930104 Sheets 1-4, Revision 1, CMT/CL Balance Line DEG Break LOCA
LKL930105 Sheets 1-2, Revision 1, DVI #1 Line Small Break LOCA
LKL930106 Sheets 1-3, Revision 2, DEG DVI Break Piping Arrangement
LKL940110 Sheets 1-3, Revision 0, PZR/CMT Line DEG Break Pipe Arrangement
LKL930108 Sheets 1-2, Revision 1, Hot Leg Small Break Piping Arrangement
LKL930108 Sheet 3, Revision 2, Hot Leg Small Break Piping Arrangement
LKL930501 Sheet 1, Revision 0, Cold Leg Small Break Pipe Arrangement
LKL930107 Sheet 1, Revision 2, Cold Leg Break Spool