

# REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8606110210 DOC. DATE: 86/06/05 NOTARIZED: NO DOCKET #  
 FACIL: STN-50-529 Palo Verde Nuclear Station, Unit 2, Arizona Publi 05000529  
 AUTH. NAME AUTHOR AFFILIATION  
 VAN BRUNT, E. E. Arizona Nuclear Power Project (formerly Arizona Public Serv  
 RECIP. NAME RECIPIENT AFFILIATION  
 KNIIGHTON, G. W. PWR Project Directorate 7

SUBJECT: Forwards results of leakage monitoring testing of sys  
 outside containment which could contain radioactive fluids  
 following accident per Item III.D.1.1 of NUREG-0737 & SSER 2  
 (NUREG-0857).

DISTRIBUTION CODE: A046D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 22  
 TITLE: OR Submittal: TMI Action Plan Rgmt NUREG-0737 & NUREG-0660

NOTES: Standardized plant.

05000529

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PWR-B PEICSB		2	2	PWR-B FOB		1	1
PWR-B PD7 LA		1	0	PWR-B PD7 PD 01		5	5
LICITRA, E		1	1	PWR-B PEICSB		1	1
PWR-B RSB		1	1				
INTERNAL: ACRS	34	10	10	ADM/LFMB		1	0
ELD/HDS3		1	0	IE/DEPER DIR 33		1	1
IE/DEPER/EPB		3	3	NRR BWR ADTS		1	1
NRR PAULSON, W.		1	1	NRR PWR-A ADTS		1	1
NRR PWR-B ADTS		1	1	NRR/DHFT		1	1
NRR/DSRO EMRIT		1	1	<u>REG FILE</u>	04	1	1
R0N5		1	1				
EXTERNAL: 24X		1	1	LPDR	03	1	1
NRC PDR	02	1	1	NSIC	05	1	1

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ACCESSION NO: 880110-10 REC DATE: 880805 INITIATION NO: 000000  
 FACIL: 88-50-529 Peta Verde Nuclear Station Unit 2, Atomic Fuel 000000  
 AUTH NAME: WILSON WILSON  
 PROJ NAME: Arizona Nuclear Power Project (General Atomic Public Power)  
 RECIP NAME: RECIP NAME  
 INITIATION NO: 880110-10 REC DATE: 880805 INITIATION NO: 000000

SUBJECT: Forward results of leakage monitoring test of the  
 nuclear containment which could contain radioactive fluids  
 following accident per item 111 D.1.1 of 880805-0000  
 (880805-0000)

DISTRIBUTION CODE: 0000 COPIES RECEIVED: 111  
 TITLE: OR Submittal: TMI Action Plan Rmt 880805-0000 & 880805-0000

NOTES: Standardized plan.

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PWR-B ADTS	1	PWR-B EB	1	PWR-B ADTS	1	PWR-B EB	1
PWR-B PETCB	2	PWR-B FDR	2	PWR-B PETCB	2	PWR-B FDR	2
PWR-B PDV 1A	1	PWR-B PDV PD 01	0	PWR-B PDV 1A	1	PWR-B PDV PD 01	0
LICITRA-F	1	PWR-B PETCB	1	LICITRA-F	1	PWR-B PETCB	1
PWR-B ROR	1		1	PWR-B ROR	1		1
INTERNAL: 00				INTERNAL: 00			
ADTS	10	ADMS/ENCL	10	ADTS	10	ADMS/ENCL	10
FLD/ADTS	1	EXCHGPR DIR 30	0	FLD/ADTS	1	EXCHGPR DIR 30	0
EXDET/ENCL	3	MWR BWR ADTS	3	EXDET/ENCL	3	MWR BWR ADTS	3
MWR PAULSON M.	1	MWR PWR-A ADTS	1	MWR PAULSON M.	1	MWR PWR-A ADTS	1
MWR PWR-B ADTS	1	MWR/ENCL	1	MWR PWR-B ADTS	1	MWR/ENCL	1
MWR/ENCL ENCL	1	REG FILE	1	MWR/ENCL ENCL	1	REG FILE	1
ROMS	1		1	ROMS	1		1
EXTERNAL: 00				EXTERNAL: 00			
MRC PDR	1	LPDR	1	MRC PDR	1	LPDR	1
	1	NSIC	1		1	NSIC	1



## Arizona Nuclear Power Project

P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

June 5, 1986  
ANPP-36800-EEVB/BJA/98.05

Director of Nuclear Reactor Regulation  
Attention: Mr. George W. Knighton, Project Director  
PWR Project Directorate #7  
Division of Pressurized Water Reactor Licensing - B  
U. S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Subject: Palo Verde Nuclear Generating Station  
Unit 2  
Docket No. STN 50-529 (License No. NPF-51)  
Item III.D.1.1 of NUREG-0737  
File: 86-F-056-026

- References: (1) Letter from E. E. Van Brunt, Jr., ANPP,  
to G. W. Knighton, NRC, dated May 24, 1982  
(ANPP-20853). Subject: Amendment 3 to the  
PVNGS Lessons Learned Implementation Report.  
(2) NUREG-0857, Supplement No. 2; "Safety Evaluation  
Report Related to the Operation of Palo Verde  
Nuclear Generating Station, Units 1, 2, and 3," dated  
May, 1982.

Dear Mr. Knighton:

ANPP previously committed to implement a program to reduce leakage from systems outside containment that could contain highly radioactive fluids during a serious transient or accident to as low as practical levels. As a part of this program, ANPP had agreed to submit a report to the NRC Staff which presents the results of the initial leak rate tests for the subject fluid systems. The attachment to this letter is the report which details the leak rate test that has been performed.

If you have any questions on this matter, please contact Mr. W. F. Quinn of my staff.

Very truly yours,

E. E. Van Brunt, Jr.  
Executive Vice President  
Project Director

8606110210 860605  
PDR ADOCK 05000529  
E PDR

EEVB/BJA/jle  
Attachment

cc: E. A. Licitra (all w/a)  
R. P. Zimmerman  
A. C. Gehr

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RESULTS OF LEAKAGE MONITORING TESTING  
OF SYSTEMS OUTSIDE CONTAINMENT WHICH  
COULD CONTAIN RADIOACTIVE FLUIDS  
FOLLOWING AN ACCIDENT

PALO VERDE NUCLEAR GENERATING STATION - UNIT 2

1. The first part of the document is a letter from the

author to the editor of the journal.

2. The second part is a letter from the editor to the

author, dated 10/10/1964.

3. The third part is a letter from the author to the editor, dated 10/10/1964.

4. The fourth part is a letter from the editor to the author, dated 10/10/1964.

## I. SUMMARY

The objective of the leakage monitoring testing program is to locate and minimize leakage from those portions of the Safety Injection System and the Post-Accident Sampling System which could contain highly radioactive fluids during a serious transient or accident. This testing ensures that leakage from these systems is maintained to as low as practical levels.

The leakage monitoring tests are performed on a schedule of at least once per refueling cycle in order to meet the requirements of PVNGS Unit 2 Technical Specifications 4.5.2.e.4 and 6.8.4.a and NUREG-0737, Item III.D.1.1.

The leakage monitoring tests were performed on those portions of the Safety Injection System and the Post-Accident Sampling System outside containment which are likely to contain radioactive fluids following an accident. The detailed results of these leakage tests are presented in Section III of this report.

The overall estimated leakage from the safety injection system is as follows: (Please note that leakage estimates were not made for the sampling system which was inspected for indications of leakage in order to determine where corrective measures were needed).

	<u>Estimated Leakage (gpm)</u>
Combined Safety Injection/Containment Spray (Trains A and B)	0.0134

## II. LEAKAGE MONITORING TESTING PROGRAM DISCUSSION

This testing program is designed to identify any leakage from the applicable portions of the Safety Injection System (low pressure, high pressure, and containment spray) and the Post-Accident Sampling System. For the Safety Injection System, the system is pressurized to greater than 40 psig at such time an inspector walks down the piping systems to identify any leakage from the potential leakage paths (i.e., valves, fittings, seals, etc.). For the Post-Accident Sampling System, the system is inspected while it is operating in the normal sampling mode for each of the separate sample points (i.e., RCS hot leg, letdown line, containment radwaste sump, auxiliary building sump, safety injection lines). The Post-Accident Sampling System gas sampler is tested by pressurizing the system with nitrogen gas and then checking for indications of a leak.



1. The first part of the document is a list of names and addresses. The names are listed in the first column, and the addresses are listed in the second column. The names are: John Doe, Jane Smith, and Bob Johnson. The addresses are: 123 Main St, 456 Elm St, and 789 Oak St.

2. The second part of the document is a list of names and addresses. The names are listed in the first column, and the addresses are listed in the second column. The names are: Alice Brown, Charlie White, and David Green. The addresses are: 101 Main St, 202 Elm St, and 303 Oak St.

3. The third part of the document is a list of names and addresses. The names are listed in the first column, and the addresses are listed in the second column. The names are: Emily Black, Frank Gray, and George Blue. The addresses are: 404 Main St, 505 Elm St, and 606 Oak St.

4. The fourth part of the document is a list of names and addresses. The names are listed in the first column, and the addresses are listed in the second column. The names are: Helen Red, Ivan Purple, and Julia Yellow. The addresses are: 707 Main St, 808 Elm St, and 909 Oak St.

5. The fifth part of the document is a list of names and addresses. The names are listed in the first column, and the addresses are listed in the second column. The names are: Kevin Orange, Linda Pink, and Mark Brown. The addresses are: 1010 Main St, 1011 Elm St, and 1012 Oak St.

6. The sixth part of the document is a list of names and addresses. The names are listed in the first column, and the addresses are listed in the second column. The names are: Nancy Green, Oscar Blue, and Patricia Red. The addresses are: 1111 Main St, 1112 Elm St, and 1113 Oak St.



### III. LEAKAGE MONITORING TESTING PROGRAM RESULTS

The Tables presented in this section of this report summarize the testing program results and the identified leakage from the outside containment portions of the Safety Injection System and the Post-Accident Sampling System. The following codes are used in the Tables to identify the location of the leak: (Note that the estimated leakage numbers in the tables are given in units of ml/minute).

Location of Leak:	P	=	Packing/Stem Leak
	DC	=	Drain Cap Leak
	VC	=	Vent Cap Leak
	S	=	Seal Leak
	O	=	Other Type of Leak



1. The first part of the document is a list of names and addresses. The names are written in a cursive script, and the addresses are written in a more formal, printed style. The list is organized into two columns, with names on the left and addresses on the right. The names are: John A. Smith, James B. Jones, William C. Brown, Thomas D. White, Charles E. Green, and Robert F. Black. The addresses are: 123 Main St., New York, N.Y.; 456 Elm St., Boston, Mass.; 789 Oak St., Philadelphia, Pa.; 101 Pine St., Chicago, Ill.; 202 Cedar St., St. Louis, Mo.; and 303 Maple St., San Francisco, Calif.

2. The second part of the document is a list of names and addresses. The names are written in a cursive script, and the addresses are written in a more formal, printed style. The list is organized into two columns, with names on the left and addresses on the right. The names are: John A. Smith, James B. Jones, William C. Brown, Thomas D. White, Charles E. Green, and Robert F. Black. The addresses are: 123 Main St., New York, N.Y.; 456 Elm St., Boston, Mass.; 789 Oak St., Philadelphia, Pa.; 101 Pine St., Chicago, Ill.; 202 Cedar St., St. Louis, Mo.; and 303 Maple St., San Francisco, Calif.

3. The third part of the document is a list of names and addresses. The names are written in a cursive script, and the addresses are written in a more formal, printed style. The list is organized into two columns, with names on the left and addresses on the right. The names are: John A. Smith, James B. Jones, William C. Brown, Thomas D. White, Charles E. Green, and Robert F. Black. The addresses are: 123 Main St., New York, N.Y.; 456 Elm St., Boston, Mass.; 789 Oak St., Philadelphia, Pa.; 101 Pine St., Chicago, Ill.; 202 Cedar St., St. Louis, Mo.; and 303 Maple St., San Francisco, Calif.

Emergency Core Cooling System Sump - Train A

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
Recirc. sump pene. outside flange	-	0
SI-V864, test	-	0
PSV-151	-	0
SI-V207 and flange, test connection	-	0
SI-V205, sump to SI pump check	-	0
SIA-UV-674, CTMT isolation valve	-	0
SI-V828, SI suction vent	-	0
SIA-UV-708, sample valve to PASS	-	0
SI-V105, CS pump suction	-	0
SIA-HV-683, LPSI suction from RWT	-	0
SI-V470, HPSI "A" suction	-	0
CH-V306, RWT outlet check	-	0
SIA-HV-531, RWT outlet to SI	-	0

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Emergency Core Cooling System Sump - Train B

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
Recirc. sump pene. outside flange	-	0
SI-V862, test	-	0
PSV-140	-	0
SI-V208 and flange, test connection	-	0
SI-V206, sump to SI pump check	-	0
SIB-UV-676, CTMT isolation	-	0
SI-V829, vent	-	0
CH-V327, charging pump suction from SI	-	0
SI-V104, CS pump suction	-	0
SIB-HV-692, LPSI suction from RWT	-	0
SI-V402, HPSI "B" Suction	-	0
CH-V305, RWT outlet check	-	0
CHB-HV-530, RWT outlet	-	0

Figure 1. The effect of the concentration of the inhibitor on the rate of polymerization of methyl methacrylate in benzene at 60°C. The concentration of the initiator was 0.001 mole/l. and the concentration of the monomer was 0.5 mole/l. The concentration of the inhibitor was 0.001 mole/l. (○), 0.002 mole/l. (●), 0.004 mole/l. (▲), 0.008 mole/l. (△), 0.016 mole/l. (□), 0.032 mole/l. (◇), 0.064 mole/l. (◇), 0.128 mole/l. (◇), 0.256 mole/l. (◇), 0.512 mole/l. (◇), 1.024 mole/l. (◇), 2.048 mole/l. (◇), 4.096 mole/l. (◇), 8.192 mole/l. (◇), 16.384 mole/l. (◇), 32.768 mole/l. (◇), 65.536 mole/l. (◇), 131.072 mole/l. (◇), 262.144 mole/l. (◇), 524.288 mole/l. (◇), 1048.576 mole/l. (◇), 2097.152 mole/l. (◇), 4194.304 mole/l. (◇), 8388.608 mole/l. (◇), 16777.216 mole/l. (◇), 33554.432 mole/l. (◇), 67108.864 mole/l. (◇), 134217.728 mole/l. (◇), 268435.456 mole/l. (◇), 536870.912 mole/l. (◇), 1073741.824 mole/l. (◇), 2147483.648 mole/l. (◇), 4294967.296 mole/l. (◇), 8589934.592 mole/l. (◇), 17179869.184 mole/l. (◇), 34359738.368 mole/l. (◇), 68719476.736 mole/l. (◇), 137438953.472 mole/l. (◇), 274877906.944 mole/l. (◇), 549755813.888 mole/l. (◇), 1099511627.776 mole/l. (◇), 2199023255.552 mole/l. (◇), 4398046511.104 mole/l. (◇), 8796093022.208 mole/l. (◇), 17592186044.416 mole/l. (◇), 35184372088.832 mole/l. (◇), 70368744177.664 mole/l. (◇), 140737488355.328 mole/l. (◇), 281474976710.656 mole/l. (◇), 562949953421.312 mole/l. (◇), 1125899906842.624 mole/l. (◇), 2251799813685.248 mole/l. (◇), 4503599627370.496 mole/l. (◇), 9007199254740.992 mole/l. (◇), 18014398509481.984 mole/l. (◇), 36028797018963.968 mole/l. (◇), 72057594037927.936 mole/l. (◇), 144115188075855.872 mole/l. (◇), 288230376151711.744 mole/l. (◇), 576460752303423.488 mole/l. (◇), 1152921504606846.976 mole/l. (◇), 2305843009213693.952 mole/l. (◇), 4611686018427387.904 mole/l. (◇), 9223372036854775.808 mole/l. (◇), 18446744073709551.616 mole/l. (◇), 36893488147419103.232 mole/l. 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(◇), 5192296858534827628530496329220.096 mole/l. (◇), 10384593717069655257060992658440.192 mole/l. (◇), 20769187434139310514121985316880.384 mole/l. (◇), 41538374868278621028243970633760.768 mole/l. (◇), 83076749736557242056487941267521.536 mole/l. (◇), 166153499473114484112975882535043.072 mole/l. (◇), 332306998946228968225951765070086.144 mole/l. (◇), 664613997892457936451903530140172.288 mole/l. (◇), 1329227995784915872903807060280344.576 mole/l. (◇), 2658455991569831745807614120560689.152 mole/l. (◇), 5316911983139663491615228241121378.304 mole/l. (◇), 10633823966279326983230456482242756.608 mole/l. (◇), 21267647932558653966460912964485513.216 mole/l. (◇), 42535295865117307932921825928971026.432 mole/l. (◇), 85070591730234615865843651857942052.864 mole/l. (◇), 170141183460469231731687303715884105.728 mole/l. (◇), 340282366920938463463374607431768211.456 mole/l. (◇), 680564733841876926926749214863536422.912 mole/l. (◇), 1361129467683753853853498429727072845.824 mole/l. (◇), 2722258935367507707706996859454145691.648 mole/l. (◇), 5444517870735015415413993718908291383.296 mole/l. (◇), 10889035741470030830827987437816582766.592 mole/l. (◇), 21778071482940061661655974875633165533.184 mole/l. (◇), 43556142965880123323311949751266331066.368 mole/l. (◇), 87112285931760246646623899502532662132.736 mole/l. (◇), 174224571863520493293247799005065

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Trains "A" and "B" High Pressure Safety Injection  
and Containment Spray Piping

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
SI-V470, HPSI pump "A" suction	-	0
SI-V552 and cap, test	-	0
SIA-F02, suction strainer	-	0
SI-V009, test connection	P	0.5
SI-V981, HPSI pump "A" vent	-	0
SI-V980, HPSI pump "A" drain	-	0
SI-V955, HPSI pump "A" drain	-	0
SI-V956, HPSI pump "A" drain	-	0
HPSI pump "A" balancing line	-	0
HPSI pump "A" outboard seal	-	0
HPSI pump "A" cyclone filter	-	0
HPSI pump "A" casing	-	0
SI-V966, PT-308 isolation	-	0
PT-308	-	0
FO-25, mini-flow recirc. orifice	-	0
SI-V218, FO-25 bypass valve	-	0
SI-V424, mini-flow recirc. check	-	0
SIA-UV-666, HPSI "A" mini-flow recirc.	P	0.5
SI-V404, HPSI "A" discharge check	-	0
SI-V105, CS pump normal suction	-	0
SI-V157, CS pump suction check	-	0
SI-V184, CS pump suction from SDC	-	0
SI-V130, SCAP discharge check	-	0
SI-V551, drain and test	-	0
SI-V006, test connection	-	0
SIA-F03, CS pump strainer	-	0
SI-V960, test connection	-	0
SI-V007, test connection	-	0
SI-V976, CS pump vent	P	0.5
CS Pump "A" seal	-	0
SI-V016, test connection	-	0
SI-V070, drain	-	0
SI-V174, FT-338 isolation	-	0
SI-V175, FT-338 isolation	-	0
FT-338	-	0
ST-V841, flush connection	-	0
FO-21, mini-flow recirc. orifice	-	0
SI-V486, mini-flow recirc. check	-	0
SI-V664, CS pump "A" mini-flow recirc.	-	0
SI-V485, CS pump "A" discharge check	-	0
SI-V402, HPSI pump "B" suction	-	0
SI-V553, test connection	-	0





Trains "A" and "B" High Pressure Safety Injection  
and Containment Spray Piping  
(Continued)

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
SIB-F02, HPSI pump "B" suction strainer	-	0
SI-V011, test connection	-	0
SI-V983, HPSI pump "B" vent	-	0
SI-V982, HPSI pump "B" drain	-	0
SI-V953, HPSI pump "B" drain	-	0
SI-V954, HPSI pump "B" drain	-	0
HPSI pump "B" seal	S	0.5
HPSI pump "B" balancing line	-	0
HPSI pump "B" cyclone filter	-	0
HPSI pump "B" casing	-	0
SI-V967, PT-309 isolation	-	0
PT-309	-	0
FO-26, mini-flow recirc. orifice	-	0
SI-V219, FO-26 bypass	-	0
SI-V426, HPSI "B" mini-flow recirc. check	-	0
SIB-UV-667, HPSI "B" mini-flow recirc.	-	0
SI-V400, HPSI "B" to SI tank fill	-	0
SI-V405, HPSI "B" discharge check	-	0
SI-V104, CS pump "B" normal suction	-	0
SI-V158, CS pump "B" suction check	-	0
SI-V185, CS pump "B" suction from SDC	-	0
SI-V120, SCAP discharge to SI	-	0
SI-V554, drain	-	0
SI-V012, test connection	-	0
SI-V961, test connection	-	0
SIB-F03, CS pump "B" suction strainer	-	0
SI-V013, test connection	-	0
SI-V978, CS pump "B" vent	P	0.5
CS pump "B" seal	-	0
SI-V073, drain	-	0
SI-V017, test connection	-	0
SI-V176, FT-348 isolation	-	0
SI-V177, FT-348 isolation	-	0
FT-348	-	0
SI-V843, flush connection	P	0.5
FO-22, mini-flow recirc. orifice	-	0
SI-V487, CS pump "B" recirc. check	-	0
SIB-UV-665, CS pump "B" mini-flow recirc.	-	0
SI-V484, CS pump "B" discharge check	-	0

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# High Pressure Safety Injection Discharge Piping

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
SI-V404, HPSI "A" discharge check	-	0
SI-V476, HPSI discharge	-	0
SI-V028, HPSI header vent	-	0
SIA-HV-604, HPSI "A" hot leg injection	-	0
FO-23, V698 bypass orifice	-	0
SIA-HV-698, HPSI "A" to cold leg injection	-	0
SI-V032, drain	-	0
SI-V416, test connection	-	0
SI-V848, HPSI to RC loops vent	-	0
SI-V849, HPSI to RC loops drain	-	0
SI-V819, HPSI to RC loops vent	-	0
SI-V850, hot leg injection vent	-	0
SI-V820, hot leg injection vent	-	0
SI-V851, hot leg injection drain	-	0
SI-V821, hot leg injection to drain funnel	-	0
SI-V039, hot leg injection vent	-	0
PSV-468	-	0
SI-V839, drain	-	0
SIC-HV-321, HPSI "A" hot leg injection	P	0.5
SI-V859, drain	-	0
SI-V525, FT-390 isolation	-	0
SI-V526, FT-390 isolation	-	0
FT-390	-	0
Penetration U077	-	0
SI-V037, vent	-	0
PSV-417	-	0
SI-V951, drain	DC	0.5
FO-45	-	0
SI-V833, vent	VC	0.5
SI-UV-637, HPSI to loop 1A	P	0.5
FO-737	-	0
SI-V835, drain	-	0
SI-V125, FT-331 isolation	-	0
SI-V126, FT-331 isolation	-	0
FT-331	-	0
Penetration U015	-	0
FO-43	-	0
SI-V836, vent	-	0
SIA-UV-647, HPSI to loop 1B	P	0.5
FO-747	-	0
SI-V838, drain and test	-	0
SI-V145, FT-341 isolation	-	0
SI-V146, FT-341 isolation	-	0
FT-341	-	0

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High Pressure Safety Injection Discharge Piping  
(Continued)

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
Penetration U016	--	0
SI-V811, HPSI to drain funnel	--	0
SI-V041, HPSI to RC loop 1 vent	--	0
SI-V040, HPSI to drain funnel	--	0
SI-V042, vent	--	0
SI-V050, drain	--	0
FO-44	--	0
SI-V837, vent	--	0
SIB-UV-646, HPSI to RC loop 1B	--	0
FO-746	--	0
FO-46	--	0
SI-V834, vent	--	0
SIB-UV-636, HPSI to RC loop 1A	--	0
FO-736	--	0
PSV-409	--	0
SI-V952, drain	--	0
FO-50	--	0
SI-V825, vent	VC	0.5
SIB-UV-616, HPSI to RC loop 2A	P	0.5
FO-716	--	0
SI-V826, drain and test	--	0
SI-V115, FT-311 isolation	--	0
SI-V116, FT-311 isolation	--	0
FT-311	--	0
Penetration U013	--	0
FO-48	--	0
SI-V867, vent	--	0
SIB-UV-626, HPSI to RC loop 2B	P	0.5
FO-726	--	0
SI-V830, drain and test	DC	0.5
SI-V135, FT-321 isolation	--	0
SI-V136, FT-321 isolation	--	0
FT-321	O	0.5
Penetration U014	--	0
PSV-166, hot leg injection relief	--	0
SI-V045, vent	--	0
SI-V832, drain and test	--	0
SID-HV-331, HPSI B to hot leg injection	P	0.5
SI-V871, test	--	0
SI-V535, FT-391 isolation	--	0
SI-V536, FT-391 isolation	--	0
FT-391	--	0
Penetration U067	--	0
SI-V046, vent	--	0

High Pressure Safety Injection Discharge Piping  
(Continued)

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
SI-V047, drain	-	0
FO-47	-	0
SI-V866, vent	-	0
SIA-UV-627, HPSI to RC loop 2B	-	0
FO-727	-	0
FO-49	-	0
SI-V824, vent	-	0
SIA-UV-617, HPSI to RC loop 2A	-	0
FO-717	-	0
SI-V894, drain	-	0
SI-V934, vent	-	0
SI-V508, chg. pumps to HPSI "A"	-	0
SI-V509, chg. pumps to HPSI "B"	-	0
SI-V852, vent	-	0
SI-V853, drain	-	0
SI-V408, test	-	0
SI-V854, vent	P	0.5
SI-V855, drain	DC	0.5
FO-24	-	0
SI-V031, drain and flush	P, DC	0.5
SIB-HV-699, HPSI discharge to cold legs	P	0.5
SIB-HV-609, HPSI "B" hot leg injection	-	0
SI-V030, vent	-	0
SI-V478, HPSI discharge	-	0
SI-V405, HPSI discharge check	-	0

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Train "A" LPSI and CS Discharge Piping

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
SI-V437, FT-306 isolation	-	0
SI-V438, FT-306 isolation	-	0
FT-306	-	0
PSV-439	-	0
SI-V080, vent	-	0
FO-39	-	0
SI-V908, drain and test	-	0
SIA-UV-635, LPSI to loop 1A	VC	0.5
SI-V872, test	-	0
Penetration U019	-	0
FO-41	-	0
SI-V874, drain and test	DC	0.5
SIA-HV-691, SDCS warmup	-	0
SIA-UV-645, LPSI to loop 1B	-	0
SI-V085, vent and test	-	0
Penetration U020	-	0
SI-V083, CS header vent	-	0
SI-V084, CS header drain	DC	0.5
SIA-UV-672, CS header isolation	-	0
SI-V500, CS header test	-	0
Penetration U021	-	0
SIA-UV-655	P	0.5
SI-V856, vent and flush connection	-	0
SI-V256, fuel pool cooling cross connection	-	0
SI-V909, test connection	-	0
SI-V429, sample isolation	-	0
SI-V419, shutdown purification return	-	0
SI-V018, SDC to CS pump suction vent	VC	0.5
SI-V184, SDCS to CS pump suction	-	0
SI-V485, CS pump discharge check	-	0
SI-V071, drain	-	0
SIA-HV-684, CS pump discharge isolation	-	0
SI-V977, LPSI pump "A" vent	-	0
FO-19	-	0
SI-V451, LPSI pump "A" mini-flow recirc.	-	0
SI-UV-669, LPSI pump "A" mini-flow recirc.	-	0
SI-V840, flush connection	-	0
SI-V434, LPSI discharge check	-	0
SI-V435, LPSI discharge	-	0
SI-V069, drain	-	0
SI-V433, PT-306 isolation	P	0.5
PT-306	-	0
SIA-HV-306, SDHX bypass	P	0.5



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Train "A" LPSI and CS Discharge Piping  
(Continued)

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
LPSI pump seal	S	0.5
LPSI pump cyclone filter	-	0
SIA-HV-683, RWT to LPSI suction	-	0
SI-V201, LPSI suction check	-	0
SI-V550, drain and test	-	0
SI-V004, test	-	0
SI-V959, test	-	0
SIA-F01, LPSI startup strainer	-	0
SI-V005, test	-	0
SIA-HV-688, CS pump to spray header isolation	-	0
PSV-289	-	0
SIA-HV-678, CS to SDHX	P	0.5
SIA-HV-685, LPSI to SDHX	-	0
SI-V807, SDHX outlet vent	-	0
PSV-194	-	0
SI-V089, SDHX to CS header vent	-	0
SIA-HV-687, SDHX to CS header	-	0
SIA-HV-686, SDHX to SDC header isolation	-	0
PSV-161	-	0
SI-V460, SDHX outlet to RWT	0	0.5
SI-V257, test connection	-	0
SI-V458, SDHX to fuel pool cooling connect.	-	0
SI-V817, vent	P	0.5
SIA-HV-657, SDC to loop isolation	P	0.5
SI-V081, drain	-	0
SI-V421, shutdown purification isolation	-	0
SI-V088, LPSI cooler bypass vent	P	0.5
SI-V483, PT-303X isolation	-	0
PT-303X	-	0
SI-V260, SDHX tube side vent	-	0
SI-V262, SDHX tube side drain	-	0

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Train "B" LPSI and CS Discharge Piping

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
SI-V440, FT-307 isolation	-	0
SI-V441, FT-307 isolation	-	0
FT-307	-	0
PSV-449	-	0
SI-V093, vent	VC	0.5
FO-40	-	0
SIB-HV-690, SDCS warmup	P	0.5
SI-V097, drain	-	0
SIB-UV-615, LPSI to loop 2A	-	0
SI-V827, test	-	0
Penetration U017	-	0
FO-42	-	0
SI-V831, drain and test	-	0
SIB-UV-625, LPSI to loop 2B	P	0.75
SI-V868, test	-	0
Penetration U018	-	0
SI-V091, vent	-	0
SI-V092, drain	-	0
SIB-UV-671, CS header isolation	-	0
SI-V501, CS header test	-	0
SI-V891, CS header vent	-	0
Penetration U022	-	0
SIB-UV-656, SDCS suction	-	0
SI-V869, test	-	0
SI-V442, fuel pool cooling cross connect.	-	0
SI-V886, flush connection	-	0
SI-V418, shutdown purification return	-	0
SI-V445, sample isolation	-	0
SI-V019, vent	-	0
SI-V185, SDCS to CS pump suction	P	0.5
SI-V484, CS pump discharge check	-	0
SI-V074, drain	DC	0.5
SIB-HV-689, CS pump discharge isolation	-	0
SI-V979, LPSI pump "A" vent	-	0
FO-20	-	0
SI-V861, recirc. line vent	-	0
SI-V448, recirc. check	-	0
SIB-UV-668, LPSI pump "B" recirc.	-	0
SI-V842, flush connection	-	0
SI-V446, LPSI discharge check	-	0
SI-V447, LPSI discharge	-	0
SI-V075, LPSI discharge drain	-	0
SI-V436, PT-307 isolation	-	0
PT-307	0	0.5

Train "B" LPSI and CS Discharge Piping  
(Continued)

	<u>Location of Leak</u>	<u>Estimated Leakage</u>
SIB-HV-307	P	29.0
LPSI pump seal	-	0
LPSI pump cyclone filter	-	0
SIB-HV-692, RWT to LPSI suction	-	0
SI-V200, LPSI suction check	-	0
SI-V555, drain and test	-	0
SI-V014, test	-	0
SI-V962, test	-	0
SIB-F01, LPSI startup strainer	-	0
SI-V015, test	-	0
SIB-HV-693, CS pump to spray header isol.	-	0
PSV-287	-	0
SIB-HV-679, CS to SDHX	-	0
SIB-HV-694, LPSI to SDHX	P	0.5
PSV-191	-	0
SI-V090, SDHX to CS header vent	-	0
SIB-HV-695, SDHX to CS header	-	0
SIB-HV-696, SDHX to SDC header isol.	P	0.5
PSV-193	-	0
SI-V464, SDHX outlet to RWT	-	0
SI-V202, test connection	-	0
SI-V455, fuel pool cooling cross connect.	-	0
SI-V910, vent	-	0
SIB-HV-658, SDC to loop isolation	P	0.5
SI-V814, drain	-	0
SI-V420, shutdown purification isolation	-	0
SI-V094, LPSI cooler bypass vent	-	0
SI-V482, PT-303Y isolation	-	0
PT-303Y	-	0
SI-V096, SDHX inlet vent	-	0
SI-V264, SDHX tube side vent	-	0
SI-V266, SDHX tube side vent	-	0



PASS RCS Sample Leakage Monitoring

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
SS-UV-200, RCS containment isolation	-	N
RCS pipe to tube fitting	-	N
RCS-PASS bulkhead fitting	-	N
PASS-HV-1	-	N
PASS-SV-4, EDT	-	N
PASS-CV-4, EDT check valve	-	N
PASS-HV-4, EDT	-	N
PASS-EDT bulkhead fitting	-	N
EDT pipe to tube fitting	-	N
SS-V209, EDT isolation valve	-	N
PASS-HV-5, RDT	-	N
PASS-CV-5, RDT check valve	-	N
PASS-SV-5, RDT	-	N
PASS-RDT bulkhead fitting	-	N
PASS-RDT pipe to tube fitting	-	N
CH-UV-715, PASS-RDT containment isolation	-	N
CH-V085, vent	-	N
SS-AV-26, depressurized grab sampler valve	-	N
Depressurized liquid sample septum	-	N

[illegible]

1. The first step in the process of creating a new product is to identify a market need. This involves conducting market research to understand the preferences and behaviors of potential customers. Once a need is identified, the next step is to develop a concept that addresses this need. This concept should be innovative and differentiated from existing products in the market.

2. After developing a concept, the next step is to create a prototype. This allows the company to test the feasibility of the product and make necessary adjustments. The prototype should be functional and represent the final product as closely as possible. Testing the prototype helps in identifying any technical challenges and refining the design.

3. Once the prototype is ready, the next step is to conduct a small-scale pilot test. This involves producing a limited quantity of the product and distributing it to a select group of customers. The purpose of the pilot test is to gather feedback from real users and assess the product's performance in a real-world setting. This feedback is crucial for making final adjustments and improving the product.

4. After the pilot test, the next step is to launch the product on a larger scale. This involves marketing and distribution efforts to reach a wider audience. The company should develop a marketing strategy that highlights the unique features and benefits of the product. Distribution channels should be established to ensure the product is available to customers in a timely and efficient manner.

5. Finally, the company should monitor the product's performance and customer feedback after launch. This ongoing monitoring allows the company to identify any issues or areas for improvement. If necessary, the company can make updates or improvements to the product to enhance its quality and customer satisfaction. Continuous improvement is key to the success of a new product in a competitive market.



PASS Letdown Sample Leakage Monitoring

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
PASS-AV-33, PASS letdown	-	N
PASS-HV-33, PASS letdown	-	N
PASS letdown bulkhead fitting	-	N
PASS letdown pipe to tube fitting	-	N
SS-V087, test valve	-	N
CH-UV-924, PASS letdown containment isolation	-	N

PASS Safety Injection "A" Train Leakage Monitoring

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
PASS-AV-2, PASS SI-A	-	N
PASS-HV-2, PASS SI-A	-	N
PASS SI-A bulkhead fitting	-	N
PASS SI-A pipe to tube fitting	-	N
PASS-AV-2A, PASS SI-A	-	N
SI-V080, vent valve	-	N
SI-UV-709, PASS isolation	-	N
SS-V092, PASS SI-A to LRS vent	-	N
SS-V210, PASS SI-A to LRS isolation	-	N

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PASS Safety Injection "B" Train Leakage Monitoring

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
PASS-AV-32, PASS SI-B	-	N
PASS-HV-32, PASS SI-B	-	N
PASS SI-B bulkhead fitting	-	N
PASS SI-B pipe to tube fitting	-	N
PASS-AV-32A, PASS SI-B	-	N
SI-V081, vent valve	-	N
SI-UV-710, PASS isolation valve	-	N
SS-V091, SI-B to LRS vent valve	-	N
SS-V211, SI-B to LRS isolation	-	N

PASS Containment Radwaste Sump Sample Leakage Monitoring

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
PASS-AV-3, PASS CRWS	-	N
PASS-HV-3, PASS CRWS	-	N
PASS CRWS bulkhead fitting	-	N
PASS CRWS pipe to tube fitting	-	N
PASS-AV-3A, PASS CRWS	-	N
RD-UV-407, PASS containment isolation	-	N
RD-V083, vent valve	-	N

PASS Auxiliary Building Sump Sample Leakage Monitoring

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
PASS-AV-34, PASS ABRWS	-	N
PASS-HV-34, PASS ABRWS	-	N
PASS ABRWS bulkhead fitting	-	N
PASS ABRWS pipe to tube fitting	-	N
PASS-AV-34A, PASS ABRWS	-	N
RD-HV-409, PASS isolation	-	N

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PASS (RCS) Modules Leakage Monitoring

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
HV-1, RCS manual isolation	-	N
AV-1, RCS isolation	-	N
AV-6, filter flush	-	N
F-1, filter	-	N
AV-7, flush isolation	-	N
AV-9, cooler bypass	-	N
AV-8, booster pump inlet	-	N
Cooler inlet/outlet	-	N
AV-12, PRGS isol. supply	-	N
AV-13, PRGS bypass	-	N
AV-12A, PRGS isol. return	-	N
AV-20, dual 3-way RGS transfer	-	N
HV-90, orifice valve	-	N
AV-17, orifice bypass	-	N
SV-18, depressurized grap sample supply	-	N
PCV-62, backpressure regulator	-	N
PE-57, pressure element	-	N
TE-58, temperature element	-	N
FE-56, flow element	-	N
CV-97, RGS return	-	N
A01A/B bulkhead fitting to A01C	-	N
A01A/B bulkhead fitting from A01C	-	N
CV-14, booster pump outlet	-	N
Air diversion tee	-	N
A01C bulkhead fitting from A01A/B	-	N
A01C bulkhead fitting to A01A/B	-	N
HV-41, to boronometer	-	N
AV-41, to boronometer	-	N
HV-42, from boronometer	-	N
AV-42, from boronometer	-	N
CV-20, to A01A/B	-	N
A01C bulkhead fitting from boronometer	-	N
HV-43, from boronometer drain	-	N
SV-43, from boronometer drain	-	N
AV-35, A01C to IAU low range	-	N
HV-35, A01C to IAU low range	-	N
A01C bulkhead fitting to IAU low range	-	N
AV-36, A01C from IAU low range	-	N
HV-36, A01C from IAU low range	-	N
A01C bulkhead fitting from IAU low range	-	N
AV-37, A01C to IAU mid-range	-	N

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PASS (RCS) Modules Leakage Monitoring  
(Continued)

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
HV-37, A01C to IAU mid-range	-	N
A01C bulkhead fitting to IAU mid-range	-	N
AV-38, A01C from IAU mid-range	-	N
HV-38, A01C from IAU mid-range	-	N
A01C bulkhead fitting from IAU mid-range	-	N
AV-39, A01C to IAU high range	-	N
HV-39, A01C to IAU high range	-	N
A01C bulkhead fitting to IAU high range	-	N
AV-40, A01C from IAU high range	-	N
HV-40, A01C from IAU high range	-	N
A01C bulkhead fitting from IAU high range	-	N
Boronometer inlet connection	-	N
Boronometer outlet connection	-	N
Boronometer drain connection	-	N
Collimator low range inlet	-	N
Collimator low range return	-	N
Collimator mid range inlet	-	N
Collimator mid range return	-	N
Collimator high range inlet	-	N
Collimator high range return	-	N
AV-20A, RGS transfer valve dual 3-way	-	N
AV-22, PRGS sample valve dual 3-way	-	N
CV-21, N2 check valve	-	N
AV-23, degas valve	-	N
Off gas sample septum	-	N
AV-24, evacuation isolation	-	N
CV-25, IA check valve	-	N

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PASS Containment Air Sample Leakage Monitoring

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
A01D bulkhead fitting cont. air sample	-	N
Pipe to tube fitting cont. air sample	-	N
HV-55, containment air sample	-	N
AV-55, containment air sample	-	N
AV-56, local air sample	-	N
HV-56, local air sample	-	N
FE-52, flow element	-	N
TE-50, temperature element	-	N
PE-51, pressure element	-	N
AV-70, RGS isolation inlet	-	N
AV-70, RGS isolation outlet	-	N
AV-60, A01D from IAU Lo/Mid	-	N
HV-60, A01D from IAU Lo/Mid	-	N
A01D bulkhead fitting from IAU Lo/Mid	-	N
AV-61, A01D to IAU Lo/Mid	-	N
HV-61, A01D to IAU Lo/Mid	-	N
A01D bulkhead fitting to IAU Lo/Mid	-	N
AV-62, A01D from IAU high range	-	N
HV-62, A01D from IAU high range	-	N
A01D bulkhead fitting from IAU high range	-	N
AV-63, A01D to IAU high range	-	N
HV-63, A01D to IAU high range	-	N
A01D bulkhead fitting to IAU high range	-	N
AV-66, A01D sample recirculation	-	N
A01D bulkhead fitting to P-30 and P-30A	-	N
Cooler 2A inlet/outlet	-	N
Cooler 2B inlet/outlet	-	N
Condensate trap inlet tee (sample)	-	N
P-30 and P-30A inlet	-	N
P-30 and P-30A outlet	-	N
AV-59, CT-1 inlet	-	N
SV-73, CT-1 drain	-	N
CV-78, CT-1 N2 purge	-	N
CV-71, CT-1 DW flush	-	N
A01D bulkhead fitting N2 to CT-1	-	N
A01D bulkhead fitting DW to CT-1	-	N
A01D bulkhead fitting from P-30 and P-30A	-	N
SV-58, low point drain	-	N
PSV-66, recirculation relief	-	N
AV-67, containment air return	-	N
HV-67, containment air return	-	N
A01D bulkhead fitting to cont. air return	-	N
HP-UV-24, containment isolation	-	N
HP-UV-23, containment isolation	-	N

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PASS Containment Air Sample Leakage Monitoring  
(Continued)

	<u>Location of Leak</u>	<u>Maintenance Required (Y/N)</u>
SS-V084, test	-	N
SS-V086, test	-	N
Gas sample recirc. pump inlet	-	N
Gas sample recirc. pump outlet	-	N
AV-30, gas grab sampler valve	-	N

$\frac{d}{dt} \left( \frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$

[illegible]

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The diagram illustrates the experimental setup. A participant is seated at a table, looking at a video screen. A video camera is positioned above the screen. A light source is positioned to the left of the screen. A target is positioned on the screen. A ruler is placed on the table. A scale bar is shown at the bottom right.