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INDIAN POINT UNIT 3

PROBABILISTIC RISK ASSESSMENT-BASED

SYSTEM INSPECTION PLANS

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1. INTRODUCTION

The tables and paragraphs in this inspection plan have been prepared to provide inspection guidance based on review of the Indian Point Probabilistic Safety Study (IPPSS).[1] The guidance should be used to aid in the selection of areas to inspect and is not intended either to replace current I&E inspection guidance or to constitute an additional set of inspection requirements. In using this information one should realize that it is based primarily on the IPPSS. Hence, recent system experience, failures, and modifications should be considered when reviewing these tables. Since plant modifications are normally an ongoing continual process, it is recommended that relevant changes be catalogued so that these inspection plans can be periodically revised required.

2. PRIORITIZED SYSTEMS LIST

The plant safety systems have been prioritized with respect to their impact on overall plant risk and offsite consequences. If decisions must be made to select one system over another for inspection, then this list can be used for that purpose. However, since these systems represent only a small portion of the plant systems, it is hoped that the entire list will be addressed during an inspection cycle.

System Tables: Three tables have been prepared for each system and they are presented in descending order of importance as follows:

<u>Table 1 - Failure Modes</u>

Those components or licensee activities which play a dominant role in contributing to the systems' importance are presented, along with a brief description of why these items are important. If these items are focussed on when a system is inspected, then most of the risk significant areas will have been addressed. For experienced inspectors, this table is probably sufficient.

<u>Table 2 - I&E Procedures</u>

For those who prefer additional guidance, this table identifies those I&E inspection procedures which can be used to assure the availability of the items shown in Table 1. The inspection procedures were identified based on the failure modes presented and an understanding of I&E procedures. The procedures selected are those which provide routine guidance on the principal plant programmatic activities such as operations, maintenance, Instrumentation/Control and surveillance testing. There are many other inspection procedures which could also be used depending on the inspection criteria or the inspector's preference. However, the procedures selected will generally provide adequate inspection coverage of the dominant failure modes.

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[1] Power Authority of the State of New York and Consolidated Edison Company of New York, Inc., "Indian Point Probabilistic Safety Study," Volumes 1-12, 1982.

Table 3 - Modified System Walkdown

This table provides an abbreviated version of the licensee's system checklist which includes only those items which are related to the dominant failure modes. It is generally less than one third of the normal checklist. Caution should be observed when using the checklists, since they are based on certain versions of the licensee's checklist. The revision date of the licensee's checklist is indicated at the end of the modified checklist.

3. DOMINANT ACCIDENT SEQUENCES

The IPPSS has separated the dominant accident sequences (sometimes referred to as scenarios in IPPSS) into three different categories with each sequence ranked within the category. The three categories are each ranked with respect to:

- core melt frequency
- latent effects release frequency
- early deaths release frequency

The core melt frequency does not take into account offsite consequences. the particular accident sequence which leads to core melt determines whether containment failure, or bypass occurs and whether it occurs early or late into the scenario. The accident sequence also determines the type of radioactivity release which occurs since the effects of mitigating systems, such as containment sprays or fan coolers, can be considered. The type of radioactive release also affects whether early fatalities or latent health effects predominate. The core melt frequency is a consequence measure used in PRAs for simplicity, to avoid dealing with the fission product transport, and health effects. It does not consider the mitigating effects of the containment, and the importance of maintaining containment integrity, nor does it consider the mitigating actions that may be employed in a slow melt as compared with a fast melt.

The accompanying Table I-2 shows the ranking of the dominant accident scenarios according to core melt frequency, latent effects release frequency and early deaths release frequency. For a complete listing of all twenty-four major scenarios, the reader should refer to the IPPSS, Volume 12, Table 8.3-10A-1.

Consideration of health effects rather than just core melt frequency alone is more appropriate to the NRC mission of protecting the public health and safety. However, referring to the table, it can be observed that of the first ten scenarios ranked by core melt frequency, six also appear among the two health effects categories. The six are rank numbers 1,2,3,6,7 and 9 by core melt frequency. Among the two health effects rankings (latent effects and early deaths), interfacing systems LOCA appear on both but not on the core melt ranking list. These distributions are shown on the accompanying Tables I-3 to I-5.

Table I-6 shows the ranking with respect to core melt frequency for the dominant accident sequences as revised by Sandia National Laboratories in NUREG/CR-2934, "Review and Evaluation of the Indian Point Probabilistic Safety Study," December 1982. The most important result of this revised ranking was the addition of an accident sequence for loss of component cooling water due to a pipe break causing a Reactor Coolant Pump (RCP) Seal LOCA and failure of the Safety Injection Pumps. This sequence becomes the number one accident sequence with respect to core melt frequency. However, it is based on certain assumptions concerning the likelihood of a RCP seal LOCA. This is further discussed in Table A2-1 for the Component Cooling Water System.

NUREG/CR-2934 provides a useful discussion concerning the completeness of the IPPSS (Section 4.7) and also certain insights into the methodology and assumptions of the IPPSS in the summary and conclusions section (Section 5). This information may be of particular benefit to the NRC inspector in the implementation of the system inspection plans contained herein. The tables in this section have been prepared to give the inspector additional insights into the use of PRA in the inspection process and the information provided should be used at the inspector's discretion.

4. ADDITIONAL REFERENCES

There are two other references specifically related to Unit 3 which provide background information on use of the IPPSS in the development of the system inspection plans contained herein:

1. J. H. Taylor, R. Fullwood and A. Fresco, "Probabilistic Safety Study Applications Program for Inspection of the Indian Point Unit 3 Nuclear Power Plant," NUREG/CR-4565, March 1986.

2. Letter to Bernard M. Hillman, NRC Region I from John H. Taylor, Brookhaven National Laboratory, dated Januray 8, 1986, with attachment "Indian Point 3 - Systems Importance Ranking Based on NSPKTRII," by James C. Higgins, January 1986.

The first item contains general information on the use of PRA in the inspection process as well as definitions of the importance measures used to develop the systems prioritization listing for Unit 3 and the results of the actual PRA-based system inspections performed at Indian Point 3 on a trial basis during 1985 for the Service Water, Reactor Protection and Safeguards Actuation Systems.

The second item contains background details on the generation of the systems prioritization list with a discussion of the inherent limitations.

TABLE I-1
INDIAN POINT UNIT 3
SYSTEMS PRIORITIZATION BY INSPECTION
IMPORTANCE INCLUDING HEALTH EFFECTS

High Importance Group	System Table Nos.
Auxiliary Feedwater System (AFWS)	9
Component Cooling Water System (CCWS)	3
Electric Power System (EPS)	2
High Pressure Injection System (HPIS)	5
Reactor Protection System (RPS)	4
Safeguards Actuation System (SAS)	11
Service Water System (SWS)	1

Intermediate Importance Group	System Table Nos.
Low Pressure Injection System (LPIS) - including Refueling Water Storage Tank (RWST)	10
Reactor Coolant System (PZR PORVs)*	8
Recirculation System (RS)	7
Secondary System (MSIVs)**	6

Low Importance Group	System Table Nos.
Accumulator System	12
Containment Fan Cooling System	14
Containment Spray System (CSS) - including NaOH	13

* Reactor Coolant System is dominated by failure of pressurizer power-operated relief valves (PZR PORV).

** Secondary System is dominated by failure of MSIV closure and, to a lesser degree, by failure of turbine trip.

[illegible]E 1-2
COMPARISON OF CO[illegible]T AND RELEASE FREQUENCY
CONTRIBUTIONS [illegible] DOMINANT SCENARIOS

RANK	BY CORE MELT FREQUENCY	MEAN ANNUAL FREQUENCY	BY LATENT EFFECTS RELEASE FREQUENCY	MEAN ANNUAL FREQUENCY	BY EARLY DEATHS RELEASE FREQUENCY	MEAN ANNUAL FREQUENCY
1	Small LOCA: Failure of High Pressure Recirculation Cooling	8.2E-5	Fire: Specific Fires in Switchgear Room and Cable Spreading Room Causing RCP Seal LOCA and Failure of Power Cables to the Safety Injection Pumps, Containment Spray Pumps and Fan Coolers	5.7E-6	Interfacing System LOCA	5.7E-7
2	Large LOCA: Failure of Pressure Recirculation Cooling	1.1E-5	Seismic: Loss of Control or AC Power	4.7E-6	Small LOCA: Failure of High Pressure Recirculation Cooling	8.2E-9
3	Medium LOCA: Failure of Low Pressure Recirculation Cooling	1.1E-5	Wind: Loss of Offsite Power and Service Water Pumps	9.2E-7	Fire: Specific Fires in Switchgear Room and Cable Spreading Room Causing RCP Seal LOCA and Failure of Power Cables to the Safety Injection Pumps, Containment Spray Pumps and Fan Coolers	1.1E-9
4	Fire: Other Fire Areas Such as Cable Spreading Room, Auxiliary Feedwater Pump Room, etc.	6.7E-6	Fire: Upper Tunnel	7.4E-7	Large LOCA: Failure of Low Pressure Recirculation Cooling	1.1E-9
5	Large LOCA: Failure of Safety Injection	6.4E-6	Interfacing System LOCA	5.7E-7	Medium LOCA: Failure of Low Pressure Recirculation Cooling	1.1E-9
6	Fire: Specific Fires in Switchgear Room.... etc.	5.7E-6	TT/LOP: Loss of All AC, RCP (Seal) LOCA, Failure to Recover	4.8E-7	Seismic: Loss of Control or AC Power	9.4E-10
7	Seismic: Loss of Control or AC Power	4.7E-6	Small LOCA: Failure of High Pressure Recirculation Cooling	8.2E-9		
8	Small LOCA: Failure of Safety Injection	2.8E-6				
9	Turbine Trip Due to Loss of Offsite Power: Loss of All AC (due to diesel failure and combined diesel/service water failure), RCP Seal LOCA, and Failure to Recover External AC Power Until After 1 Hr.	7.7E-6				
10	Medium LOCA: Failure of Low Press. Safety Inj.	1.7E-6				

TABLE I-3
DOMINANT SCENARIOS COMMON TO CORE MELT, LATENT EFFECTS RELEASE, AND EARLY DEATHS RELEASE FREQUENCY

SCENARIO	CORE MELT RANKING	LATENT EFFECTS RANKING	EARLY DEATHS RANKING
a) Small LOCA: Failure of High Pressure Recirculation Cooling	1	7	2
b) Large LOCA: Failure of Low Pressure Recirculation Cooling	2	8	4
c) Medium LOCA: Failure of Low Pressure Recirculation Cooling	3	9	5
d) Fire: Specific Fires in Switch-gear Room & Cable Spreading Room Causing RCP Seal LOCA & Failure of Power Cables to the Safety Injection Pumps, Containment Spray Pumps & Fan Coolers	6	1	3
e) Seismic: Loss of Control or AC Power	7	2	6
f) Turbine Trip Due to Loss of Off-site Power Loss of All AC (due to diesel failure & combined diesel/service water failure), RCP Seal LOCA, & Failure to Recover External AC Power Until After 1 Hour.	9	6	10

TABLE I-4
DOMINANT SCENARIOS COMMON ONLY TO LATENT EFFECTS AND EARLY DEATHS RELEASE FREQUENCIES

SCENARIO	LATENT EFFECTS RANKING	EARLY DEATHS RANKING
a) Interfacing Systems LOCA	5	1
b) Wind: Loss of Offsite Power & Service Water Pumps	3	11
c) Fire: Upper Tunnel	4	13

TABLE I-5
DOMINANT SCENARIOS CONTRIBUTING ONLY TO CORE MELT FREQUENCY

SCENARIOS	CORE MELT RANKING
a) Fire: Other Fire Areas Such as Cable Spreading Room, Auxiliary Feedwater Pump Room, etc.	4
b) Large LOCA: Failure of Safety Injection	5
c) Small LOCA: Failure of Safety Injection	8
d) Medium LOCA: Failure of Safety Injection	10

TABLE I-6*
INDIAN POINT 3 REVISED DOMINANT ACCIDENT SEQUENCES
($\geq 10^{-5}$/Ryr)

RANK WITH RESPECT TO CORE MELT	SEQUENCE	DAMAGE STATE	FREQUENCY
1	Loss of Component Cooling Due to a Pipe Break Causing RCP Seal LOCA and Failure of Safety Pumps	SEFC	1.4(-4)
2	Large LOCA: Failure of Recirculation Cooling	ALF	3.9(-5)
3	Medium LOCA: Failure of Recirculation Cooling	ALF	3.9(-5)
4	Loss of Main Feedwater: ATWS, Failure of Turbine Trip and Safety Injection System	SEFC	2.5(-5)
5	Seismic: Loss of Control	SE	2.4(-5)
6	Small LOCA: Failure of Recirculation Cooling	SLF	2.2(-5)
7	Fire: Specific Fires in Switchgear Room or Cable Spreading Room Causing RCP Seal LOCA and Failure of Power Cables to the Safety Injection Pumps, the Containment Spray Pumps, and Fan Coolers	SE	1.9(-5)
8	Fire in Cable Spreading Room Causing Failure of Safety Injection Followed by Failure of the Operator to Take Local Control of AFWS	TEFC	1.8(-5)

* Source: NUREG/CR-2934, "Review and Evaluation of the Indian Point Probabilistic Safety Study," Sandia National Laboratories, December 1982, Table 5.2-6.

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

1. Service Water System

TABLE 1-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PC - Periodic calibration activities and training.
PT - Periodic testing activities, procedures, and training.
MT - Preventive or unscheduled maintenance activities, procedures, and training.
OP - Normal and emergency operating procedures, check-off lists, training, etc.
ISI - Inservice inspection activities and training.

Mission Success Criteria

For the purpose of the probabilistic safety study, system success was defined as successful operation of two of the three SW pumps supplying the nuclear header for 24 hours after the initiating event and successful operation of one of the three SW pumps supplying the conventional header for 24 hours after the initiating event. The nuclear header normally supplies essential plant services, which in this case are the three Emergency Diesel Generators (EDGs) and the five containment building ventilation fan cooler recirculation units (FCUs). The conventional header supplies non-essential plant services, which in this case consists of the Component Cooling Heat Exchangers. Either header can be supplied by either group of three SW pumps 31, 32, and 33 or 34, 35, and 36.

Although the Backup SW Pumps 37, 38, and 39 can supply essential plant services in the event of loss of the normal water supply, the third set of pumps cannot be selected for automatic starting, are not considered part of the engineered safeguards system, and were therefore excluded from the IPPSS analysis. Therefore, they have not been included here.

1.a) <u>Header Discharge Check Valve SWN 100-2 Fails to Open or Manual Insolation Valve SWN 98 Left in the Closed Position or Nuclear Header Piping Rupture (SWPs 31,32,33)</u>

Two of the three Service Water Pumps are required to supply the designated nuclear header for 24 hours following an initiating event. Failure of any of these valves in the closed position or a pipe rupture will

TABLE 1-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

prevent service water flow to the designated header. Testing of the header and pumps not in use according to the Technical Specifications should reduce the probability of failure. (PT,MT,OP,ISI)

b) Header Discharge Check Valve SWN 100-1 Fails to Open or Manual Isolation Valve SWN 99 Left in the Closed Position or Nuclear Header Piping Rupture (SWPs 34,35,36)

Two of the three Service Water Pumps are required to supply the designated nuclear header for 24 hours following an initiating event. Failure of any of these valves in the closed position or a pipe rupture will prevent service water flow to the designated header. Testing of the header and pumps not in use according to the Technical Specifications should reduce the probability of failure. (PT,MT,OP,ISI)

2. Service Water Pumps (SWPs) 31-36 Fail to Start or Run

a) Mechanical pump failure.
b) Electric motor or control circuit failure.
c) Pump discharge isol. valves SWN 2-1 to 2-6 left in closed position.
d) Pump discharge check valves SWN 1-1 to 1-6 fail to open.
e) Pump discharge expansion joint ruptures.

Failure of any combination of two out of three pumps will prevent sufficient service water flow from being provided to the essential header. Testing of the pumps which are not in use according to the Technical Specifications should reduce the probability of failure. (PT,MT)

3. Mode Selector Switch Improperly Positioned

Failure of this system is dominated by the human error of mispositioning the mode selector switch. There is no indication in the control room to aid the operator in determining the correct position for this switch. This error, if undetected, leads directly to system failure. Verification and review of the System Operating Procedures and Check-off Lists should reduce the probability of failure. (OP)

4. Diesel Generator SW Outlet Flow Control Valves FCV-1176 and FCV-1176A Fail to Open on Demand and Remain Open for 24 Hours

Failure to open both of these valves will cause unavailability of all three Diesel Generators. In the event of Loss of Offsite Power, the DGs are required to supply electrical power. Testing of valves according to the Technical Specifications should reduce the probability of failure. (PT, MT)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

1. Service Water System

TABLE 1-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODES
61726	Monthly Surveillance Observation	SW Pumps 31-36	2
		Pump/Header Discharge Check Valves	1,2
		Mode Selector Switch	3
		DG Outlet Flow Control Valve	4
		System Piping	1
62700	Maintenance	SW Pumps and Motors 31-36	2
62703	Monthly Maintenance Observation	SW Pump Strainers	2
		Pump/Header Discharge Check Valves	1,2
		Pump/Header Main Isolation Valves	1,2
71707	Operational Safety Verification	SW Pumps 31-36	2
71710	ESF System Walkdown	SW Pumps 31-36	2
		Mode Selection Switches	3
		SW Pump Local/Remote Switches	2
		Pump Strainers	2
		Key Valves and Breakers as per Table 1-3	1,2,3,4

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

1. Service Water System

TABLE 1-3 MODIFIED SYSTEM WALKDOWN

COMPONENT	ESSENTIAL PUMPS 31, 32, 33		C.R. or	SWITCH POSITION 34, 35, 36	
1. Control Room					
• SW Pump Selector Switch (Pumps supplying essential header)	31,32,33	______		34,35,36	______
• TCV-1103 Cont. Temp. Controller	MAN/AUTO	______		MAN/AUTO	______
2. Intake Structure					
• SWN-2 A, B, C, D, E, F Pump Outlet Valves (6)	OPEN	______		OPEN	______
• ΔP Across Strainer (Reading for Each Pump Strainer)	READING	______			
		______			
		______			
		______			
		______			
		______			
• SWN-4 Supply from 31,32,33 SWP Discharge Header	SHUT	______		OPEN	______
• SWN-5 Supply from 34,35,36 SWP Discharge Header	OPEN	______		SHUT	______
3. Valve Pit (SWS to Conventional Plant)					
• SWN-6 - SW Pumps 34,35,36 Discharge Isolation to Conventional Essential Header	SHUT	______		OPEN	______
• SWN-7 - SW Pumps 31,32,33 Discharge Isolation to Conventional Essential header	OPEN	______		SHUT	______

TABLE 1-3 (Cont'd)

COMPONENT	ESSENTIAL PUMPS 31, 32, 33	C.R. or	SWITCH POSITION 34, 35, 36
4. Valve Pit (Standby Service Water)			
• SWN-96 - SW Pumps 37,38,39 Discharge Isolation VLV to Pumps 31,32,33 Discharge Header	OPEN ______		SHUT ______
• SWN-97 - SW Pumps 37,38,39 Discharge Isolation Valve to Pumps 31,32,33 Discharge Header	SHUT ______		OPEN ______
• SWN-98 - SW Pumps 31,32,33 Discharge Isolation Valve to Nuclear Services	OPEN ______		OPEN ______
• SWN-99 - SW Pumps 34,35,36 Discharge Isolation Valve to Nuclear Services	OPEN ______		OPEN ______
5. 480 Volt Bus Feeds to Service Water Pumps			
<u>Bus No. 2A</u>			
• No. 32 SW Pump Breaker			RACKED IN ________
• Breaker Control Power Fuses			RACKED IN ________
<u>Bus No. 3A</u>			
• No. 35 SW Pump Breaker			RACKED IN ________
• Breaker Control Power Fuses			RACKED IN ________
<u>Bus No. 5A</u>			
• No. 31 SW Pump Breaker			RACKED IN ________
• Breaker Control Power Fuses			RACKED IN ________
• No. 34 SW Pump Breaker			RACKED IN ________
• Breaker Control Power Fuses			RACKED IN ________
<u>Bus No. 6A</u>			
• No. 33 SW Pump Breaker			RACKED IN ________
• Breaker Control Power Fuses			RACKED IN ________
• No. 36 SW Pump Breaker			RACKED IN ________
• Breaker Control Power Fuses			RACKED IN ________

TABLE 1-3 (Cont'd)

COMPONENT	ESSENTIAL PUMPS 31, 32, 33	C.R. SWITCH POSITION or 34, 35, 36
6. Service Water Transfer Panel		
• No. 1 Pump Switch		REMOTE ______
• No. 2 Pump Switch		REMOTE ______
• No. 3 Pump Switch		REMOTE ______
• No. 4 Pump Switch		REMOTE ______
• No. 5 Pump Switch		REMOTE ______
• No. 6 Pump Switch		REMOTE ______
7. CCR Air Conditioning		
• SWN-94-A Inlet to AC 32	CLOSED ______	OPEN ______
• SWN-94-B Inlet to AC 31	CLOSED ______	OPEN ______
8. SW to Diesel Generators		
• SWN-30 Inlet Stop from 31,32,33 SWP Header	OPEN ______	CLOSED ______
• SWN-29 Inlet Stop from 34,35,36 SWP Header	SHUT ______	OPEN ______
• SWN-62-5 Inlet Stop from 31,32,33 SWP Header for DG 33	OPEN ______	CLOSED ______
• SWN-62-6 Inlet Stop from 34,35 36, SWP Header for DG 33	SHUT ______	OPEN ______
• SWN-62-3 Inlet Stop from 31,32,33 SWP Header for DG 32	OPEN ______	SHUT ______
• SWN-62-4 Inlet Stop from 34,35,36 SWP Header for DG 32	SHUT ______	OPEN ______
• SWN-62-1 Inlet Stop from 31,32,33 SWP Header for DG 31	OPEN ______	SHUT ______
• SWN-62-2 Inlet Stop from 34,35,36 SWP Header for DG 31	SHUT ______	OPEN ______

TABLE 1-3 (Cont'd)

COMPONENT	ESSENTIAL PUMPS 31, 32, 33	C.R. SWITCH POSITION or 34, 35, 36
9. Service Water Pipe Chase (Cont. Coolers)		
• SWN-38 SW Supply to Fan Cooler Units from 34,35,36	SHUT ______	OPEN ______
• SWN-39 SW Supply to Fan Cooler Units from 31,32,33	OPEN ______	SHUT ______

IP3 SERVICE WATER SYSTEM PRIORITY VALVES AND SWITCHES

NOTES:

1. The list of priority valves and switches for the service water system is extensive because it takes all of these valves to establish the "essential" manifold. If at any time the position of one or more of these valves does not correspond to the column indicated by the control room selector switch position, then one or more essential loads will not be satisfied during an accident or emergency condition involving loss of power. For example, with the selector switch position in the 31, 32, 33 position, if SWN 30 is shut, the diesels will not receive any cooling water, and will eventually shut down on over-temperature. During normal plant operation, this fault would not be discovered because the diesels could be fed from SWN-29 which supplies water from the second (non-essential in this case) manifold.

2. The control room selector switch position 31, 32, 33 or 34, 35, 36 establishes the essential manifold.

3. The ΔP across the strainers (intake structure) is not a normal part of the system line-up check-off list (COL-RW 2), but should be included in the inspectors observations since this reading will indicate the following:

   - Pump running or shutdown
   - Strainer condition (i.e., clogged)

4. Breaker position (racked in) and pump switch position (remote) on the SW transfer panel will enable pump operation from the control room during normal and emergency conditions.

REFERENCES

Number	Title	Rev.	Date
	NYPA IP3 Check-Off Lists:		
1. COL-RW-2	Service Water System	4	9/9/85

2. Comments by NRC Resident Inspector R. Barklay, 1/9/87.

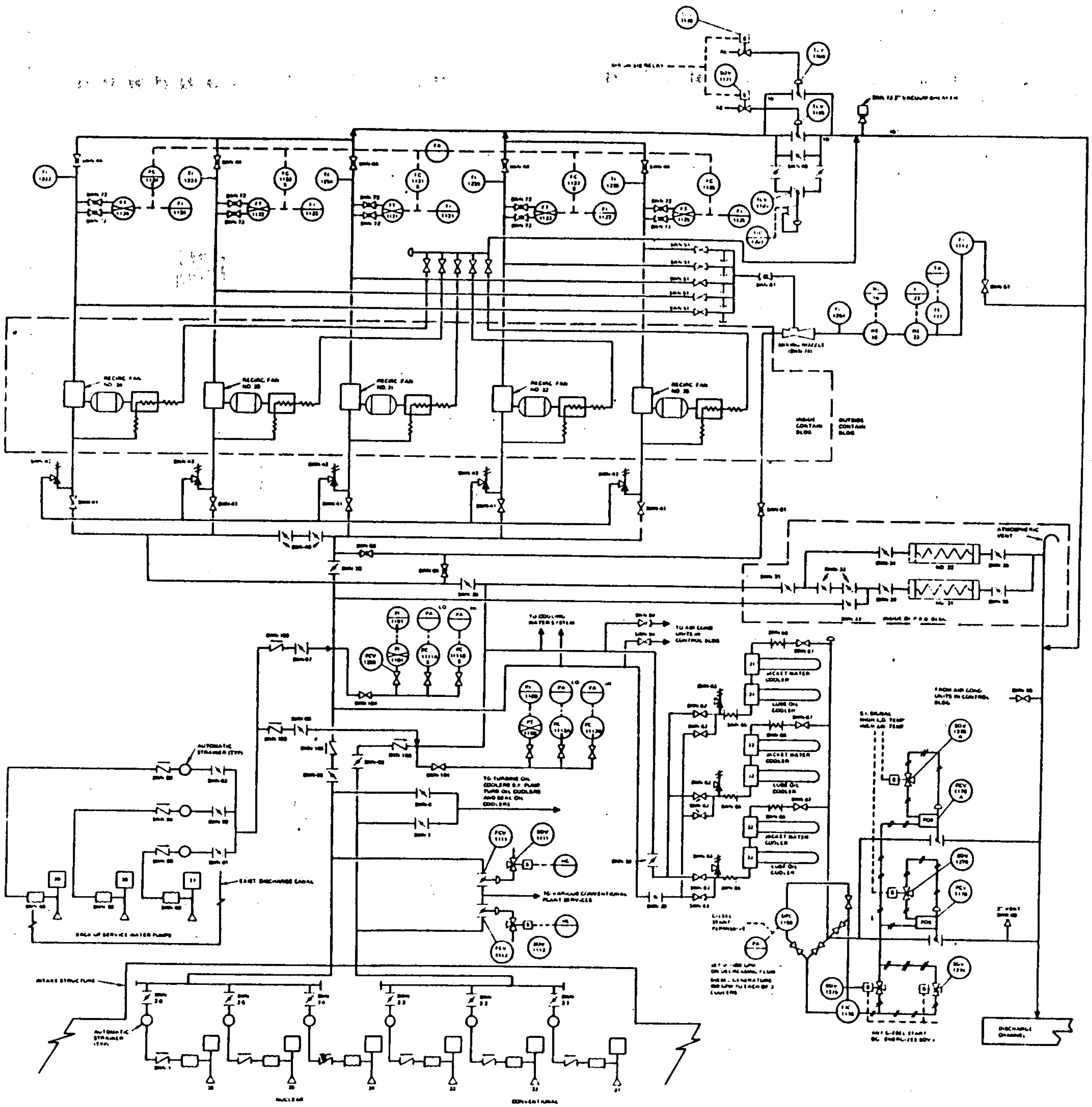

Figure 1-1: Indian Point 3 Simplified Schematic of Service Water System
Source: IPPSS - Figure 1.6.2.3.8-4

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

2. Electric Power System

TABLE 2-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PT - Periodic testing activities, procedures, and training
MT - Preventive or unscheduled maintenance activities, procedures, and training
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

The Electric Power System (EPS) is analyzed for 16 operability states such as "Failure of Power at Bus 2A," "Failure of Power at Bus 3A," etc. for both cases of offsite power available and unavailable. However, since the system is effectively a support system to the front line systems such as HPCI or RCIC or to other support systems such as Service Water, failure of specific segments of the EPS is not analyzed directly in the IPPSS but it is reflected in the minimal cutsets of the systems which the EPS supports. Therefore, the basis for the inspection plan priorities is provided in the following discussion.

As indicated in the IPPSS (Section 1.6.2.2.1, page 1.6-222) the results for the EPS are quantified in detail only at the specific event sequence level and not under the broad category of electric power. The results presented in Section 1.6.2.2.1, do not provide the full quantification of the contribution to risk from electric power failures. However, the tables and fault trees presented for individual failure states do contain common factors, including testing errors, diesel generator unavailability, circuit breaker failures (hardware), and offsite power unavailability. These factors, dominated by Emergency Diesel Generator (EDG) failures, are transposed to the operationally oriented items recommended for inclusion in an inspection plan. The basis for each of the items follows:

TABLE 2-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

1. Emergency Diesel Generator (EDG) Mode Selector Switch Not in Auto Position

During periodic surveillance testing, the local mode selector switch is placed in the "local" position. Failure to return this switch to "AUTO" results in the loss of automatic start capability. (OP)

As identified on page 1.6-177, the probability for the unavailability of EDGs due to the control switch in the wrong postion is 2.5 x 10^{-5} for 1 EDG, 2 x 10^{-6} for 2 EDGs, and 1.6 x 10^{-7} for 3 EDGs. This is related to the failure of the EDGs to start on demand which comprises nearly 50% of the total EDG unavilability. (1.6-149)

2. Emergency Bus Normal Supply Breakers, Station Service Transformer and Bus Transfer Scheme Circuit Breaker Fails Open/Closed

Power to the emergency 480V buses from offsite sources including the unit gas turbine installation is provided via circuit breakers and a transformer. The loss of normal power to the emergency bus due to a generator trip, offsite supply fault, or breaker mechanism and associated relaying failure could result in partial system failure. (MT,PT)

As identified on page 1.6-222, the failure of the station service transformer is the most important contributor to the loss of power at more than 2 buses. In addition, page 1.6-150 indicates that failures of common supplies to various buses (2A, 3A, 5A, 6A) are dominant contributors to the loss of normal power to these buses. The loss of supply to these buses is reflected in the importance of maintaining and testing the bus supply breakers. This is therefore included in the inspection plan.

3. Emergency Bus Supply Breaker From EDG Fails to Close

In an undervoltage situation, the supply circuit breakers from the EDG will close only after the diesel has obtained rated speed and the normal supply breakers have opened. Failure of the EDG breaker to close results in a loss of power to that bus. (PT,MT)

Related to the unavailability of the EDG during startup is the inability of the EDG to supply the emergency bus due to problems with the supply breaker. This single item is identified separately due to the fairly complex logic associated with the breaker operation.

4. Emergency Diesel Generator, Air Start Solenoid Valve, DC Lube Oil Pump, Air Compressor and Receivers, and Logic (Permissives) Fail to Start

The EDG is a complex device requiring a number of inputs to be satisfied in order to achieve a successful start. This includes logic, starting air, DC power, and other subsystems. (PT,MT)

TABLE 2-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

Successful starting and continued operation of the EDGs requires the availability of four auxiliary systems, including starting air, fuel oil transfer, service water, and 125V DC control power. The importance of these support/subsystems are outlined on page 1.6-158.

5. DC Power Panel Loss of DC Control Power

Failure of DC power to the EDG results in the inability to start the diesel due to the loss of generator field flashing capability and the loss of automatic operation of the air start solenoid. Similarly, loss of circuit breaker operation also results. Loss of DC power can also be attributed to battery and/or battery charger failure. (PT,MT)

DC power availability affects starting and loading of the EDGs. The inspection plan identifies the specific DC power supplies to the EDG control panels. The fairly large amount of equipment associated with Station DC Power (batteries, battery chargers, control panels) warrants attention in this inspection plan.

6. 480 Volt Bus Tie Breakers Mispositioned Closed

During normal power operation, the bus tie breakers are positioned OPEN. In the situation where the cross tie breaker is mispositioned closed, a fault on either of the two buses results in the loss of both. (OP)

A large number of multiple bus failures presented in the IPPSS illustrate the importance of maintaining safety bus cross tie breakers open. This is reflected in the assumption of bus independence and redundancy. If the bus tie breakers are inadvertently closed, this independence is compromised (common mode failure probability increases).

7. EDG Trips While Running

Containing a number of protective devices, the EDG could fail while running due to the improper operation of these devices. Similarly, subsystems such as fuel oil transfer, jacket water, and ventilation could render the EDG inoperable. (PT,MT)

While comprising only 18% of the total EDG unavailability (page 1.6-149) the inspection of protective devices which could fail the EDG during operation is still justified due to the large amount of hardware and number of interfaces associated with EDG operation.

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

2. Electric Power System

TABLE 2-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

NUMBER	TITLE	COMPONENTS	FAILURE MODES
61726	Monthly Surveillance Observation	Emergency Diesel Generators (EDG)	1,3,4,7
		Batteries	5
		Mode Selector Switches	1
	(Quarterly)	Battery	5
62700	Maintenance	EDG	1,6,7
		Batteries	5
		Circuit Breakers	2,3,6
		Relays	4
		Battery Charger	5
71707	Operational Safety Verification	Bus Tie Breakers	6
		Mode Selector Switches	1
56700	Calibration	EDG	4,7

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

2. Electric Power System

TABLE 2-3 MODIFIED SYSTEM WALKDOWN

	COMPONENT	DESIRED POSITION	ACTUAL POSITION
1.0	Diesel Generator Rooms		
	EDG Control Switch (31,32,33 EDG)	Auto	______
	EDG Breaker Switch (EG-1,-2,-3)	Auto	______
	Indicating Lamp	Open	______
	2AT/3A Cross Tie Breaker Switch (No. 31 EDG)	Auto	______
	Indicating Lamp	Open	______
	DA-14 1&2 Starting Air Isolation Valves (DG#31)	Open	______
	DA-14 3&4 Starting Air Isolation Valves (DG#32)	Open	______
	DA-14 5&6 Starting Air Isolation Valves (DG#33)	Open	______
2.0	Control Room		
	Circuit Breaker Switches EG-1,-2,-3	Auto	______
	Indicating Lamps	Green(Open)	______
	480 Volt Bus Supply Breakers, 2A,3A,5A,6A	Closed	______
	480 Volt Bus Tie Breakers, 2A-3A, 2A-5A,3A-6A	Open	______
	118 Volt AC Bus No. 31,32,33,34	Energized	______
3.0	Switchgear		
	Circuit Breakers EG-1, -2, -3	Racked In	______
	Supply Breakers to MCC 36A,B,C (El. 15' Control Bldg.)	Closed	______
	Circuit Breakers to Fuel Oil Transfer Pumps at MCCs 36A,B,C	Closed	______
OTHER			
	Battery Chargers 31,32,33,34	Energized	______
	DG-12-1 DG #31 Fuel Oil Transfer Pump Discharge Valve	Open	______
	DF-9-2 DG #32 Fuel Oil Transfer Pump Discharge Valve	Open	______
	DF-9-3 DG #33 Fuel Oil Transfer Pump Discharge Valve	Open	______
	DC Power Panels No. 31,32,33,34	Energized	______

TABLE 2-3 (Cont'd)

REFERENCES

Number	Title	Rev.	Date
	NYPA IP3 Check-Off Lists:		
1. COL-EL-1	6900 & 480V AC Distribution	3	6/26/85
2. COL-EL-3	118V AC Instrument Buses, 115V DC Distribution	3	10/5/83
3. COL-EL-5	Diesel Generators	6	2/19/85

4. Comments by NRC Resident Inspector R. Barklay, 1/9/87.

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

2. Electric Power System

TABLE 2-4 PROPOSED INSPECTION PLANT FOR DIESEL GENERATORS AT NUCLEAR PLANTS

A. Objective

To review and evaluate Diesel Generator design operation, and maintenance at NPPs to ensure that the DGs will be available when needed to power safety systems.

B. Details

1. The inspection of the following items should focus on DG auxiliary systems as follows: Fuel Injection System, Turbocharger, Starting System, Speed/Load Control, Cooling Water, Lube Oil, Fuel Oil, Control and Monitoring Systems, and Generator.

2. Using the LER, 50.55e, and Part 21 systems computer printout, select 3 recent failures (within 2 years) for followup at the NPP. When at the plant select an additional 2 failures from the internal systems. Evaluate the licensee's response to these failures for proper failure analysis, corrective action, notification of vendor, Part 21 evaluation and documentation.

3. Maintenance: Refer to IE I.P.s 62700 and 62702, as they apply to DG maintenance. Additionally, does the NPP have, and have they implemented the DG vendors' maintenance recommendations (especially those recommendations unique to nuclear service DGs such as Colt's described in NSAC-79)? Are maintenance personnel specially trained on DGs? Is failure information fed back into maintenance program? Has the NPP implemented recommendations of various studies referenced in Section 4 above.

4. Design Change Control: Select two DG modifications and verify proper implementation. Utilizing information from DG vendor inspection on modifications recommended, verify that NPP is receiving all pertinent information in this area from the vendor. (Reference IE I.P. 37700).

5. Spare Parts and Precurement: Review how spare parts and services are purchased and parts stored, both from DG vendors and direct from sub-vendor. Verify adequate Part 21 and QA, particularly when vendors are only supplying commercial grade parts and services (e.g., Woodward Governor and Stewart and Stevenson). Verify ASME code specified where appropriate. Tour spare parts storage area. (Reference IE I.P. 38701B).

6. Training: Ensure appropriate DG specific training given to maintenance, operations, QA, and management personnel. Are there adequate documents to describe DG operation onsite (both main engine and auxiliary system)? (Reference IE I.P. 41700).

TABLE 2-3 (Cont'd)

7. Observe DGs in operation. Ensure they run smoothly and are operated per procedure. Look for abnormal vibration and leaks (air, fuel oil, or lube oil). Check that readings are within specified limits. Are limits per DG vendor recommendations (are recommendations clearly specified)? Is air quality in DG room satisfactory without excessive dust? Are control cabinets properly gasketed? Are instruments calibrated? Is trending of operating data performed to detect degradation early?

8. Is NPP receiving all appropriate service information from vendor: design, maintenance, operational, etc? This is especially important for General Motors DG owners (verify they recieve "Power Pointers" from GM).

9. Review site practices to limit DG cold fast starts.

10. Reliability records and calculations: Check logs, procedures, and calculations versus Reg. Guide 1.108 criteria.

11. Ensure that pertinent studies on DG performance have been reviewed and recommendations implemented as appropriate (e.g., NUREG/CR-0660 and NSAC-79).

12. Torquing: Ensure plant has adequate specifications for all torquing. Ensure it is documented and done with calibrated equipment. Observe re-torquing if in progress.

Source

J. C. Higgins and M. Subudhi, "A Review of Emergency Diesel Generator Performance at Nuclear Power Plants," NUREG/CR-4440, Brookhaven National Laboratory, November 1985.

REFERENCES

1. NSAC-79, "A Limited Performance Review of Fairbanks Morse and General Motors Diesel Generators at Nuclear Plants," Nuclear Safety Analysis Center, Electric Power Research Institute, April 1984.

2. G. Boner and H. Hanners, "Enhancement of On-Site Emergency Diesel Generator Reliability," NUREG/CR-0660, University of Dayton, February 1979.

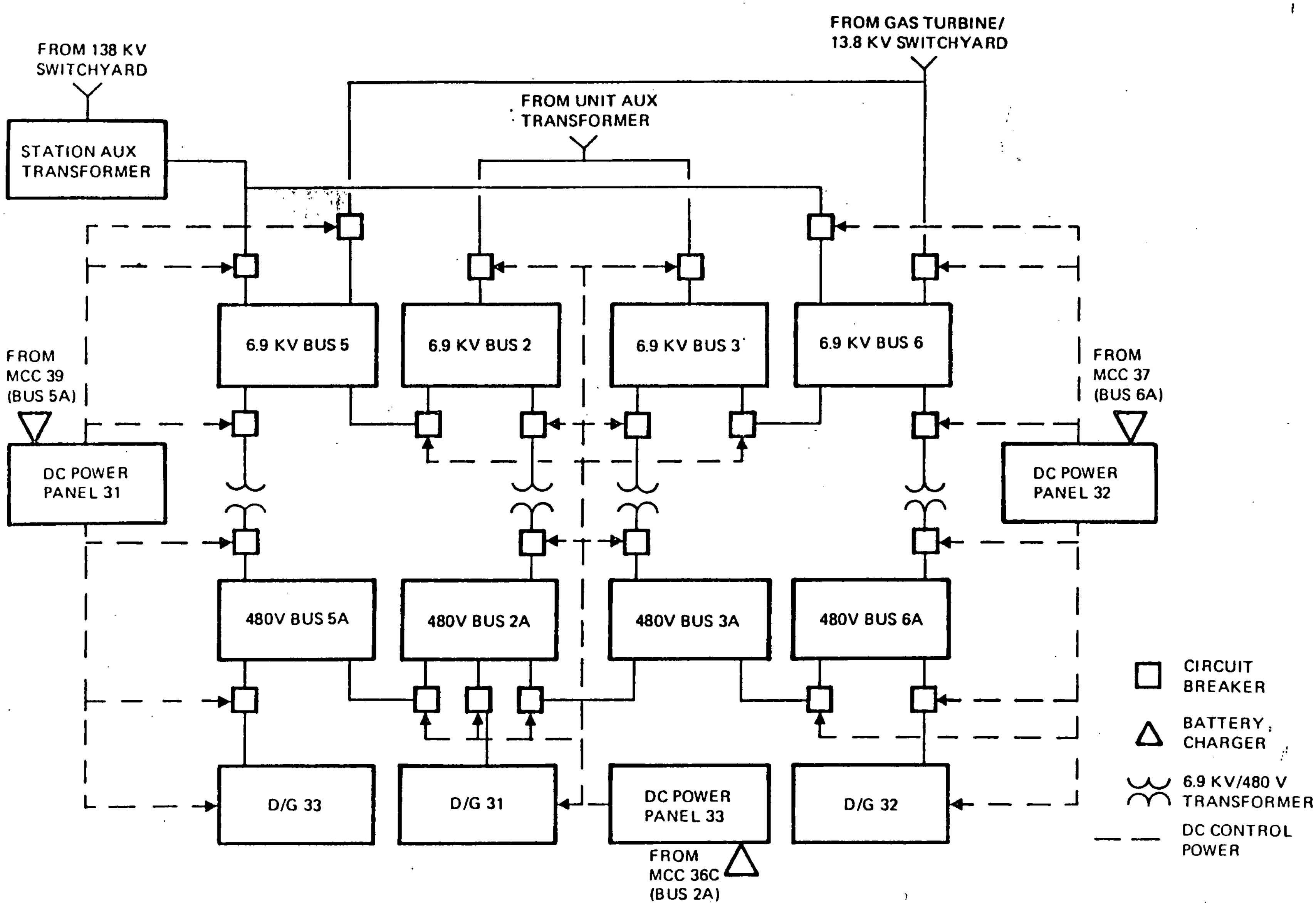

Figure 2-1: Indian Point 3 480V Essential Power Supply Block Diagram

Source: IPPSS - Figure 1.6.2.2.1-1

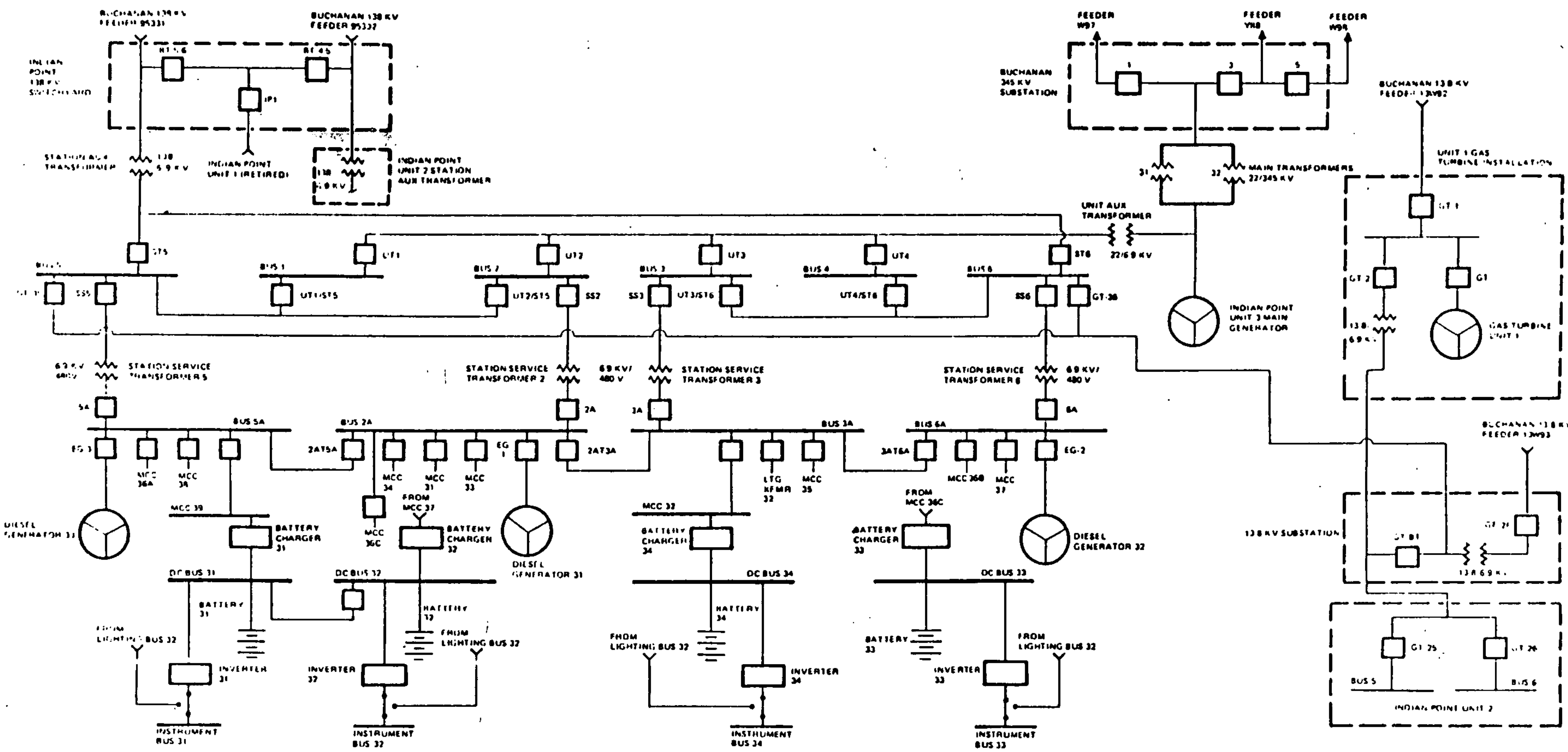

Figure 2-2: Indian Point 3 Electric Power System Diagram

Source: IPPSS - Figure 1.6.2.2.1-2

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

3. Component Cooling Water System

TABLE 3-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

ISI - Inservice inspection activities, procedures and training.
PT - Periodic testing activities, procedures and training.
MT - Preventive or unscheduled maintenance activities, procedures and training.
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

The Component Cooling Water System supplies water for heat removal during the recirculation phase of all LOCAs and during all transient events, specifically to remove residual and sensible heat from the Residual Heat Removal (RHR) heat exchangers, the RHR pumps, Safety Injection (SI) pumps and the charging pumps. It also supplies water to the auxiliary component cooling pumps for recirculation pump cooling. During normal operation, the CCWS also supplies cooling water to the four Reactor Coolant Pump (RCP) thermal barrier heat exchangers as well as to the three charging pump oil coolers. The IPPSS did not consider loss of the CCWS as an initiating event. However, in NUREG/CR-2934,† Sandia National Laboratories (SNL) determined that loss of the CCWS due to a pipe break causing a RCP Seal LOCA and failure of the SI pumps is the leading accident sequence based on core melt frequency, assuming that loss of seal cooling would lead to a 1200 gpm LOCA after 30 minutes. Therefore, some of the observations from the SNL review were included as conditions that can lead to failure, in order to account for the considerable uncertainty concerning seal LOCAs.

In the IPPSS itself, system success is defined as one of three CCWS pumps operating initially, followed by a second pump as power is available, and one of two CCWS heat exchangers operating to supply post-accident cooling. The IPPSS analysis was based on the assumptions that the system was in the normal mode of cooling prior to the LOCA or transient and that no operator action to recover the system following failure or to correct deficiencies would be taken.

† G. J. Kolb et al., "Review and Evaluation of the Indian Point Probabilistic Safety Study," NUREG/CR-2934, December 1982.

TABLE 3-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

1. Large Pipe Break Causes Drainage of CCWS and Operators Fail to Connect a Spool Piece to Establish City Water Cooling to the Charging Pumps Within 20 Minutes

   Drainage of all CCWS capacity caused by a large pipe break will lead to an RCP Seal LOCA from loss of cooling flow from the charging pumps. City water must be established to the charging pumps within 20 minutes by means of a spool piece. (ISI,OP) (This is based on the SNL review of the IPPSS).

2. Service Water Supply Valves SWN-31, SWN-32 or Headers to CCW Heat Exchangers Are Closed Due to Maintenance Error or Plugging

   Since these valves are alternately the single flow path from the Conventional Header Service Water Pumps, or Nuclear Header Service Water Pumps, which supplies both CCW Heat Exchangers inadvertent closure or blockage of one of these valves can cause loss of both HXs and thus loss of all CCW. (MT,OP)

3. CCW Heat Exchanger SW Supply Isolation Valves 34-1 and 34-2/Discharge Isolation Valves 35-1 and 35-2 Are Closed Due to Maintenance Error or Plugging

   Inadvertent closure or blockage of one of these valves will cause loss of one CCW Heat Exchanger. (MT,OP)

4. CCW Heat Exchanger Inlet Isolation Valves 759A and 759B/Outlet Isolation Valves 765A and 765B Are Closed Due to Maintenance Error or Plugging

   Inadvertent closure or blockage of one of these valves will cause loss of one CCW Heat Exchanger. (MT,OP)

5. CCW Heat Exchangers Fail to Function Due to Maintenance Outage, Severe Tube Leaks or Plugging

   Failure of the CCW Heat Exchangers causes loss of CCW capability, thereby causing failure of RHR cooling and core damage. (MT,OP)

6. CCW Pumps and Motors Fail to Start or Run Due to Maintenance Outage and/or Mechanical or Electrical Failure (Including Control Circuit Failure)

   Failure of all three pumps will cause insufficient CCW flow during accident conditions. (MT,OP,PT,TS)

Table 3-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE
7. Pump Suction/Discharge Valves 760 A,B,C, 762 A,B,C/Pump Discharge Check Valves 761 A,B,C/Pump Suction and Discharge Header Valves 766 A,B, 759 C,D are Closed Due to Maintenance Error or Plugging Failure of all three pump trains will cause insufficient CCW flow during accident conditions. (MT,OP,PT,TS)
8. Pump Suction Strainers Exhibit Excessive ΔP Excessive ΔP across the pump suction strainers will reduce pump flow capability and inhibit system performance. (OP)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

3. Component Cooling Water System

TABLE 3-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

MODULE	TITLE	COMPONENTS	FAILURE MODES
61726	Monthly Surveillance Observation	Service Water Supply/Discharge Valves SWN-31,32,33,34/SWN-36	1,2
		CCW HX Inlet/Outlet Shutoff Valves V-759A/B, V-765A/B	2,3
		CCW Heat Exchangers	4
		CCW Pumps and Motors	5
		Pump Discharge Check Valves	6
		CCW Pump Suction/Header/Discharge Valves	6
		CCW Pump Suction Strainers	7
62700	Maintenance	CCW Heat Exchangers	4
		CCW Pumps and Motors	5
62703	Monthly Maintenance Observation	CCW Heat Exchangers	4
		CCW Pumps and Motors	5
		CCW Pump Discharge Check Valves	6
		CCW Pump Suction Strainers	7
71707	Operational Safety Verification	CCW Heat Exchangers	4
		CCW Pumps and Motors	5
71710	ESF System Walkdown	Key components per Table 3-3	1-7

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

3. Component Cooling Water System

TABLE 3-3 MODIFIED SYSTEM WALKDOWN

COMPONENT	ESSENTIAL SW PUMPS / SWPs 31, 32, 33	C.R. SWITCH POSITION SWPs 34, 35, 36
1.a) Service Water Supply Valve to CCW Heat Exchangers from Conventional Header, SWN-31	SHUT ________	OPEN ________
b) Service Water Supply Valve to CCW Heat Exchangers from Nuclear Header, SWN-32	OPEN ________	SHUT ________
c) CCW Heat Exchangers Service Water Supply Cross-Tie Valves		
SWN 33-1	OPEN ________	OPEN ________
SWN 33-2	OPEN ________	OPEN ________
d) CCW Heat Exchanger 31 Service Water Supply Inlet and Outlet Stop Valves		
SWN 34-1	OPEN ________	OPEN ________
SWN 35-1	THROTTLED ______	THROTTLED ______
e) CCW Heat Exchanger 32 Service Water Supply Inlet & Outlet Stop Valves		
SWN 34-2	OPEN ________	OPEN ________
SWN 35-2	THROTTLED ______	THROTTLED ______
2.a) CCW Heat Exchanger 31 Inlet & Outlet Stop Valves		
759 A	OPEN ________	
765A	OPEN ________	
b) CCW Heat Exchanger 32 Inlet & Outlet Stop Valves		
759B	OPEN ________	
765B	OPEN ________	

Table 3-3 (Cont'd)

COMPONENT	DESIRED POSITION	ACTUAL POSITION
3.a) CCW Surge Tank 31 Pumps Suction Stop Valve 832A	LOCKED OPEN	______
b) CCW Surge Tank 32 Pumps Suction Stop Valve 832B	LOCKED OPEN	______
4.a) CCW Pump 31 Suction Valve 760A	OPEN	______
Discharge Stop Valve 762A	OPEN	______
b) CCW Pump 32 Suction Valve 760B	OPEN	______
Discharge Stop Valve 762B	OPEN	______
c) CCW Pump 33 Suction Stop Valve 760C	OPEN	______
Discharge Stop Valve 762C	OPEN	______
5.a) CCW Pumps 31, 32, 33 Suction Header Valves 766A	OPEN	______
766B	OPEN	______
b) Discharge Header Valves 759C	OPEN	______
759D	OPEN	______

6. <u>Walkdown of High Rupture Risk Lines</u>

Piping Header Description	Location	Status
1. CCW Heat Exchanger 31 Inlet and Outlet Headers	______ ______	______ ______
2. CCW Heat Exchanger 32 Inlet and Outlet Headers	______ ______	______ ______

TABLE 3-3 (Cont'd)

COMPONENT	CONDITION	
Piping Header Description	Location	Status
3. CCW Surge Tank Inlet and Outlet Piping	______ ______	______
4. CCW Pump 31 Discharge and Suction Piping	______ ______	______
5. CCW Pump 32 Discharge and Suction Piping	______ ______	______
6. CCW Pump 33 Discharge and Suction Piping	______ ______	______

REFERENCES

	Number	Title	Rev.	Date
		NYPA - IP3 Check-off Lists:		
1.	COL-RW-2	Service Water System	4	9/9/85
2.	COL-CC-1 W/TPCN-84-159-OPS	Component Cooling Loop	4	12/11/84
3.	COL-CCV-1	Component Cooling Verification	0	2/15/85
4.	COL-LV-1	Locked Valve Check List	13	3/20/85

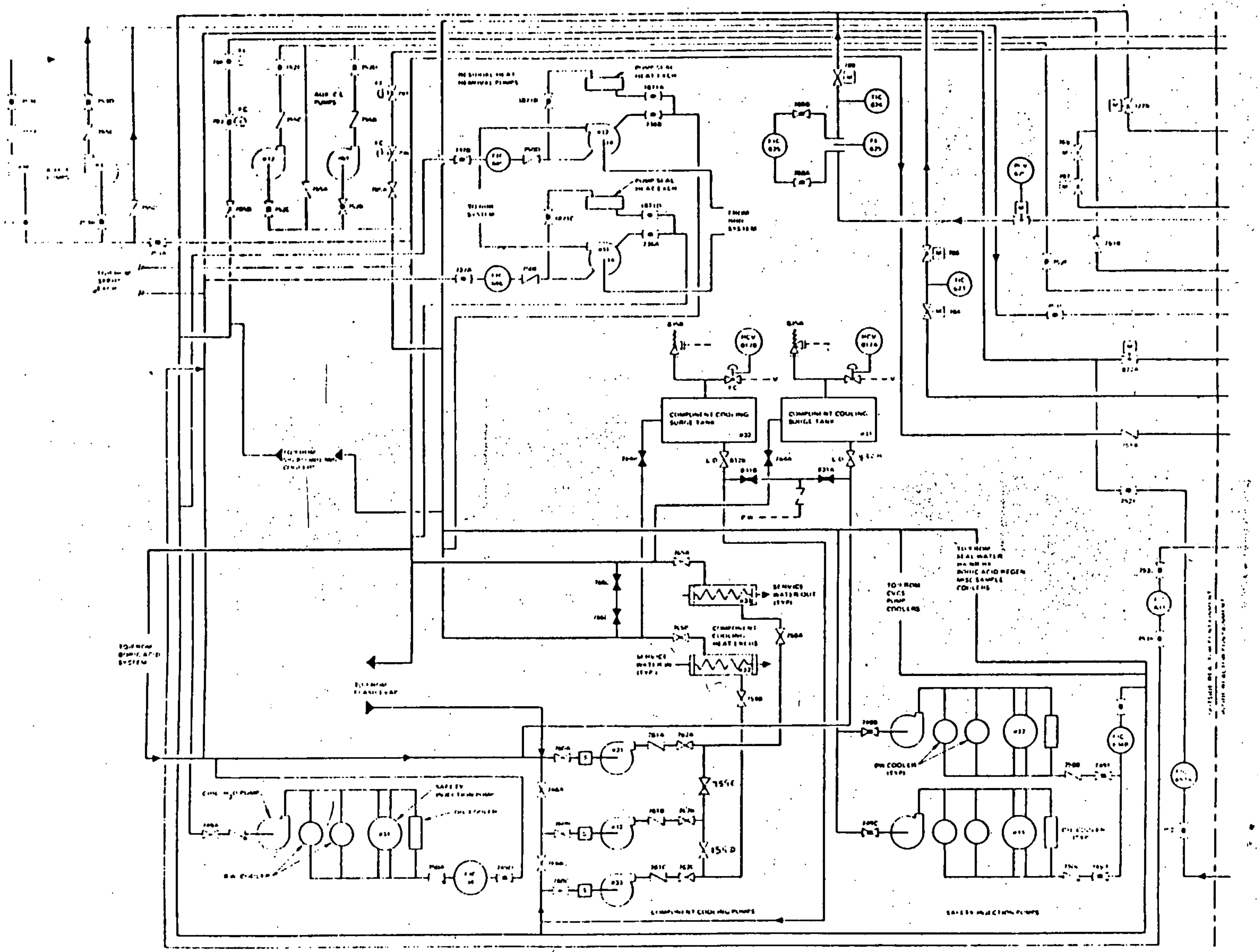

Figure 3-1: Indian Point 3 Simplified Schematic of Component Cooling System (Sheet 1 of 2)

Source: IPPSS - Figure 1.6.2.3.7-4

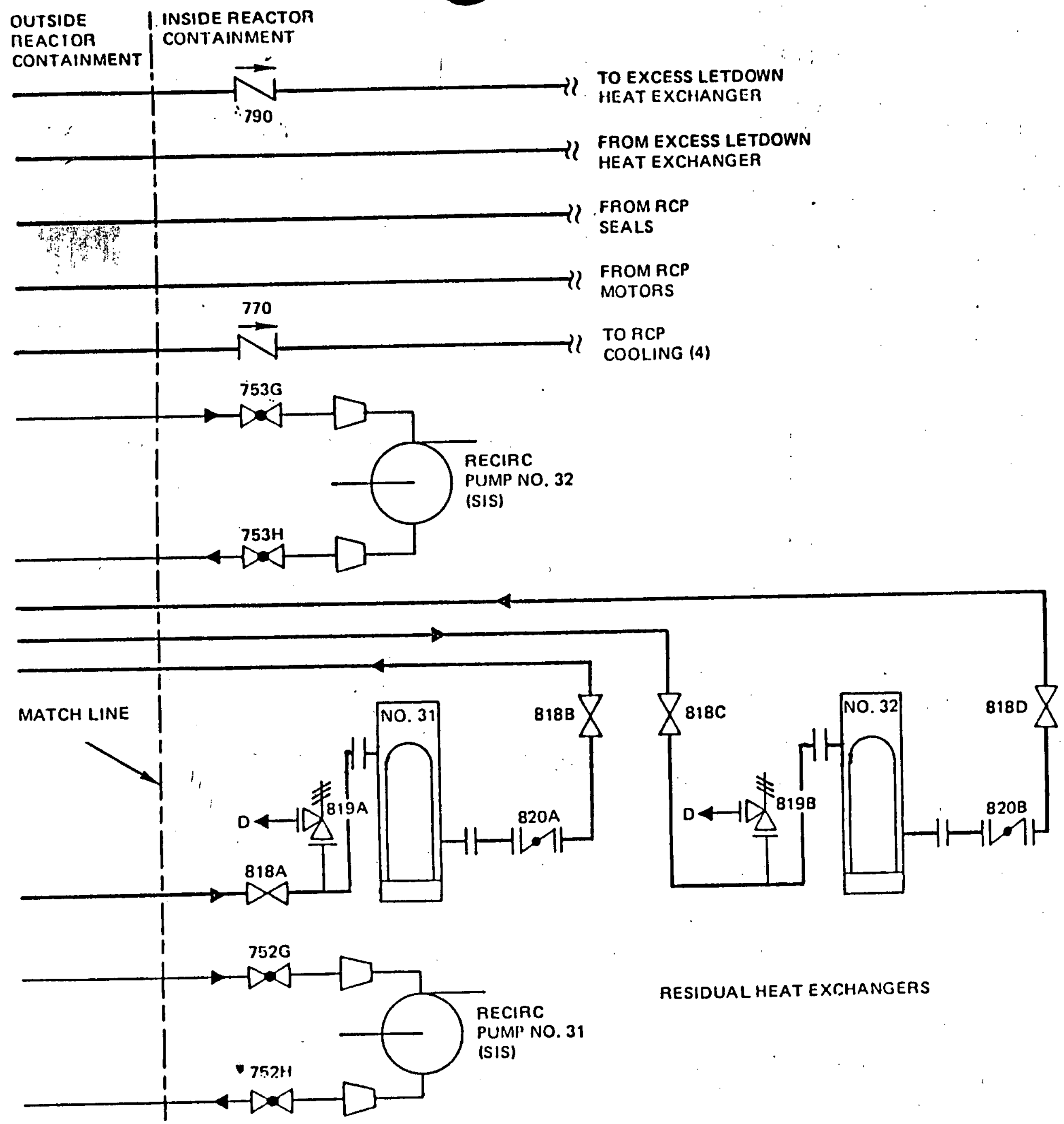

Figure 3-1: (Sheet 2 of 2)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

4. Reactor Protection System

TABLE 4-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PC - Periodic calibration activities, procedures, and training.
PT - Periodic testing activities, procedures, and training.
MT - Preventive or unscheduled maintenance activities, procedures, and training.
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

The Reactor Protection System consists of two redundant separate trains of logic and control to open the reactor trip breakers and remove power from the control rod drive mechanism magnetic coils. Trip signals from various process sensors are utilized to de-energize undervoltage devices in the two series connected trip breakers. When power is removed from the magnetic coils, the rod control cluster assemblies fall into the active fuel region of the reactor core, thereby inserting negative reactivity and making the reactor subcritical. One of the two trains must function to trip the reactor.

1. Process Instruments (Sensors and Bistables) Fail to Initiate a Reactor Trip Signal Due to Calibration Error, Maintenance Error or Mechanical or Electrical Failure.

   Two or more redundant channels can fail in a common manner due to calibration or maintenance errors or mechanical or electrical failure. This could cause system failure for the monitored parameter. (PC,PT,MT)

2. Reactor Trip Breakers Fail to Open

   The failure of the reactor trip breakers to open when required could result in electrical power being maintained on the control rod drive mechanisms thereby preventing control rod insertion. (PT,MT)

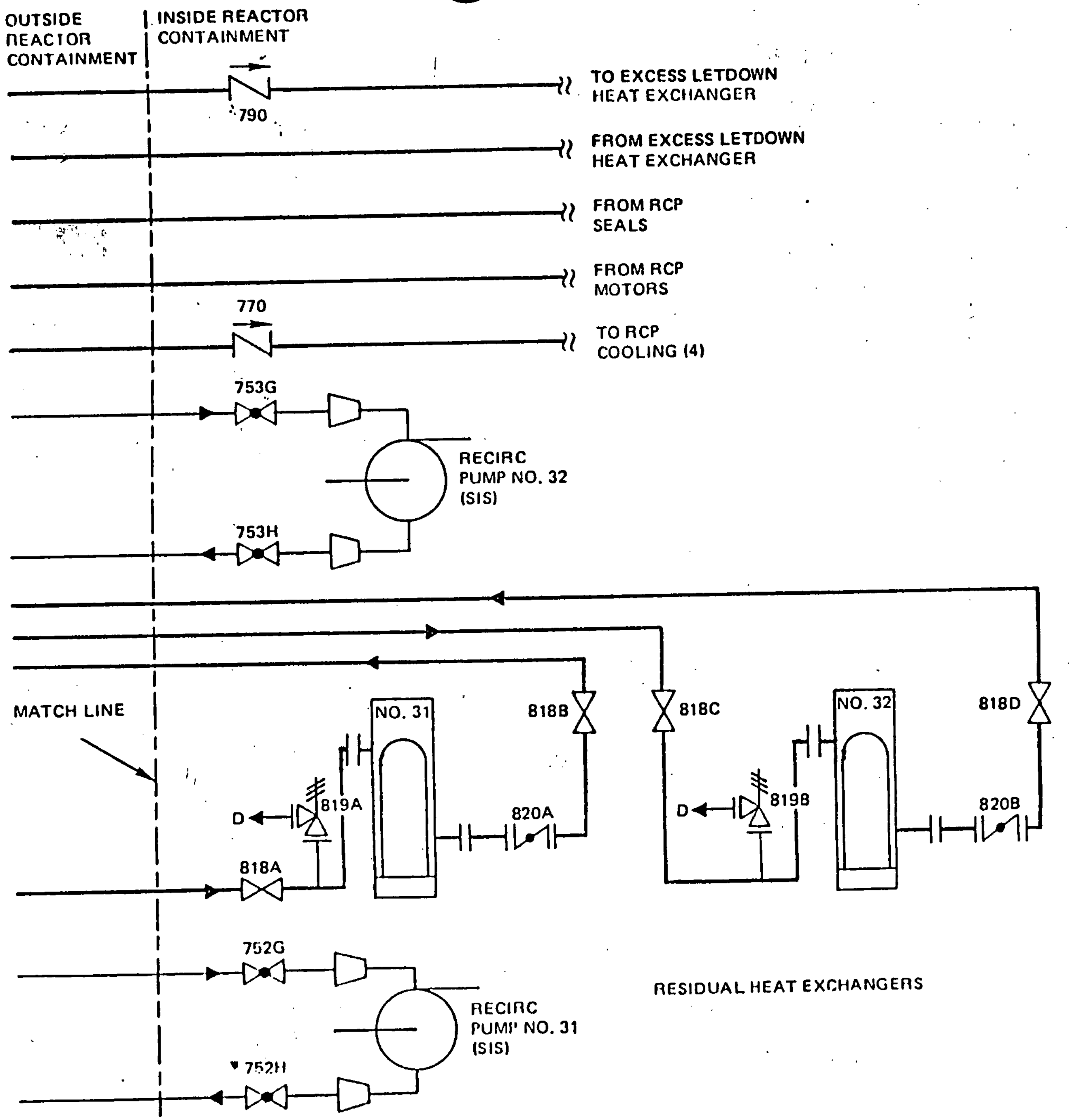

Figure 3-1: (Sheet 2 of 2)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

4. Reactor Protection System

TABLE 4-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

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   Two or more redundant channels can fail in a common manner due to calibration or maintenance errors or mechanical or electrical failure. This could cause system failure for the monitored parameter. (PC,PT,MT)

2. Reactor Trip Breakers Fail to Open

   The failure of the reactor trip breakers to open when required could result in electrical power being maintained on the control rod drive mechanisms thereby preventing control rod insertion. (PT,MT)

TABLE 4-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE
3. Logic Relays Fail to Open The failure of the logic relay contacts to open based on a trip signal from the appropriate bistable could result in system failure. (PT)
4. Reactor Trip Bypass Breakers Fail to Open During surveillance testing, the bypass breakers may be closed to permit testing of the reactor trip breaker. Failure of the bypass breaker to trip could result in system failure. (PT,MT)
5. Rod Control Cluster Assemblies Fail to Insert During most of the plant operating time, the Control Rod Drive Mechanisms hold the control rods withdrawn from the core in a static position by means of a stationary gripper which latches the rods by means of an applied magnetic field. The control rods drop by de-energizing the gripper. Restriction to rod movement could result in a failure to bring the reactor subcritical during a scram condition. (PT,MT)
6. Reactor Trip Breaker Undervoltage Relays Fail to Operate Failure of both trip breaker under-voltage relays could prevent the reactor trip breakers from operating resulting in system failure. (PT,MT)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

4. Reactor Protection System

TABLE 4-2 INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODES
56700	Calibration	Process Instruments (Sensors & Bistables)	1
52051	Instrument Components and Systems-Procedure Review	Process Instruments (Sensors & Bistables)	1
52053	Instrument Components and Systems-Work Observation	Process Instruments (Sensors & Bistables)	1
52055	Instrument Components and Systems-Record Review	Process Instruments (Sensors & Bistables)	1
61725	Surveillance and Calibration Control Program	Process Instruments (Interlocks)	1
61726	Monthly Surveillance Observation	Logic Relays	3
		Reactor Trip Breakers	2
		Reactor Trip Bypass Breakers	4
		Rod Control Cluster Assemblies	5
62702	Maintenance	Reactor Trip Breakers	2
		Reactor Trip Bypass Breakers	4
		Reactor Trip Breaker UV Relays	6
71707	Operational Safety Verification	Process Instruments (Control Room Indication and Status Lights)	1

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

4. Reactor Protection System

TABLE 4-3 MODIFIED SYSTEM WALKDOWN

The Reactor Protection System is a normally energized system whose operability must be assured by extensive surveillance testing. Observation of the conduct of this testing will provide the inspector with direct input regarding the safety function capability of the system. System walkdown during normal power operation will reveal little regarding the safety function status.

COMPONENT	REQUIRED STATUS	ACTUAL STATUS
1. Reactor Trip Breakers	RTA Closed	________
	RTB Closed	________
2. Reactor Trip Bypass Breakers	BYA Open	________
	BYB Open	________
3. Annunciator Panel - RPS (Top Section of CCR Supervisory Panel)	No windows illuminated	________
4. RPS Trip Status Panel	No bypass lights illuminated;	________
	P-7, P-8, P-10, intermediate range hi flux, low power range hi flux permissive lights illuminated	________
5. RPS Permissive and Bypass Status Panel	No lights illuminated	________
6. Process Instrument Bistables Mode Switches	No RPS channel in test lights illuminated	________

<u>REFERENCES</u>

Comments by NRC Resident Inspector R. Barklay, 1/9/87.

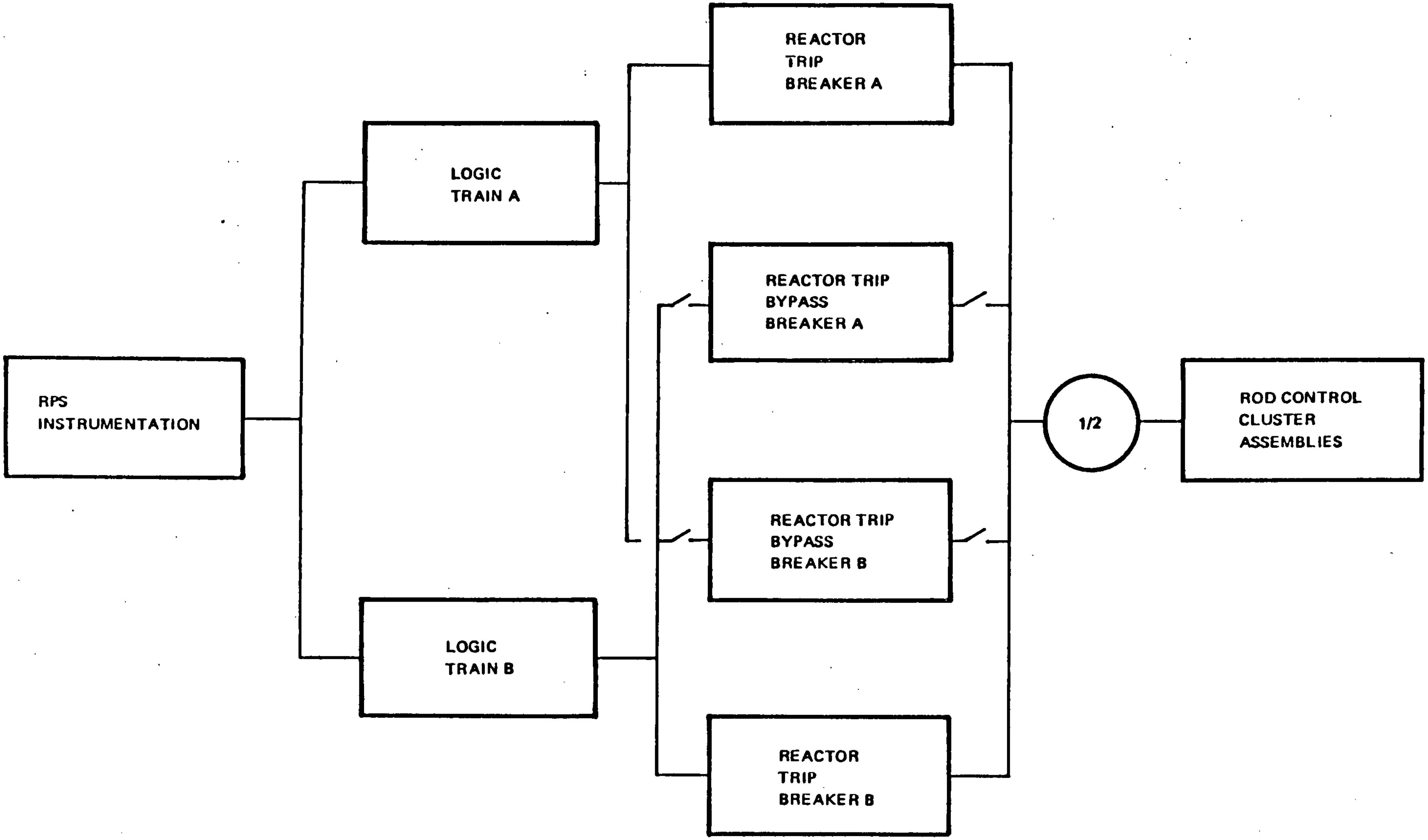


Figure 4-1: Simplified Block Diagram, Indian Point 3 Reactor Protection System

Source IPPSS - Figure 1.6.2.2.2-2

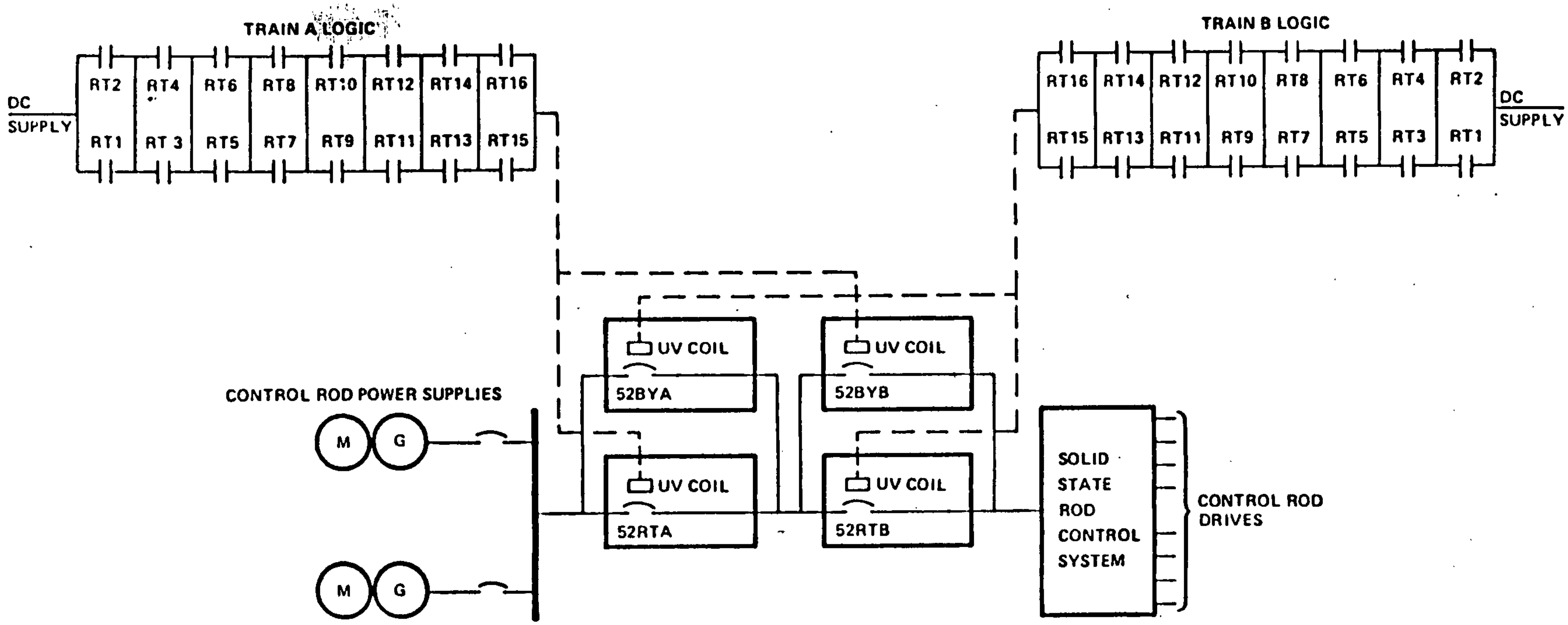


Figure 4-2. Simplified system arrangement Indian Point 3 reactor protection system.
Source: IPPSS Figure 1.6.2.2.2-3

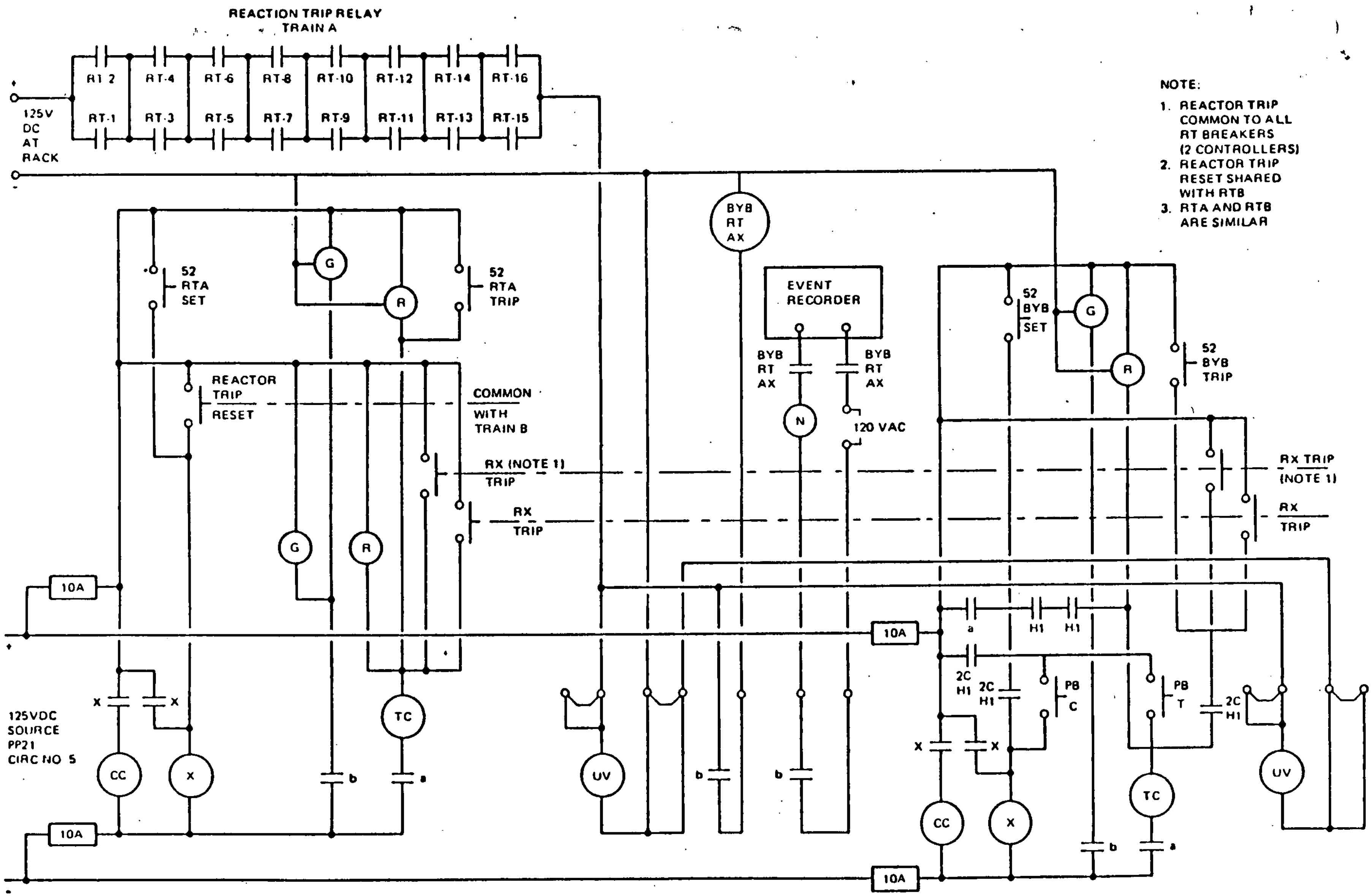


Figure 4-3. Indian Point 3 Reactor Trip Breaker Schematic
Source: IPPSS Fig[illegible]1.6.2.2.2-4

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

5. High Pressure Injection System

TABLE 5-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PT - Periodic testing activities and procedures.
MT - Preventive or unscheduled maintenance activities and procedures.
OP - Normal and emergency operating procedures, check-off lists, etc.

Mission Success Criteria

For a Medium LOCA, two out of three pumps are required to deliver flow to two of four injection legs. For a Small LOCA, one out of three pumps is required to deliver flow to one of four injection legs. The suction source for this system is the Refueling Water Storage Tank (RWST). Since the RWST appears in the Intermediate Importance Group, the failure conditions pertaining to the RWST itself are contained in the tables for the Low Pressure Injection System, Tables 10-1 to 10-3.

1. Safety Injection Pumps 31, 32, 33 Fail to Start or Run Due to Random Failure and/or Maintenance Outage.

   a) Control circuitry (manual or automatic) or dc power failure.
   b) Pump mechanical failure.
   c) Motor electrical failure or loss of AC power.

   All three of the SI pumps are normally on a standby basis, or under test. Injection flow is required to prevent core damage and subsequent loss of core cooling capability. (PT,MT)

2. Check Valves Fail to Open Due to Random Failure.

   *a) RWST Supply Line Isolation, 847.
   b) SI Pump Discharge: Pump 31-849A/Pump 33-849B/Pump 32-852A, 852B.
   c) Loop 1 Cold Leg 857A, G/Hot Leg 857E, L.
   Loop 2 Cold Leg 857S, T/Hot Leg 857D, K.
   Loop 3 Cold Leg 857Q, R/Hot Leg 857F, M.
   Loop 4 Cold Leg 857U, W/Hot Leg 857C, J.

TABLE 5-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

A check valve failing to open will cause loss of flow partially or completely subverting the mission success flow requirements upon a LOCA or steamline break. (PT)

*3. RWST Supply Line Isolation MOV 1810 (De-energized Open), is Closed Due to Plugging or Maintenance Error.

Closure of this valve completely prevents all flow from the Refueling Water Storage Tank (RWST), thereby disabling the HPI system. (PT, MT)

4. Boron Injection Tank (BIT) Upstream MOVs 1852A, 1852B/Downstream MOVs 1835A/1835B - One or Both A Valves Fails to Open Upon a SI Signal in Conjunction With One or Both B Valves Failing to Open.

The BIT discharges into the RCS Hot Legs through Line 16. In addition to providing additional flow paths (to the Hot Legs), the BIT provides a source of borated water to provide additional negative reactivity during a steam line break accident. (PT,MT)

5. Normally Open MOVs Fail to Remain Open Due to Spurious Actuation or Maintenance Error.

a) SI Pump 32 Suction Isolation MOVs 887A, 887B.
b) SI Pump 32 Discharge Isolation MOVs 851A, 851B/Isolation MOVs.
c) Isolation MOVs Loop 1 Hot Leg, 856E.
Loop 2 Cold Leg, 856J.
Loop 3 Cold Leg, 856H.
Loop 4 Hot Leg, 856C.

A MOV which is inadvertently closed will cause loss of flow partially or completely subverting the mission success flow requirements upon a LOCA or steam line break. (PT,MT)

6. Locked Open Manual Valves Are Closed Due to Plugging or Maintenance Error.

*a) RWST Supply Line Isolation, 846.
b) SI Pump 31 Suction Valve 848A/Discharge Valve 850A.
c) SI Pump 33 Suction Valve 848B/Discharge Valve 850B.

Closure of valve 846 will prevent all flow from the Refueling Water Storage Tank, thereby completely disabling the HPI system. Closure of either of the A valves will prevent flow from Pump 31 while closure of either of the B valves will prevent flow from Pump 33. Depending on whether a Small or Medium LOCA has occurred, mission success may be jeopardized. (PT,MT,OP)

*Check valve 847, MOV 1810 or locked-open manual valve 846 failing to open or transferring closed will prevent all flow to the SI pumps from the RWST. These valves are considered sources of single-point failures.

TABLE 5-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE
7. <u>Manual Valves Are Closed Due to Plugging or Maintenance Error.</u> a) Loop 1 Cold Leg, 856A. b) Loop 2 Hot Leg, 856D. c) Loop 3 Hot Leg, 856F. d) Loop 4 Cold Leg, 856K. Closure of any one of these valves will cause loss of flow partially subverting the mission success flow requirements (PT, MT, OP).

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

5. High Pressure Injection System

TABLE 5-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODE
61726	Monthly Surveillance Observation	SI Pumps 31, 32, 33	1
		MOV 1810	3
		Manual Valves 846,847	6
71710	ESF Walkdown	Manual L.O. Valves 846, 848A, 848B, 850A, 850B	
		MOVs 887A, 887B, 851A, 851B	5
		Check Valves 857A,G,E,L,S,T,D,K,Q, R,F,M,U,W,C,J	2
	(Quarterly)	MOVs 856C,E,H,J	5
	(Refueling)	MOVs 1835A,B,1852A,B	4
	(Quarterly-when accessible)	Manual Valves 856A,D,F,K	7
62700	Maintenance	SI Pumps 31,32,33	1
62703	Monthly Maintenance Observation	MOVs 1810,887A,887B, 851A,815B,1835A,1838B, 1852A,1852B, 856	3,4,5

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

5. High Pressure Injection System

TABLE 5-3 MODIFIED SYSTEM WALKDOWN

COMPONENT	DESIRED POSITION	ACTUAL POSITION
1.0 Primary Auxiliary Building (PAB) 34' Elevation - SI Pump Room		
#31 Safety Injection Pump		
Valve 848A SIP 31 Suction Stop	L. O.	________
#33 Safety Injection Pump		
Valve 848B SIP 33 Suction Stop	L. O.	________
2.0 RWST - 81' Elevation		
Valve 846 RWST Outlet Stop	L. O.	________
3.0 Power Supplies		
3.1 480 V Switchgear - Control Bldg. 15' Elevation		
Bus 5A		
#31 Safety Injection Pump Breaker Racked In	Yes	________
Control Fuses In	Yes	________
Bus 2A		
#32 Safety Injection Pump Breaker Racked In	Yes	________
Control Fuses In	Yes	________
Bus 6A		
#33 Safety Injection Pump Breaker Racked In	Yes	________
Control Fuses In	Yes	________
3.2 MCC-36A - 55' Elevation PAB		
Valves 856C High Head Inj. Line Stop (Cold Leg Loop 4)	Energized	________
Valve 856E High Head Inj. Line Stop (Cold Leg Loop 1)	Energized	________

TABLE 5-3 (Cont'd)

COMPONENT	DESIRED POSITION	ACTUAL POSITION
Valve 856G High Head Inj. Line Stop	De-Energized	______
	LOCKED	______
Valve 887A SI Pump #32 Suction Stop	Energized	______
Valve 1810 RWST Outlet Stop	De-Energized	______
	LOCKED	______
Valve 851A SI Pump #32 Discharge Stop	De-Energized	______
	LOCKED	______
Valve 850C SI Pump #31 Discharge Stop	De-Energized	______
	LOCKED	______
Valve 1835A Boron Inj. Tank Outlet Stop	Energized	______
Valve 1852A Boron Inj. Tank Inlet Stop	Energized	______
3.3 MCC-36B - 55' Elevation PAB		
Valve 856H High Head Inj. Line Stop (Cold Leg Loop 3)	Energized	______
Valve 856J High Head Inj. Line Stop (Cold Leg Loop 2)	Energized	______
Valve 856B High Head Inj. Line Stop	De-Energized	______
	LOCKED	______
Valve 887B SI Pump #32 Suction Stop	Energized	______
Valve 851B SI Pump #32 Suction Stop	De-Energized	______
	LOCKED	______
Valve 850A SI Pump #31 Discharge Stop	De-Energized	______
	LOCKED	______
Valve 1835B Boron Inj. Tank Outlet Stop	Energized	______
Valve 1852B Boron Inj. Tank Inlet Stop	Energized	______
4.0 Control Switches		
4.1 CCR-SBF-1 Panel		
Valve 1810 RWST Outlet Stop	AUTO	______
4.2 CCR-SBF-2 Panel		
SI Pump #31	AUTO	______
Pump Indicating Light	STOP	______
SI Pump #32	AUTO	______
Pump Indicating Light	STOP	______
SI Pump #33	AUTO	______
Pump Indicating Light	STOP	______

TABLE 5-3 (Cont'd)

COMPONENT	DESIRED POSITION	ACTUAL POSITION
Valve 887A SI Pump #32 Suction Stop	AUTO	________
Valve Indicating Light	OPEN	________
Valve 887B SI Pump #32 Suction Stop	AUTO	________
Valve Indicating Light	OPEN	________
Valve 1852A BIT Inlet Stop	AUTO	________
Valve Indicating Light	OPEN	________
Valve 1852B BIT Inlet Stop	AUTO	________
Valve Indicating Light	OPEN	________
Valve 856C High Head Inj.Line Stop (Cold Leg Loop 4)	AUTO	________
Valve Indicating Light	OPEN	________
Valve 856E High Head Inj.Line Stop (Cold Leg Loop 1)	AUTO	________
Valve Indicating Light	OPEN	________
Valve 856G High Head Inj.Line Stop (Hot Leg Loop 1)	AUTO	________
Valve Indicating Light	NONE	________
Valve 856H High head Inj.Line Stop (Cold Leg Loop 3)	AUTO	________
Valve Indicating Light	OPEN	________
Valve 856B High Head Inj.Line Stop (Hot Leg Loop 3)	AUTO	________
	NONE	________
Valve 851A SI Pump #32 Discharge Stop	AUTO	________
Valve Indicating Light	NONE	________
Valve 851B SI Pump #32 Discharge Stop	AUTO	________
Valve Indicating Light	NONE	________
4.3 <u>PAG - 55' Elevation Waste Disposal Boron Recycle Panel</u>		
Valve 850A SI Pump #31 Discharge Stop	NEUTRAL	________
Valve Indicating Light	RED	________
Valve 850C SI Pump #31 Discharge Stop	NEUTRAL	________
Valve Indicating Light	RED	________

REFERENCES

	Number	Title	Rev.	Date
		NYPA - IPA3 Check-Off Lists:		
1.	COL-SIV-1	Safety Injection Verification	0	2/15/85
2.	COL-LV-1	Locked Valve Check List	13	3/20/85

3. Comments by NRC Resident Inspector R. Barklay, 1/9/87.

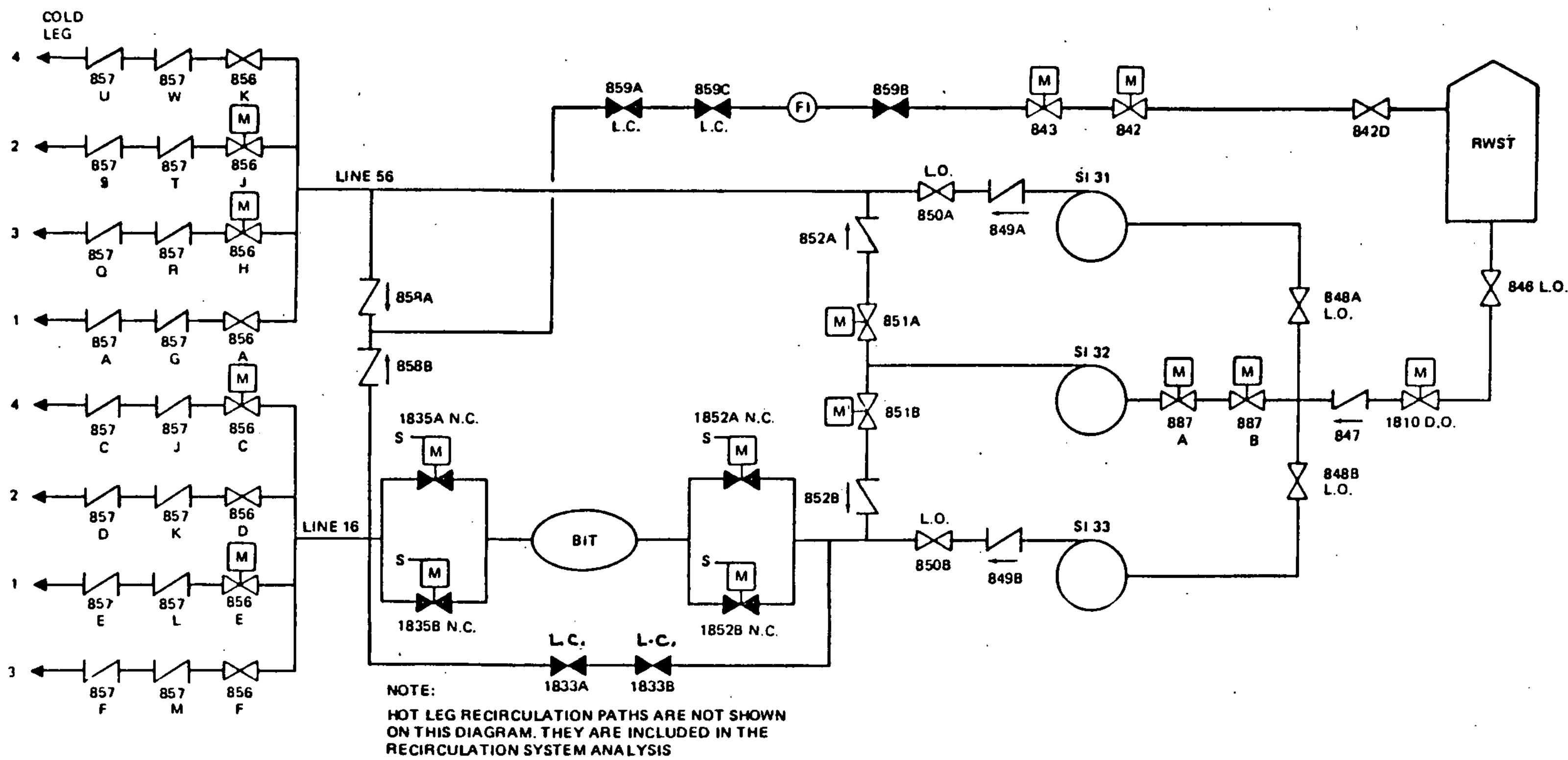


Figure 5-1. Indian Point 3 high pressure injection system simplified P&ID
Source: IPPSS Figure 1.6.2.3.1-4

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

6. Secondary System (MSIVs)

TABLE 6-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PC - Periodic calibration activities, procedures, and training
PT - Periodic testing activities, procedures, and training
MT - Preventive or unscheduled maintenance activities, procedures, and training
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

There are four event sequences identified in the IPPSS which involve closure of the Main Steam Isolation Valves (MSIVs). These sequences and the respective success criteria are as follows:

a) MS-1 - MSIV Trip - The success of MS-1 depends on closure of the steam line check valve, or trip of the MSIV, either by automatic or manual actuation. Automatic isolation of the MSIVs results from a high-high containment pressure signal. The emergency operating procedures direct the operator to manually close the MSIV for the faulted steam generator.

b) MS-2 - MSIV Trip - If TT-1 does not occur, an automatic signal to trip the MSIVs may be generated on high steam flow (with low steam pressure or low T_{avg}). If an automatic signal is not generated, emergency operating procedures call for isolating the steam generators that continue to blow down. Therefore, a manual MSIV trip is required. If at least one steam generator is available, AFWS flow can be maintained by existing procedures. Therefore, the success of MS-2 is defined as a manual trip signal combined with the successful tripping of at least one MSIV, since the automatic signal cannot be guaranteed.

c) TT-1 - Turbine Trip - The success of TT-1 includes the generation of automatic or manual turbine trip signals and actual trip of the turbine stop/control valves.

TABLE 6-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

d) TT-2 - Turbine Trip/MSIV Closure - The success of this function depends on rapid interruption of steam flow through the turbine by closure of the turbine stop/control valves or main steam line isolation valves. The purpose of this function is to minimize steam generator water losses during the early phases of the transient, thus allowing more time before significant reductions occur in steam generator tube heat transfer. This will reduce pressurizer insurges which in turn reduces the potential for significant overpressures during the early phases of the transient. Failure to stop turbine steam load is assumed to result in severe overpressurization of the reactor coolant system.

1. MSIVs Fail to Trip by Automatic Actuation or Valve Mechanical Failure

Automatic closure of the MSIVs is triggered by the high-high containment pressure signal or high steam flow in conjunction with low steam pressure or low T_{avg}. If these valves fail to close when required, this results in excessive steam generator water losses during early phases of the transient which causes significant reductions in steam generator tube heat transfer. This causes pressurizer insurges which may cause significant RCS overpressurization during the early phases of the transient. Testing and surveillance of the automatic control circuitry and the air control supply/exhaust valves as required by the technical specifications should reduce the probability of failure. (PC,PT)

2. MSIVs Fail to Close Due to Lack of Operator Action or Failure of the Manual Control Circuitry

The control room operator must isolate the steam generators that continue to blow down if automatic signals have failed, or is when directed to isolate a faulted steam generator by the emergency procedures. Failure to isolate will cause overpressurization of the RCS as described in 1 above. Testing and surveillance of the manual control and air control supply/exhaust valve circuitry as required by the technical specifications and review of the appropriate emergency operating procedures should reduce the probability of failure. (PT,OP)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

6. Secondary System (MSIVs)

TABLE 6-2 - I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS
56700	Calibration	Main Steam Isolation Valves (MSIVs)
52051	Instrument Components and Systems-Procedure Review	Control Circuitry
52053	Instrument Components and Systems-Work Observation	Control Circuitry
52055	Instrument Components and Systems-Record Review	Control Circuitry
61725	Surveillance & Calibration Control Program	Control Circuitry
61726	Monthly Surveillance Observation	MSIVs Control Circuitry
62702	Maintenance (Refueling)	MSIVs
71707	Operational Safety Verification	MSIVs Control Circuitry
71710	ESF System Walkdown	MSIVs Control Circuitry

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

6. Secondary System (MSIVs)

TABLE 6-3 MODIFIED SYSTEM WALKDOWN

CONTROL SWITCHES CENTRAL CONTROL ROOM	DESIRED POSITION	ACTUAL POSITION
1. Main Steam Isolation Valves		
- Steam Generator 31	Open	______
- Steam Generator 32	Open	______
- Steam Generator 33	Open	______
- Steam Generator 34	Open	______

Note: Refer to Table 11-3 "Safeguards Actuation System - System Walkdown."

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

7. Recirculation System

TABLE 7-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PT - Periodic testing activities, procedures, and training.
MT - Preventive or unscheduled maintenance activities, procedures, and training.
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

Low Head Recirculation is successful if one low pressure pump (RHR or Recirculation) supplies cooling water to the core for 24 hours.

High Head Recirculation is successful if one Safety Injection (SI) pump supplies cooling water to the core for 24 hours.

Containment Spray Recirculation is successful if one low pressure pump supplies water to one Spray Header.

Hot Leg Recirculation is successful if one SI pump supplies water to one Hot Leg.

One RHR heat exchanger can provide sufficient cooling for all cases.

1. Recirculation Pumps 31,32 Fail to Start Because of Operator Failure to Initiate Switchover After a LOCA

   Operator error in failing to initiate switchover within 20 minutes after a large LOCA will cause insufficient core cooling. (OP)

2. Auxiliary Component Cooling Water Pumps 31, 32, 33 & 34 Fail to Start Upon Demand

   Pumps are required to provide cooling water to the recirculation pumps if the component cooling water pumps are unavailable. (PT,MT,OP)

TABLE 7-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

3. CCW Outlet Isolation Valves From RHR Heat Exchangers 31 & 32 MOVs 822A, 822B Fail to Open Upon Demand and Unavailable Due to Maintenance and Random Failure

   Failure of these valves to open prevents cooling water flow to the RHR heat exchangers, thereby causing insufficient core cooling. (PT, MT, OP)

4. Recirculation Pump Discharge Header Isolation Valves MOVs 1802A, 1802B Fail to Open Upon Demand

   Failure of these valves to open prevents all flow to the RHR heat exchangers from the recirculation pumps, thereby causing insufficient core cooling. (PT,MT,OP)

5. Containment Spray Recirculation Isolation Valves MOVs 889A, 889B Fail to Open Upon Demand

   Failure of these valves to open prevents adequate post-LOCA containment spray. (PT,MT,OP)

6. Hot Leg Recirculation Isolation Valves MOVs 856B, 856G Fail to Open Upon Demand

   Failure of these valves to open prevents recirculation coolant flow to the hot legs (24 hours after the accident). (PT,MT,OP)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

7. Recirculation System

TABLE 7-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODES
61726	Monthly Surveillance/ Observation	Recirculation Pumps 31 & 32 Auxiliary Component	1-6
71710	ESF Walkdown	Cooling Water Pumps 31,32,33, 34 MOVs 1802A, 1802B, 885A, 885B, 889A, 889B, 856B, 856G, 745A, 745B Auxiliary Component Cooling Manual Valves 752A-H,J,K 753A-H,J,K,818A-D, 820A, 820B	
	(Refueling and Cold Shutdown)	CCW MOVs 822A & 822B	
62702	Maintenance	CCW MOVs 822A & 822B	3
62703	Monthly Maintenance	Recirculation Pumps 31 & 32 Aux. Cooling Water Pumps 31-34	1 2

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

7. Recirculation System

TABLE 7-3 MODIFIED SYSTEM WALKDOWN

COMPONENT	DESIRED POSITION	ACTUAL POSITION
1.0 Inside Containment 46' Elevation - Inside Crane Wall Recirculation Pumps Manual Valves		
752G Pump 31 Inlet Stop	Open	______
752H Pump 31 Outlet Stop	Open	______
753G Pump 32 Inlet Stop	Open	______
753H Pump 32 Outlet Stop	Open	______
2.0 PAB - Elevation 55'-MCCs		
2.1 MCC-36A		
MOV 822A RHR Heat Exchanger 31 CCW outlet Stop Valve	Energized	______
MOV 856G High Head (Hot Leg-Loop 1) Injection Line Stop Valve	De-energized	______
	Locked	______
MOV 889A Containment Spray Recirculation Stop Valve	Energized	______
MOV 1802A Recirculation Pump Stop Valve	Energized	______
MOV 885A Containment Sump Stop Valve	Energized	______
Aux. Component Cooling Water Pump 31	Energized	______
Aux. Component Cooling Water Pump 32	Energized	______
2.2 MCC-36B		
MOV 822B RHR Heat Exchanger 32 CCW Outlet Stop Valve	Energized	______
MOV 889B Containment Spray Recirculation Stop Valve	Energized	______
MOV 1802B Recirculation Pump Stop Valve	Energized	______
MOV 885B Containment Sump Stop Valve	Energized	______
MOV 856B High Head (Hot Leg-Loop 3) Injection Line Stop Valve	De-energized	______
	Locked	______
Aux. Component Cooling Water Pump 33	Energized	______
Aux. Component Cooling Water Pump 34	Energized	______

TABLE 7-3 (Cont'd)

COMPONENT	DESIRED POSITION	ACTUAL POSITION
2.3 MCC-37		
480V Switchgear-Elevation 15'		
6A		
Recirculation Pump 32		
Breaker Racked In	Yes	______
Control Fuses In	Yes	______
5A		
Recirculation Pump 31		
Breaker Racked In	Yes	______
Control Fuses In	Yes	______
SBF2		
MOV 856G High head (Hot Leg-Loop 1)		
Branch Line	Auto	______
	Shut	______
	De-energized	______
MOV 856B High Head (Hot Leg-Loop 3)		
Branch Line	Auto	______
	Shut	______
	De-energized	______
3.0 PAB-68' Elevation		
3.1 Auxiliary Component Cooling Pumps 31 & 32 Manual Valves		
752A Inlet Stop to Aux. CCW Pumps 31&32	Open	______
752B Suction Stop to Pump 31	Open	______
752C Suction Stop to Pump 32	Open	______
752D Discharge Stop from Pump 31	Open	______
752E Discharge Stop from Pump 32	Open	______
752F Containment Isolation to Recirculation Pump 31	Open	______
3.2 Auxiliary Component Cooling Pumps 33 & 34		
753A Inlet Stop to Aux. CCW Pumps 33&34	Open	______
753B Suction Stop to Pump 33	Open	______
753C Suction Stop to Pump 34	Open	______
753D Discharge Stop from Pump 33	Open	______
753E Discharge Stop from Pump 34	Open	______
753F Containment Isolation to Recirculation Pump 32	Open	______
3.3 Control		
Aux. CCW Pump 31 Running Light	Not Illuminated	______
Aux. CCW Pump 32 Running Light	Not Illuminated	______

TABLE 7-3 (Cont'd)

COMPONENT			DESIRED POSITION	ACTUAL POSITION
Aux. CCW Pump 33 Running Light			Not Illuminated	______
Aux. CCW Pump 34 Running Light			Not Illuminated	______
4.0 PAB-41' Elevation Lower Penetration Area				
752J	FIC-633A	Inlet Stop (Recirculation Pump 31 CCW Outlet)	Throttled	______
752K	FIC-633A	Outlet Stop (Recirculation Pump 31 CCW Outlet)	Throttled	______
753J	FIC-633B	Inlet Stop (Recirculation Pump 32 CCW Outlet)	Throttled	______
753K	FIC-633B	Outlet Stop (Recirculation Pump 32 CCW Outlet)	Throttled	______

REFERENCES

Number		Title	Rev.	Date
		NYPA-IP3 Check-off Lists:		
1.	COL-SI-1	Safety Injection System	9	6/1/84
2.	COL-ACCV	Auxiliary Component Cooling Verification	0	2/15/85

3. Comments by NRC Resident Inspector R. Barklay, 1/9/87.

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

8. Reactor Coolant System (PORVs)

TABLE 8-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PC - Periodic calibration activities, procedures, and training
PT - Periodic testing activities, procedures, and training
MT - Preventive or unscheduled maintenance activities, procedures, and training
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

There are several events modeled in the IPPSS which involve successful operation and closure of the pressurizer power-operated relief valves (PZR PORVs) and accompanying block valves. These events generally involve primary cooling bleed and feed or steam generator tube rupture (SGTR) operator response actions. In general, when auxiliary feedwater is unavailable, successful operator response requires that two PZR PORVs and one Safety Injection pump be operable.

1. Pressurizer Power-Operated Relief Valves (PZR PORVs) PCV-455C & PCV-456 and Block Valves MOVs535 & 536 Fail to Remain Open

   In the event that Auxiliary Feedwater Cooling should fail (and the Main Feedwater System is unavailable), the operator must recognize the need and take action to manually open the PZR PORVs and Block Valves, if not already open to provide bleed and feed cooling to the primary system. Failure to do so can lead to core damage. Surveillance and testing of the valves and the manual and automatic control circuitry as required by the Technical Specifications and review of the emergency operating procedures should reduce the probability of failure.
   (MT,PC,PT,OP)

2. Pressurizer Power-Operated Relief Valves PCV-455C & PCV-456 Fail to Reseat and Block Valves MOVs535 & 536 Fail to Close

   Upon initiation of the bleed and feed mode of operation, the operator must recognize the need and take action to manually close the PZR PORVs and block valves. Failure to do so can lead to core damage. Surveillance and testing

TABLE 8-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

of the valves and the manual and automatic control circuitry as required by the Technical Specifications and review of the emergency operating procedures should reduce the probability of failure. (MT,PC,PT,OP)

3. Pressurizer Safety Valves PCV-464, PCV-466, PCV-468 Fail to Open

In the event of an ATWS above 80% power, RCS relief is required to prevent pressure from exceeding 3200 psia. Depending upon the value of the moderator temperature coefficient such capability might be supplied by the three Pressurizer Safety Valves, or in combination with one PZR PORV, or may not be possible. Therefore under the applicable conditions, the three safety valves must open. Failure to do so can lead to severe core damage. Testing of the valves in accordance with the Technical Specification can reduce the probability of failure. (PT)

4. Pressurizer Safety Valves PCV-464, PCV-466, PCV-468 Fail to Reseat

Upon opening of the safety valves as described above, and since each safety valve has a 6 in. inlet line, failure to reseat can lead to an uncontrolled small, medium or large LOCA. Testing of the valves in accordance with the Technical Specifications can reduce the probability of failure. (PT)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

8. Reactor Coolant System

TABLE 8-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODE
56700	Calibration	Pressurizer PORVs PORV Block Valves Pressurizer Safety Valves	1,2,3,4
52051	Instrument Components and Systems-Procedure Review	Control Circuitry	1,2
52053	Instrument Components and Systems-Work Observation	Control Circuitry	1,2
52055	Instrument Components and Systems-Record Review	Control Circuitry	1,2
61725	Surveillance & Calibration Control Program	Control Circuitry	1,2
61726	Monthly Surveillance Observation	Pressurizer PORVs PORV Block Valves Control Circuitry	1,2,3,4
62702	Maintenance (Refueling only)	Pressurizer PORVs PORV Block Valves Pressurizer Safety Valves	1,2,3,4
71707	Operational Safety Verification	Pressurizer PORVs PORV Block Valves Pressurizer Safety Valves	1,2,3.4
71710	ESF System Walkdown	Control Circuitry	1,2

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

8. Reactor Coolant System

TABLE 8-3 MODIFIED SYSTEM WALKDOWN

COMPONENT	DESIRED POSITION	ACTUAL POSITION
Inside Containment Elev. 130' - Top of the Pressurizer		
RCS-PCV-455C Power-Operated Relief Valve	SHUT	________
RCS-PCV-456 Power-Operated Relief Valve	SHUT	________
RCS-MOV-535 Motor-Operated Isolation (Block) Valve to PCV-455C	OPEN	________
RCS-MOV-536 Motor-Operated Isolation (Block) Valve to PCV-456	OPEN	________
RCS-527 Power Operated Relief Line Vent	SHUT	________
Blind Flange Installed	YES	________
RCS-574A PCV-464 Loop Seal Drain	SHUT	________
RCS-574B PCV-466 Loop Seal Drain	SHUT	________
RCS-574C PCV-468 Loop Seal Drain	SHUT	________
RCS-526 Loop Seal Drain Line Stop Valve	SHUT	________
RCS-PCV-464 Code Safety (Gag Removed)	YES	________
RCS-PCV-466 Code Safety (Gag Removed)	YES	________
RCS-PCV-468 Code Safety (Gag Removed)	YES	________

REFERENCES

Number	Title	Rev.	Date
	NYPA IP3 Check-Off Lists		
1. COL-RCS-1	Reactor Coolant System	3	9/13/85

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

9. Auxiliary Feedwater System

TABLE 9-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PT - Periodic testing activities and procedures.
MT - Preventive or unscheduled maintenance activities and procedures.
OP - Normal and emergency operating procedures, check-off lists, etc.

Mission Success Criteria

The Auxiliary Feedwater System (AFWS) must deliver at least 200 GPM to each of two steam generators. Approximately 30 minutes are available from the time of reactor trip until Auxiliary Feedwater is required based on normal steam generator inventories. Each motor-driven AFW pump has a capacity of 400 GPM while the steam-driven pump can deliver 800 GPM.

1. AFW Pumps 31,32,33 Fail to Start Due to Failure of Turbine Driven Pump (32), Maintenance, or Human Error

   Under loss of power (loss of bus 3A & 5A) turbine pump must start and feed water within 30 minutes to two steam generators. If fire in auxiliary feed pump room or maintenance of turbine driven pump, or failure of operator to increase speed of turbine driven pump for 30 minutes occurs, failure of AFWS results. (PT, MT, OP)

2. Valves FCV 406 A&B3 or FCV 406C&D Failure to Increase Speed (Turbine Driven Pump) and Valve Failure Due to Human Error

   Under degraded power conditions, with loss of one bus (3A or 5A), if valves on the redundant train fail, then turbine speed must be increased within 30 minutes or failure of AFWS results. (PT, OP)

3. Valves BFD 62,62-1,62-2,62-3, and BFD 48,48-2,48-4,and 48-6 Human Error Failure to Return to Locked Open Position After Test

   Under normal power conditions, if all discharge valves are closed, failure of AFWS results. (PT, OP)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

9. Auxiliary Feedwater System

TABLE 9-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODES
61726	Monthly Surveillance Observation	AFW Pumps 31,32,33 Locked Open Manual	1
		Valves BFD 62,62-1 62-2, 62-3 and BFD-48,48-2,48-4 & 48-6	2
		Air-Operated Valves FCV 406 A&B,C&D	3
62700	Maintenance	AFW Pumps 31,32,33	2
62703	Monthly Maintenance	AFW Pumps 31,32,33	2,3
71707	Operational Safety Verification	AFW Pumps 31,32,33	1
71710	ESF System Walkdown	See Table 8-3	1-3

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

9. Auxiliary Feedwater System

TABLE 9-3 MODIFIED SYSTEM WALKDOWN

COMPONENT		DESIRED POSITION	ACTUAL POSITION
1.0	Condensate Storage Tank		
CT-6 CST Outlet		LO	________
2.0	Auxiliary BFP Building-15' Elevation		
2.1	ABFP 31 Discharge to S/G 31		
BFD-62-4	FCV-406A Inlet Manual Stop Valve	LO	________
BFD-38	FCV-406A Outlet Manual Stop Valve	LO	________
FCV-406A	Flow Control Valve	Closed	________
2.2	ABFP 31 Discharge to S/G 32		
BFD-62-1	FCV-406B Inlet Manual Stop Valve	LO	________
BFD-36	FCV-406B Outlet Manual Stop Valve	LO	________
FCV-406B	Flow Control Valve	Closed	________
2.3	ABFP 33 Discharge to S/G 33		
BFD-62-2	FCV-406C Inlet Manual Stop Valve	LO	________
BFD-41	FCV-406C Outlet Manual Stop Valve	LO	________
FCV-406C	Flow Control Valve	Closed	________
2.4	ABFP 33 Discharge to S/G 34		
BFD-62-3	FCV-406D Inlet Manual Stop Valve	LO	________
BFD-43	FCV-406D Outlet Manual Stop Valve	LO	________
FCV-406D	Flow Control Valve	Closed	________
2.5	ABFP 32 Discharge		
2.5.1	To S/G 31		
BFD-48-8	FCV-405A Inlet Manual Stop Valve	LO	________
BFD-48-1	FVC-405A Outlet Manual Stop Valve	LO	________
FVC-405A	Flow Control Valve	Shut	________
2.5.2	To S/G 32		
BFD-48-2	FCV-405B Inlet Manual Stop Valve	LO	________
BFD-48-3	FCV-405B Outlet Manual Stop Valve	LO	________
FCV-405B	Flow Control Valve	Shut	________

TABLE 9-3 (Cont'd)

COMPONENT		DESIRED POSITION	ACTUAL POSITION
2.5.3 To S/G 33			
BFD-48-4	FCV-405C Inlet Manual Stop Valve	LO	________
BFD-48-5	FCV-405C Outlet Manual Stop Valve	LO	________
FCV-405C	Flow Control Valve	Shut	________
2.5.4 To S/G 34			
BFD-48-6	FCV-405D Inlet Manual Stop Valve	LO	________
BFD-48-7	FCV-405D Outlet Manual Stop Valve	LO	________
FCV-405D	Flow Control Valve	Shut	________
2.6 Local Control Panel			
ABFP 31 Transfer Switch		Remote	________
ABFP 33 Transfer Switch		Remote	________
ABFP 32 Transfer Switch		Auto	________
2.7 Condensate Supply From Condensate Storage Tank			
CT-64	Condensate to Auxiliary Boiler Feed Pump Suction/Header Stop Valve	LO	________
2.8 Condensate Suction Supply to Auxiliary Boiler Feed Pumps			
2.8.1 Auxiliary Boiler Feed Pump 31			
CT-27	Suction Manual Stop Valve	LO	________
2.8.2 Auxiliary Boiler Feed Pump 31			
CT-30	Suction Manual Stop Valve	LO	________
2.8.3 Auxiliary Boiler Feed Pump 33			
CT-33	Suction Manual Stop Valve	LO	________
2.9 City Water Supply to Auxiliary Boiler Feed Pumps Unit #1 Utility Tunnel			

Note: This valve will have to be checked by Consolidated Edison Support Facilities personnel.

CT-49	Header Manual Stop Valve	Open	________

TABLE 9-3 (Cont'd)

COMPONENT		DESIRED POSITION	ACTUAL POSITION
2.9.1 City Water to Auxiliary Boiler Feed Pump 31			
PCV-1187	City Water Supply Valve	Shut	______
2.9.2 City Water to Auxiliary Boiler Feed Pump 32			
PCV-1188	City Water Supply Valve	Shut	______
2.9.3 City Water to Auxiliary Boiler Feed Pump 33			
PCV-1189	City Water Supply Valve	Shut	______
2.10 Turbine Driven Auxiliary Feed Water Pump 32 Steam Supply			
MS-54	PCV-1139 Inlet Manual Stop Valve	LO	______
MS-32-1	MST-64 HDR Isolation Valve	Open	______
MS-34-1	MST-64 Inlet Stop Valve	Open	______
3.0 Control Building (480V Switchgear)			
3.1 Auxiliary BFP Breakers			
ABFP 31		Racked In	______
ABFP 33		Racked In	______
4.0 Auxiliary BFP Building 72' Elevation			
4.1 ABFP 32 Steam Supply			
MS-41	Stop Valve from S/G 32 Main Steam Line	LO	______
MS-42	Stop Valve from S/G 33 Main Steam Line	LO	______
5.0 Auxiliary BFP Building 43' Elevation			
5.1 ABFP 32 Steam Supply			
MS-177	PCF-1310A Bypass Isolation Valve	LS	______
6.0 Auxiliary BFP Building 32' Elevation			
6.1 ABFP 32 Steam Supply			
MS-176	PCV-1310B Bypass Isolation Valve	LS	______

TABLE 9-3 (Cont'd)

COMPONENT	DESIRED POSITION	ACTUAL POSITION
7.0 Control Room		
7.1 Panel SCF		
ABFP 31 Control Switch	Auto	________
Indicating Lamp	Green	________
ABFP 32 Control Switch	Auto	________
Indicating Lamp	Green	________
ABFP 33 Control Switch	Auto	________
Indicating Lamp	Green	________
ABFP 31 Recirculation Valve 1121	Auto	________
Indicating Lamp	Green	________
ABFP 33 Recirculation Valve 1123	Auto	________
Indicating Lamp	Green	________
ABFP 32 Steam Supply Isolation Valve 1310A	Auto	________
Switch Position, & Indicating Lamp	Red	________
ABFP 32 Steam Supply Isolation Valve 1310B	Auto	________
Switch Position & Indicating Lamp	Red	________
7.1.1 ABFP 32 Flow Controllers		
S/G 31	Shut	________
S/G 32	Shut	________
S/G 33	Shut	________
S/G 34	Shut	________
Aux. FWP Turbine Speed Control	As Reqd.	________
7.1.2 ABFPs 31 & 33 Flow Controllers		
S/G 31	Full Open	________
S/G 32	Full Open	________
S/G 33	Full Open	________
S/G 34	Full Open	________
ABFP City Water Make-up Valves		
Aux. FWP 31 Make Up Valve SOV-1287	Shut	________
Indicator Lamp	Green	________
Aux. FWP 32 Make Up Valve SOV-1288	Shut	________
Indicator Lamp	Green	________
Aux. FWP 33 Make Up Valve SOV-1289	Shut	________
Indicator Lamp	Green	________

TABLE 9-3 (Cont'd)

COMPONENT			DESIRED POSITION	ACTUAL POSITION
7.1.3	ABFP Condensate Supply			
	CT-6	Open Indications (2)	Red	________
	CT-64	Open Indications (2)	Red	________

REFERENCES

Number	Title	Rev.	Date
	NYPA-IP3 Check-off List:		
1. COL-FW-2	Auxiliary Feedwater System	8	9/11/85

2. Comments by NRC Resident Inspector R. Barklay, 1/9/87.

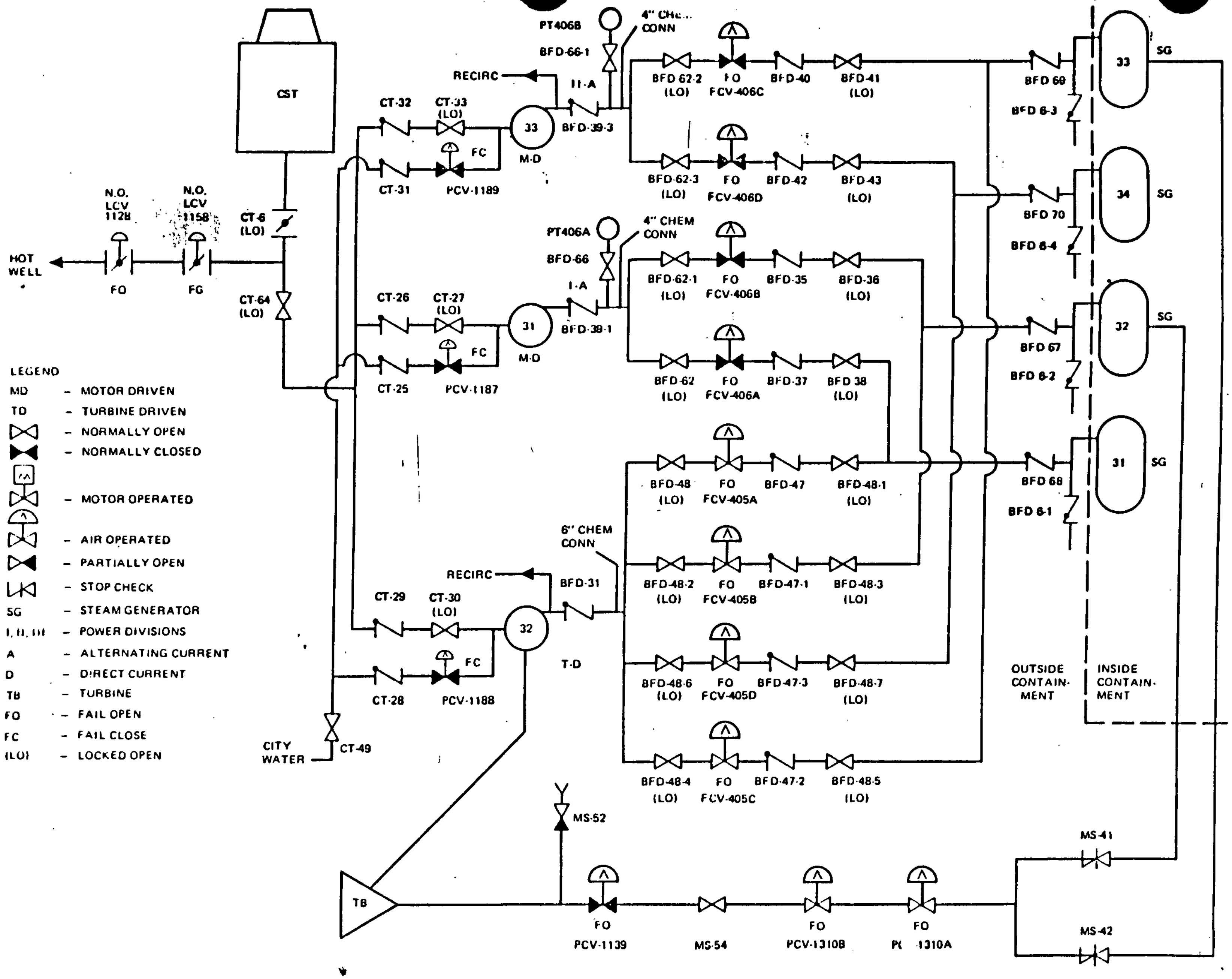


Figure 9-1. IP3 Auxiliary Feedwater System Schematic
Source: IPPSS Figure 1.6.2.3.9-4

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

10. Low Pressure Injection System

TABLE 10-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

ISI- Inservice inspection activities, procedures and training.
PT - Periodic testing activities, procedures, and training.
MT - Preventive or unscheduled maintenance activities, procedures, and training.
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

Success occurs if at least one of the two Residual Heat Removal (RHR) pump trains provides sufficient flow from the Refueling Water Storage Tank (RWST) to keep the core covered after a large LOCA, given that two of the three intact legs (excluding the broken leg) deliver flow to the core.

1. RHR Pumps 31 and 32 Fail to Start or Run Upon a Safety Injection Signal or Unavailable Due to Maintenance.

   Pump failure includes mechanical pump failures and electrical supply, motor and control circuit failures (PT, MT).

2. RWST Outlet Isolation Valves Locked Open Manual Valve 846, MOV 882 (De-energized Open) or Check Valve 881 are Left in the Closed Position Due to Maintenance Error or are Plugged.

   Closure of any of these valves will block all flow from the RWST to the RHR pumps, thereby causing system failure (PT, MT, OP).

3. Locked Open RHR Pump Manual Discharge Valves 739A, 739B/Suction Valves 735A, 735B are Left in the Closed Position Due to Maintenance Error, or are Plugged.

   Closure of any of these valves will prevent flow from the associated RHR pump (PT, MT, OP).

4. RHR Pump Discharge Check Valves 738A, 738B Fail to Open Due to Plugging.

   Same as 3.

Table 10-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

5. MOV 744 Pump Discharge Header Isolation Valve (De-energized open) Inadvertently Closed Due to Maintenance Error, or Check Valve 741 Fails to Open Due to Plugging*

   Closure of these valves will block all flow from the RHR pumps to the RHR Heat Exchangers and hence to the Cold Leg injection lines (PT, MT, OP).

6. RHR Heat Exchanger 31 Locked Open Manual Inlet Isolation Valve 742 is Inadvertently Closed Due to Maintenance Error, or is Plugged.

   Closure of this valve will block all SI flow through RHR Heat Exchanger 31 and thus prevent flow to the Cold Legs from HX 31. Heat Exchanger 32 remains available (PT, MT, OP).

7. RHR Heat Exchanger 31 Discharge Motor-Operated Isolation Valves MOVs 747 and 899B and Throttling MOV-HCV 638 are Inadvertently Closed Due to Maintenance Error, or Spurious Actuation or Plugging.

   Closure of any of these valves will prevent flow from RHR HX 31 directly to the Cold Legs. However, flow will be diverted through MOVs 1869B and 1869A to the discharge of RHR HX 32 and into the Cold Legs (PT. MT, OP).

8. RHR Heat Exchanger 32 Inlet Isolation MOVs 745A and 745B Inadvertently Closed Due to Maintenance Error, or Spurious Actuation or Plugging.

   Closure of either of these valves will block all SI flow through RHR Heat Exchanger 32 (except for any return flow through the Recirculation Pumps from the Recirculation Sump) and thus prevent flow to the Cold Legs from HX 31. Heat Exchanger 32 remains available (PT, MT, OP).

9. RHR Heat Exchanger 32 Discharge Motor-Operated Isolation Valves MOVs 746 and 899A and Throttling MOV-HCV 640 are Inadvertently Closed Due to Maintenance Error, or Spurious Actuation, or Plugging.

   Closure of any of these valves will prevent flow from RHR HX 32 directly to the Cold Legs. However, flow will be diverted through MOVs 1869A and 1869B to the discharge of RHR HX 31 and into the Cold Legs (PT, MT, OP).

*MOV 744 and Check Valve 741 are sources of single point failures.

Table 10-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

10. Cold Leg Check Valves (Loop 1-897A, 838A; Loop 2-897B, 838B; Loop 3-897C, 838C; Loop 4-897D, 838D) Fail to Open Due to Plugging.

Failure of either check valve in a leg to open will block SI flow through that leg. Two of the three intact legs (excluding the broken leg) are required to deliver sufficient flow to the reactor core following a large LOCA (PT, OP).

11. Low Water Level in, or Blockage of, Flow from the RWST

The RWST is the initial water source for both the High Pressure Injection and Low Pressure Injection Systems as well as for the Containment Spray Pumps. Low water level can be caused by operator failure to maintain the level above Technical Specification requirements or by sudden leakage caused by tank rupture. Blockage of flow can occur due to the presence of foreign objects in the tank. (ISI,OP)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

10. Low Pressure Injection System

TABLE 10-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODES
61726	Monthly Surveillance/ Observation	RHR Pumps 31 and 32 HCV 638,640	1 - 11
71707	Operation Safety/ Verification	MOVs 745A, 745B MOVs 746, 747	
71710	ESF System Walkdown	MOVs 899A, 899B MOV 744 MOV 882 Manual L.O. Valves 735A, 735B 739A, 739B 846 RWST	
62700	Maintenance	RHR Pumps 31 and 32	1 - 4
62703	Monthly Maintenance Observation	HCV 638, 640 MOVs 745A, 745B 746, 747 899A, 899B 744, 882	2,5,7-9

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

10. Low Pressure Injection System

TABLE 10-3 MODIFIED SYSTEM WALKDOWN

COMPONENT	DESIRED POSITION	ACTUAL POSITION
1. MCCs - Elev. 55'		
1.1 MCC-36A		
MOV 746 RHR Loop 2 Discharge Stop Valve	ENERGIZED	______
MOV 744 RHR Loops 1&2 Isolation Valve	DE-ENERGIZED	______
	LOCKED	______
MOV 640 RHR Loop 2 Flow Control Valve	ENERGIZED	______
MOV 747 RHR Loop 1 Discharge Stop Valve	ENERGIZED	______
1.2 MCC-36B		
MOV 899A RHR Loop 2 Discharge Stop Valve	ENERGIZED	______
MOV 882 RHR Pumps 31 & 32 Suction Stop Valve	DE-ENERGIZED	______
	LOCKED	______
MOV 638 RHR Loop 1 Flow Control Valve	ENERGIZED	______
MOV 899B RHR Loop 1 Discharge Stop Valve	ENERGIZED	
2. Control Room		
SGF		
HCV-638 RHR Flow Control Valve	AUTO	______
	OPEN	______
HCV-640 RHR Flow Control Valve	AUTO	______
	OPEN	______
MOV 746 RHR Loop 2 Stop Valve	AUTO	______
	OPEN	______
MOV 899A RHR Loop 2 Stop Valve	AUTO	______
	OPEN	______
MOV 747 RHR Loop 1 Stop Valve	AUTO	______
	OPEN	______
MOV 899B RHR Loop 1 Stop Valve	AUTO	______
	OPEN	______
SBF2		
MCC-36A	SHUT	______
MCC-36B	SHUT	______
Manual Defeat SI Train A	NORMAL	______
Manual Defeat SI Train B	NORMAL	______
SBF-1		
MOV 882 RHR Suction Valve	AUTO	______
	DE-ENERGIZED	______

Table 10-3 (Cont'd)

COMPONENT		DESIRED POSITION	ACTUAL POSITION
3. Refueling Water Storage Tank Elev. 81'			
HCV-846	Outlet Stop	Locked Open	______
S-201	Vent	Capped	______
		Shut	______
PW-84	Tank Initial Fill Stop	Locked Shut	______
HCV-1862	Miscellaneous Return Stop	Locked Open	______
HCV-844	Local Sample Stop	Shut	______
HCV-840A	Level Instrument Stop (LI-921)	Open	______
HCV-840B	Level Instrument Stop (LI-920)	Open	______
HCV-870	Drain	Shut	______
		Capped	______
S-200	Vent	Shut	______
		Capped	______

Tank Integrity	Yes	No
Visible Leakage	______	______
Tank Level within Tech Spec Limits	______	______
Local Indication	______	______
Control Room Indication	______	______
Boron Concentration within Tech Spec Limits	______	______

REFERENCES

Number	Title	Rev.	Date
NYPA-IP2 Checkoff Lists:			
1. COL-SI-1	Safety Injection System	9	6/1/84
2. COL-LV-1	Locked Valve Check List	13	3/20/85
3. Comments by NRC Resident Inspector R. Barklay, 1/9/87			

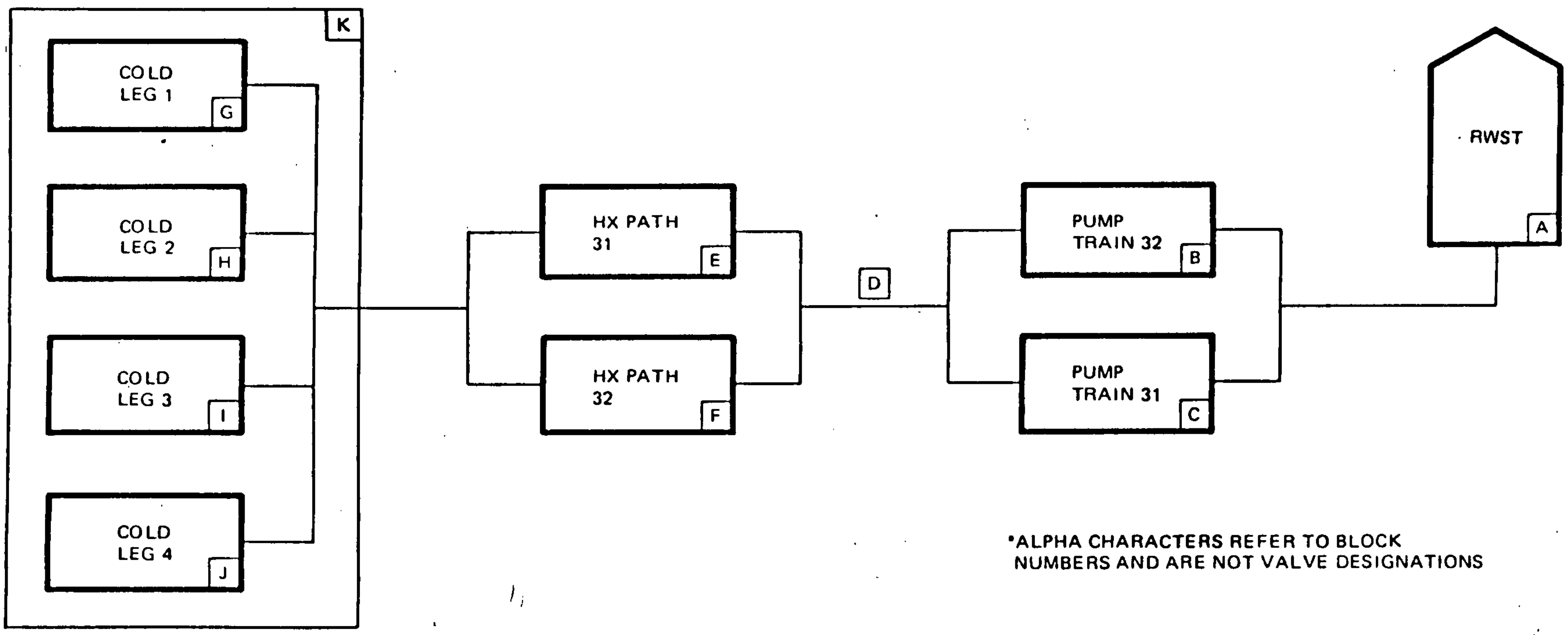


Figure 10-1. IP3 Low Pressure Injection System Block Diagram
Source: IPPSS Figure 1.6.2.3.2-2

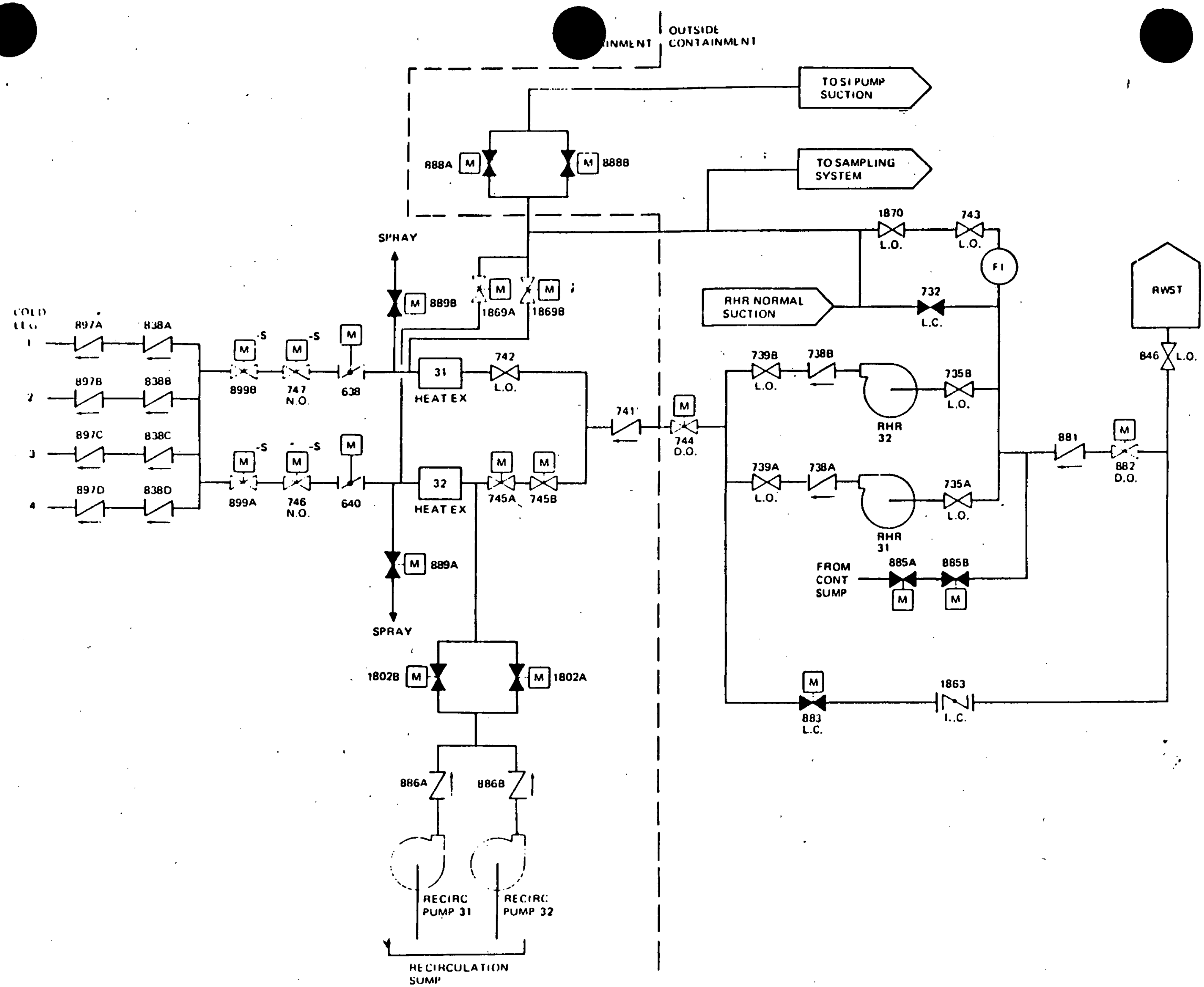


Figure 10-2. IP3 Low Pressure Injection System Simplified P&ID
Source: IPPSS Figure 1.6.2.3.2-3

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

11. Safeguards Actuation System (SAS)

TABLE 11-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PC - Periodic calibration activities, procedures, and training
PT - Periodic testing activities, procedures, and training
MT - Preventive or unscheduled maintenance activities, procedures, and training
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

The Safeguards Actuation System is composed of two subsystems, safety injection (SI) actuation, and containment spray (CS) actuation. Failure of the SI actuation subsystem is defined as failure of both channels of SI logic or failure in the SI instrumentation. Failure of a single channel of SI logic includes failure to actuate any single equipment actuation relay. Failure of the CS actuation subsystem is defined as failure of both channels of CS logic or failure in the CS instrumentation.

1. Process Instruments (Sensors, Signal Conditioners and Bistables) Fail to Initiate a Safeguards Actuation Signal (SAS) Due to Calibration Error

   Two or more redundant channels can fail in a common manner due to calibration errors possibly causing system failure for the monitored parameter. (PC)

2. Process Instruments (Sensors, Signal Conditioners and Bistables) Fail to Initiate a SAS Due to Maintenance Error

   The failure to properly position the process instrument valving or other isolation prior to and following maintenance could result in system failure for the monitored parameter. (MT)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

Table 11-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

3. Process Instruments (Sensors, Signal Conditioners and Bistables) Fail Due to Mechanical or Electrical Faults

   Two or more redundant channels can fail due to mechanical or electrical problems possibly resulting in system failure for the monitored parameter. (PT,MT)

4. Logic Relays Fail to Close When Required

   The failure of a logic relay contact to close based on a Safeguards Actuation Signal from the appropriate bistable could result in system failure. (PT,MT)

5. DC Power Fuse Opened Prematurely by Maintenance Error

   The opening of the DC power circuit supplying power to a SAS channel will cause loss of SAS capability. (MT,OP)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

11. Safeguards Actuation System (SAS)

TABLE 11-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODES
56700	Calibration	Process Instruments (Sensors, Signal Conditioners & Bistables)	1,2,3
52051	Instrument Components and Systems-Procedure Review	Process Instruments (Sensor, Signal Conditioners & Bistables)	1,2
52053	Instrument Components and Systems-Work Observation	Process Instruments (Sensors, Signal Conditioners & Bistables)	1,2,3
52055	Instrument Components and Systems-Record Review	Process Instruments (Sensors, Signal Conditioners & Bistables)	1,2,3
61725	Surveillance & Calibration Control Program	Process Instruments and Logic Control Circuitry (Sensors, Signal Conditioners Bistables, Logic Relays and Circuits)	1,2,3,4,5
61726	Monthly Surveillance Observation	Logic Control Circuitry (Bistables, Logic Relays and Circuits)	1,2,3,4,5
62702	Maintenance	Process Instruments (Sensors and Signal Conditioners)	2,3,5
71707	Operational Safety Verification	Process Instruments (Control Room Indication and Status Lights)	1,2,3
71710	ESF System Walkdown	Process Instruments and Logic Control Circuitry Status Lamps	2,3,4,5

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

TABLE 11-3

Safeguards Actuation System
System Walkdown

The Safeguards Actuation System is a normally energized system which must de-energize to actuate (close) the relay contacts (with the exception of the Containment High-High Pressure network which must energize to actuate). Operability must be assured by extensive surveillance testing, the observation of which will provide the inspector with direct input regarding the safety function capability of the system. System walkdown during normal power operation will only reveal whether certain circuits are properly aligned. The following information can be verified during normal plant operation:

TABLE 11-3 (Cont'd)

Normal Plant Operation
Status Check and Lamp Check †

For the Logic Channel under Test, have licensee personnel open the appropriate panel doors. Verify that the appropriate Test Panel Lights are ON or OFF as indicted in the table below. For those lamps that are normally not illuminated, have licensee personnel press only those which are *.

NORMAL OPERATION WALKDOWN

NO.	COMPONENTS	REQUIRED STATUS	ACTUAL STATUS	
			CHANNEL 1	CHANNEL 2
	LIGHTS ON PANEL 1-1			
716	Safeguards Actuating Block Relay (Red)	OFF *		
717	Auto DC Power	ON		
718	Manual DC Power	ON		
	CONTAINMENT SPRAY LAMPS			
719	Matrix	OFF *		
720	Master	OFF *		
721	Actuating Relay	ON		
	STEAM LINE ISOLATION LAMPS			
722	Flow Matrix	OFF		
	DO NOT TEST #723			
724 725 726 727	Actuating Relays 1,2,3 and 4	ALL ON		

† Reference documents: NYPA Periodic Test Procedures 3PT-M14A/B both entitled, "Safety Injection System Logic Channel Functional Test," Rev. 10, February 25, 1985.

TABLE 11-3 (Cont'd)

NO.	COMPONENTS	REQUIRED STATUS	ACTUAL STATUS CHANNEL 1	CHANNEL 2
	CONTAINMENT ISOLATION B LAMPS			
728	Master	OFF *		
729	Actuating Relay	ON		
	LIGHTS ON PANEL 1-2 SAFETY INJECTION LAMPS			
736	Master	OFF *		
730	Matrix	OFF *		
732 733 734 735	Actuating Relays 1,2,3 and 4	ALL ON		
731	Block Matrix	OFF if pressurizer pressure above 1900 psig, ON if below 1900 psig.		
	CONTAINMENT VENTILATION ISOLATION LAMPS			
737	Master	OFF *		
738	Actuating Relay	ON		

TABLE 11-3 (Cont'd)

NO.	COMPONENTS	REQUIRED STATUS	ACTUAL STATUS CHANNEL 1	CHANNEL 2
	CONTAINMENT ISOLATION A LAMPS			
739	Master	OFF *		
740 741 742 743	Actuating Relays 1,2,3 and 4	ALL ON		
792	Rx Trip Aux. Relay	OFF if reactor not tripped, on otherwise.		
	FEEDWATER ISOLATION LAMPS			
793	Feedwater Isolation Actuating Relay 1	OFF* if reactor not tripped, on otherwise.		
794	Feedwater Isolation Actuating Relays 2	OFF *		
795 796 797 798	Steam Generator Hi Level Matrix Lamps 1,2,3 and 4	ALL OFF *		

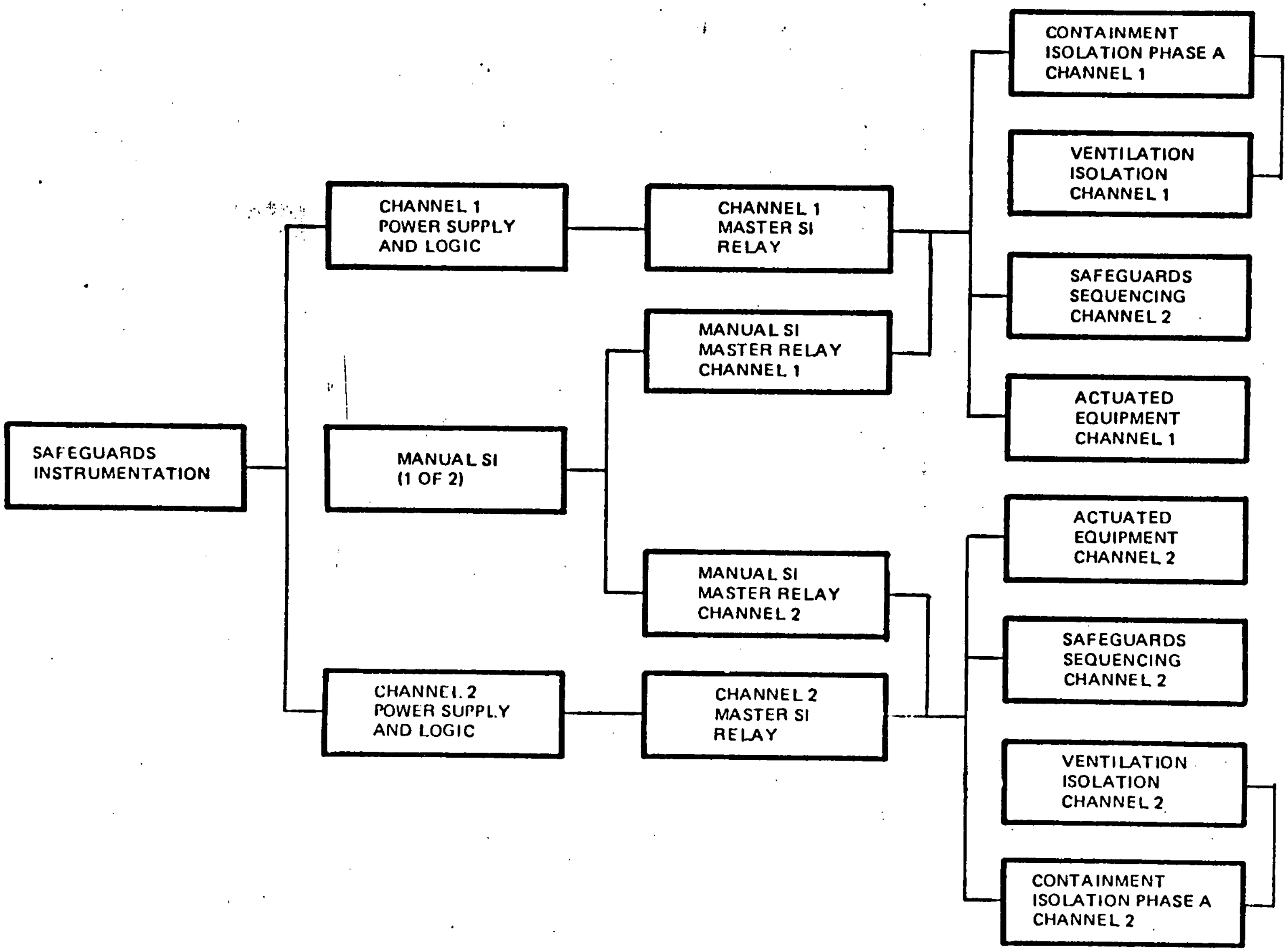


Figure 11-1. IP3 Safeguards Actuation Safety Injection Subsystem

Source: IPPSS Figure 1.6.2.2.3-2

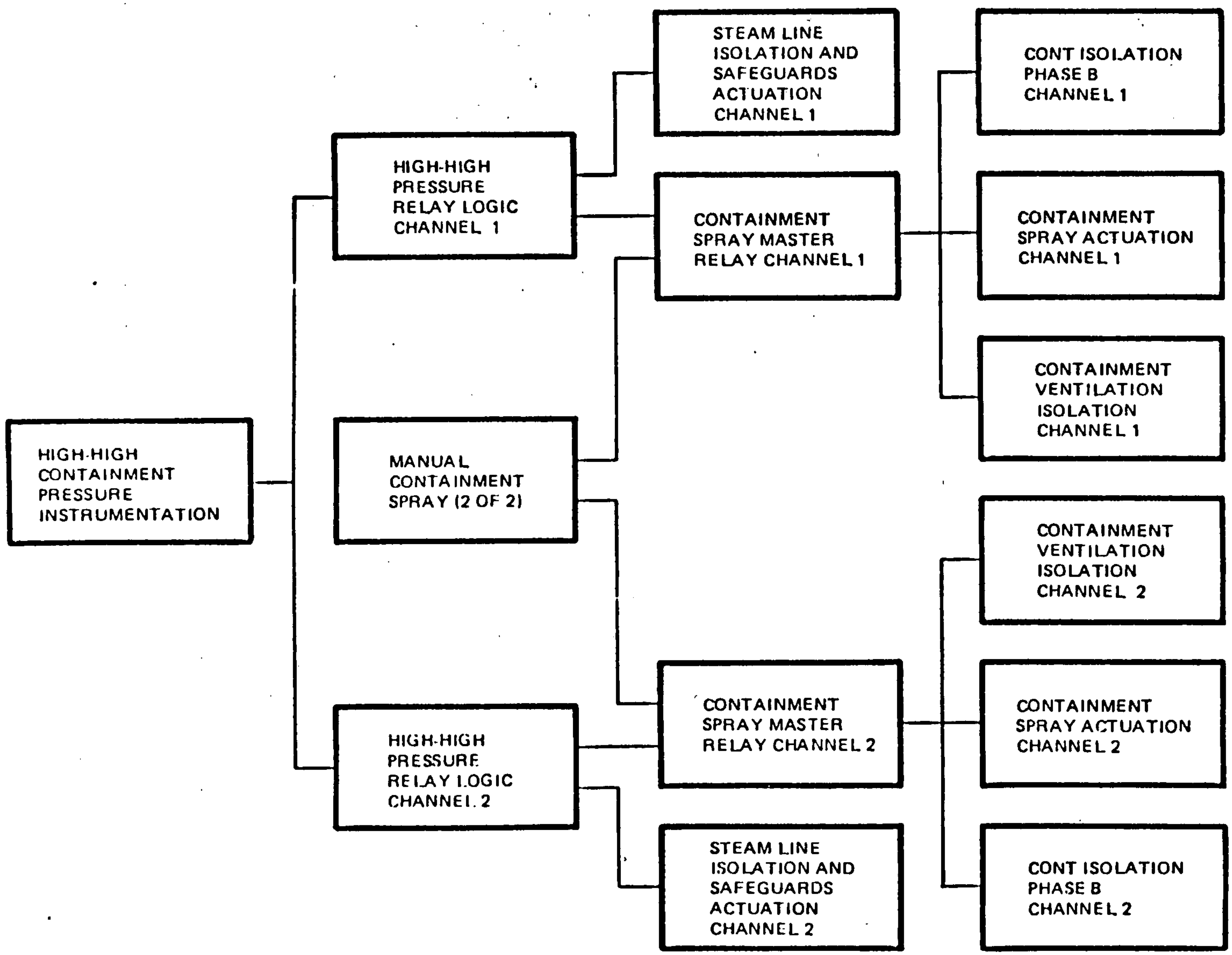


Figure 11-2. IP3 Safeguards Actu[illegible]on Containment Spray Subsystem
Source: IPPSS F[illegible]e 1.6.2.2.3-3

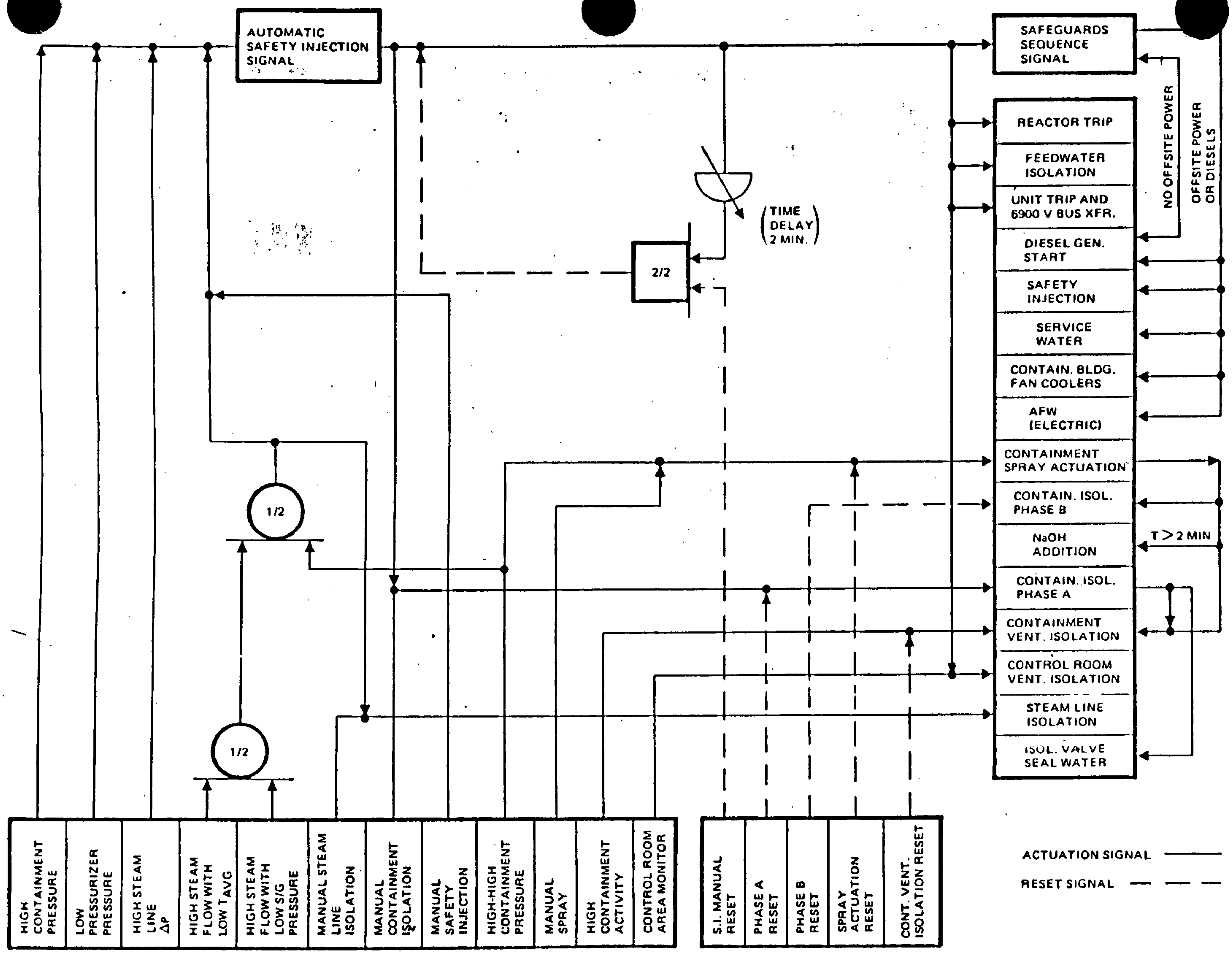


Figure 11-3. IP3 Safeguards Actuation System Functional Block Diagram Relationships
Source: IPPSS Figure 1.6.2.2.3-4

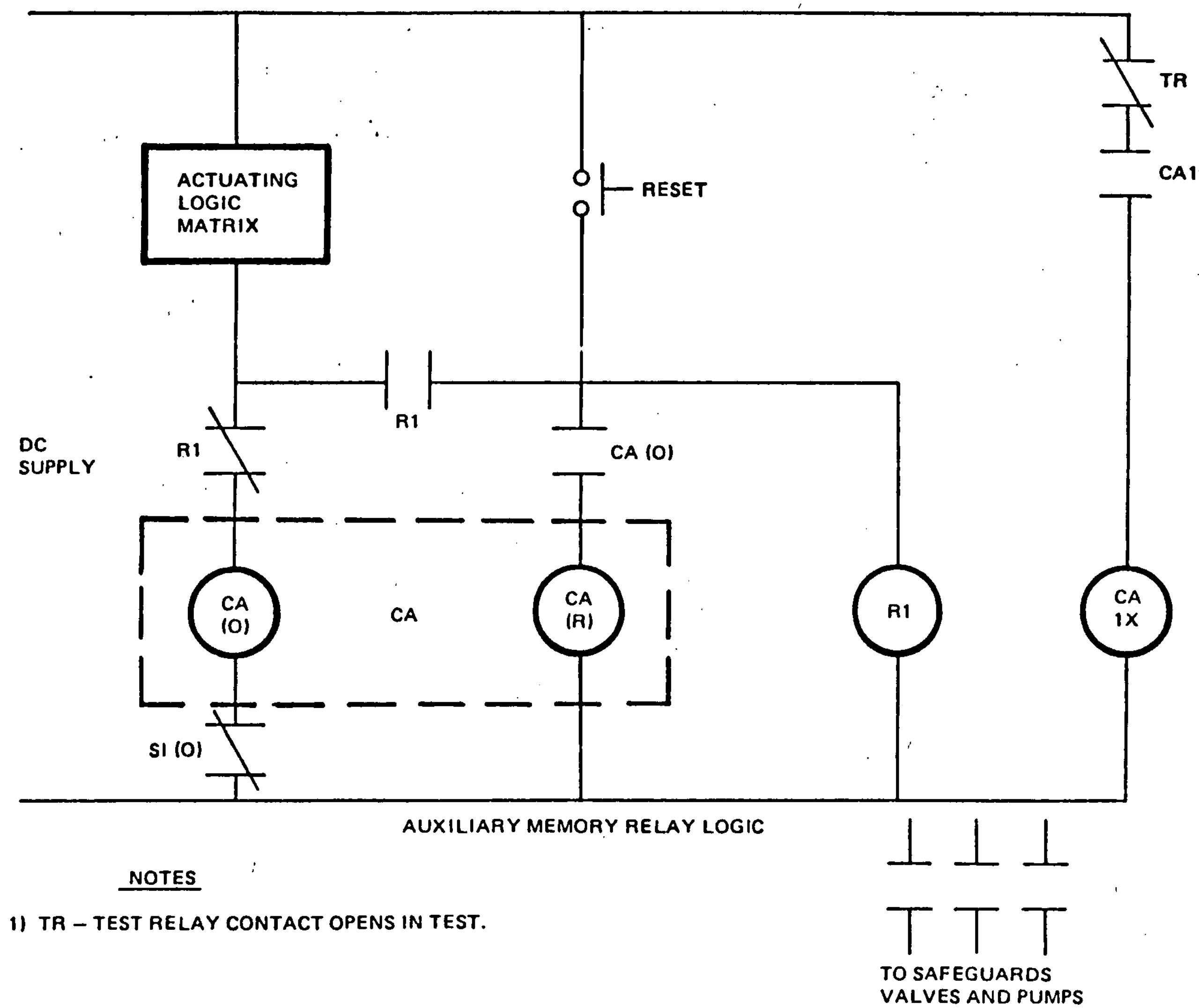
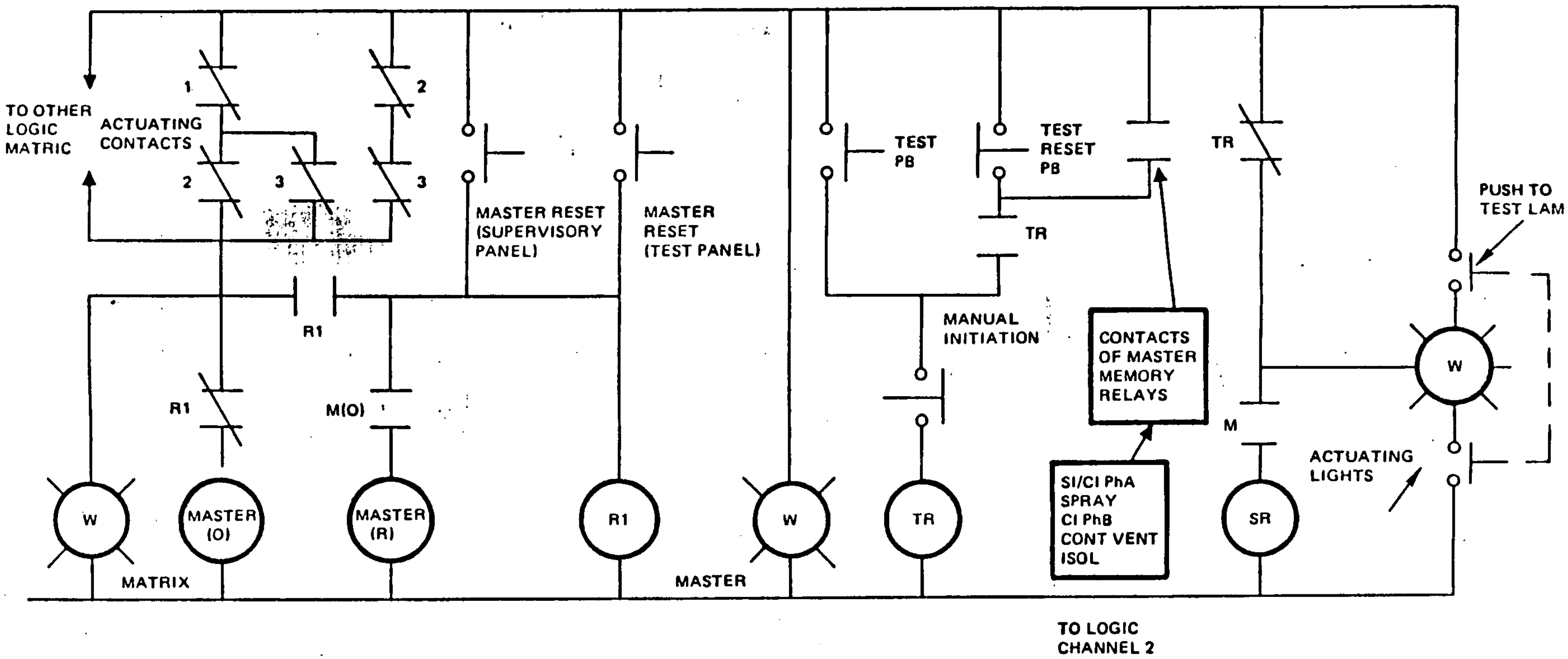


Figure 11-4. IP3 Safeguards Actuation Logic Arrangement - Master/Reset Relay
Source: IPPSS Figure 1.6.2.2.3-5



NOTES

1) SLAVE RELAY IS SR.

2) MASTER RELAY IS ANY OF THE MEMORY RELAYS ASSOCIATED WITH SI, CONTAINMENT SPRAY, CI PHASE B, CONTAINMENT VENTILATION ISOLATION.

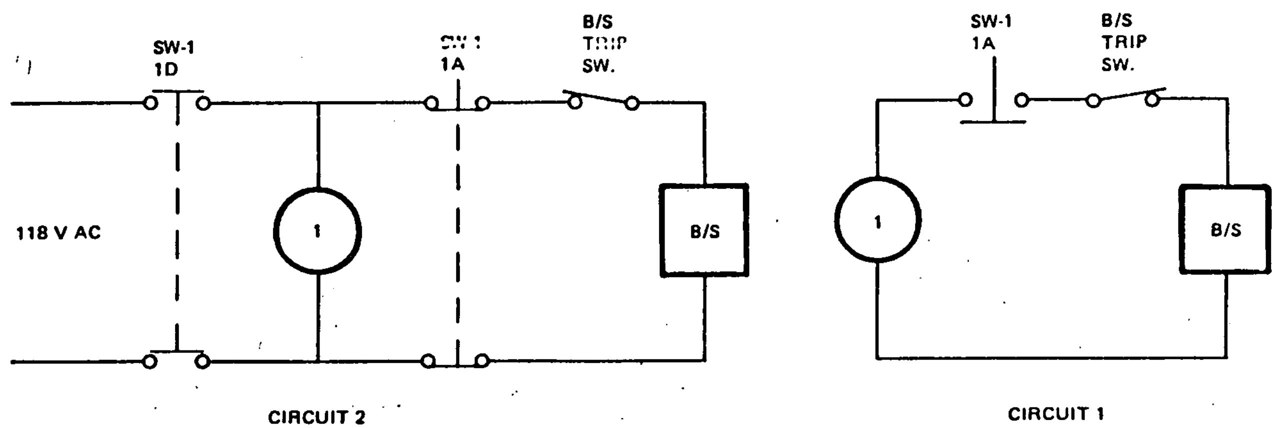


Figure 11-5. IP3 Safeguards Actuation Tests Circuits
Source: IPPSS Figure 1.6.2.2.3-6

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

12. Accumulator System

TABLE 12-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PC - Periodic calibration activities, procedures, and training.
PT - Periodic testing activities and procedures.
MT - Preventive or unscheduled maintenance activities procedures, and training.
OP - Normal and emergency operating procedures, check-off lists, training, etc.

Mission Success Criteria

The accumulator system is utilized during a large loss of coolant accident (LOCA) in which the pressure in the core decreases enough to allow injection because of the higher pressure nitrogen in each of the accumulator tanks. Success is defined as the injection of three accumulators into the three intact legs, given that a LOCA has occurred on the fourth leg, assuming that:

- The refueling water storage is available.
- The safeguards actuation signal is present.

The accumulator system does not depend on electric power. Both the Low Pressure Injection System and the Accumulator System are required for successful emergency coolant injection for a large LOCA.

1. Check Valves 895 A,B,C,D, 897 A,B,C,D Fail to Open Due to Plugging

   Failure of any of these valves to open will cause loss of flow from at least one accumulator, thereby causing a mission failure given a LOCA, since flow from all three accumulators is assumed to be required, reflecting the flow into the broken loop. (PT,MT)

2. MOVs 849 A,B,C,D, (De-energized open) Are Inadvertently Closed Due to Maintenance Error, Plugging or Spurious Actuation

   Failure of any of these valves to remain open will cause loss of flow from at lease one accumulator, thereby causing a mission failure given a LOCA. (PT,MT)

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

12. Accumulator System

TABLE 12-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODES
61725	Monthly Surveillance Observation	Check Valves 895 A-D Check Valves 897 A-D	1 1
71710	ESF Walkdown	MOVs 849 A-D	2
62703	Monthly Maintenance Observation		

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

12. Accumulator System

TABLE 12-3 MODIFIED SYSTEM WALKDOWN

COMPONENT	DESIRED POSITION	ACTUAL POSITION
1. MCCS - ELEVATION 55'		
MCC-36A		
MOV 849A Accumulator 31 Discharge Valve	DE-ENERGIZED LOCKED	________ ________
MOV 849C Accumulator 33 Discharge Valve	DE-ENERGIZED LOCKED	________ ________
MCC-36B		
MOV 849B Accumulator 32 Discharge Valve	DE-ENERGIZED LOCKED	________ ________
MOV849D Accumulator 34 Discharge Valve	DE-ENERGIZED LOCKED	________ ________
2. Control Room		
MOV 849A Accumulator 31 Discharge Valve	AUTO DE-ENERGIZED	________ ________
MOV 849B Accumulator 32 Discharge Valve	AUTO DE-ENERGIZED	________ ________
MOV 849C Accumulator 33 Discharge Valve	AUTO DE-ENERGIZED	________ ________
MOV 849D Accumulator 34 Discharge Valve	AUTO DE-ENERGIZED	________ ________

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

~~Table 12-3 (Cont'd.)~~ TABLE 12-3 (Cont'd)

	COMPONENT	DESIRED POSITION	ACTUAL POSITION
Inside Containment Elevation 95' PCV-455C N_2 Supply			
8309	Accumulator Inlet	OPEN LOCKED	________ ________
8310	Accumulator Inlet Vent	SHUT CAPPED	________ ________
8311	Accumulator Inlet Vent	SHUT CAPPED	________ ________
8312	Accumulator Drain	SHUT CAPPED	________ ________
8313	Accumulator Outlet	OPEN CAPPED	________ ________
8314	PI6301 Stop	OPEN	________
8315	Accumulator Outlet Vent	SHUT CAPPED	________ ________
8316	PI-6301 Stop	OPEN	________
Elevation 95' PCV-456 N_2 Supply			
8317	Accumulator Inlet	OPEN LOCKED	________ ________
8318	Accumulator Inlet Vent	SHUT CAPPED	________ ________
8319	Accumulator Inlet Vent	SHUT CAPPED	________ ________
8320	Accumulator Drain	SHUT CAPPED	________ ________
8321	Accumulator Outlet	OPEN LOCKED	________ ________
8322	PI-6300 Stop	OPEN	________
8323	Accumulator Outlet Vent	SHUT CAPPED	________ ________
8324	PI-6302 Stop	OPEN	________

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

Table 12-3 (Cont'd)

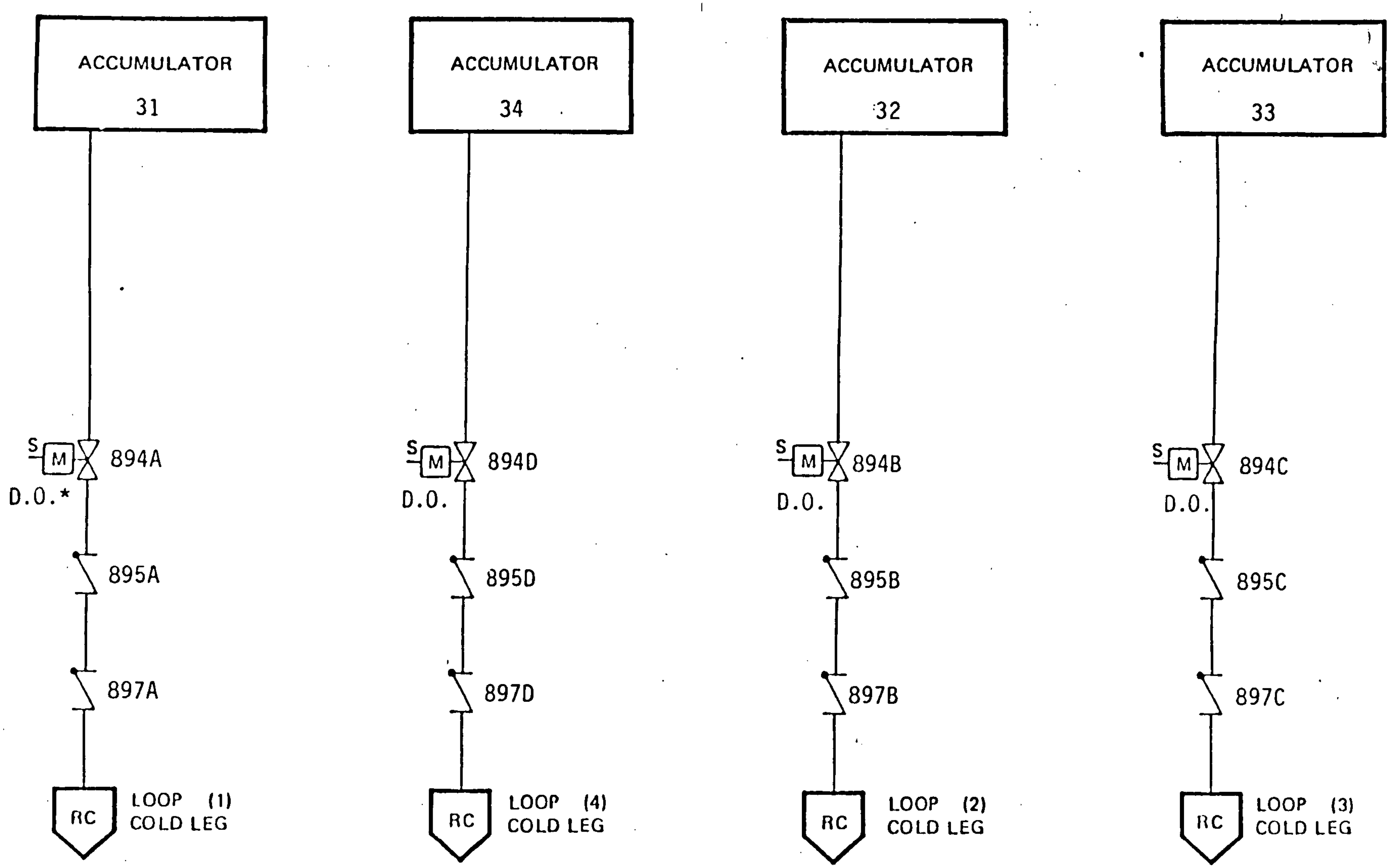
COMPONENT		DESIRED POSITION	ACTUAL POSITION
Inside Containment Elevation 95' PCV-455C N_2 Supply			
8309	Accumulator Inlet	OPEN LOCKED	
8310	Accumulator Inlet Vent	SHUT CAPPED	
8311	Accumulator Inlet Vent	SHUT CAPPED	
8312	Accumulator Drain	SHUT CAPPED	
8313	Accumulator Outlet	OPEN CAPPED	
8314	PI6301 Stop	OPEN	
8315	Accumulator Outlet Vent	SHUT CAPPED	
8316	PI-6301 Stop	OPEN	
Elevation 95' PCV-456 N_2 Supply			
8317	Accumulator Inlet	OPEN LOCKED	
8318	Accumulator Inlet Vent	SHUT CAPPED	
8319	Accumulator Inlet Vent	SHUT CAPPED	
8320	Accumulator Drain	SHUT CAPPED	
8321	Accumulator Outlet	OPEN LOCKED	
8322	PI-6300 Stop	OPEN	
8323	Accumulator Outlet Vent	SHUT CAPPED	
8324	PI-6302 Stop	OPEN	

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

Table 12-3 (Cont'd)

REFERENCES

Number	Title	Rev.	Date
NYPA-IP3 Checkoff List:			
1. COL-SI-1	Safety Injection System	9	6/1/84
2. COL-RCS-1	Reactor Coolant System	8	9/13/85
3. Comments by NRC Resident Inspector R. Barklay 1/9/87.			



*D.O. → Deenergized open.

Figure 12-1. IP3 Accumulator Simplified P&ID
Source: IPPSS Figure 1.6.2.3.3-3

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

13. Containment Spray System

TABLE 13-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PT - Periodic testing activities
MT - Preventive or unscheduled maintenance activities and procedures.
OP - Normal and emergency operating procedures, check-off lists, etc.

Mission Success Criteria

Containment Spray During the injection phase, either of the two spray trains delivering borated water at 2,600 GPM through its set of 221 spray nozzles is sufficient to maintain containment pressure below the design pressure following a LOCA when the reactor cores residual heat is released to containment as steam.

Either of the two parallel pump trains are sufficient for system success. The normally closed motor-operated valve (MOV) in each spray train must open and the pump must start and run for a maximum of 2 hours with minimum safeguards. Otherwise, all valves are normally in their correct positions for system operation.

NaOH addition During the injection phase and continuing for 30 minutes into the recirculation phase, at least one of the NaOH addition trains must introduce approximately 25 GPM of the NaOH solution from the spray additive tank into an operating containment spray train.

1. Containment Spray Pumps 31 & 32 Fail to Start or Operate Due to Random Failure or Unavailable Due to Maintenance.

   Pumps failing to start or operate causes loss of both the containment spray and NaOH addition functions (PT, MT).

2. Containment Spray Pumps Discharge Isolation Valves MOVs 866A, 866B Fail to Open Due to Random Failure and Maintenance.

   Valves failing to open causes loss of both the containment spray and NaOH addition functions (PT).

Table 13-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

3. Containment Spray Pump Discharge Check Valves 867A, 867B Fail to Open Due to Plugging.

   Valves failing to open causes loss of both the containment spray and NaOH addition functions (PT).

4. Locked Open Containment Manual Isolation Valves 869A, 869B Are Plugged or Inadvertently Closed Due to Maintenance Error.

   Both of these valves in the closed position prevents flow inside containment to the containment spray headers, thereby failing both containment spray and NaOH addition (MT, OP).

5. Locked-Open Containment Spray Pump Suction Valves 865A, 865B Are Plugged or Inadvertently Closed Due to Maintenance Error.

   Both of these valves in the closed position prevents flow from the RWST to the containment spray pumps, thereby failing both containment spray and NaOH addition (PT, MT, OP).

6. Locked-Open Spray Additive Tank Isolation Valve 1841 Plugged or Inadvertently Closed Due to Maintenance Error*

   Valve in the closed position prevents NaOH addition (MT, OP).

7. RWST to Eductor Flushing, Locked Closed, Manual Valve 873B Inadvertently Left Open Due to Maintenance Error*

   Valve failing to remain closed will cause insufficient NaOH addition (PT, MT).

8. Spray Additive Tank Air-Operated Diaphragm Valves 876A, 876B (Normally Closed, Fail Open) Fail to Open 2 Minutes After the Safeguards Actuation Signal Due to Random Failure.

   Either of these valves failing to open prevents sufficient NaOH addition which is required to mitigate fission product release inside containment (PT).

9. Eductors 31 & 32 Suction Check Valves 1838A, 1838B Fail to Open Due to Plugging.

   Valves failing to open prevents additive flow to the containment spray pumps, thereby failing NaOH addition (PT).

Table 13-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE
10. Eductors 31 & 32 Suction Locked-Open Manual Valves 1839A, 1839B Plugged or Inadvertently Closed Due to Maintenance Error. Valves failing to open prevents additive flow to the containment spray pumps, thereby failing NaOH addition (PT, MT).
*These are considered single failure points.

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

13. Containment Spray System

TABLE 13-2 I&E INSPECTION PROCEDURES FOR SYSTEM OPERATION

PROCEDURE NUMBER	TITLE	COMPONENTS	FAILURE MODE
61726	Monthly Surveillance Observation	Containment Spray Pumps	1
		31&32 MOVs 866A, 866B	2
71710	ESF Walkdown	Locked Open Manual Valves	
		869A, 869B,	4
		865A, 865B	5
		1839A, 1839B, 1841	6,10
		Air Operated Diaphragm Valves 876A, 876B	8
		Locked Closed Manual Valve 873B	7
62703	Monthly Maintenance Observation	Containment Spray Pumps 31 & 32	1
		MOVs 866A, 866B	2

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

13. Containment Spray System

TABLE 13-3 MODIFIED SYSTEM WALKDOWN

COMPONENT		DESIRED POSITION	ACTUAL POSITION
1.0 PAB-41' Elevation			
1.1 Spray Pumps			
865A	Spray Pump 31 Suction Stop Valve	LO	______
865B	Spray Pump 32 Suction Stop Valve	LO	______
1.2 Spray Additive Tank			
1841	Spray Additive Tank Discharge Stop Valve	LO	______
1839A	Eductor 31 Suction Stop Valve	LO	______
1839B	Eductor 32 Suction Stop Valve	LO	______
873B	Eductor Bypass Valve to Spray Pump Suction	LS	______
2.0 PAB-54' Elevation			
869A	Spray Header A Containment Isolation Valve	LO	______
869B	Spray Header B Containment Isolation Valve	LO	______
3.0 Power Supplies			
3.1 480 V Switchgear-Control Bldg. 15' Elevation			
5A			
Containment Spray Pump 31			
Breaker Racked In		Yes	______
Control Fuses In		Yes	______
6A			
Containment Spray Pump 32			
Breaker Racked In		Yes	______
Control Fuses In		Yes	______
3.2 MCC-36A-55' Elevation PAB			
866A	Spray Pump 31 Discharge MOV	Energized	______

Table 13-3 (Cont'd)

COMPONENT		DESIRED POSITION	ACTUAL POSITION
3.3 MCC-36B-55' Elevation PAB			
866B	Spray Pump 32 Discharge MOV	Energized	
4.0 Control Switches			
CCR-SBF-1 Panel			
Containment Spray Pump 31		Auto	______
Pump Indicating Light		Stop	______
Containment Spray Pump 32		Auto	______
Pump Indicating Light		Stop	______
866A	Spray Pump 31 Discharge MOV	Auto	______
	Valve Indicating Light	Shut	______
866B	Spray Pump 32 Discharge MOV	Auto	______
	Valve Indicating Light	Shut	______
876A	Spray Additive Tank Discharge	Shut	______
	Valve Indicating Light	Shut	______
876B	Spray Additive Tank Discharge	Shut	______
	Valve Indicating Light	Shut	______

REFERENCE

Number	Title	Rev.	Date
NYPA-IP3 Check-off list:			
COL-CSV-1	Containment Spray Verification	0	2/15/85

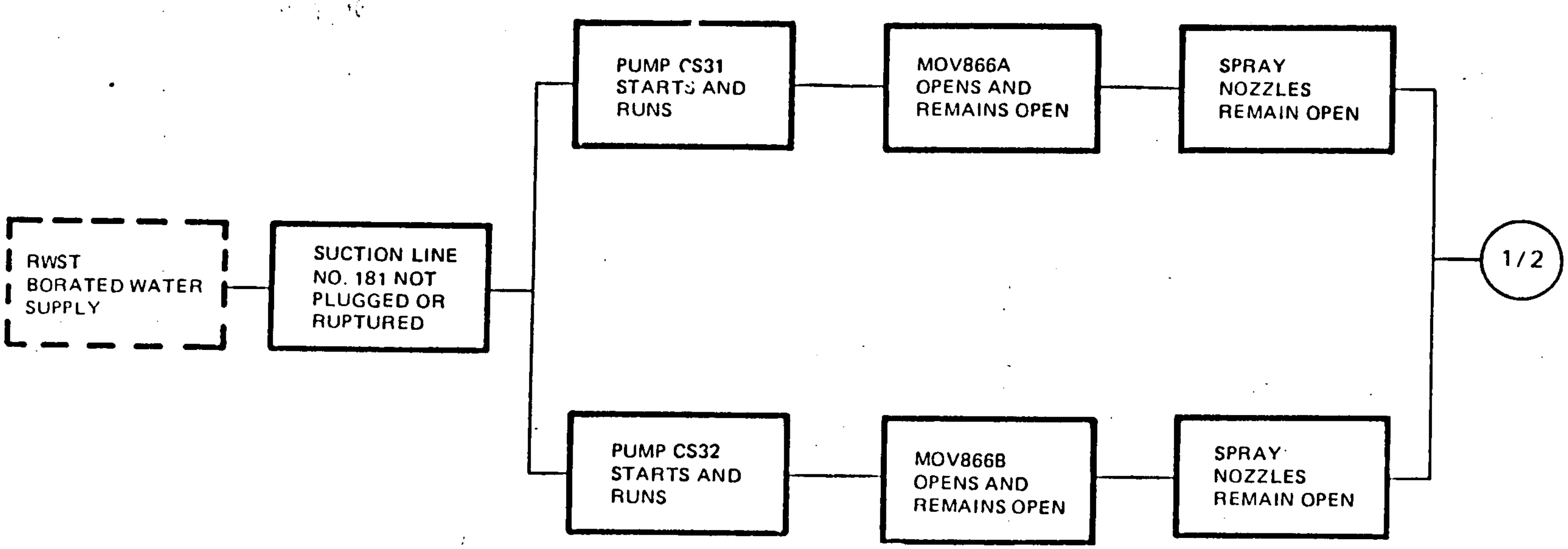


Figure 13-1. IP3 Block Diagram of Containment Spray System
Source: IPPSS Figure 1.6.2.3.5-3

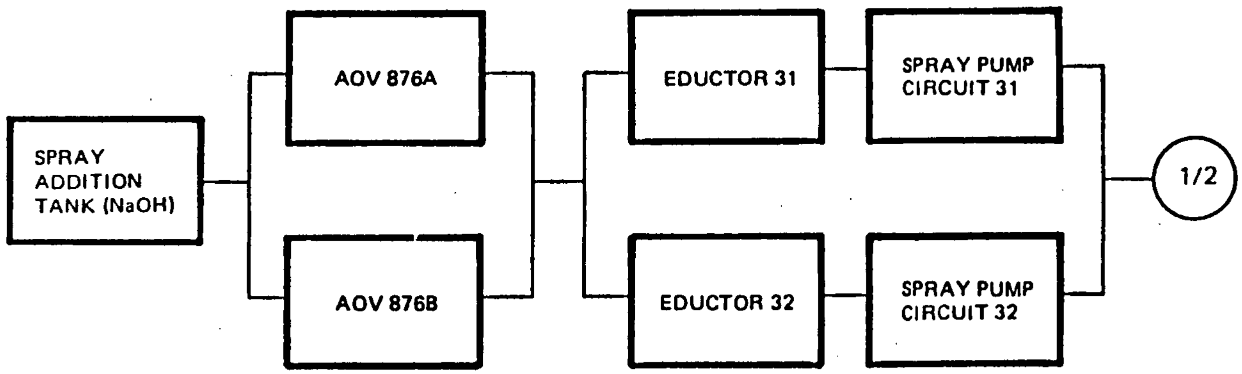


Figure 13-2. IP3 Block Diagram of NaOH Addition System
Source: IPPSS Figure 1.6.2.3.5-4

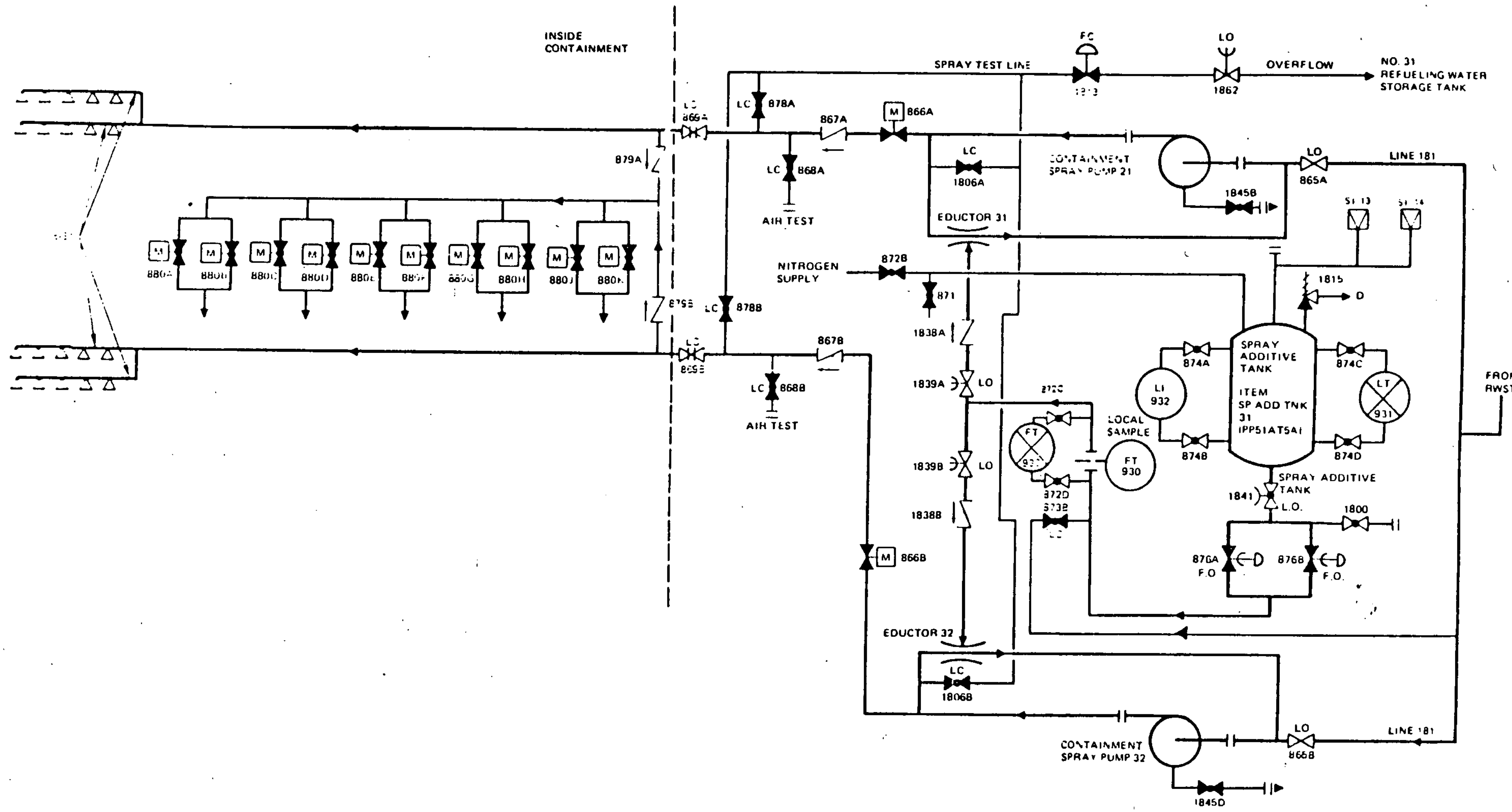


Figure 13-3. IP3 Containment Spray System P&ID Schematic
Source: IPPSS Figure 1.6.2.3.5-5

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY - BASED
INSPECTION PLAN

14. Containment Fan Cooling System

TABLE 14-1 IMPORTANCE BASIS AND FAILURE MODE IDENTIFICATION

CONDITIONS THAT CAN LEAD TO FAILURE

General Guidance

Surveillance of the licensee's periodic testing and/or preventive or unscheduled maintenance activities and procedures and/or normal and emergency operating procedures and check-off lists in accordance with the Technical Specifications and relevant NRC bulletins and information notices should reduce the probability of failure for the conditions listed below. The most relevant aspects are designated for each condition as follows:

PC - Periodic calibration activities, procedures, and training.
PT - Periodic testing activities, procedures, and training.
MT - Preventive or unscheduled maintenance activities, procedures, and training.
OP - Normal and emergency operating procedures, check-off lists, training etc.

Mission Success Criteria

Any three of the five Fan Cooler Units (FCUs) in operation and transferred to the accident mode (internal repositioning of dampers to divert part of the containment atmosphere through the charcoal filters to remove radioactive iodine) is sufficient for large LOCAs with Containment Spray inoperative. Less than three may be adequate for Small LOCAs.

1. Three of the Five Fan Cooler Units 31 to 35 Fail to Start or Run, or Fail to Transfer to the Accident Mode Upon a SI Signal, or are Unavailable Due to Maintenance.

   Failure of the minimum required number of FCUs to operate when required constitutes system failure. A FCU can fail due to mechanical fan failure, loss of power supply or control circuitry to the motors and dampers, loss of Service Water to the coolers, failure of the internal dampers to be repositioned to the accident mode, or failure of the charcoal beds to be adequately drained, or quenched in the event of a hydrogen fire. The Containment Spray System acts as an alternative (PT, MT, OP).

2. Service Water Temperature Control Valves TCV 1104 and 1105 Fail to Open Upon a SI Signal or are Out Due to Maintenance.

   Failure of both of these valves to open will cause insufficient SW flow for accident conditions (PT, MT, OP).

Table 14-1 (Cont'd)

CONDITIONS THAT CAN LEAD TO FAILURE

3. FCU's Service Water Supply Valves SWN-38 or SWN-39 from the Service Water Pumps Transfer Closed Due to Maintenance Error or Plugging*

Inadvertent closure of valve SWN-38 will cause loss of SW to all five FCUs from SWPs 34, 35, 36 while closure of SWN-39 prevents SW flow from SWPs 31, 32, 33. These valves are considered sources of single point failures (MT, OP).

4. Service Water Header to FCU, Cross Tie Isolation Valves SWN-40-1, SWN-40-2 Transfer Closed Due to Maintenance Error Plugging.

Inadvertent closure of one or both of these valves will cause the loss of operability of two or three FCUs (MT, OP).

5. FCUs Service Water Valves Transfer Closed Due to Maintenance Error or Plugging.

a) Service Water Isolation Valves to FCUs
Inlet: SWN-41-1 to 41-5
Outlet: SWN-44-1 to 44-5

b) Service Water Valves to FCU Motor Coolers
Supply: SWN-520, 522, 524, 526, 528
Return: SWN-521, 523, 525, 527, 529

c) Service Water to FCU 31-35 Motor Cooler Outlet Isolation Valves
SWN-71-1 to SWN-71-5

Inadvertent closure of one or more of these valves will cause the loss of operability of one or more of the FCUs (MT, OP).

*Single point failures.

Table 14-3 (Cont'd)

COMPONENT	DESIRED POSITION	ACTUAL POSITION
3. Control Room		
3.1 Supervisory Panel SBF-1		
Service Water Temperature Control Valves	Essential SWS Pumps 31,32,33 or	CR Switch Position 34,35,36
TCV 1104	SHUT ________	SHUT ________
Lamp Indicates	SHUT ________	SHUT ________
TCV 1105	SHUT ________	SHUT ________
Lamp Indicates	SHUT ________	SHUT ________
(Accident position all OPEN)		
3.2 Supervisory Panel SBF-2		
Cont. Air Temp Controller (TCV-1103)	Auto	________
FCU 31 Control Switch	Auto	________
FCU 31 Indicating Light	Run	________
FCU 32 Control Switch	Auto	________
FCU 32 Indicating Light	Run	________
FCU 33 Control Switch	Auto	________
FCU 33 Indicating Light	Run	________
FCU 34 Control Switch	Auto	________
FCU 34 Indicating Light	Run	________
FCU 35 Control Switch	Auto	________
FCU 35 Indicating Light	Run	________
FCU 31 A&B Damper Flow Vlv 1293 Control Switch	Open	________
FCU 31 A&B Damper Flow Vlv 1293 Indicating Light	Red	________
FCU 31 C Damper Flow Vlv 1294 Control Switch	Open	________
FCU 31 C Damper Flow Vlv 1294 Indicating Light	Red	________
FCU 31 D Damper Flow Vlv 1295 Control Switch	Shut	________
FCU 31 D Damper Flow Vlv 1295 Indicating Light	Green	________
FCU 32 A&B Damper Flow Vlv 1296 Control Switch	Open	________

Table 14-3 (Cont'd)

COMPONENT	DESIRED POSITION	ACTUAL POSITION
FCU 32 A&B Damper Flow Vlv 1296 Indicating Light	Red	________
FCU 32 C Damper Flow Vlv 1297 Control Switch	Open	________
FCU 32 C Damper Flow Vlv 1297 Indicating Light	Red	________
FCU 32 D Damper Flow Vlv 1298 Control Switch	Shut	________
FCU 32 D Damper Flow Vlv 1298 Indicating Light	Green	________
FCU 33 A&B Damper Flow Vlv 1299 Control Switch	Open	________
FCU 33 A&B Damper Flow Vlv 1299 Indicating Light	Red	________
FCU 33 C Damper Flow Vlv 1300 Control Switch	Open	________
FCU 33 C Damper Flow Vlv 1300 Indicating Light	Red	________
FCU 33 D Damper Flow Vlv 1301 Control Switch	Shut	________
FCU 33 D Damper Flow Vlv 1301 Indicating Light	Green	________
FCU 34 A&B Damper Flow Vlv 1302 Control Switch	Open	________
FCU 34 A&B Damper Flow Vlv 1302 Indicating Light	Red	________
FCU 34 C Damper Flow Vlv 1303 Control Switch	Open	________
FCU 34 C Damper Flow Vlv 1303 Indicating Light	Red	________
FCU 34 D Damper Flow Vlv 1304 Control Switch	Shut	________
FCU 34 D Damper Flow Vlv 1304 Indicating Light	Green	________
FCU 35 A&B Damper Flow Vlv 1305 Control Switch	Open	________
FCU 35 A&B Damper Flow Vlv 1305 Indicating Light	Red	________
FCU 35 C Damper Flow Vlv 1306 Control Switch	Open	________
FCU 35 C Damper Flow Vlv 1306 Indicating Light	Red	________
FCU 35 D Damper Flow Vlv 1307 Control Switch	Shut	________

Table 14-3 (Cont'd)

COMPONENT	DESIRED POSITION	ACTUAL POSITION
FCU 35 D Damper Flow Vlv 1307 Indicating Light	Green	________
4. PAB Mechanical Penetration Area		
4.1 Service Water Inlet Isolation Valves		
FCU 31, SWN 41-1	OPEN	________
FCU 32, SWN 41-2	OPEN	________
FCU 33, SWN 41-3	OPEN	________
FCU 34, SWN 41-4	OPEN	________
FCU 35, SWN 41-5	OPEN	________
4.2 Service Water Outlet Isolation Valves		
FCU 31, SWN 44-1	OPEN	________
FCU 32, SWN 44-2	OPEN	________
FCU 33, SWN 44-3	OPEN	________
FCU 34, SWN 44-4	OPEN	________
FCU 35, SWN 44-5	OPEN	________
4.3 Service Water to FCU Motor Cooler Outlet Isolation Valves		
FCU 31, SWN 71-1	OPEN	________
FCU 32, SWN 71-2	OPEN	________
FCU 33, SWN 71-3	OPEN	________
FCU 34, SWN 71-4	OPEN	________
FCU 35, SWN 71-5	OPEN	________
4.4 Service Water Header to FCUs Cross Tie Isolation Valves		
SWN 40-1	OPEN	________
SWN 40-2	OPEN	________

4.5 Fan Cooler Units Service Water Supply Valves	Essential SWS Pumps 31,32,33	or	CR Switch Position 34,35,36
4.5.1 From SWPs 34, 35, 36 Isolation Valve SWN-38	SHUT ________		OPEN ________
4.5.2 From SWPs 31, 32, 33 Isolation Valve SWN-39	OPEN ________		SHUT ________

Table 14-3 (Cont'd)

REFERENCES

Number	Title	Rev.	Date
NYPA IP3 Check-off Lists:			
1. COL-CB-1	Containment Cooling & Filtration	3	5/11/83
2. COL-RW-2	Service Water System	4	9/9/85

3. Comments by NRC Resident Inspector R. Barklay 1/9/87

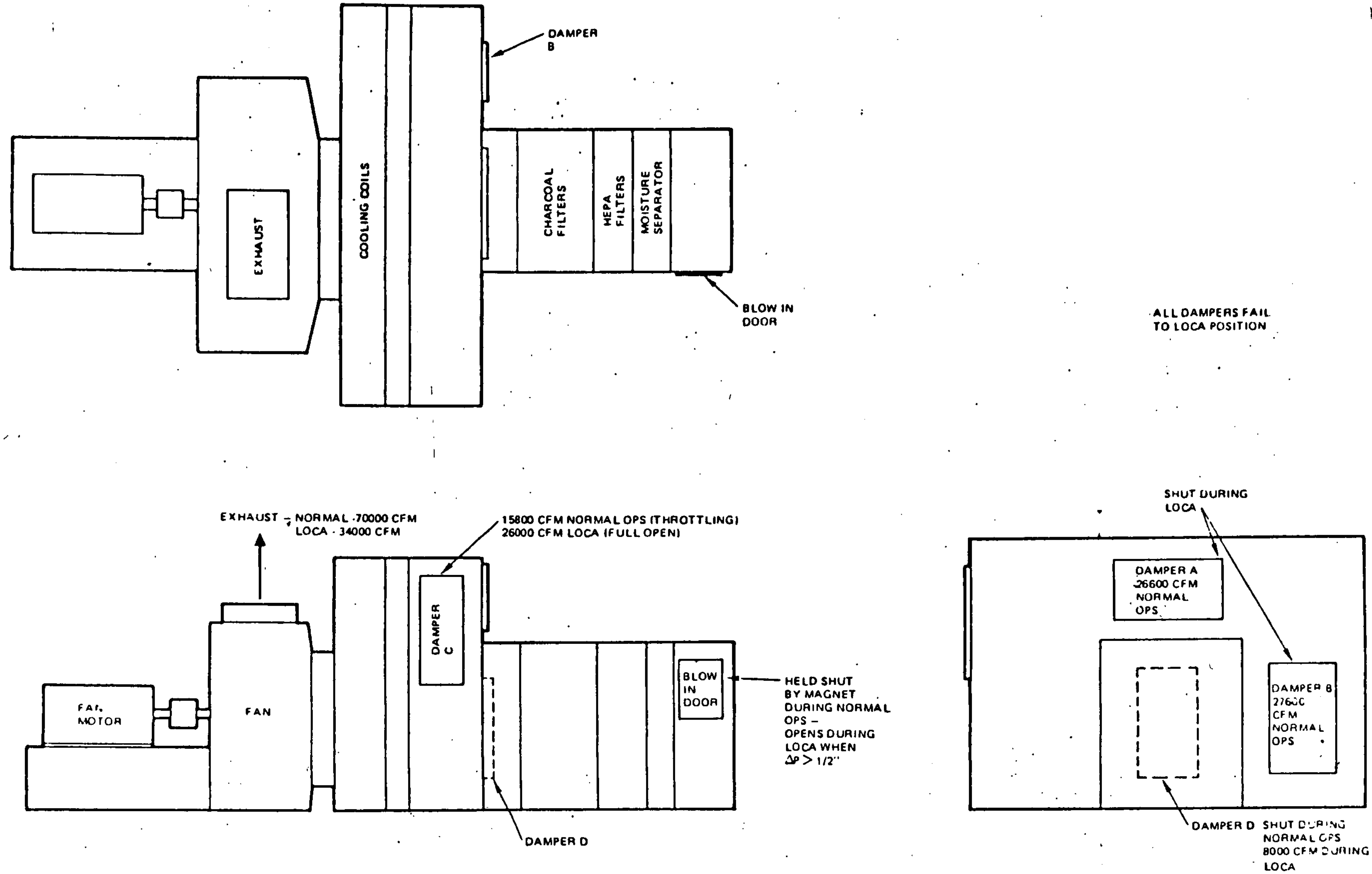


Figure 14-1. IP3 Diagram of Fan Cooler Unit
Source: IPPSS Figure 1.6.2.3.6-3

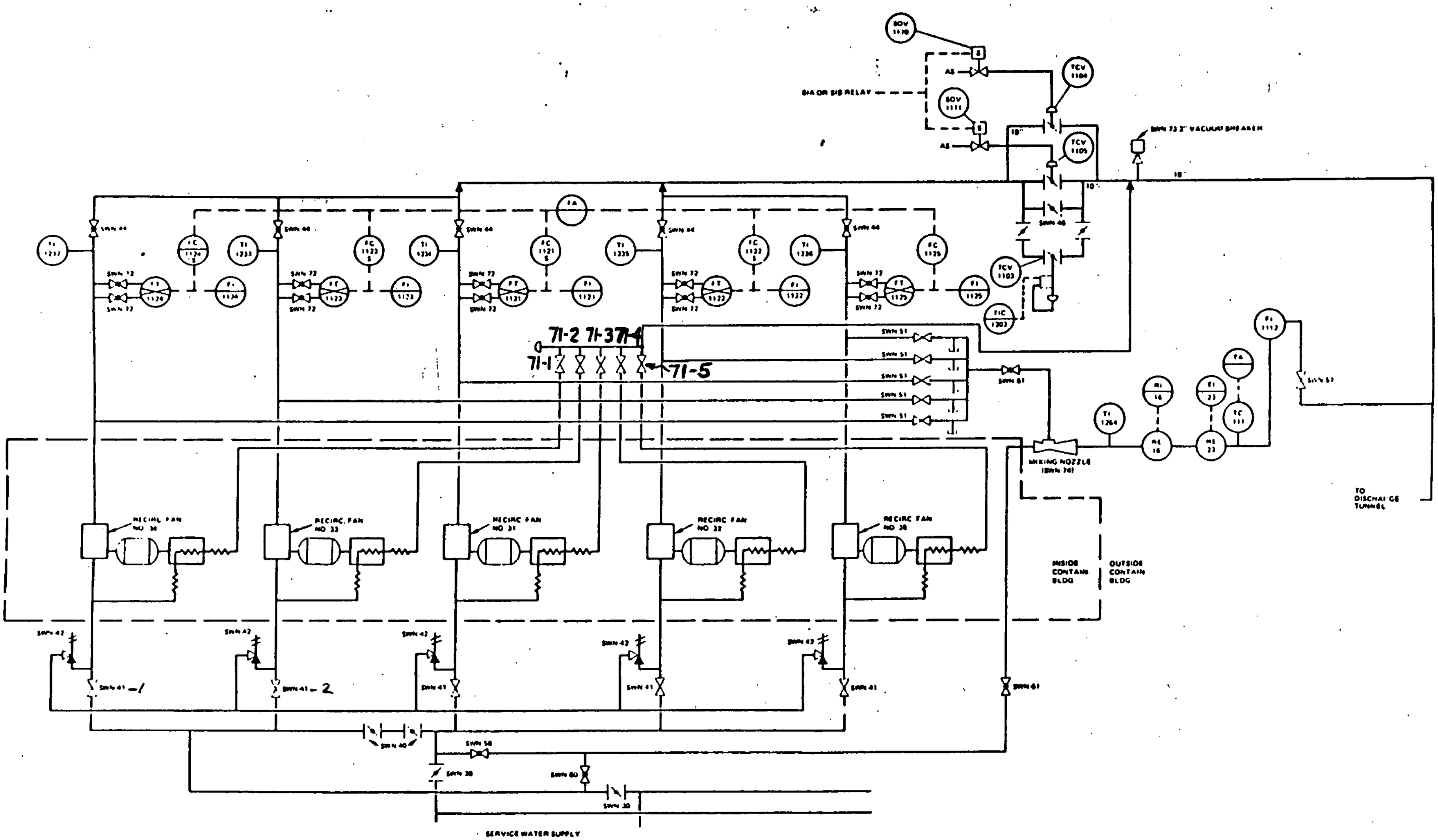


Figure 14-2. Simplified P&ID of Service Water to IP3 Fan Cooler Units
Source: IPPSS Figure 1.6.2.3.6-4

INDIAN POINT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

15. Inside Containment

TABLE 15 - MODIFIED SYSTEM WALKDOWN

Discussion

During power operation, the Containment Building is a high radiation area that is only accessible for very limited time periods, if at all. To facilitate the inspection of components located inside the containment during periods when access is permissible, those components from the previous system walkdown tables which are located inside the containment are listed below.

SYSTEM TABLE NO.	COMPONENT	DESIRED POSITION	ACTUAL POSITION
1. 46'0 Elevation - Inside Crane Wall			
Recirculation 7-3	Recirculation Pumps Manual Valves		
	752G Pump 31 Inlet Stop	OPEN	______
	752H Pump 31 Outlet Stop	OPEN	______
	753G Pump 32 Inlet Stop	OPEN	______
	753H Pump 32 Outlet Stop	OPEN	______
2. 68'0 Elevation			
Containment Fan Cooling 14-3	Fan Cooler Units Motor Cooler Isolation Valves		
	SWN-520 FCU 31 Motor Supply Valve	OPEN	______
	SWN-521 FCU 31 Motor Return Valve	OPEN	______
	SWN-522 FCU 32 Motor Supply Valve	OPEN	______
	SWN-524 FCU 32 Motor Return Valve	OPEN	______

Table 15 (Cont'd)

SYSTEM TABLE NO.		COMPONENT	DESIRED POSITION	ACTUAL POSITION
14-3 (Cont'd.)				
		SWN-524 FCU 33 Motor Supply Valve	OPEN	______
		SWN-525 FCU 33 Motor Return Valve	OPEN	______
		SWN-526 FCU 34 Motor Supply Valve	OPEN	______
		SWN-527 FCU 34 Motor Return Valve	OPEN	______
		SWN-528 FCU 35 Motor Supply Valve	OPEN	______
		SWN-529 FCU 35 Motor Return Valve	OPEN	______
3. <u>Elevation 95'</u> <u>PCV-455C N_2 Supply</u>				
Accumulator 12-3	8309	Accumulator Inlet	OPEN LOCKED	______ ______
	8310	Accumulator Inlet Vent	SHUT CAPPED	______ ______
	8311	Accumulator Inlet Vent	SHUT CAPPED	______ ______
	8312	Accumulator Drain	SHUT CAPPED	______ ______
	8313	Accumulator Outlet	OPEN CAPPED	______ ______
	8314	PI6301 Stop	OPEN	______
	8315	Accumulator Outlet Vent	SHUT CAPPED	______ ______
	8316	PI-6301 Stop	OPEN	______

Table 15 (Cont'd)

SYSTEM TABLE NO.	COMPONENT	DESIRED POSITION	ACTUAL POSITION
12-3 (Cont'd)			
	8320 Accumulator Drain	CAPPED SHUT	________ ________
	8321 Accumulator Outlet	CAPPED OPEN	________ ________
	8322 PI-6300 Stop	LOCKED OPEN	________ ________
	8323 Accumulator Outlet Vent	SHUT	________
	8324 PI-6302 Stop	CAPPED OPEN	________ ________
4. <u>Elev. 130'-Top of the Pressurizer</u>			
Reactor Coolant, 8-3	RCS-PCV-455C Power-Operated Relief Valve	SHUT	________
	SRCS-PCF-456 Power-Operated Relief Valve	SHUT	________
	RCS-MOV-535 Motor-Operated Isolation (Block) Valve to PCV-455C	OPEN	________
	RCS-MOV-536 Motor-Operated Isolation (Block) Valve to PCV-456	OPEN	________
	RCS-527 Power Operated Relief Line Vent Blind Flange Installed	SHUT YES	________ ________
	RCS-574A PCV-464 Loop Seal Drain	SHUT	________
	RCS-574B PCV-466 Loop Seal Drain	SHUT	________
	RCS-574C PCV-468 Loop Seal Drain	SHUT	________
	RCS-526 Loop Seal Drain Line Stop Valve	SHUT	________
	RCS-PCV-464 Code Safety (Gag Removed)	YES	________
	RCS-PCV-466 Code Safety (" ")	YES	________
	RCS-PCV-468 Code Safety (" ")	YES	________

Table 15 (Cont'd)

REFERENCES

	Number	Title	Rev.	Date
	NYPA-IP3 Check-Off Lists:			
1.	COL-ACCV-1	Auxiliary Component Cooling Verification	0	9/13/85
2.	COL-CB-1	Containment Cooling & Filtration	3	5/11/83
3.	COL-SI-1	Safety Injection System	9	6/1/84
4.	COL-RCS-1	Reactor Coolant System	8	9/13/85

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

TABLE 16 - PLANT OPERATIONS INSPECTION GUIDANCE

SYSTEM	FAILURE	DISCUSSION
1. Service Water System	Header Discharge Check Valve SWN 100-2 Fails to Open or Manual Isolation Valve SWN 98 Left in the Closed Position or Nuclear Header Piping Rupture (SWPs 31,32,33)	Table 1-1, Item 1a
	Header Discharge Check Valve SWN 100-1 Fails to Open or Manual Isolation Valve SWN 99 Left in the Closed Position or Nuclear Header Piping Rupture (SWPs 34,35,36)	Table 1-1, Item 1b
	Mode Selector Switch Improperly Positioned	Table 1-1, Item 3
	Diesel Generator SW Outlet Flow Control Valves FCV-1176 and FCV-1176A Fail to Open on Demand and Remain Open for 24 Hours	Table 1-1, Item 4
2. Electric Power System	Emergency Diesel Generator (EDG) Mode Selector Switch Not in Auto Position	Table 2-1, Item 1
	480 Volt Bus Tie Breakers Mispositioned Closed	Table 2-1, Item 6
	EDG Trips While Running	Table 2-1, Item 7
3. Component Cooling Water System	Large pipe break causes drainage of CCWS and operators fail to connect a spool piece to establish city water cooling to the charging pump within 20 minutes.	Table 3-1, Item 1
	Service Water Supply Valves SWN-32, SWN-32 Header to CCW Heat Exchangers Are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 2
	CCW Heat Exchanger SW Supply Isolation Valves 34-1 and 34-2/Discharge Isolation Valves 35-1 and 35-2 Are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 3
	CCW Heat Exchanger Inlet Isolation Valves 759A and 759B/Outlet Isolation Valves 765A and 765B Are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 4

Table 16 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
3. Component Cooling Water System (Cont'd)	CCW Heat Exchangers Fail to Function Due to Maintenance Outage, Severe Tube Leaks or Plugging	Table 3-1, Item 5
	Pump Suction/Discharge Valves 760 A,B,C, 762 A,B,C/Pump Discharge Check Valves 761 A,B,C/Pump Suction and Discharge Header Valves 766 A,B, 759 C,D are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 7
	Pump Suction Strainers Exhibit Excessive ΔP	Table 3-1, Item 8
5. High Pressure Injection System	Locked Open Manual Valves Are Closed Due to Plugging or Maintenance Error: a) RWST Supply Line Isolation, 846, b) SI Pump 31 Suction Valve 848A/ Discharge Valve 850A, c) SI Pump 33 Suction Valve 848B/ Discharge Valve 850B	Table 5-1, Item 6
	Manual Valves Are Closed Due to Plugging or Maintenance Error: a) Loop 1 Cold Leg, 856A, b) Loop 2 Hot Leg, 856D, c) Loop 3 Hot Leg, 856F, d) Loop 4 Cold Leg, 856K.	Table 5-1, Item 7
6. Secondary System (MSIVs)	MSIVs Fail to Close Due to Lack of Operator Action or Failure of the Manual Control Circuitry	Table 6-1, Item 2
7. Recirculation System	Recirculation Pumps 31,32 Fail to Start Because of Operator Failure to Initiate Switchover After a LOCA	Table 7-1, Item 1
	Auxiliary Component Cooling Water Pumps 31, 32, 33 & 34 Fail to Start Upon Demand	Table 7-1, Item 2
	CCW Outlet Isolation Valves From RHR Heat Exchangers 31 & 32 MOVs 822A, 822B Fail to Open Upon Demand and Unavailable Due to Maintenance and Random Failure	Table 7-1, Item 3
	Recirculation Pump Discharge Header Isolation Valves MOVs 1802A, 1802B Fail to Open Upon Demand	Table 7-1, Item 4

Table 16 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
7. Recirculation System (Cont'd)	Containment Spray Recirculation Isolation Valves MOVs 889A, 889B Fail to Open Upon Demand	Table 7-1, Item 5
	Hot Leg Recirculation Isolation Valves MOVs 856B, 856G Fail to Open Upon Demand	Table 7-1, Item 6
8. Reactor Coolant System (PORVs)	Pressurizer Power-Operated Relief Valves (PZR PORVs) PCV-455C & PCV-456 and Block Valves MOVs 535 & 536 Fail to Remain Open	Table 8-1, Item 1
	Pressurizer Power-Operated Relief Valves PCV-455C & PCV-456 Fail to Reseat and Block Valves MOVs 535 & 536 Fail to Close	Table 8-1, Item 2
9. Auxiliary Feedwater System	AFW Pumps 31,32,33 Fail to Start Due to Failure of Turbine Driven Pump (32), Maintenance, and Human Error	Table 9-1, Item 1
	Valves FCV 406A & B3 or FCV 406C & D Failure to Increase Speed (Turbine Driven Pump) and Valve Failure Due to Human Error	Table 9-1, Item 2
	Valves BFD 62,62-1,62-2,62-3, and BFD 48,48-2,48-4,and 48-6 Human Error Failure to Return to LO Position After Test	Table 9-1, Item 3
10. Low Pressure Injection System	RWST Outlet Isolation Valves Locked Open Manual Valve 846, MOV 882 (De-energized Open) or Check Valve 881 Left in the Closed Position Due to Maintenance Error or Plugged	Table 10-1, Item 2
	Locked Open RHR Pump Manual Discharge Valves 739A, 739B/Suction Valves 735A, 735B Left in the Closed Position Due to Maintenance Error, or Plugged	Table 10-1, Item 3
	RHR Pump Discharge Check Valves 738A, 738B Fail to Open Due to Plugging	Table 10-1, Item 4
	MOV 744 Pump Discharge Header Isolation Valve (De-energized open) Inadvertently Closed Due to Maintenance Error, or Check Valve 741 Fails to Open Due to Plugging	Table 10-1, Item 5

Table 16 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
10.Low Pressure Injection System (Cont'd)	RHR Heat Exchanger 31 Locked Open Manual Inlet Isolation Valve 742 Inadvertently Closed Due to Maintenance Error, or Plugged	Table 10-1, Item 6
	RHR Heat Exchanger 31 Discharge Motor-Operated Isolation Valves MOVs 747 and 899B and Throttling MOV-HCV 638 Inadvertently Closed Due to Maintenance Error, or Spurious Actuation or Plugging	Table 10-1, Item 7
	RHR Heat Exchanger 32 Inlet Isolation MOVs 745A and 745B Inadvertently Closed Due to Maintenance Error, or Spurious Actuation or Plugging	Table 10-1, Item 8
	RHR Heat Exchanger 32 Discharge Motor-Operated Isolation Valves MOVs 746 and 899A and Throttling MOV-HCV 640 Inadvertently Closed Due to Maintenance Error, or Spurious Actuation, or Plugging	Table 10-1, Item 9
	Cold Leg Check Valves (Loop 1-897A, 838A; Loop 2-897B, 838B; Loop 3-897C, 838C; Loop 4-897D, 838D) Fail to Open Due to Plugging	Table 10-1, Item 10
	Low water level in or blockage of flow from the RWST	Table 10-1, Item 11
11.Safeguards Actuation System	DC Power Fuse Opened Prematurely by Maintenance Error	Table 11-1, Item 5
13.Containment Spray System	Locked Open Containment Manual Isolation Valves 869A, 869B Are Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1, Item 4
	Locked-Open Containment Spray Pump Suction Valves 865A, 865B Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1, Item 5

Table 16 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
13. Containment Spray System (Cont'd)	Locked-Open Spray Additive Tank Isolation Valve 1841 Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1, Item 6
14. Containment Fan Cooling System	Three of the Five Fan Cooler Units 31 to 35 Fail to Start or Run, or Fail to Transfer to the Accident Mode Upon a SI Signal, or are Unavailable Due to Maintenance	Table 14-1, Item 1
	Service Water Temperature Control Valves TCV 1104 and 1105 Fail to Open Upon a SI Signal or are Out Due to Maintenance	Table 14-1, Item 2
	FCU's Service Water Supply Valves SWN-38 or SWN-39 from the Service Water Pumps Transfer Closed Due to Maintenance Error or Plugging	Table 14-1, Item 3
	Service Water Header to FCU, Cross Tie Isolation Valves SWN-40-1, SWN-40-2 Transfer Closed Due to Maintenance Error Plugging	Table 14-1, Item 4
	FCUs Service Water Valves Transfer Closed Due to Maintenance Error or Plugging: a) Service Water Isolation Valves to FCUs Inlet: SWN-41-1 to 41-5 Outlet: SWN-44-1 to 44-5 b) Service Water Valves to FCU Motor Coolers Supply: SWN-520, 522, 524, 526, 528 Return: SWN-521, 523, 525, 527, 529 c) Service Water to FCU 31-35 Motor Cooler Outlet Isolation Valves SWN-71-1 to SWN-71-5	Table 14-1, Item 5

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

TABLE 17 - PERIODIC TESTING AND CALIBRATION INSPECTION GUIDANCE

SYSTEM	FAILURE	DISCUSSION
1. Service Water System	Header Discharge Check Valve SWN 100-2 Fails to Open or Manual Isolation Valve SWN 98 Left in the Closed Position or Nuclear Header Piping Rupture (SWPs 31,32,33)	Table 1-1, Item 1a
	Header Discharge Check Valve SWN 100-1 Fails to Open or Manual Isolation Valve SWN 99 Left in the Closed Position or Nuclear Header Piping Rupture (SWPs 34,35,36)	Table 1-1, Item 1b
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Mechanical pump failure	Table 1-1, Item 2a
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Electric motor or control circuit failure	Table 1-1, Item 2b
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Pump discharge isolation valves SWN 2-1 to 2-6 left in closed position	Table 1-1, Item 2c
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Pump discharge check valves SWN 1-1 to 1-6 fail to open.	Table 1-1, Item 2d
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Pump discharge expansion joint ruptures.	Table 1-1, Item 2e
	Diesel Generator SW Outlet Flow Control Valves FCV-1176 and FCV-1176A Fail to Open on Demand and Remain Open for 24 Hours	Table 1-1, Item 4

Table 17 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
2. Electric Power System	Emergency Bus Normal Supply Breakers, Station Service Transformer and Bus Transfer Scheme Circuit Breaker Fails Open/Closed	Table 2-1, Item 2
	Emergency Bus Supply Breaker From EDG Fails to Close	Table 2-1, Item 3
	Emergency Diesel Generator, Air Start Solenoid Valve, DC Lube Oil Pump, Air Compressor and Receivers, and Logic (Permissives) Fail to Start	Table 2-1, Item 4
	DC Power Panel Loss of DC Control Power	Table 2-1, Item 5
	EDG Trips While Running	Table 2-1, Item 7
3. Component Cooling Water System	CCW Pumps and Motors Fail to Start or Run Due to Maintenance Outage and/or Mechanical or Electrical Failure (Including Control Circuit Failure)	Table 3-1, Item 6
	Pump Station/Discharge Valves 760 A,B,C, 762 A,B,C/Pump Discharge Check Valves 761 A,B,C/Pump Suction and Discharge Header Valves 766 A,B, 759 C,D are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 7
4. Reactor Protection System	Process Instruments (Sensors and Bistables) Fail to Initiate a Reactor Trip Signal Due to Calibration or Maintenance Error or Mechanical or Electrical Failure	Table 4-1, Item 1
	Reactor Trip Breakers Fail to Open	Table 4-1, Item 2
	Logic Relays Fail to Open	Table 4-1, Item 3
	Reactor Trip Bypass Breakers Fail to Open	Table 4-1, Item 4
	Rod Control Cluster Assemblies Fail to Insert	Table 4-1, Item 5
	Reactor Trip Breaker Undervoltage Relays Fail to Operate	Table 4-1, Item 6

Table 17 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
5. High Pressure Injection System	Safety Injection Pumps 31, 32, 33 Fail to Start or Run Due to Random Failure and/or Maintenance Outage: a) Control circuitry (manual or automatic) or dc power failure, b) Pump mechanical failure, c) Motor electrical failure or loss of ac power	Table 5-1, Item 1
	Check Valves Fail to Open Due to Random Failure: a) RWST Supply Line Isolation, 847, b) SI Pump Discharge: Pump 31-849A/ Pump 33-849B/Pump 32-852A, 852B, c) Loop 1 Cold Leg 857A, G/Hot Leg 857E, L, Loop 2 Cold Leg 857S, T/Hot Leg 857D, K, Loop 3 Cold Leg 857Q, R/Hot Leg 857F, M, Loop 4 Cold Leg 857U, W/Hot Leg 857C, J	Table 5-1, Item 2
	RWST Supply Line Isolation MOV 1810 (De-energized Open), is Closed Due to Plugging or Maintenance Error	Table 5-1, Item 3
	Boron Injection Tank (BIT) Upstream MOVs 1852A, 1852B/Downstream MOVs 1835A/1835B - One or Both A Valves Fail to Open Upon a SI Signal in Conjunction With One or Both B Valves Failing to Open	Table 5-1, Item 4
	Normally Open MOVs Fail to Remain Open Due to Spurious Actuation or Maintenance Error: a) SI Pump 32 Suction Isolation MOVs 887A, 887B, b) SI Pump 32 Discharge Isolation MOVs 851A, 851B/Isolation MOVs, c) Isolation MOVs Loop 1 Hot Leg, 856E, Loop 2 Cold Leg, 856J, Loop 3 Cold Leg, 856H, Loop 4 Hot Leg, 856C	Table 5-1, Item 5
	Locked Open Manual Valves Are Closed Due to Plugging or Maintenance Error: a) RWST Supply Line Isolation, 846, b) SI Pump 31 Suction Valve 848A/ Discharge Valve 850A, c) SI Pump 33 Suction Valve 848B/ Discharge Valve 850B	Table 5-1, Item 6

Table 17 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
5. High Pressure Injection System (Cont'd)	Manual Valves Are Closed Due to Plugging or Maintenance Error: a) Loop 1 Cold Leg, 856A, b) Loop 2 Hot Leg, 856D, c) Loop 3 Hot Leg, 856F, d) Loop 4 Cold Leg, 856K.	Table 5-1, Item 7
6. Secondary System (MSIVs)	Main Steam Isolation Valves (MSIVs) Fail to Trip by Automatic Actuation or Valve Mechanical Failure	Table 6-1, Item 1
	MSIVs Fail to Close Due to Lack of Operator Action or Failure of the Manual Control Circuitry	Table 6-1, Item 2
7. Recirculation System	Auxiliary Component Cooling Water Pumps 31, 32, 33 & 34 Fail to Start Upon Demand	Table 7-1, Item 2
	CCW Outlet Isolation Valves From RHR Heat Exchangers 31 & 32 MOVs 822A, 822B Fail to Open Upon Demand and Unavailable Due to Maintenance and Random Failure	Table 7-1, Item 3
	Recirculation Pump Discharge Header Isolation Valves MOVs 1802A, 1802B Fail to Open Upon Demand	Table 7-1, Item 4
	Containment Spray Recirculation Isolation Valves MOVs 889A, 889B Fail to Open Upon Demand	Table 7-1, Item 5
	Hot Leg Recirculation Isolation Valves MOVs 856B, 856G Fail to Open Upon Demand	Table 7-1, Item 6
8. Reactor Coolant System (PORVs)	Pressurizer Power-Operated Relief Valves (PZR PORVs) PCV-455C & PCV-456 and Block Valves MOVs 535 & 536 Fail to Remain Open	Table 8-1, Item 1
	Pressurizer Power-Operated Relief Valves PCV-455C & PCV-456 Fail to Reseat and Block Valves MOVs 535 & 536 Fail to Close	Table 8-1, Item 2
	Pressurizer Safety Valves PCV-464, PCV-466, PCV-468 Fail to Open	Table 8-1, Item 3

Table 17 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
	Pressurizer Safety Valves PCV-464, PCV-466, PCV-468 Fail to Reseat	Table 8-1, Item 4
9. Auxiliary Feedwater System	AFW Pumps 31,32,33 Fail to Start Due to Failure of Turbine Driven Pump (32), Maintenance, and Human Error	Table 9-1, Item 1
	Valves FCV 406A & B3 or FCV 406C & D Failure to Increase Speed (Turbine Driven Pump) and Valve Failure Due to Human Error	Table 9-1, Item 2
	Valves BFD 62,62-1,62-2,62-3, and BFD 48,48-2,48-4,and 48-6 Human Error Failure to Return to LO Position After Test	Table 9-1, Item 3
10.Low Pressure Injection System	RHR Pumps 31 and 32 Fail to Start or Run Upon a Safety Injection Signal or Unavailable Due to Maintenance	Table 10-1, Item 1
	RWST Outlet Isolation Valves Locked Open Manual Valve 846, MOV 882 (De-energized Open) or Check Valve 881 Left in the Closed Position Due to Maintenance Error or Plugged	Table 10-1, Item 2
	Locked Open RHR Pump Manual Discharge Valves 739A, 739B/Suction Valves 735A, 735B Left in the Closed Position Due to Maintenance Error, or Plugged	Table 10-1, Item 3
	RHR Pump Discharge Check Valves 738A, 738B Fail to Open Due to Plugging	Table 10-1, Item 4
	MOV 744 Pump Discharge Header Isolation Valve (De-energized open) Inadvertently Closed Due to Maintenance Error, or Check Valve 741 Fails to Open Due to Plugging	Table 10-1, Item 5
	RHR Heat Exchanger 31 Locked Open Manual Inlet Isolation Valve 742 Inadvertently Closed Due to Maintenance Error, or Plugged	Table 10-1, Item 6
	RHR Heat Exchanger 31 Discharge Motor-Operated Isolation Valves MOVs 747 and 899B and Throttling MOV-HCV 638 Inadvertently Closed Due to Maintenance Error, or Spurious Actuation or Plugging	Table 10-1, Item 7

Table 17 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
10. Low Pressure Injection System (Cont'd)	RHR Heat Exchanger 32 Inlet Isolation MOVs 745A and 745B Inadvertently Closed Due to Maintenance Error, or Spurious Actuation or Plugging	Table 10-1, Item 8
	RHR Heat Exchanger 32 Discharge Motor-Operated Isolation Valves MOVs 746 and 899A and Throttling MOV-HCV 640 Inadvertently Closed Due to Maintenance Error, or Spurious Actuation, or Plugging	Table 10-1, Item 9
	Cold Leg Check Valves (Loop 1-897A, 838A; Loop 2-897B, 838B; Loop 3-897C, 838C; Loop 4-897D, 838D) Fail to Open Due to Plugging	Table 10-1, Item 10
11. Safeguards Actuation System	Process Instruments (Sensors, Signal Conditioners and Bistables) Fail to Initiate a Safeguards Actuation Signal (SAS) Due to Calibration Error	Table 11-1, Item 1
	Process Instruments (Sensors, Signal Conditioners and Bistables) Fail Due to Mechanical or Electrical Faults	Table 11-1, Item 3
	Logic Relays Fail to Close When Required	Table 11-1, Item 4
12. Accumulator System	Check Valves 895 A,B,C,D, 897 A,B,C,D Failure to Open Due to Plugging	Table 12-1, Item 1
	MOVs 849 A,B,C,D, (De-energized Open) Inadvertently Closed Due to Maintenance Error, Plugging or Spurious Actuation	Table 12-1, Item 2
13. Containment Spray System	Containment Spray Pumps 31 & 32 Fail to Start or Operate Due to Random Failure or Unavailable Due to Maintenance	Table 13-1, Item 1
	Containment Spray Pumps Discharge Isolation Valves MOVs 866A, 866B Fail to Open Due to Random Failure and Maintenance	Table 13-1, Item 2

Table 17 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
13. Containment Spray System (Cont'd)	Containment Spray Pump Discharge Check Valves 867A, 867B Fail to Open Due to Plugging	Table 13-1, Item 3
	Locked-Open Containment Spray Pump Suction Valves 865A, 865B Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1, Item 5
	Locked-Open Spray Additive Tank Isolation Valve 1841 Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1, Item 6
	RWST to Eductor Flushing, Locked Closed, Manual Valve 873B Inadvertently Left Open Due to Maintenance Error	Table 13-1, Item 7
	Spray Additive Tank Air-Operated Diaphragm Valves 876A, 876B (Normally Closed, Fail Open) Fail to Open 2 Minutes After the Safeguards Actuation Signal Due to Random Failure	Table 13-1, Item 8
	Eductors 31 & 32 Suction Check Valves 1838A, 1838B Fail to Open Due to Plugging	Table 13-1, Item 9
	Eductors 31 & 32 Suction Locked-Open Manual Valves 1839A, 1839B Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1 Item 10
14. Containment Fan Cooling System	Three of the Five Fan Cooler Units 31 to 25 Fail to Start or Run, or Fail to Transfer to the Accident Mode Upon a SI Signal, oir are Unavailable Due to Maintenance	Table 14-1, Item 1
	Service Water Temperature Control Valves TCV 1104 and 1105 Fail to Open Upon a SI Signal or are Out Due to Maintenance	Table 14-1, Item 2

INDIAN POINT UNIT 3
PROBABILISTIC SAFETY STUDY-BASED
INSPECTION PLAN

TABLE 18 - MAINTENANCE INSPECTION GUIDANCE

SYSTEM	FAILURE	DISCUSSION
1. Service Water System	Header Discharge Check Valve SWN 100-2 Fails to Open or Manual Isolation Valve SWN 98 Left in the Closed Position or Nuclear Header Piping Rupture (SWPs 31,32,33)	Table 1-1, Item 1a
	Header Discharge Check Valve SWN 100-1 Fails to Open or Manual Isolation Valve SWN 99 Left in the Closed Position or Nuclear Header Piping Rupture (SWPs 34,35,36)	Table 1-1, Item 1b
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Mechanical pump failure	Table 1-1, Item 2a
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Electric motor or control circuit failure	Table 1-1, Item 2b
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Pump discharge isolation valves SWN 2-1 to 2-6 left in closed position	Table 1-1, Item 2c
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Pump discharge check valves SWN 1-1 to 1-6 fail to open.	Table 1-1, Item 2d
	Service Water Pumps (SWPs) 31-36 Fail to Start or Run: Pump discharge expansion joint ruptures.	Table 1-1, Item 2e
	Diesel Generator SW Outlet Flow Control Valves FCV-1176 and FCV-1176A Fail to Open on Demand and Remain Open for 24 Hours	Table 1-1, Item 4
2. Electric Power System	Emergency Bus Normal Suply Breakers, Station Service Transformer and Bus Transfer Scheme Circuit Breaker Fails Open/Closed	Table 2-1, Item 2
	Emergency Bus Supply Breaker From EDG Fails to Close	Table 2-1, Item 3

Table 18 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
2. Electric Power System (Cont'd)	Emergency Diesel Generator, Air Start Solenoid Valve, DC Lube Oil Pump, Air Compressor and Receivers, and Logic (Permissives) Fail to Start	Table 2-1, Item 4
	DC Power Panel Loss of DC Control Power	Table 2-1, Item 5
	EDG Trips While Running	Table 2-1, Item 7
3. Component Cooling Water System	Service Water Supply Valves SWN-31, SWN-32 on Headers to CCW Heat Exchangers Are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 2
	CCW Heat Exchanger SW Supply Isolation Valves 34-1 and 34-2/Discharge Isolation Valves 35-1 and 35-2 Are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 3
	CCW Heat Exchanger Inlet Isolation Valves 759A and 759B/Outlet Isolation Valves 765A and 765B Are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 4
	CCW Heat Exchangers Fail to Function Due to Maintenance Outage, Severe Tube Leaks or Plugging	Table 3-1, Item 5
	CCW Pumps and Motors Fail to Start or Run Due to Maintenance Outage and/or Mechanical or Electrical Failure (Including Control Circuit Failure)	Table 3-1, Item 6
	Pump Suction/Discharge Valves 760 A,B,C, 762 A,B,C/Pump Discharge Check Valves 761 A,B,C/Pump Suction and Discharge Header Valves 766 A,B, 759 C,D are Closed Due to Maintenance Error or Plugging	Table 3-1, Item 7
4. Reactor Protection System	Process Instruments (Sensors and Bistables) Fail to Initiate a Reactor Trip Signal Due to Calibration or Maintenance or Mechanical or Electrical Failure	Table 4-1, Item 1

Table 18 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
4. Reactor Protection System (Cont'd)	Reactor Trip Breakers Fail to Open	Table 4-1, Item 2
	Reactor Trip Bypass Breakers Fail to Open	Table 4-1, Item 4
	Rod Control Cluster Assemblies Fail to Insert	Table 4-1, Item 5
	Reactor Trip Breaker Undervoltage Relays Fail to Operate	Table 4-1, Item 6
5. High Pressure Injection System	Safety Injection Pumps 31, 32, 33 Fail to Start or Run Due to Random Failure and/or Maintenance Outage: a) Control circuitry (manual or automatic) or dc power failure, b) Pump mechanical failure, c) Motor electrical failure or loss of ac power	Table 5-1, Item 1
	RWST Supply Line Isolation MOV 1810 (De-energized Open), is Closed Due to Plugging or Maintenance Error	Table 5-1, Item 3
	Boron Injection Tank (BIT) Upstream MOVs 1852A, 1852B/Downstream MOVs 1835A/1835B - One or Both A Valves Fail to Open Upon a SI Signal in Conjunction With One or Both B Valves Failing to Open	Table 5-1, Item 4
	Normally Open MOVs Fail to Remain Open Due to Spurious Actuation or Maintenance Error: a) SI Pump 32 Suction Isolation MOVs 887A, 887B, b) SI Pump 32 Discharge Isolation MOVs 851A, 851B/Isolation MOVs, c) Isolation MOVs Loop 1 Hot Leg, 856E, Loop 2 Cold Leg, 856J, Loop 3 Cold Leg, 856H, Loop 4 Hot Leg, 856C	Table 5-1, Item 5

Table 18 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
5. High Pressure Injection System (Cont'd)	Locked Open Manual Valves Are Closed Due to Plugging or Maintenance Error: a) RWST Supply Line Isolation, 846, b) SI Pump 31 Suction Valve 848A/ Discharge Valve 850A, c) SI Pump 33 Suction Valve 848B/ Discharge Valve 850B	Table 5-1, Item 6
	Manual Valves Are Closed Due to Plugging or Maintenance Error: a) Loop 1 Cold Leg, 856A, b) Loop 2 Hot Leg, 856D, c) Loop 3 Hot Leg, 856F, d) Loop 4 Cold Leg, 856K.	Table 5-1, Item 7
7. Recirculation System	Auxiliary Component Cooling Water Pumps 31, 32, 33 & 34 Fail to Start Upon Demand	Table 7-1, Item 2
	CCW Outlet Isolation Valves From RHR Heat Exchangers 31 & 32 MOVs 822A, 822B Fail to Open Upon Demand and Unavailable Due to Maintenance and Random Failure	Table 7-1, Item 3
	Recirculation Pump Discharge Header Isolation Valves MOVs 1802A, 1802B Fail to Open Upon Demand	Table 7-1, Item 4
	Containment Spray Recirculation Isolation Valves MOVs 889A, 889B Fail to Open Upon Demand	Table 7-1, Item 5
	Hot Leg Recirculation Isolation Valves MOVs 856B, 856G Fail to Open Upon Demand	Table 7-1, Item 6
8. Reactor Coolant System (PORVs)	Pressurizer Power-Operated Relief Valves (PZR PORVs) PCV-455C & PCV-456 and Block Valves MOVs 535 & 536 Fail to Remain Open	Table 8-1, Item 1
	Pressurizer Power-Operated Relief Valves PCV-455C & PCV-456 Fail to Reseat and Block Valves MOVs 535 & 536 Fail to Close	Table 8-1, Item 2

Table 18 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
9. Auxiliary Feedwater System	AFW Pumps 31,32,33 Fail to Start Due to Failure of Turbine Driven Pump (32), Maintenance, or Human Error	Table 9-1, Item 1
10. Low Pressure Injection System	RHR Pumps 31 and 32 Fail to Start or Run Upon a Safety Injection Signal or Unavailable Due to Maintenance	Table 10-1, Item 1
	RWST Outlet Isolation Valves Locked Open Manual Valve 846, MOV 882 (De-energized Open) or Check Valve 881 Left in the Closed Position Due to Maintenance Error or Plugged	Table 10-1, Item 2
	Locked Open RHR Pump Manual Discharge Valves 739A, 739B/Suction Valves 735A, 735B Left in the Closed Position Due to Maintenance Error, or Plugged	Table 10-1, Item 3
	RHR Pump Discharge Check Valves 738A, 738B Fail to Open Due to Plugging	Table 10-1, Item 4
	MOV 744 Pump Discharge Header Isolation Valve (De-energized open) Inadvertently Closed Due to Maintenance Error, or Check Valve 741 Fails to Open Due to Plugging	Table 10-1, Item 5
	RHR Heat Exchanger 31 Locked Open Manual Inlet Isolation Valve 742 Inadvertently Closed Due to Maintenance Error, or Plugged	Table 10-1, Item 6
	RHR Heat Exchanger 31 Discharge Motor-Operated Isolation Valves MOVs 747 and 899B and Throttling MOV-HCV 638 Inadvertently Closed Due to Maintenance Error, or Spurious Actuation or Plugging	Table 10-1, Item 7
	RHR Heat Exchanger 32 Inlet Isolation MOVs 745A and 745B Inadvertently Closed Due to Maintenance Error, or Spurious Actuation or Plugging	Table 10-1, Item 8

Table 18 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
10. Low Pressure Injection System (Cont'd)	RHR Heat Exchanger 32 Discharge Motor-Operated Isolation Valves MOVs 746 and 899A and Throttling MOV-HCV 640 Inadvertently Closed Due to Maintenance Error, or Spurious Actuation, or Plugging	Table 10-1, Item 9
11. Safeguards Actuation System	Process Instruments (Sensors, Signal Conditioners and Bistables) Fail to Initiate a SAS Due to Maintenance Error	Table 11-1, Item 2
	Process Instruments (Sensors, Signal Conditioners and Bistables) Fail Due to Mechanical or Electrical Faults	Table 11-1, Item 3
	Logic Relays Fail to Close When Required	Table 11-1, Item 4
	DC Power Fuse Opened Prematurely by Maintenance Error	Table 11-1, Item 5
12. Accumulator System	Check Valves 895 A,B,C,D, 897 A,B,C,D Fail to Open Due to Plugging	Table 12-1, Item 1
	MOVs 849 A,B,C,D, (De-energized Open) Inadvertently Closed Due to Maintenance Error, Plugging or Spurious Actuation	Table 12-1, Item 2
13. Containment Spray System	Containment Spray Pumps 31 & 32 Fail to Start or Operate Due to Random Failure or Unavailable Due to Maintenance	Table 13-1, Item 1
	Locked Open Containment Manual Isolation Valves 869A, 869B Are Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1, Item 4
	Locked-Open Containment Spray Pump Suction Valves 865A, 865B Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1, Item 5
	Locked-Open Spray Additive Tank Isolation Valve 1841 Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1, Item 6

Table 18 (Cont'd)

SYSTEM	FAILURE	DISCUSSION
13. Containment Spray System (Cont'd)	RWST to Eductor Flushing, Locked Closed, Manual Valve 873B Inadvertently Left Open Due to Maintenance Error	Table 13-1, Item 7
	Eductors 31 & 32 Suction Locked-Open Manual Valves 1839A, 1839B Plugged or Inadvertently Closed Due to Maintenance Error	Table 13-1 Item 10
14. Containment Fan Cooling System	Three of the Five Fan Cooler Units 31 to 35 Fail to Start or Run, or Fail to Transfer to the Accident Mode Upon a SI Signal, or are Unavailable Due to Maintenance	Table 14-1, Item 1
	Service Water Temperature Control Valves TCV 1104 and 1105 Fail to Open Upon a SI Signal or are Out Due to Maintenance	Table 14-1, Item 2
	FCU's Service Water Supply Valves SWN-38 or SWN-39 from the Service Water Pumps Transfer Closed Due to Maintenance Error or Plugging	Table 14-1, Item 3
	Service Water Header to FCU, Cross Tie Isolation Valves SWN-40-1, SWN-40-2 Transfer Closed Due to Maintenance Error Plugging	Table 14-1, Item 4
	FCUs Service Water Valves Transfer Closed Due to Maintenance Error or Plugging: a) Service Water Isolation Valves to FCUs Inlet: SWN-41-1 to 41-5 Outlet: SWN-44-1 to 44-5 b) Service Water Valves to FCU Motor Coolers Supply: SWN-520, 522, 524, 526, 528 Return: SWN-521, 523, 525, 527, 529 c) Service Water to FCU 31-35 Motor Cooler Outlet Isolation Valves SWN-71-1 to SWN-71-5	Table 14-1, Item 5