8005150363

INDIAN POINT UNIT 2

ELECTRICAL EQUIPMENT

ENVIRONMENTAL QUALIFICATION

REPORT

MAY 1980

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INTRODUCTION

This report summarizes the results of an investigation conducted to review the environmental qualification levels for safety related electrical equipment installed in the Indian Point Unit 2 Nuclear Plant. The investigation was initiated in response to environmental qualification requirements submitted to Consolidated Edison in NRC's I&E Bulletin 79-01B and later ammended by the A. Schwencer to William J. Cahill, Jr. letter dated March 5, 1980. This letter exempted the Unit 2 station from responding to Bulletin 79-01B by requiring participation in the Systematic Evaluation Program (SEP) relative to the environmental qualification of electrical equipment.

The scope of systems and components identified for investigation was determined using the Indian Point Unit 2 FSAR and plant emergency procedures as major sources for reference information. A list of safety related systems that were reviewed as part of this evaluation is included in Appendix A attached to this report.

Definitions of inside containment and outside containment service conditions reported in Appendix B were developed using appropriate environmental conditions that could occur as the result of postulated events consisting of a loss of coolant accident (LOCA) or a main streamline break (MSLB) or a feedwater line break (FWLB). Inside containment service conditions were specified on the basis of results obtained from accident analysis submitted

in the FSAR. Information contained in the High Energy Line Break (HELB) evaluation and the radiation/shielding design review response to NUREG-0578 was used to determine outside containment service conditions.

The steps taken to specify these conditions are in accordance with the NRC "Guidelines for Evaluating Environmental Qualifications of Class 1E Electrical Equipment in Operating Reactors" and the SEP owner group letter to J. Ahearne, dated March 1980. Details relating to these service conditions are presented in Appendix B.

A list of safety related components was developed using information contained in the plant emergency procedures, FSAR, system flow diagrams, electrical interconnecting drawings, cable drawings, systems descriptions, elementary diagrams and component drawings. This list was then reviewed to identify equipment that would be exposed to severe service conditions following a postulated accident. A physical inventory of equipment located in environmental service condition areas was conducted to assure completeness of the list. This listing complete with the service conditions from Appendix B and the qualification data associated with the components are presented in the SEP format and are included in the attached Appendix C.

Areas outside the containment that do not experience significant stress due to a change in service conditions following a MSLB or FWLB were determined on the basis of adequate ventilation or air conditioning systems. Plant areas served by redundant ventilation or air conditioning systems are:

- Primary Auxiliary Building (PAB) outside of the high radiation areas identified in Appendix B.

- Electrical Cabling Tunnel and Penetration Area
- Control Building
- Diesel Generator Rooms

The results of this investigation indicate that the environmental qualification of electrical equipment is in general agreement with the plant licensing basis specified in the FSAR. However, certain components identified in Appendix C have been designated for replacement with components meeting later requirements.

SECTION 2

PARAMETER ABBREVIATIONS

Temp - Temperature in degrees fahrenheit

Press - Pressure in pounds per square inch gauge

R H - Relative Humidity in percent

Chem - Containment Chemical Spray

Rad - Integrated Radiation Dose

Sub - Submerged

Spec - Specifications

Qual - Qualifications

Ref - Reference

LOCATION ABBREVIATIONS

C - Inside containment

PP - Pipe penetration area outside of containment adjacent to auxiliary building

AP - Auxiliary pump room

SP - Steam and feedline penetration areas

SI - Safety injection pump room

RH - Residual heat removal pump room

APPENDIX A

LIST OF SAFETY RELATED SYSTEMS

Safeguards Activation System

Containment Isolation System

Steamline Isolation System

Feedwater Isolation System

Accumulator System

High Head Safety Injection System

Low Head Safety Injection System

Residual Heat Removal System

Containment Spray System

Fan Cooler System

Containment Heat Removal System

Hydrogen Recombiner System

Auxiliary Feedwater System

Primary Auxiliary Building Ventilation System

Control Building H.V.A.C. System

Diesel Room Ventilation System

Component Cooling System

Service Water System

Radiation Monitoring System

Emergency Diesel System

480 Volt Switchgear System

Motor Control System

125 Volt DC System

Control Room Display Instrumentation

APPENDIX B

DEFINITION OF AND BASIS FOR HOSTILE SERVICE CONDITIONS

1. Description of In Containment Environment.

   (a) The design temperature and pressure conditions established for the containment environment following a postulated accident are 271°F (Figure 1) and 47 psig (Figure 2) respectively.

   (b) The highest pressure from a LOCA is a double ended cold leg break, (Ref. FSAR Section 14.3), resulting in a containment pressure of 40 psig (See Figure 3). The temperature curve (See Figure 4) shows a peak temperature of 258°F.

   (c) The radiation dose for 30 days following a LOCA including normal radiation, is assumed to yield a total integrated dose of $2X10^7$ Rads. (Ref. Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors.)

   (d) The Containment Spray chemistry using 40% sodium hydroxide and 2000ppm boric acid solution, yields a ph of approximately 10. (Response to bulletin 77-04.)

2. Description of Environment for Main Steam, Main Feed and Auxiliary Feed Pump areas outside Containment.

   (a) The highest temperature and pressure from a break in the Auxiliary Feed Pump Steam Line in the Auxiliary Feed Pump Room is 213°F and 0.9 psig. These are reduced to ambient within 5 minutes because of High Temperature Trip Sensors set at 135°F, isolating the Auxiliary Steam Driven Pump Steam Line. (Ref. 20)

   (b) The highest temperature and pressure from a Main Feed or Steam Line break in the Main Feed and Steam area is a negligible temperature increase and a pressure of 0.42 psig. (Ref. 20)

   (c) The radiation integrated dose for 30 days, including normal radiation, is negligible and therefore is neglected. (Ref. 21)

3. Description of Environment for Pipe Penetration, Residual Heat Removal and Safety Injection areas in the Auxiliary Building.

   (a) The radiation levels in this area are very dependent upon location up to a maximum integrated dose of $8.6X10^6$ Rads for 30 days. (Ref. 21)

   (b) Temperatures, pressures and humidity are ambient and do not change because of the accident.

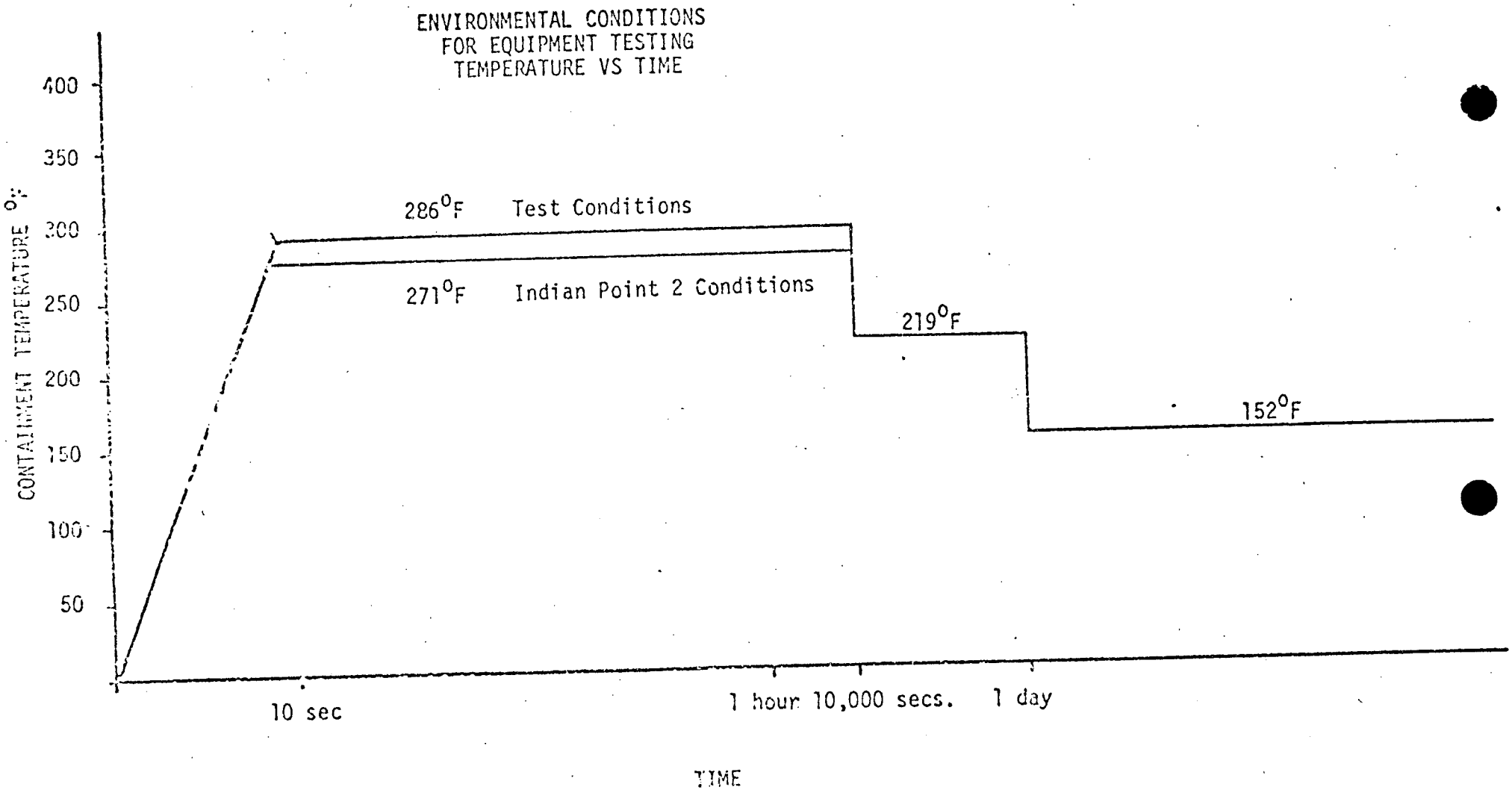
ENVIRONMENTAL CONDITIONS
FOR EQUIPMENT TESTING
TEMPERATURE VS TIME
CONTAINMENT TEMPERATURE °F
400
350
300
250
200
150
100
50
286°F Test Conditions
271°F Indian Point 2 Conditions
219°F
152°F
10 sec
1 hour 10,000 secs.
1 day
TIME

Figure 1

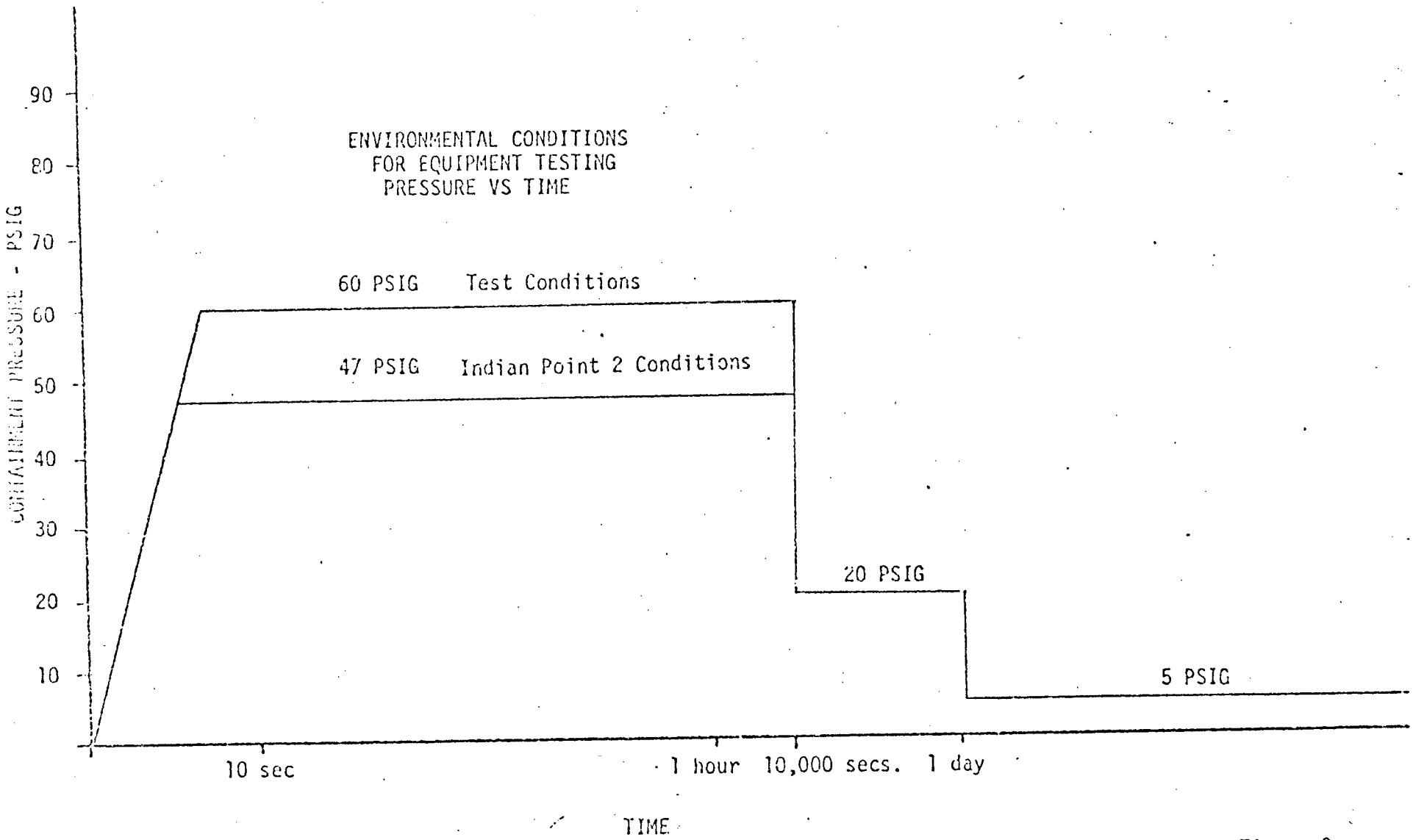
ENVIRONMENTAL CONDITIONS
FOR EQUIPMENT TESTING
PRESSURE VS TIME
CONTAINMENT PRESSURE - PSIG
90
80
70
60
50
40
30
20
10
60 PSIG Test Conditions
47 PSIG Indian Point 2 Conditions
20 PSIG
5 PSIG
10 sec
1 hour
10,000 secs.
1 day
TIME

Figure 2

CONTAINMENT PRESSURE TRANSIENT

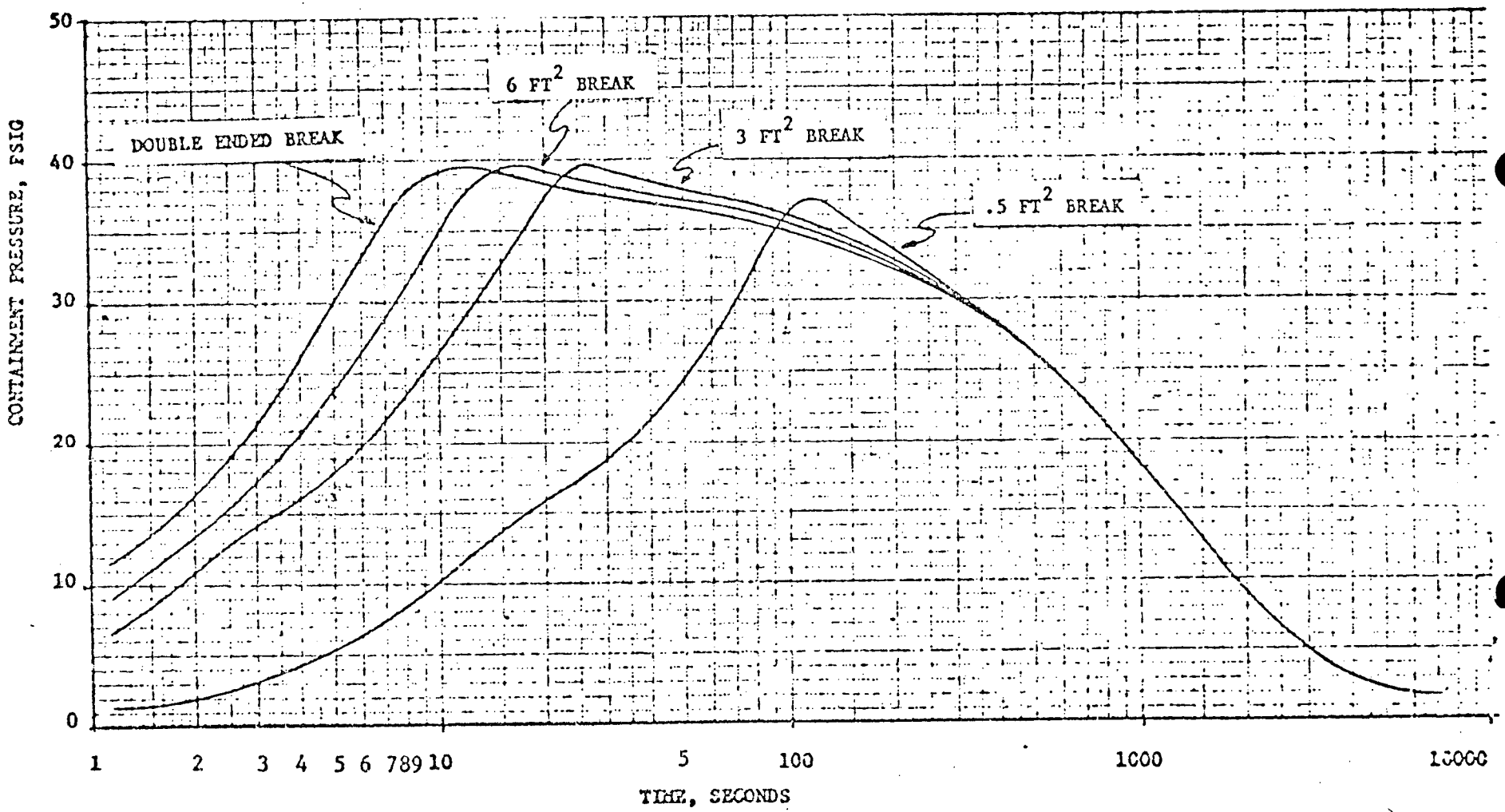

Figure 3

CONTAINMENT ATMOSPHERE TEMPERATURE
DESIGN BASES SAFETY INJECTION

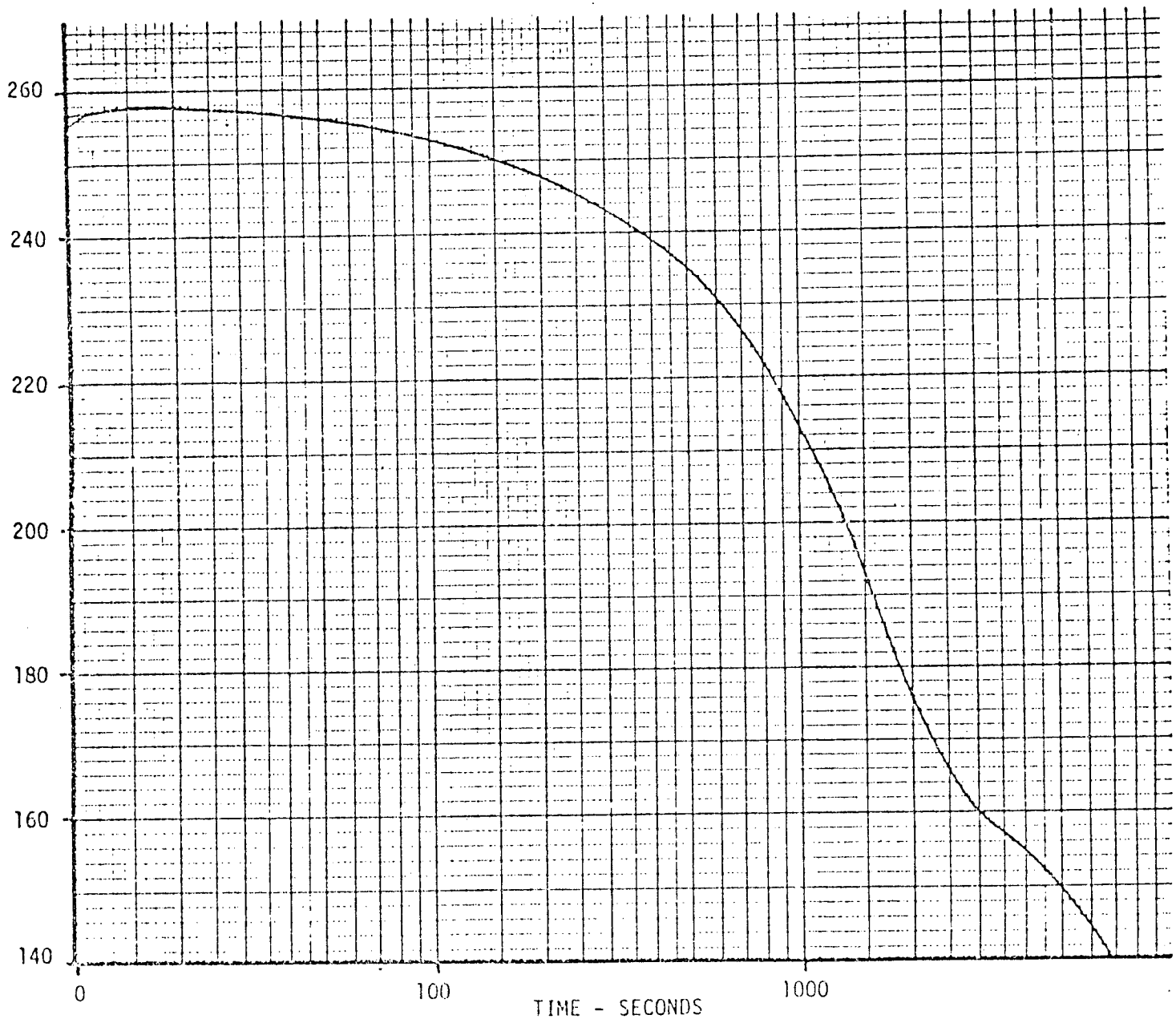

Figure 4

APPENDIX C

TABULATION OF SAFETY RELATED ELECTRICAL EQUIPMENT INCLUDING SERVICE REQUIREMENTS

INDIAN POINT UNIT 2

Equipment Type Motor Operators	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
High Head Injection Valves	C	30 days	Temp	271	300	Sequential	(1), (2),(22),(24)	
MOV-856, A,B,C,D,E, & F			Press	47	70			
Limitorque SMB-00			R H	100	100			
H-Insulation			Chem	Yes	Yes			
			Rad	$2X10^7$	$2X10^8$			
			Sub	No				
Charcoal Filter	C	30 days	Temp	271	300	Sequential	(1), (2),(22),(24)	
Dousing Valves			Press	47	70			
MOV-880 A Thru H Plus			R H	100	100			
J Thru K			Chem	Yes	Yes			
Limitorque SMB-00			Rad	$2X10^7$	$2X10^8$			
H-Insulation			Sub	No				
Recirculation Spray Valves	C	30 days	Temp	271	300	Sequential	(1), (2),(22),(24)	
MOV-889 A & B			Press	47	70			
Limitorque SMB-00			R H	100	100			
H-Insulation			Chem	Yes	Yes			
			Rad	$2X10^7$	$2X10^8$			
			Sub	No				
Recirculation Pump	C	30 days	Temp	271	300	Sequential	(1), (2),(22),(24)	
Discharge Valves			Press	47	70			
MOV-1802 A & B			R H	100	100			
Limitorque SMB-00			Chem	Yes	Yes			
H-Insulation			Rad	$2X10^7$	$2X10^8$			
			Sub	No				
Residual Heat	C	<8 hrs.	Temp	271	286			
Exchanger Cooling			Press	47	60			
Water Supply Valves			R H	100	100			
MOV-822 A & B			Chem	Yes	Yes			
Limitorque SMB-00			Rad	$2X10^7$	$2X10^8$	Separate	(1),(23)	Note (a)
B-Insulation			Sub	No				

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Equipment Type Motor Operators	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Safety Injection Pump Suction Isolation Valves MOV-887 A & B Limitorque SMB-00 B-Insulation	SI	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$7X10^5$	$2X10^8$	Separate	(1),(23)
			Sub	No			
High Head Recirculation Valves MOV-888 A & B Limitorque SMB-00 B-Insulation	PP	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$2X10^8$	Separate	(1),(23)
			Sub	No			
Refueling Water Storage Tank Discharge Valve MOV-1810 Limitorque SMB-00 B-Insulation	SI	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$7X10^5$	$2X10^8$	Separate	(1),(23)
			Sub	No			
Boron Injection Tank Discharge Valves MOV-1821 Limitorque SMB-00 B-Insulation MOV-1822 A & B Limitorque SMB-000 B-Insulation	SI	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$7X10^5$	$2X10^8$	Separate	(1),(23)
			Sub	No			
Boron Injection Tank Discharge Valve MOV-1831 Limitorque SMB-0 B-Insulation	SI	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$7X10^5$	$2X10^8$	Separate	(1),(23)
			Sub	No			

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Equipment Type Motor Operators	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Reactor Coolant Pump Seal Water Valve MOV-222 Limitorque SMB-000 B-Insulation	PP	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$2X10^8$	Separate	(1),(23)
			Sub	No			
Residual Heat Isolation Valve MOV-744 Limitorque SMB-1 B-Insulation	PP	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$2X10^8$	Separate	(1),(23)
			Sub	No			
Safety Injection System Mini-Flow Isolation Valves MOV-842 & 843 Limitorque SMB-00 B-Insulation	SI	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$7X10^5$	$2X10^8$	Separate	(1),(23)
			Sub	No			
High Head Safety Injection Discharge Valves MOV-851 A & B Limitorque SMB-00 B-Insulation	SI	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$7X10^5$	$2X10^8$	Separate	(1),(23)
			Sub	No			
Containment Sump Stop Valves MOV-885 A & B Limitorque SMB-0 B-Insulation	PP	30 days	Temp	AMB			
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$2X10^8$	Separate	(1),(23)
			Sub	No			

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Equipment Type Motor Operators	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
Residual Heat Exchanger Isolation Valves MOV-745 A & B Limitorque SMB-00 H-Insulation	C	30 days	Temp	271	300	Sequential	(1), (2),(22),(24)	
			Press	47	70			
			R H	100	100			
			Chem	Yes	Yes			
			Rad	$2X10^7$	$2X10^8$			
			Sub	No				
Residual Heat Exchanger Isolation Valves MOV-746 & 747 Limitorque SMB-2 H-Insulation	C	30 days	Temp	271	300	Sequential	(1), (2),(22),(24)	
			Press	47	70			
			R H	100	100			
			Chem	Yes	Yes			
			Rad	$2X10^7$	$2X10^8$			
			Sub	No				
Residual Heat Loop Flow Control Valves MOV-638 & 640 Limitorque SMB-00 B-Insulation	C	<8 hrs.	Temp	271	286	Separate	(1),(23)	Note (a)
			Press	47	60			
			R H	100	100			
			Chem	Yes	Yes			
			Rad	$2X10^7$	$2X10^8$			
			Sub	No				
Reactor Coolant Pump Cooling Water Supply Valves MOV-797, 769, 784, 786, FCV-625, & 789 Limitorque SMB-00 B-Insulation	PP	30 days	Temp	AMB				
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$2X10^8$	Separate	(1),(23)	
			Sub	No				

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Equipment Type Transmitters	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
Pressurizer Pressure PT-455, 456, 457 & 474 Foxboro 611-GM	C	5 min.	Temp	271	286	Separate	(1), (3)	Note (c)
			Press	47	60			
			R H	100	100			
			Chem	Yes	Yes			
			Rad	$<5X10^5$	$<1X10^7$			
			Sub	No				
Pressurizer Level PT-459, 460 & 461 Foxboro 613 HM-H	C	5 min.	Temp	271	286	Separate	(1), (3)	Note (c)
			Press	47	60			
			R H	100	100			
			Chem	Yes	Yes			
			Rad	$<5X10^5$	$<1X10^7$			
			Sub	No				
High Head Flow FT-924, 925, 926 & 927 Foxboro 611 DM-C	C	30 min.	Temp	271	286	Separate	(1), (3)	Notes (c), (h)
			Press	47	60			
			R H	100	100			
			Chem	Yes	Yes			
			Rad	$2X10^6$	$<1X10^7$			
			Sub	No				
Recirculation Spray FT-945 A & B Foxboro 613 DM-HS1	C	30 min.	Temp	271	286	Separate	(1), (3)	Note (c), (h)
			Press	47	60			
			R H	100	100			
			Chem	Yes	Yes			
			Rad	$2X10^6$	$<1X10^7$			
			Sub	No				
Residual Heat Removal Recirculation Flow 946 A Thru D Foxboro 613 HM	C	30 min.	Temp	271	286	Separate	(1), (3)	Note (c), (h)
			Press	47	60			
			R H	100	100			
			Chem	Yes	Yes			
			Rad	$2X10^6$	$<1X10^7$			
			Sub	No				

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Equipment Type Transmitters	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
Steam Generator Level	C	5 min.	Temp	271	286	Separate	(1),(3)	Note (c)
LT-417 A Thru D			Press	47	60			
LT-427 A Thru D			R H	100	100			
LT-437 A Thru D			Chem	Yes	Yes			
LT-447 A Thru D			Rad	$<5x10^5$	$<1x10^7$			
Foxboro 613 DM			Sub	No				
Reactor Coolant System	C	30 min.	Temp	271	286	Separate	(1),(3)	Note (c)
Pressure			Press	47	60			
PT-402 & 403			R H	100	100			
Foxboro 611 GH-K			Chem	Yes	Yes			
			Rad	$2x10^6$	$<1x10^7$			
			Sub	No				
Safety Injection Pump	SI	30 days	Temp	AMB		Separate	(1)	
Discharge			Press	AMB				
PT-922 & 923			R H	AMB				
Foxboro 611-GM-DS1			Chem	No				
			Rad	$7x10^5$	$<1x10^7$			
			Sub	No				
Safety Injection Pump	SI	30 days	Temp	AMB		Separate	(1)	
Suction			Press	AMB				
PT-947			R H	AMB				
Foxboro 611-GM			Chem	No				
			Rad	$7x10^5$	$1x10^7$			
			Sub	No				
Main Feedwater Flow	AP	5 min.	Temp	213		Analysis		Note (e)
FT-418 A & B			Press	0.9				
FT-428 A & B			R H	100				
FT-438 A & B			Chem	No				
FT-448 A & B			Rad	No				
Foxboro 613 GM			Sub	No				

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Equipment Type Transmitters	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Main Steam Pressure	AP	5 min.	Temp	213		Analysis	Note (e)
PT-419 A, B, & C			Press	0.9			
PT-429 A, B, & C			R H	100			
PT-439 A, B, & C			Chem	No			
PT-449 A, B, & C			Rad	No			
Foxboro 611 GM			Sub	No			
Containment Pressure	PP	5 min.	Temp	AMB		Separate (1)	
PT-948 A, B, & C			Press	AMB			
PT-949 A, B, & C			R H	AMB			
Foxboro 611 GM-AS1			Chem	No			
			Rad	NEG	$<1x10^7$		
			Sub	No			
Sump Level Transmitters	C	30 min.	Temp	271	295	Specification (18)	Note (j)
LT-938, 939, 940 & 941			Press	47	60		
GEMS-LS 1900			R H	100			
			Chem	Yes			
			Rad	$2x10^6$			
			Sub	No			
Auxiliary Feedwater Flow	AP	30 days	Temp	AMB			Note (e),(r)
FT-1200, 1201, 1202 & 1203			Press	AMB			
Rosemount 1153A			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			
Auxiliary Feedwater Pump	AP	30 days	Temp	AMB		Analysis	Note (e), (f), (r)
Discharge Valves			Press	AMB			
PT-406 A & B			R H	AMB			
Foxboro 611-GM			Chem	No			
			Rad	No			
			Sub	No			

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Equipment Type Solenoid Valves	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
Containment Pressure Relief Valve PCV-1190 ASCO 8320	C	30 days	Temp	271		Analysis	(4), (6)	Note (f),(m)
			Press	47				
			R H	100				
			Chem	Yes				
			Rad	$2X10^7$				
			Sub	No				
Containment Pressure Relief Valves PCV-1191 & 1192 ASCO 8316	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Main Feedwater Regulator Valves FCV-417, 427, 437 & 447 ASCO 8300 & 8210	SP	5 min.	Temp.	NEG		Analysis	(4),	Note (b), (f)
			Press	0.42				
			R H	AMB				
			Chem	No				
			Rad	No				
			Sub	No				
Auxiliary Feedwater Recirculation Flow Trip Valves FCV-1121 & 1123 ASCO 8300	AP	30 days	Temp	AMB		Analysis		Note (e), (f),(r)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	No				
			Sub	No				
Low Flow Feedwater Regulator Valves FCV-417L, 427L, 437L & 447L ASCO- 8300	SP	5 min.	Temp	NEG		Analysis	(4)	Note (b), (f)
			Press	0.42				
			R H	AMB				
			Chem	No				
			Rad	No				
			Sub	No				

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Equipment Type Solenoid Valves	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
Containment Ventilation Purge Valves FCV-1170 & 1172 ASCO 8316	C	30 days	Temp	271		Analysis	(4), (6)	Note (f), (m)
			Press	47				
			R H	100				
			Chem	Yes				
			Rad	$2X10^7$				
			Sub	No				
Main Steam Isolation Valves MS-1-21, 22, 23, & 24 Laurence 500 & 1200	SP	5 min.	Temp	NEG		Analysis		Note (b), (f), (g)
			Press	0.42				
			R H	AMB				
			Chem	No				
			Rad	No				
			Sub	No				
Sampling Valve 959 ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Reactor Coolant System Sampling Isolation Valves 956 E & F ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Letdown Isolation Valves 201 & 202 ASCO 8316	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub					

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Equipment Type Solenoid Valves	Loc.	Time Needed	Environment Parameter	Environment Spec.	Environment Qual.	Qual. Method	Reference	
Excess Letdown Heat Exchanger Isolation Valves 791, 793, 796, & 798 ASCO 8314 ASCO 8316	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Pressurizer Relief Tank Make-Up Isolation Valves 519 & 552 ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Pressurizer Steam Space Sample Isolation Valves 956 A & B ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Pressurizer Liquid Space Sample Isolation Valves 956 C & D ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Pressurizer Relief Tank Gas Analyzer Isolation Valves 548 & 549 ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				

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Equipment Type Solenoid Valves	Loc.	Time Needed	Environment Parameter	Environment Spec.	Environment Qual.	Qual. Method	Reference	
Containment Radiation Monitoring Valves PCV-1234 Thru 1241 ASCO 8316	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Containment Ventilation Purge Exhaust Valves FCV-1171 & 1173 ASCO 8316	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Steam Generator Sample Isolation Valves PCV-1223 Thru 1226A ASCO 8300	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Steam Generator Blowdown Isolation Valves PCV-1214 Thru 1217A ASCO 8300	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Instrument Air Isolation Valve PCV-1228 ASCO 8300	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				

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Equipment Type Solenoid Valves	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
Accumulator Sample Isolation Valves 956 G & H ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Hydrogen Recombiner Isolation Valves IV-2A & B, 3A & B, & 5A & B Laurence 629BG85PS	PP	30 days	Temp	AMB		Analysis		Note (1)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$2.8X10^4$				
			Sub	No				
Steam Jet Air Ejector Effluent Isolation Valves PCV-1229 & 1230 ASCO 8300	PP	30 days	Temp	AMB		Analysis	(4),(5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Fan Cooler Unit Damper Controls #21, 22, 23, 24, 25 ASCO 8320	C	30 days	Temp	271		Analysis	(4), (6)	Note (f), (m)
			Press	47				
			R H	100				
			Chem	Yes				
			Rad	$2X10^7$				
			Sub	No				
Auxiliary Feedwater Pump Steam Pressure Control Valve PCV-1139 ASCO 8210	AP	0 min.	Temp	AMB		Analysis		Note (d), (r)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	No				
			Sub	No				

Equipment Type Solenoid Valves	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
Reactor Coolant Drain Tank Gas Analyzer Isolation Valves 1788 & 1789 ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Reactor Coolant Drain Tank Discharge Valves 1702 & 1705 ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Containment Sump Pump Discharge Valves 1723 & 1728 ASCO 8316	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Reactor Coolant Drain Tank Vent Valves 1786 & 1787 ASCO 8314	PP	30 days	Temp	AMB		Analysis	(4), (5)	Note (f)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$	$6X10^6$			
			Sub	No				
Condensate Storage Tank Valve LCV-1158 ASCO 8320	AP	30 days	Temp	AMB		Analysis		Note (b),(r)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	No				
			Sub	No				

INDIAN POINT UNIT 2

Equipment Type Solenoid Valves	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
City Water Suction Control Valves PCV-1187, 1188, & 1189 ASCO 8300	AP	30 days	Temp	AMB		Analysis	Note (b),(r)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			
Steam Supply To Turbine Driven Auxiliary Feed Pump #22 Valves PCV-1310 A & B ASCO 8316	SP	30 min.	Temp	NEG		Analysis	Note (b)
			Press	0.42			
			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			

INDIAN POINT UNIT 2

Equipment Type Limit Switches	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Containment Pressure Relief Valve PCV-1190 NAMCO EA 180	C	30 days	Temp	271	340	Sequential (9)	Note (k), (m)
			Press	47	70		
			R H	100	100		
			Chem	Yes	Yes		
			Rad	$2X10^7$	$2X10^8$		
			Sub	No			
Containment Pressure Relief Valves PCV-1191 & 1192 MICRO EXD-AR 7480, 7421, 7425 & 7450	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$			
			Sub	No			
Main Feedwater Regulator Valves FCV-417, 427, 437, & 447 NAMCO D2400X	SP	5 min.	Temp	NEG		Analysis	Note (b), (k)
			Press	0.42			
			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			
Auxiliary Feedwater Recirculation Flow Trip Valves FCV-1121 & 1123 MICRO BZE 62RN	AP	30 days	Temp	AMB		Analysis	Note (e), (u), (r)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			
Containment Ventilation Purge Valves FCV-1170 & 1172 NAMCO EA 180	C	30 days	Temp	271	340	Sequential (9)	Note (v)
			Press	47	70		
			R H	100	100		
			Chem	Yes	Yes		
			Rad	$2X10^7$	$2X10^8$		
			Sub	No			

INDIAN POINT UNIT 2

Equipment Type Limit Switches	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Steam Generator Sample Isolation Valves PCV 1223 thru 1226A NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Containment Ventilation Purge Exhaust Valves FCV-1171 & 1173 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (v)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Containment Radiation Monitoring Valves PCV-1234 thru 1241 NAMCO D 2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Accumulator Sample Isolation Valves 956 G & H NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			

INDIAN POINT UNIT 2

Equipment Type Limit Switches	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Pressurizer Relief Tank Make-Up Isolation Valves 519 & 552 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Pressurizer Steam Space Sample Isolation Valves 956 A & B NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Pressurizer Liquid Space Sample Isolation Valves 956 C & D NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Pressurizer Relief Tank Gas Analyzer Isolation Valves 548 & 549 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Reactor Coolant Drain Tank Gas Analyzer Isolation Valves 1788 & 1789 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			

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Equipment Type Limit Switches	Loc.	Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Main Steam Isolation Valves MS-1-21, 22, 23, & 24 NAMCO SL3	SP	5 min.	Temp	NEG		Analysis	Note (b), (k)
			Press	0.42			
			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			
Sampling Valve 959 MICRO BZE 62RN	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$			
			Sub	No			
Reactor Coolant System Sampling Isolation Valves 956 E & F NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Letdown Isolation Valves 201 & 202 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Excess Letdown Heat Exchanger Isolation Valves 791, 793, 796, & 798 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			

Equipment Type Limit Switches	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Reactor Coolant Drain Tank Discharge Valves 1702 & 1705 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Containment Sump Pump Discharge Valves 1723 & 1728 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
Reactor Coolant Drain Tank Vent Valves 1786 & 1787 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (k)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6X10^6$	$1.8X10^7$	Design Spec.	
			Sub	No			
City Water Suction Control Valves PCV-1187, 1188 & 1189 MICRO BZE-2RN	AP	30 days	Temp	AMB		Analysis	Note (e),(r),(u)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			
Auxiliary Feedwater Pump Steam Pressure Valve PCV-1139 MICRO OPD-AR 6923	AP	30 days	Temp	AMB		Analysis	Note (d),(e),(r),(u)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			

Equipment Type Limit Switches	Loc.	Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Hydrogen Recombiner Isolation Valves IV-2A & B, 3A & B & 5A & B MICRO EXHAR3	PP	30 days	Temp	AMB		Analysis	Note (s)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.3X10^4$			
			Sub	No			
Fan Cooler Control Units #21, 22, 23, 24 & 25 NAMCO D2400X	C	30 days	Temp	271		Analysis	Note (k),(m)
			Press	47			
			R H	100			
			Chem	Yes			
			Rad	$2X10^7$			
			Sub.	No			
Instrument Air Isolation Valves PCV-1228 NAMCO D2400X	PP	30 days	Temp	AMB		Analysis	Note (f)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$3.6x10^6$	$6x10^6$		
			Sub	No			

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Equipment Type Motors	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Auxiliary Feed Pump Motor Westinghouse Model 50 B-Insulation	AP	30 days	Temp	AMB		Analysis	Note (e),(r)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	No			
			Sub	No			
Residual Heat Removal Pump Motor Westinghouse Model DP-5097PZ and Life Line D Model VSW1 5008P20	RH	30 days	Temp	AMB		Separate	(10)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$8.6X10^6$	$2X10^8$		
			Sub	No			
Safety Injection System Pump Motor Westinghouse 509US	SI	30 days	Temp	AMB		Separate	(10)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$7X10^5$	$2X10^8$		
			Sub	No			
Safety Injection System Recirculation Pump Motor Westinghouse Model 588.5PH	C	30 days	Temp	271	324	Separate	(11),(12)
			Press	47	80		
			R H	100	100		
			Chem	Yes	Yes		
			Rad	$2X10^7$	$1.4X10^8$		
			Sub	No			
Fan Cooler Motors 21,22,23,24, & 25 Model 69F97009 Type CSP	C	30 days	Temp	271	324	Separate	(11),(12)
			Press	47	80		
			R H	100	100		
			Chem	Yes	Yes		
			Rad	$2X10^7$	$1.4X10^8$		
			Sub	No	Yes		

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Equipment Type Transducers Electro-pneumatic	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
Auxiliary Feedwater Flow Control Valves FCV-405 A,B,C, & D FCV-406 A,B,C, & D Foxboro 69TA1	AP	30 days	Temp	AMB		Analysis		Note (e),(r)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	No				
			Sub	No				
Main Steam Atmospheric Relief Valves PCV-1134, 1135, 1136 & 1137 Fisher-Governor 546	SP	30 min.	Temp	NEG	320	Separate	(13)	Note (b)
			Press	0.42	75			
			R H	AMB	100			
			Chem	No				
			Rad	No				
			Sub	No				
Fan Cooler Service Water Return Valves TCV-1103, 1104 & 1105 Fisher-Governor 546	PP	30 days	Temp	AMB		Analysis		Note (n)
			Press	AMB				
			R H	AMB				
			Chem	No				
			Rad	$3.6X10^6$				
			Sub	No				

INDIAN POINT UNIT 2

Equipment Type Electrical Equipment	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference	
600V Power Cable	C	30 days	Temp	271	300	Sequential	(1),(8),(17)	Note (w)
Single Conducter, Silicone			Press	407	80			
Rubber Insulation			R H	100	100			
Asbestos Braid Jacket			Chem	Yes	Yes			
(12, 10, 8)			Rad	$2X10^7$	$2X10^8$			
Raychem Splices			Sub	No				
600V Power Cable	C	30 days	Temp	271	300	Sequential	(1),(8),(12),(19),(17)	Note (w)
Single Conductor, Silicone			Press	47	80			
Rubber Insulation			R H	100	100			
Asbestos Braid Jacket			Chem	Yes	Yes			
(4,4/0,350 MCM)			Rad	$2X10^7$	$2X10^8$			
Raychem Splices			Sub	No				
600V Power & Control	C	30 days	Temp	271	300	Sequential	(1),(8),(17)	Note (w)
Multi-Conductor #12 Kerite			Press	47	80			
Insulation With Pair Braid			R H	100	100			
Zinc, Tape, Kerite Jacket			Chem	Yes	Yes			
Overall			Rad	$2X10^7$	$2X10^8$			
Raychem Splices			Sub	No				
Terminal Blocks	C	30 days	Temp	271	340	Separate	(14), (15), (16)	Note (p)
Westinghouse			Press	47	106			
542247 (805432)			R H	100	100			
			Chem	Yes	Yes			
			Rad	$2X10^7$	$2X10^7$			
			Sub	No				
Electrical Penetrations	C	30 days	Temp	271	320	Separate	(7)	Note (q)
Crouse Hinds			Press	47	90			
			R H	100	100			
			Chem	Yes	-			
			Rad	$2X10^7$	-			
			Sub	No				

INDIAN POINT UNIT 2

Equipment Type Electrical Equipment	Loc.	Time Needed	Environment Parameter	Spec.	Qual.	Qual. Method	Reference
Hydrogen Recombiner Panel Westinghouse	PP	30 days	Temp	AMB		Analysis	Note (t)
			Press	AMB			
			R H	AMB			
			Chem	No			
			Rad	$7X10^4$			
			Sub	No			
Hydrogen Recombiner Westinghouse	C	30 days	Temp	271	286	Separate	(1)
			Press	47	60		
			R H	100	100		
			Chem	Yes	Yes		
			Rad	$2X10^7$	$1.7X10^8$		
			Sub	No			
Resistance Temperature Detectors TE 411 A & B, 421 A & B, 431 A & B, 441 A & B Rosemount 176 KF	C	5 min.	Temp	271	320	Sequential	(18)
			Press	47	66		
			R H	100	100		
			Chem	Yes	Yes		
			RAD	$5X10^5$	$1X10^8$		

NOTES:

(a) Valve tested in environment and acceptable for 8 hrs. Valve not normally used during an accident. If adjustment for flow is required it will be done immediately following switchover to recirculation. Failure does not cause the valve to change position.

(b) Pressure and temperature changes approximate ambient conditions.

(c) Will be replaced with sequentially qualified Barton transmitters per NRC meeting on April 3, 1980.

(d) Function not required if auxiliary feedwater pump steamline breaks.

(e) Conditions are near normal during the accident. Area temperature and pressure return to normal within 5 minutes due to sensors set at 135°F causing auxiliary feedwater pump steamline isolation.

(f) Valve will close (its' safe position) for all poetntial modes of failure.

(g) Main valve maintained closed by seat differential pressure.

(h) Flows will be established and adjusted following change over to recirculation. No further need to monitor flow after this event.

(j) Two containment and two recirculation sump level instruments are used to monitor level of water in containment during a loss of coolant accident. The instruments are manufactured by DeLavel (Model LS-1900S), and are designed for submerged service at 295°F and 60 psig. Westinghouse WCAP 9157 analyzed instruments of this design and found that since these devices have seen considerably more severe service than the postulated accident, environmental testing is not required.

The primary function of the sump level instrumentation is to ensure adequate water inventory to the suction of the recirculation pumps and

Containment sump pumps. This can be achieved via the refueling water level instrumentation and equating the volume of water injected to a water level in containment.

(k) Limit switch is for position indication only, valves are closed on SI and/or containment isolation signal. Once the valve is closed there is no known failure that would cause the valve to open.

(l) Solenoid valves do not have material with a Rad threshold lower than the specified value.

(m) Valves in containment are automatically deenergized, instrument air is automatically isolated from containment and the air compressor is automatically tripped on a SI signal.

(n) A review of Fisher Governor drawings indicates that there is no material that would be substantially affected by the radiation level. The valves are normally opened, air is removed from the controller and the valve following SI initiations. Therefore there is no known failure mode to position the valve in the unsafe position.

(p) All required safety related terminal blocks inside the containment have been replaced with qualified terminal blocks.

(q) Although no spray or radiation tests were performed, the penetrations are judged acceptable because there is no known materials on the penetration that are suseptible to damage and degradation by either sprays or radiation.

(r) Since a concurrent break in the main steam line, feedwater system or a loss of Coolant Accident in conjunction with a break in the auxiliary feedwater pump steam line results in a double failure, and is not considered using single failure criteria, a break in the auxiliary feedwater pump steam line is the accident. With this break, the auxiliary feed system is not initiated because of the small loss of steam, followed by isolation by valves 1310A&B. Therefore there is no need for pumps to start and valving to change position.

(t) Control panel does not have material with a Rad threshold lower than the specified value.

(u) Limit Switch is for position indication only.

(v) Power is administratively removed from circuit. Valves are not used while at power. Failure of the limit switch will not cause valve to change position.

(w) Review of cabling is continuing, cabling and splices outside of the containment in the hostile service areas has been analyzed relative to materials that would be effected by the environment and none were found.

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2. Limitoruqe Corporation, Nuclear Power Station Qualification Type Test report. Limitorque valve actuators for PWR service project #600456, W. Sykes, December, 1975.

3. Letter: Cahill to Schwencer, April 23, 1980. Subject: NRC meeting on April 3, 1980.

4. Westinghouse Electric Corporation, letter NS-CE-755. Potential mode of failure identified for solenoid valves. C. Eicheldinger to Vassalo, August 15, 1975.

5. ASCO solenoid valves contain nylon with a sensitivity of 5×10^7 (per reactor shielding design manual, first edition. D. Van Norstrand Company Inc. "Group 7" Plastics). Buna N with a sensitivity of 6×10^6 per ASCO Company).

6. Consolidated Edison Company response to I.E. Bulletin 79-01A dated July 18, 1979/August 1, 1979/August 30, 1979.

7. Crouse-Hinds Corp. Test report on Incident and Leakage Testing of Nuclear Reactor Electrical Penetration-Full Canister Assembly, March, 1967.

8. U.E. & C Drawing 9321-LL-3010, Conduit and Cable Schedule - General Instructions - Splicing and Terminating Instructions - Indian Point Generating Station Unit No. 2, February 14, 1969.

9. ACME Cleveland Development Co. Test report. Qualification of series EA-180 and EA-740 switches, August, 1977.

10. Westinghouse Electric Corp., WCAP-8754 Topical report: Environmental Qualification of Class 1E Motors for Nuclear Out-Of-Containment use. I. Rodens and R. H. DeLisle, June, 1976.

11. Westinghouse Electric Corp., WCAP-7829 Topical Report: Fan Cooler Motor Unit Test. C. V. Fields, April, 1972.

12. Westinghouse Electric Corp., WCAP-7343L Topical Report: Irradiation Testing of Reactor Containment Fan Cooler Motor Insulation. J. Locante, June, 1969.

13. Fisher Controls Company Project 72AR28 Prob. 1531, Report 4, dated June 12, 1973.

14. US NRC letter: Summary of Meeting held February 1, 1978 concerning Yankee-Rowe terminal boards. A. Burger to Yankee Atomic Electric Co.

15. Rochester Gas & Electric Co., Minutes of meeting, Nuclear Safety Audit & Review board. January 31, 1978.

16. Franklin Institute, report F-C4911-1. Qualification Tests of Terminal Blocks in a Simulated Loss of Coolant Accident Environment, January 1979.

17. Consolidated Edison Co. memorandum from O. J. Beusse, Construction to J. Makepeace, Technical Engineering Director; Splices at Penetrations - Unit No. 2, December, 1978.

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