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

POWER AUTHORITY OF THE STATE OF NEW YORK

DOCKET NO. 50-333

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 227
License No. DPR-59

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Power Authority of the State of New York (the licensee) dated October 3, 1994, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-59 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 227, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance to be implemented within 120 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Daniel G. McDonald, Jr.

for Ledyard B. Marsh, Director
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical Specifications

Date of Issuance: September 11, 1995

ATTACHMENT TO LICENSE AMENDMENT NO. 227

FACILITY OPERATING LICENSE NO. DPR-59

DOCKET NO. 50-333

Revise Appendix A as follows:

Remove Pages	Insert Pages	Remove Pages	Insert Pages
i	i	62	62
v	v	63	63
vii	vii	64	64
5	5	65	65
30a	30a	New	65a
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New	30g	69	69
31	31	70	70
32	32	70a	Deleted
36	36	70b	Deleted
37	37	70c	Deleted
38	38	70d	Deleted
39	39	71	71
40	40	New	71a
41	41	72	72
41a	Deleted	73	73
41b	Deleted	74	74
42	42	New	76a
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43a	43a	77e	77e
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45a	Deleted	80	80
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opened to perform necessary operational activities.

2. At least one door in each airlock is closed and sealed.

3. All automatic containment isolation valves are operable or de-activated in the isolated position.

4. All blind flanges and manways are closed.

N. Rated Power - Rated power refers to operation at a reactor power of 2,436 MWt. This is also termed 100 percent power and is the maximum power level authorized by the operating license. Rated steam flow, rated coolant flow, rated nuclear system pressure, refer to the values of these parameters when the reactor is at rated power.

O. Reactor Power Operation - Reactor power operation is any operation with the Mode Switch in the Startup/Hot Standby or Run position with the reactor critical and above 1 percent rated thermal power.

P. Reactor Vessel Pressure - Unless otherwise indicated, reactor vessel pressures listed in the Technical Specifications are those measured by the reactor vessel steam space sensor.

Q. Refueling Outage - Refueling outage is the period of time between the shutdown of the unit prior to refueling and the startup of the Plant subsequent to that refueling.

R. Safety Limits - The safety limits are limits within which the reasonable maintenance of the fuel cladding integrity and the reactor coolant system integrity are assured. Violation of such a limit is cause for unit shutdown and review by the Nuclear Regulatory Commission before resumption of unit operation. Operation beyond such a limit may not in itself result in serious consequences but it indicates an operational deficiency subject to regulatory review.

S. Secondary Containment Integrity - Secondary containment integrity means that the reactor building is intact and the following conditions are met:

1. At least one door in each access opening is closed.

2. The Standby Gas Treatment System is operable.

3. All automatic ventilation system isolation valves are operable or secured in the isolated position.

T. Surveillance Frequency Notations / Intervals

The surveillance frequency notations / intervals used in these specifications are defined as follows:

Notations	Intervals	Frequency
D	Daily	At least once per 24 hours
W	Weekly	At least once per 7 days
M	Monthly	At least once per 31 days
Q	Quarterly or every 3 months	At least once per 92 days
SA	Semiannually or every 6 months	At least once per 184 days
A	Annually or Yearly	At least once per 366 days
R	Note 1	At least once per 18 months (550 days)
S/U		Prior to each reactor startup
NA		Not applicable

Note 1: "Once each operating cycle," "once per operating cycle," "each refueling outage," "at least once during each operating cycle," "once each operating cycle not to exceed 18 months", or similar phrases, are equivalent to the definition for frequency notation "R".

3.0 Continued

D. Entry into an OPERATIONAL CONDITION (mode) or other specified condition shall not be made when the conditions for the Limiting Condition for Operation are not met and the associated ACTION requires a shutdown if they are not met within a specified time interval. Entry into an OPERATIONAL CONDITION (mode) or specified condition may be made in accordance with ACTION requirements when conformance to them permits continued operation of the facility for an unlimited period of time. This provision shall not prevent passage through OPERATIONAL CONDITIONS (modes) required to comply with ACTION requirements. Exceptions to these requirements are stated in the individual specifications.

E. When a system, subsystem, train, component or device is determined to be inoperable solely because its emergency power source is inoperable, or solely because its normal power source is inoperable, it may be considered OPERABLE for the purpose of satisfying the requirements of its applicable Limiting Condition for Operation, provided: (1) its corresponding normal or emergency power source is OPERABLE; and (2) all of its redundant system(s), subsystem(s), train(s), component(s) and device(s) are OPERABLE, or likewise satisfy the requirements of this specification. Unless both conditions (1) and (2) are satisfied, the unit shall be placed in COLD SHUTDOWN within the following 24 hours. This specification is not applicable when in Cold Shutdown or Refuel Mode.

F. Equipment removed from service or declared inoperable to comply with required actions may be returned to service under administrative control solely to perform testing required to demonstrate its operability or the operability of other equipment. This is an exception to LCO 3.0.B.

4.0 Continued

that a Surveillance Requirement has not been performed. The ACTION requirements may be delayed for up to 24 hours to permit the completion of the surveillance when the allowable outage time limits of the ACTION requirements are less than 24 hours. Surveillance requirements do not have to be performed on inoperable equipment.

D. Entry into an OPERATIONAL CONDITION (mode) shall not be made unless the Surveillance Requirement(s) associated with the Limiting Condition for Operation have been performed within the applicable surveillance interval or as otherwise specified. This provision shall not prevent passage through or to Operational Modes as required to comply with ACTION Requirements.

3.0 Bases - Continued

F. LCO 3.0.F establishes the allowance for restoring equipment to service under administrative controls when it has been removed from service or declared inoperable to comply with required actions. The sole purpose of this Specification is to provide an exception to LCO 3.0.B to allow testing to demonstrate: (a) the operability of the equipment being returned to service; or (b) the operability of other equipment.

The administrative controls ensure the time the equipment is returned to service in conflict with the requirements of the required actions is limited to the time absolutely necessary to perform the allowed testing. This Specification does not provide time to perform any other preventive or corrective maintenance.

An example of demonstrating the operability of the equipment being returned to service is reopening a containment isolation valve that has been closed to comply with the required actions and must be reopened to perform the testing.

An example of demonstrating the operability of other equipment is taking an inoperable channel or trip system out of the tripped condition to prevent the trip function from occurring during the performance of testing on another channel in the other trip system. A similar example of demonstrating the operability of other equipment is taking an inoperable channel or trip system out of the tripped condition to permit the logic to function and indicate the appropriate response during the performance of testing on another channel in the same trip system.

4.0 BASES

A. This specification provides that surveillance activities necessary to insure the Limiting Conditions for Operation are met and will be performed during the OPERATIONAL CONDITIONS (modes) for which the Limiting Conditions for Operation are applicable. Provisions for additional surveillance activities to be performed without regard to the applicable OPERATIONAL CONDITIONS (modes) are provided in the individual Surveillance Requirements.

B. Specification 4.0.B establishes the limit for which the specified time interval for Surveillance Requirements may be extended. It permits an allowable extension of the normal surveillance interval to facilitate surveillance scheduling and consideration of plant operating conditions that may not be suitable for conducting the surveillance (e.g., transient conditions or other ongoing surveillance or maintenance activities). It also provides flexibility to accommodate the length of a fuel cycle for surveillances that are performed at each refueling outage and are specified with a 24 month surveillance interval. It is not intended that this provision be used repeatedly as a convenience to extend surveillance intervals beyond that specified for surveillances that are not performed during refueling outages. The limitation of this specification is based on engineering judgement and the recognition that the most probable result of any particular surveillance being performed is the verification of conformance with the Surveillance Requirements. The limit on extension of the normal surveillance interval ensures that the reliability confirmed by surveillance activities is not significantly reduced below that obtained from the specified surveillance interval.

C. This specification establishes the failure to perform a Surveillance Requirement within the allowed surveillance

C. Continued

interval, defined by the provisions of Specification 4.0.B, as a condition that constitutes a failure to meet the OPERABILITY requirements for a Limiting Condition for Operation. Under the provisions of this specification, systems and components are assumed to be OPERABLE when Surveillance Requirements have been satisfactorily performed within the specified time interval. However, nothing in this provision is to be construed as implying that systems or components are OPERABLE when they are found or known to be inoperable although still meeting the Surveillance Requirements. This specification also clarifies that the ACTION requirements are applicable when Surveillance Requirements have not been completed within the allowed surveillance interval and that the time limits of the ACTION requirements apply from the point in time it is identified that a surveillance has not been performed and not at the time that the allowed surveillance was exceeded. Completion of the Surveillance Requirement within the allowable outage time limits of the ACTION requirements restores compliance with the requirements of Specification 4.0.C. However, this does not negate the fact that the failure to have performed the surveillance within the allowed surveillance interval, defined by the provisions of Specification 4.0.B, was a violation of the OPERABILITY requirements of a Limiting Condition for Operation that is subject to enforcement action. Further, the failure to perform a surveillance within the provisions of Specification 4.0.B is a violation of a Technical Specification requirement and is, therefore, a reportable event under the requirements of 10 CFR 50.73(a)(2)(i)(B) because it is a condition prohibited by the plant Technical Specifications.

4.0 BASES - Continued

C. Continued

If the allowable outage time limits of the ACTION requirements are less than 24 hours or a shutdown is required to comply with ACTION requirements, a 24-hour allowance is provided to permit a delay in implementing the ACTION requirements. This provides an adequate time limit to complete Surveillance Requirements that have not been performed. The purpose of this allowance is to permit the completion of a surveillance before a shutdown is required to comply with ACTION requirements or before other remedial measures would be required that may preclude completion of a surveillance. The basis for this allowance includes consideration for plant conditions, adequate planning, availability of personnel, the time required to perform the surveillance and the safety significance of the delay in completing the required surveillance. This provision also provides a time limit for the completion of Surveillance Requirements that become applicable as a consequence of OPERATIONAL CONDITION (mode) changes imposed by ACTION requirements and for completing Surveillance Requirements that are applicable when an exception to the requirements of Specification 4.0.C is allowed. If a surveillance is not completed within the 24-hour allowance, the time limits of the ACTION requirements are applicable at that time. When a surveillance is performed within the 24-hour allowance and the Surveillance Requirements are not met, the time limits of the ACTION requirements are applicable at the time the surveillance is terminated.

C. Continued

Surveillance Requirements do not have to be performed on inoperable equipment because the ACTION requirements define the remedial measures that apply. However, the Surveillance Requirements have to be met to demonstrate that inoperable equipment has been restored to OPERABLE status.

D. This specification establishes the requirement that all applicable surveillances must be met before entry into an OPERATIONAL CONDITION or other condition of operation specified in the Applicability statement. The purpose of this specification is to ensure that system and component OPERABILITY requirements or parameter limits are met before entry into an OPERATIONAL CONDITION or other specified condition associated with plant shutdown as well as startup.

Under the provisions of this specification, the applicable Surveillance Requirements must be performed within the specified surveillance interval to ensure that the Limiting Conditions for Operation are met during initial plant startup or following a plant outage.

When a shutdown is required to comply with ACTION requirements, the provisions of this specification do not apply because this would delay placing the facility in a lower CONDITION of operation.

3.1 LIMITING CONDITIONS FOR OPERATION

3.1 REACTOR PROTECTION SYSTEM

Applicability:

Applies to the instrumentation and associated devices which initiate the reactor scram.

Objective:

To assure the operability of the Reactor Protection System.

Specification:

A. The setpoints and minimum number of instrument channels per trip system that must be operable for each position of the reactor mode switch, shall be as shown in Table 3.1-1.

4.1 SURVEILLANCE REQUIREMENTS

4.1 REACTOR PROTECTION SYSTEM

Applicability:

Applies to the surveillance of the instrumentation and associated devices which initiate reactor scram.

Objective:

To specify the type of frequency of surveillance to be applied to the protection instrumentation.

Specification:

A. Instrumentation systems shall be functionally tested and calibrated as indicated in Tables 4.1-1 and 4.1-2 respectively.

The response time of the reactor protection system trip functions listed below shall be demonstrated to be within its limit at least once per 18 months. Neutron detectors are exempt from response time testing. Each test shall include at least one channel in each trip system. All channels in both trip systems shall be tested within two test intervals.

1. Reactor High Pressure (02-3PT-55A, B C, D)
2. Drywell High Pressure (05PT-12A, B, C D)
3. Reactor Water Level-Low (L3) (02-3LT-101A, B, C, D)
4. Main Steam Line Isolation Valve Closure (29PNS-80A2, B2, C2, D2) (29PNS-86A2, B2, C2, D2)
5. Turbine Stop Valve Closure (94PNS-101, 102, 103, 104)
6. Turbine Control Valve Fast Closure (94PS-200A, B, C, D)
7. APRM Fixed High Neutron Flux
8. APRM Flow Referenced Neutron Flux

3.1 (cont'd)

B. Minimum Critical Power Ratio (MCPR)

During reactor power operation, the MCPR operating limit shall not be less than that shown in the Core Operating Limits Report.

1. During Reactor power operation with core flow less than 100% of rated, the MCPR operating limit shall be multiplied by the appropriate K_f as specified in the Core Operating Limits Report.

2. If anytime during reactor operation at greater than 25% of rated power it is determined that the operating limit MCPR is being exceeded, action shall then be initiated within fifteen (15) minutes to restore operation to within the prescribed limits. If the MCPR is not returned to within the prescribed limits within two (2) hours, an orderly reactor power reduction shall begin immediately. The reactor power shall be reduced to less than 25% of rated power within the next four hours, or until the MCPR is returned to within the prescribed limits.

4.1 (cont'd)

B. Maximum Fraction of Limiting Power Density (MFLPD)

The MFLPD shall be determined daily during reactor power operation at ≥25% rated thermal power and the APRM high flux scram and Rod Block trip settings adjusted if necessary as specified in the Core Operating Limits Report.

C. MCPR shall be determined daily during reactor power operation at ≥25% of rated thermal power and following any change in power level or distribution that would cause operation with a limiting control rod pattern as described in the bases for Specification 3.3.B.5.

D. Verification of the MCPR operating limits shall be performed as specified in the Core Operating Limits Report.

3.1 BASES

A. The reactor protection system automatically initiates a reactor scram to:

1. Preserve the integrity of the fuel cladding.

2. Preserve the integrity of the Reactor Coolant System.

3. Minimize the energy which must be absorbed following a loss of coolant accident, and prevent inadvertent criticality.

This specification provides the limiting conditions for operation necessary to preserve the ability of the system to perform its intended function even during periods when instrument channels may be out of service because of maintenance. When necessary, one channel may be made inoperable for brief intervals to conduct required functional tests and calibrations. The basis for the allowable out-of-service times is provided in GE Topical Report NEDC-30851P-A, "Technical Specification Improvement Analysis for BWR Reactor Protection System," March 1988.

The Reactor Protection System is of the dual channel type (Reference subsection 7.2 FSAR). The System is made up of two independent trip systems, each having two subchannels of tripping devices. Each subchannel has an input from at least one instrument channel which monitors a critical parameter.

The outputs of the subchannels are combined in a 1 out of 2 logic; i.e., an input signal on either one or both of the subchannels will cause a trip system trip. The outputs of the trip systems are arranged so that a trip on both systems is required to produce a reactor scram.

This system meets the intent of IEEE-279 (1971) for Nuclear Power Plant Protection Systems. The system has a reliability greater than that of a 2 out of 3 system and somewhat less than that of a 1 out of 2 system.

With the exception of the average power range monitor (APRM) channel the intermediate range monitor (IRM) channels, the scram discharge volume, the main steam isolation valve closure and the turbine stop valve closure, each subchannel has one instrument channel. When the minimum condition for operation on the number of operable instrument channels per untripped protection trip system is met or if it cannot be met and the affected protection trip system is placed in a tripped condition, the effectiveness of the protection system is preserved.

Three APRM instrument channels are provided for each protection trip system. APRM's A and E operate contacts in one subchannel and APRM's C and E operate contacts in the other

4.1 BASES

A. The channels listed in Tables 4.1-1 and 4.1-2 are divided into three groups for functional testing. These are:

Group A: On-off sensors that provide a scram trip function.

Group B: Analog devices coupled with bi-stable trips that provide a scram function.

Group C: Devices which only serve a useful function during some restricted mode of operation, such as startup or shutdown, or for which the only practical test is one that can be performed at shutdown.

The sensors that make up Group (A) are on-off sensors. The probability of success is primarily a function of the sensor failure rate and the test interval. The basis for a three-month functional test interval for group (A) sensors is provided in NEDC-30851P-A, "Technical Specification Improvement Analysis for BWR Reactor Protection Systems."

Group (B) devices utilize an analog sensor coupled with a bi-stable trip (either the solid-state analog transmitter trip system (ATTS) or the more conventional arrangement of instrument amplifier and bi-stable). The sensor and amplifier are active components and a failure is almost always accompanied by an alarm and an indication of the source of trouble. An as-is failure is one that sticks mid-scale and is not capable of going either up or down in response to an out-of-limits input. This type of failure for analog devices is a rare occurrence and is detectable by an operator who observes that one signal does not track other channel(s).

The bi-stable trip circuit which is a part of the Group (B) devices can sustain failures which are revealed only during testing. Therefore, it is necessary to functionally test them periodically. A three month surveillance interval has been determined in accordance with NEDC-30851P-A, "Technical Specification Improvement Analyses for BWR Reactor Protection System."

Group (C) devices are active only during certain modes of operation. For example, the IRM is active during start-up and inactive during full power operation. Thus the only test that is meaningful is the one performed just prior to shutdown or start-up; i.e., the tests that are performed just prior to use of the instrument.

Calibration frequency of the instrument channel is divided into two groups. These are as follows:

1. Passive type indicating devices that can be compared with like units on a continuous basis.

2. Vacuum tube or semiconductor devices and detectors that drift or lose sensitivity.

4.1 BASES (cont'd)

For the APRM System, drift of electronic apparatus is not the only consideration in determining a calibration frequency. Change in power distribution and loss of chamber sensitivity dictates a calibration every 7 days. Calibration on this frequency assures plant operation at or below thermal limits.

The frequency of calibration of the APRM flow biasing network has been established as each refueling outage. The flow biasing network is functionally tested at least once every three months and, in addition, cross calibration checks of the flow input to the flow biasing network can be made during the functional test by direct meter reading. There are several instruments which must be calibrated and it will take several days to perform the calibration of the entire network. While the calibration is being performed, a zero flow signal will be sent to half of the APRM's resulting in a half scram and rod block condition. Thus, if the calibration were performed during operation, flux shaping would not be possible. Based on experience at other generating stations, drift of instruments, such as those in the flow biasing network, is not significant and therefore, to avoid spurious scrams, a calibration frequency of each refueling outage is established.

The measurement of response time provides assurance that the Reactor Protection System trip functions are completed within the time limits assumed in the transient and accident analyses.

In terms of the transient analysis, the Standard Technical Specifications (NUREG-0123, Rev.3) define individual trip function response time as "the time interval from when the monitored parameter exceeds its trip setpoint at the channel sensor until de-energization of the scram pilot valve solenoids." The individual sensor response time defined as "operating time" in General Electric (GE) design specification data sheet 22A3083AJ, note (8), is "the maximum allowable time from when the variable being measured just exceeds the trip setpoint to opening of the trip channel sensor contact during a transient." A transient is defined in note (4) of the same data sheet as "the maximum expected rate of change of the variable for the accident or the abnormal operating condition which is postulated in the safety analysis report.

4.1 BASES (cont'd)

The individual sensor response time may be measured by simulating a step change of the particular parameter. This method provides a conservative value for the sensor response time, and confirms that the instrument has retained its specified electromechanical characteristics. When sensor response time is measured independently, it is necessary to also measure the remaining portion of the response time in the logic train up to the time at which the scram pilot valve solenoids de-energize. The channel response time must include all component delays in the response chain to the ATTS output relay plus the design allowance for RPS logic system response time. A response time for the RPS logic relays in excess of the design allowance is acceptable provided the overall response time does not exceed the response time limits specified in the UFSAR. The basis for excluding the neutron detectors from response time testing is provided by NRC Regulatory Guide 1.118, Revision 2, section C.5.

The 18 month response time testing interval is based on NRC NUREG-0123, Revision 3, "Standard Technical Specifications," surveillance requirement 4.3.1.3.

Two instrument channels in Table 4.1-1 have not been included in Table 4.1-2. These are: mode switch in shutdown and manual scram. All of the devices or sensors associated with these scram functions are simple on-off switches and, hence, calibration during operation is not applicable.

B. The MFLPD is checked once per day to determine if the APRM scram requires adjustment. Only a small number of control rods are moved daily and thus the MFLPD is not expected to change significantly and thus a daily check of the MFLPD is adequate.

The sensitivity of LPRM detectors decreases with exposure to neutron flux at a slow and approximately constant rate. This is compensated for in the APRM system by calibrating twice a week using heat balance data and by calibrating individual LPRM's every 1000 effective full power hours, using TIP traverse data.

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TABLE 3.1-1

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENTS

Minimum No. of Operable Instrument Channels Per Trip System (Notes 1 and 2)	Trip Function	Trip Level Setting	Mode in Which Function Must be Operable: Refuel (Note 7)	Startup	Run	Total Number of Instrument Channels Provided by Design for Both Trip Systems	Action (Note 3)
1	Mode Switch in Shutdown		X	X	X	1 Mode Switch	A
1	Manual Scram		X	X	X	2	A
3	IRM High Flux	≤ 96% (120/125) of full scale	X	X		8	A
3	IRM Inoperative		X	X		8	A
2	APRM Neutron Flux-Startup (Note 15)	≤ 15% Power	X	X		6	A
2	APRM Flow Referenced Neutron Flux (Not to exceed 117%) (Notes 13 and 14)	(Note 12)			X	6	A or B
2	APRM Fixed High Neutron Flux (Note 14)	≤ 120% Power			X	6	A or B
2	APRM Inoperative	(Note 10)	X	X	X	6	A or B

TABLE 3.1-1 (cont'd)

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENTS

Minimum No. of Operable Instrument Channels Per Trip System (Notes 1 and 2)	Trip Function	Trip Level Setting	Mode in Which Function Must be Operable			Total Number of Instrument Channels Provided by Design for Both Trip Systems	Action (Note 3)
			Refuel (Note 7)	Startup	Run		
2	Reactor High Pressure	≤ 1045 psig	X (Note 9)	X	X	4	A
2	Drywell High Pressure (Note 16)	≤ 2.7 psig	X (Note 8)	X (Note 8)	X	4	A
2	Reactor Low Water Level (Note 16)	≥ 177 in. above TAF	X	X	X	4	A
3	High Water Level in Scram Discharge Volume	≤ 34.5 gallons per Instrument Volume	X (Note 4)	X	X	8	A
4	Main Steam Line Isolation Valve Closure	≤ 10% valve closure			X (Note 6)	8	A
2	Turbine Control Valve Fast Closure	500 < P < 850 psig Control oil pressure between fast closure solenoid and disc dump valve			X (Note 5)	4	A or C
4	Turbine Stop Valve Closure	≤10% valve closure			X (Notes 5 & 6)	8	A or C

TABLE 3.1-1 (cont'd)

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENTS

NOTES OF TABLE 3.1-1

1. There shall be two operable or tripped trip systems for each Trip Function, except as provided for below:

   a. For each Trip Function with one less than the required minimum number of operable instrument channels, place the inoperable instrument channel and/or its associated trip system in the tripped condition* within 12 hours. Otherwise, initiate the ACTION required by Table 3.1-1 for the Trip Function.

   b. For each Trip Function with two or more channels less than the required minimum number of operable instrument channels:

      1) Within one hour, verify sufficient instrument channels remain operable or tripped* to maintain trip capability in the Trip Function, and

      2) Within 6 hours, place the inoperable instrument channel(s) in one trip system and/or that trip system** in the tripped condition*, and

      3) Within 12 hours, restore the inoperable instrument channel(s) in the other trip system to an operable status, or place the inoperable instrument channel(s) in the trip system and/or that trip system in the tripped condition*.

      If any of these three conditions cannot be satisfied, initiate the ACTION required by Table 3.1-1 for the affected Trip Function.

      * An inoperable instrument channel or trip system need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, if the inoperable instrument channel is not restored to operable status within the required time, the ACTION required by Table 3.1-1 for that Trip Function shall be taken.

      ** This action applies to that trip system with the greatest number of inoperable instrument channels. If both systems have the same number of inoperable instrument channels, the ACTION can be applied to either trip system.

2. When a channel is placed in an inoperable status solely for performance of required surveillances, entry into associated Limiting Conditions For Operation and required actions may be delayed for up to 6 hours provided the associated Trip Function maintains RPS trip capability.

TABLE 3.1-1 (cont'd)

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENTS

NOTES OF TABLE 3.1-1 (cont'd)

3. Action Statements:

   A. Insert all operable control rods within four hours.
   B. Reduce power level to IRM range and place Mode Switch in the Startup position within eight hours.
   C. Reduce power level to less than 30 percent of rated within four hours.

4. Permissible to bypass, if the Reactor Mode Switch is in the Refuel or Shutdown position.

5. Bypassed when turbine first stage pressure is less than 217 psig or less than 30 percent of rated power.

6. The design permits closure of any two lines without a scram being initiated.

7. When the reactor is subcritical and the reactor water temperature is less than 212°F, only the following trip functions need to be operable:

   A. Mode Switch in Shutdown.
   B. Manual Scram.
   C. High Flux IRM
   D. Scram Discharge Volume High Level when any control rod in a control cell containing fuel is not fully inserted.
   E. APRM 15% Power Trip.

8. Not required to be operable when primary containment integrity is not required.

9. Not required to be operable when the reactor pressure vessel head is not bolted to the vessel.

10. An APRM will be considered operable if there are at least 2 LPRM inputs per level and at least 11 LPRM inputs of the normal complement.

11. (Deleted)

TABLE 3.1-1 (cont'd)

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION REQUIREMENTS

12. The APRM Flow Referenced Neutron Flux Scram setting shall be less than or equal to the limit specified in the Core Operating Limits Report.

13. The Average Power Range Monitor scram function is varied as a function of recirculation flow (W). The trip setting of this function must be maintained as specified in the Core Operating Limits Report.

14. The APRM flow biased high neutron flux signal is fed through a time constant circuit of approximately 6 seconds. The APRM fixed high neutron flux signal does not incorporate the time constant, but responds directly to instantaneous neutron flux.

15. This Average Power Range Monitor scram function is fixed point and is increased when the reactor mode switch is placed in the Run position.

16. Instrumentation common to PCIS.

TABLE 4.1-1

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION TEST REQUIREMENTS

Trip Function	Group (Note 2)	Functional Test	Functional Test Frequency (Note 3)	Instrument Check
Mode Switch in Shutdown	A	Place Mode Switch in Shutdown	R	NA
Manual Scram	A	Trip Channel and Alarm	Q	NA
RPS Channel Test Switch	A	Trip Channel and Alarm	W (Note 1)	NA
IRM High Flux	C	Trip Channel and Alarm (Note 4)	S/U and W (Note 5)	NA
IRM Inoperative	C	Trip Channel and Alarm (Note 4)	S/U and W (Note 5)	NA
APRM				
High Flux	B	Trip Output Relays (Note 4)	Q	NA
Inoperative	B	Trip Output Relays (Note 4)	Q	NA
Flow Biased High Flux	B	Trip Output Relays (Note 4)	Q	NA
High Flux in Startup or Refuel	C	Trip Output Relays (Note 4)	S/U and W (Note 5)	NA
Reactor High Pressure	B	Trip Channel and Alarm (Note 4)	Q	D
Drywell High Pressure	B	Trip Channel and Alarm (Note 4)	Q	D
Reactor Low Level	B	Trip Channel and Alarm (Note 4)	Q	D
High Water Level in Scram Discharge Instrument Volume	A	Trip Channel	Q (Note 6)	NA
High Water Level in Scram Discharge Instrument Volume	B	Trip Channel and Alarm (Note 4)	Q	D

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TABLE 4.1-1 (Cont'd)

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENTATION TEST REQUIREMENTS

Trip Function	Group (Note 2)	Functional Test	Functional Test Frequency (Note 3)	Instrument Check
Main Steam Line Isolation Valve Closure	A	Trip Channel and Alarm	Q	NA
Turbine Control Valve Fast Closure	A	Trip Channel and Alarm	Q	NA
Turbine First Stage Pressure Permissive	B	Trip Channel and Alarm (Note 4)	Q	D
Turbine Stop Valve Closure	A	Trip Channel and Alarm	Q	NA

NOTES FOR TABLE 4.1-1

1. The automatic scram contactors shall be exercised once every week by either using the RPS channel test switches or performing a functional test of any automatic scram function. If the contactors are exercised using a functional test of a scram function, the weekly test using the RPS channel test switch is considered satisfied. The automatic scram contactors shall also be exercised after maintenance on the contactors.

2. A description of the three groups is included in the Bases of this Specification.

3. Functional tests are not required on the part of the system that is not required to be operable or are tripped. If tests are missed on parts not required to be operable or are tripped, then they shall be performed prior to returning the system to an operable status.

4. This instrumentation is exempted from the instrument channel test definition. This instrument channel functional test will consist of injecting a simulated electrical signal into the instrument channels.

5. Weekly functional test required only during refuel and startup mode.

6. The functional test shall be performed utilizing a water column or similar device to provide assurance that damage to a float or other portions of the float assembly will be detected.

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3.2 LIMITING CONDITIONS FOR OPERATION

3.2 INSTRUMENTATION

Applicability:

Applies to the plant instrumentation which either (1) initiates and controls a protective function, or (2) provides information to aid the operator in monitoring and assessing plant status during normal and accident conditions.

Objective:

To assure the operability of the aforementioned instrumentation.

Specifications:

A. Primary Containment Isolation Functions

When primary containment integrity is required, the limiting conditions of operation for the instrumentation that initiates primary containment isolation are given in Table 3.2-1.

4.2 SURVEILLANCE REQUIREMENTS

4.2 INSTRUMENTATION

Applicability:

Applies to the surveillance requirement of the instrumentation which either (1) initiates and controls protective function, or (2) provides information to aid the operator in monitoring and assessing plant status during normal and accident conditions.

Objective:

To specify the type and frequency of surveillance to be applied to the aforementioned instrumentation.

Specifications:

A. Primary Containment Isolation Functions

Instrumentation shall be functionally tested and calibrated as indicated in Table 4.2-1. System logic shall be functionally tested as indicated in Table 4.2-1.

The response time of the main steam isolation valve actuation instrumentation isolation trip functions listed below shall be demonstrated to be within their limits at least once per 18 months. Each test shall include at least one channel in each trip system. All channels in both trip systems shall be tested within two test intervals.

1. MSIV Closure - Reactor Low Water Level (L1) (02-3LT-57A,B and 02-3LT-58A,B)
2. MSIV Closure - Low Steam Line Pressure (02PT-134A,B,C,D)
3. MSIV Closure - High Steam Line Flow (02DPT-116A-D, 117A-D, 118A-D, 119A-D)

3.2 (cont'd)

B. Core and Containment Cooling Systems - Initiation and Control

The limiting conditions for operation for the instrumentation that initiates or controls the Core and Containment Cooling Systems are given in Table 3.2-2. This instrumentation must be operable when the system(s) it initiates or controls are required to be operable as specified in Specification 3.5.

C. Control Rod Block Actuation

The limiting conditions of operation for the instrumentation that initiates control rod block are given in Table 3.2-3.

D. Radiation Monitoring Systems - Isolation and Initiation Functions

Refer to the Radiological Effluent Technical Specifications (Appendix B).

4.2 (cont'd)

B. Core and Containment Cooling Systems - Initiation and Control

Instrumentation shall be functionally tested, calibrated, and checked as indicated in Table 4.2-2.

System logic shall be functionally tested as indicated in Table 4.2-2.

C. Control Rod Block Actuation

Instrumentation shall be functionally tested, calibrated, and checked as indicated in Table 4.2-3.

System logic shall be functionally tested as indicated in Table 4.2-3.

D. Radiation Monitoring Systems - Isolation and Initiation Functions

Refer to the Radiological Effluent Technical Specifications (Appendix B).

3.2 BASES

Besides reactor protection instrumentation which initiates a reactor scram, additional protective instrumentation is also provided. This protective instrumentation initiates action to mitigate the consequences of accidents which are beyond the operator's ability to control, or terminates operator errors before they result in serious consequences. This set of specifications provides the limiting conditions of operation for the primary system isolation function, initiation of the Core Cooling Systems, Control Rod Block and Standby Gas Treatment Systems. The objectives of the specifications are to assure the effectiveness of the protective instrumentation when required, even during periods when portions of such systems are out of service for maintenance, and to prescribe the trip settings required to assure adequate performance. When necessary, one channel may be made inoperable for brief intervals to conduct required functional tests and calibrations.

Some of the settings on the instrumentation that initiate or control core and containment cooling have tolerances explicitly stated where the high and low values are both critical and may have a substantial effect on safety. The set points of other instrumentation, where only the high or low end of the setting has a direct bearing on safety, are chosen at a level away from the normal operating range to prevent inadvertent actuation of the safety system involved and exposure to abnormal situations.

Actuation of primary containment valves is initiated by protective instrumentation shown in Table 3.2-1 which senses the conditions for which isolation is required. Such instrumentation must be available whenever primary containment integrity is required.

The instrumentation which initiates primary containment isolation is connected in a dual bus (two trip systems) arrangement. Main Steam Line Isolation Valve (MSIV) isolation utilizes a one-out-of-two-taken-twice logic arrangement which closes the four inboard and four outboard MSIVs. Other penetrations which have both inboard and outboard automatic isolation valves (except for the primary containment hydrogen and oxygen concentration sample, and the gaseous and particulate radioactivity sample systems) utilize logic arrangements in which one trip system closes inboard isolation valves and the other trip system closes outboard isolation valves. The primary containment hydrogen and oxygen concentration sample supply and return lines, as well as the gaseous and particulate sample supply and return lines, utilize inboard and outboard isolation valves that are both closed by a single trip system. Hydrogen and oxygen concentration sample supply and return isolation valve control circuits are provided with the capability to override automatic isolation to allow sampling during and following an accident. Penetrations which are isolated by a single automatic isolation valve (and a remote manual or check valve) utilize a single trip system to effect closure of the automatic isolation valve.

The low water level instrumentation set to trip at 177 in. above the top of the active fuel closes all isolation valves except those in Group 1. Details of the isolation valve grouping are given in Section 7.3 of the updated FSAR. For valves which isolate at this level, this trip setting is adequate to prevent uncovering the core in the case of a break in the largest line.

The low-low reactor water level instrumentation is set to trip when reactor water level is 126.5 in. above the top of active fuel. This trip

3.2 BASES (cont'd)

initiates the HPCI and RCIC systems and trips the recirculation pumps. The low-low-low reactor water level instrumentation is set to trip when the water level is 18 in. above the top of active fuel. This trip activates the remainder of the ECCS subsystems, closes the main steam isolation valves, main steam line drain valves and reactor water sample line isolation valves, and starts the emergency diesel generators. These trip level settings were chosen to be high enough to prevent spurious actuation but low enough to initiate ECCS operation and primary system isolation so that post-accident cooling can be accomplished and the guidelines of 10 CFR 100 will not be exceeded. For large breaks up to the complete circumferential break of a 24 in. recirculation line and with the trip setting given above, ECCS initiation and primary system isolation are initiated in time to meet the above criteria. Reference paragraph 6.5.3.1 of the updated FSAR.

The high drywell pressure instrumentation is a diverse signal for malfunctions to the water level instrumentation and in addition to initiating ECCS, it causes isolation of Groups B and C isolation valves. For the breaks discussed above, this instrumentation will generally initiate ECCS operation before the low-low-low water level instrumentation; thus the results given above are applicable here also. Details of the isolation valve closure group are given in Section 7.3 of the updated FSAR. The water level instrumentation initiates protection for the full spectrum of loss-of-coolant accidents.

Venturis are provided in the main steam lines as a means of measuring steam flow and also limiting the loss of mass inventory from the vessel during a steam line break accident. The primary function of the instrumentation is to detect a break in the main steam line. For the worst case accident, main steam line break outside the drywell, a trip setting of 140 percent of rated steam flow in conjunction with the flow limiters and main steam line valve closure, limits the mass inventory loss such that fuel is not uncovered, fuel temperature peak at approximately 1,000°F and release of radioactivity to the environs is below 10 CFR 100 guidelines. Reference Section 14.6.5 of the updated FSAR.

The main steam line high temperature isolation function utilizes 16 sensors (instrument channels), with 4 sensors located at each of 4 different areas in the vicinity of the main steam lines. The 4 instrument channels associated with each of the 4 areas are arranged in a 1-out-of-2-taken-twice logic. Thus a main steam line break in any of the 4 areas will effect closure of all 8 main steam line isolation valves.

3.2 BASES (cont'd)

High radiation monitors in the area of the main steam lines have been provided to detect gross fuel failure as in the control rod drop accident. A trip setting of 3 times normal full-power background is established to close the main steam line drain valves, the recirculation loop sample valves, the mechanical vacuum pump isolation valves, and trip the pumps, to limit fission product release. For changes in the Hydrogen Water Chemistry hydrogen injection rate, the trip setpoint may be adjusted based on a calculated value of the expected radiation level. Hydrogen addition will result in an increase in the N-16 carryover in the main steam.

Pressure instrumentation is provided to close the main steam isolation valves in the run mode when the main steam line pressure drops below 825 psig. The reactor pressure vessel thermal transient due to an inadvertent opening of the turbine bypass valves when not in the run mode is less severe than the loss of feedwater analyzed in Section 14.5 of the FSAR, therefore, closure of the main steam isolation valves for thermal transient protection when not in the run mode is not required.

The HPCI high flow and temperature instrumentation are provided to detect a break in the HPCI steam piping. Tripping of this instrumentation results in actuation of HPCI isolation valves. Tripping logic for the high flow is a 1 out of 2 logic. The trip settings of approximately 300 percent of design flow for this high flow or 40°F above maximum ambient for high temperature are such that uncovering the core is prevented and fission product release is within limits.

The RCIC high flow and temperature instrumentation are arranged the same as that for the HPCI. The trip settings of approximately 300 percent for high flow or 40°F above maximum ambient for temperature are based on the same criteria as the HPCI.

The HPCI high temperature isolation function utilizes 16 sensors (instrument channels) located in the vicinity of the HPCI equipment and piping. The 16 instrument channels provide inputs into two trip systems, eight instrument channels per trip system. One trip system is associated with the inboard isolation valve and the other trip system is associated with the outboard isolation valves. Trip logic for each trip system is one-out-of-eight-taken-once logic for the high temperature isolation function. The logic for the RCIC high temperature isolation function is the same as the HPCI logic, except 8 instrument channels, 4 per trip system provide input to the high temperature isolation logic circuits.

The reactor water cleanup system high temperature instrumentation are arranged similar to that for the HPCI. The trip settings are such that uncovering the core is prevented and fission product release is within limits.

The instrumentation which initiates ECCS action is arranged in a dual bus system. As for other vital instrumentation arranged in this fashion, the specification preserves the effectiveness of the system even during periods when maintenance or testing is being performed. An exception to this is when logic functional testing is being performed.

The control rod block functions are provided to prevent excessive control rod withdrawal so that MCPR does not decrease to the Safety Limit. The trip

4.2 BASES

The instrumentation listed in Tables 4.2-1 through 4.2-8 will be functionally tested and calibrated at regularly scheduled intervals. The same design reliability goal as the Reactor Protection System is generally applied. Sensors, trip devices and power supplies are tested, calibrated and checked at the same frequency as comparable devices in the Reactor Protection System.

The surveillance test interval for the instrumentation channel functional tests are once/three months for most instrumentation. This surveillance interval is based on the following NRC approved licensing topical reports:

1. GE Topical Report NEDC-30851P-A, "Technical Specification Improvement Analysis for BWR Reactor Protection System," March 1988.
2. GE Topical Report NEDC-30851P-A, Supplement 1 "Technical Specification Improvement Analysis for BWR Control Rod Block Instrumentation," October 1988.
3. GE Topical Report NEDC-30851P-A, Supplement 2 "Technical Specification Improvement Analysis for BWR Isolation Instrumentation Common to RPS and ECCS Instrumentation," July 1986.
4. GE Topical Report NEDC-31677P-A, "Technical Specification Improvement Analysis for BWR Isolation Actuation Instrumentation, " July 1990.
5. GE Topical Report NEDC-30936P-A, Parts 1 and 2, "BWR Owners Group Technical Specification Improvement Methodology (With Demonstration for BWR ECCS Actuation Instrumentation)," December 1988.
6. GE Topical Report GENE-770-06-1-A, "Bases for Changes to Surveillance Test Intervals and Allowed Out-Of-Service Times For Selected Instrumentation Technical Specifications," December 1992.
7. GE Topical Report GENE-770-06-2-A, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-Of-Service Times For Selected Instrumentation Technical Specifications," December 1992.

The measurement of the response time interval for the Main Steam Isolation Valve (MSIV) isolation actuation instrumentation begins when the monitored parameter exceeds the isolation actuation setpoint at the channel sensor and ends when the MSIV pilot solenoid relay contacts open. With the exception of the MSIVs, response time testing is not required for any other primary containment isolation actuation instrumentation. The safety analyses results are not sensitive to individual sensor response times of the logic systems to which the sensors are connected for isolation actuation instrumentation

TABLE 3.2-1
PRIMARY CONTAINMENT ISOLATION SYSTEM INSTRUMENTATION REQUIREMENTS

Minimum No. of Operable Instrument Channels Per Trip System (Notes 1 and 2)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided by Design for Both Trip Systems	Action (Note 3)
2	Reactor Low Water Level (Notes 4 & 7)	≥ 177 in. above TAF	4	A
2	Reactor Low Water Level (Notes 7 & 8)	≥ 177 in. above TAF	2	A
1	Reactor High Pressure (Shutdown Cooling Isolation)	≤ 75 psig	2	D
2	Reactor Low-Low-Low Water Level	≥ 18 in. above the TAF	4	A
2	Drywell High Pressure (Notes 4 & 7)	≤ 2.7 psig	4	A
2	Drywell High Pressure (Notes 7 & 8)	≤ 2.7 psig	2	A
2	Main Steam Line Tunnel High Radiation	≤ 3 x Normal Rated Full Power Background	4	E
2	Main Steam Line Low Pressure (Note 5)	≥ 825 psig	4	B
2	Main Steam Line High Flow	≤ 140% of Rated Steam Flow	4	G
8	Main Steam Line Leak Detection High Temperature	≤ 40°F above max ambient	16	B
4	Reactor Water Cleanup System Equipment Area High Temperature	≤ 40°F above max ambient	8	C
2	Condenser Low Vacuum (Note 6)	≥ 8" Hg. Vac	4	B

TABLE 3.2-1 (Cont'd)

PRIMARY CONTAINMENT ISOLATION SYSTEM INSTRUMENTATION REQUIREMENTS

Minimum No. of Operable Instrument Channels Per Trip System (Note 1 and 2)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided by Design for Both Trip Systems	Action (Note 3)
1	HPCI Turbine Steam Line High Flow	$\leq$ 160 in H_2O dp	2	F
1	HPCI Steam Line Low Pressure	100 > P > 50 psig	2	F
1	HPCI Turbine High Exhaust Diaphragm Pressure	$\leq$ 10 psig	2	F
8	HPCI Steam Line/ Area Temperature	$\leq$ 40°F above max. ambient	16	F
1	RCIC Turbine Steam Line High Flow	$\leq$ 282 in H_2O dp	2	F
1	RCIC Steam Line Low Pressure	100 > P > 50 psig	2	F
1	RCIC Turbine High Exhaust Diaphragm Pressure	$\leq$ 10 psig	2	F
4	RCIC Steam Line/ Area Temperature	$\leq$ 40°F above max. ambient	8	F

TABLE 3.2-1 (Cont'd)

PRIMARY CONTAINMENT ISOLATION SYSTEM INSTRUMENTATION REQUIREMENTS

NOTES FOR TABLE 3.2-1

1. Whenever Primary Containment integrity is required by Specification 3.7.A.2, there shall be two operable or tripped trip systems for each Trip Function, except as provided for below:

   a. For each Trip Function with one less than the required minimum number of operable instrument channels, place the inoperable instrument channel and/or its associated trip system in the tripped condition* within:

      1) 12 hours for trip functions common to RPS instrumentation, and

      2) 24 hours for trip functions not common to RPS instrumentation,

      or, initiate the ACTION required by Table 3.2-1 for the affected trip function.

   b. For each Trip Function with two or more channels less than the required minimum number of operable instrument channels:

      1) Within one hour, verify sufficient instrument channels remain operable or tripped* to maintain trip capability in the Trip Function, and

      2) Within 6 hours, place the inoperable instrument channel(s) in one trip system and/or that trip system** in the tripped condition*, and

      3) Restore the inoperable instrument channel(s) in the other trip system to an operable status, or place the inoperable instrument channel(s) in the trip system and/or that trip system in the tripped condition* within:

         (a) 12 hours for trip functions common to RPS instrumentation, and

         (b) 24 hours for trip functions not common to RPS instrumentation.

      If any of these three conditions cannot be satisfied, initiate the ACTION required by Table 3.2-1 for the affected Trip Function.

      Asterisk shown on next page

TABLE 3.2-1 (Cont'd)

PRIMARY CONTAINMENT ISOLATION SYSTEM INSTRUMENTATION REQUIREMENTS

NOTES FOR TABLE 3.2-1 (cont'd)

* An inoperable instrument channel or trip system need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, if the inoperable instrument channel is not restored to operable status within the required time, the ACTION required by Table 3.2-1 for that Trip Function shall be taken.

** This action applies to that trip system with the greatest number of inoperable instrument channels. If both systems have the same number of inoperable instrument channels, the ACTION can be applied to either trip system.

2. When a channel, and/or the affected primary containment isolation valve, is placed in an inoperable status solely for performance of required instrumentation surveillances, entry into associated Limiting Conditions for Operation and required actions may be delayed as follows:

   a) for up to 6 hours for Trip Functions utilizing a two-out-of-two-taken-once logic; or

   b) for up to 6 hours for the remaining Trip Functions provided the associated Trip Function maintains PCIS initiation capability for at least one containment isolation valve in the affected penetration.

3. Actions:

   A. Place the reactor in the cold condition within 24 hours.
   B. Isolate the main steam lines within eight hours.
   C. Isolate Reactor Water Cleanup System within four hours.
   D. Isolate shutdown cooling within four hours.
   E. Isolate the main steam line drain valves, the recirculation loop sample valves, and the mechanical vacuum pump, within eight hours.
   F. Isolate the affected penetration flow path(s) within one hour and declare the affected system inoperable.
   G. Isolate the affected main steam line within eight hours.

TABLE 3.2-1 (Cont'd)

PRIMARY CONTAINMENT ISOLATION SYSTEM INSTRUMENTATION REQUIREMENTS

NOTES FOR TABLE 3.2-1 (cont'd)

4. These signals also start SGTS and initiate secondary containment isolation.

5. Only required in run mode (interlocked with Mode Switch).

6. Only required in the run mode and turbine stop valves are open.

7. Instrumentation common to RPS.

8. Trip Function utilizes a two-out-of-two-taken-once logic for isolation of both primary containment isolation valves on the hydrogen and oxygen sample, and gaseous and particulate sample supply and return lines.

TABLE 3.2-2

CORE AND CONTAINMENT COOLING SYSTEM INITIATION AND CONTROL INSTRUMENTATION OPERABILITY REQUIREMENTS

Item No.	Minimum No. of Operable Instrument Channels Per Trip System (Notes 1 and 2)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided by Design for Both Trip Systems	Remarks
1	2	Reactor Low-Low Water Level	≥ 126.5 in. above TAF	4 (HPCI & RCIC)	Initiates HPCI, RCIC, and SGTS.
2	2	Reactor Low-Low-Low Water Level	≥ 18 in. above TAF	4 (Core Spray & RHR)	Initiates Core Spray, RHR (LPCI), and Emergency Diesel Generators.
				4 (ADS)	Initiates ADS (if not inhibited by ADS override switches), in conjunction with Confirmatory Low Level, 120 second delay and RHR (LPCI) or Core Spray pump discharge pressure interlock.
3	2	Reactor High Water Level	≤ 222.5 in. above TAF	2 (Note 8)	Trips HPCI turbine.
4	2	Reactor High Water Level	≤ 222.5 in. above TAF	2 (Note 8)	Closes RCIC steam suppply valve.
5	1 (Note 9)	Reactor Low Level (inside shroud)	≥ 0 in. above TAF	2	Prevents inadvertent operation of containment spray during accident condition.
6	2	Containment High Pressure	1 < p < 2.7 psig	4	Prevents inadvertent operation of containment spray during accident condition.

TABLE 3.2-2 (Cont'd)

CORE AND CONTAINMENT COOLING SYSTEM INITIATION AND CONTROL INSTRUMENTATION OPERABILITY REQUIREMENTS

Item No.	Minimum No. of Operable Instrument Channels Per Trip System (Notes 1 and 2)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided by Design for Both Trip Systems	Remarks
7	1 (Note 9)	Reactor Low Level	$\geq$ 177 in. above TAF	2	Confirmatory low water level for ADS actuation.
8	2	Drywell High Pressure	$\leq$ 2.7 psig	4	Initiates Core Spray, RHR (LPCI), HPCI and SGTS.
9	2	Reactor Low Pressure	$\geq$ 450 psig	4	Permits opening Core Spray and RHR (LPCI) injection valves.
10	1 (Note 9)	Reactor Low Pressure	$50 \leq p \leq 75$ psig	2	Permits closure of RHR (LPCI) injection valves while in shutdown cooling in conjunction with PCIS signal.
11	1 (Notes 3 & 9)	Core Spray Pump Start Timer (each loop)	11 $\pm$ 0.6 sec.	1 (Note 8)	Initiates starting of core spray pump. (each loop)
12	1 (Notes 3 & 9)	RHR (LPCI) Pump Start Timer			
		1st Pump (A Loop)	1.0 + 0.5 (-) 0 sec.	1 (Note 8)	Starts 1st Pump (A Loop)
		1st Pump (B Loop)	1.0 + 0.5 (-) 0 sec.	1 (Note 8)	Starts 1st Pump (B Loop)
		2nd Pump (A Loop)	6.0 $\pm$ 0.5 sec.	1 (Note 8)	Starts 2nd Pump (A Loop)
		2nd Pump (B Loop)	6.0 $\pm$ 0.5 sec.	1 (Note 8)	Starts 2nd Pump (B Loop)

TABLE 3.2-2 (Cont'd)

CORE AND CONTAINMENT COOLING SYSTEM INITIATION AND CONTROL INSTRUMENTATION OPERABILITY REQUIREMENTS

Item No.	Minimum No. of Operable Instrument Channels Per Trip System (Notes 1 and 2)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided by Design for Both Trip Systems	Remarks
13	1 (Note 9)	Auto Blowdown Timer	120 sec. $\pm$ 5 sec.	2	Initiates ADS (if not inhibited by ADS override switches).
14	4	RHR (LPCI) Pump Discharge Pressure Interlock	125 psig $\pm$ 20 psig	8	Permits ADS actuation.
15	2	Core Spray Pump Discharge Pressure Interlock	100 psig $\pm$ 10 psig	4	Permits ADS actuation.
16	1 (Note 9)	RHR (LPCI) Trip System Bus Power Monitor	Loss of Voltage	2	Monitors availability of power to logic systems.
17	1 (Note 9)	Core Spray Trip System Bus Power Monitor	Loss of Voltage	2	Monitors availability of power to logic systems.

TABLE 3.2-2 (cont'd)

CORE AND CONTAINMENT COOLING SYSTEM INITIATION AND CONTROL INSTRUMENTATION OPERABILITY REQUIREMENTS

Item No.	Minimum No. of Operable Instrument Channels Per Trip System (Notes 1 and 2)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided by Design for Both Trip Systems	Remarks
18	1 (Note 9)	ADS Trip System Bus Power Monitor	Loss of Voltage	2	Monitors availability of power to logic systems.
19	1 (Note 9)	HPCI Trip System Bus Power Monitor	Loss of Voltage	2	Monitors availability of power to logic systems.
20	1 (Note 9)	RCIC Trip System Bus Power Monitor	Loss of Voltage	2	Monitors availability of power to logic systems.
21	1 (Note 9)	Core Spray Sparger to Reactor Pressure Vessel d/p	$\leq$ 0.5 psid	2	Alarms to indicate Core Spray sparger pipe break.
22	2	Condensate Storage Tank Low Level	$\geq$ 59.5 in. above tank bottom (= 15,600 gal. avail)	2 (Note 8)	Transfers RCIC pump suction to suppression chamber.
23	2	Condensate Storage Tank Low Level	$\geq$ 59.5 in. above tank bottom (=15,600 gal avail)	2 (Note 8)	Transfers HPCI pump suction to suppression chamber.
24	2	Suppression Chamber High Level	$\leq$ 6 in. above normal level	2 (Note 8)	Transfers HPCI pump suction to suppression chamber.
25	1 (Note 9)	LPCI Cross-Connect Valve Position	NA	1 (Note 8)	Alarms when valve is not closed.

TABLE 3.2-2 (cont'd)

CORE AND CONTAINMENT COOLING SYSTEM INITIATION AND CONTROL INSTRUMENTATION OPERABILITY REQUIREMENTS

Item No.	Minimum No. of Operable Instrument Channels Per Trip System (Notes 1 and 2)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided by Design for Both Trip Systems	Remarks
26	(1 per 4kV bus) (Note 9)	4kV Emergency Bus Undervoltage Relay (Degraded Voltage)	110.6 ± 1.2 secondary volts	2	Initiates both 4kV Emergency Bus Undervoltage Timers. (Degraded Voltage LOCA and non-LOCA) (Notes 4 and 6)
27	(1 per 4kV bus) (Note 9)	4kV Emergency Bus Undervoltage Timer (Degraded Voltage LOCA)	9.0 ± 1.0 sec.	2	(Note 5)
28	(1 per 4kV bus) (Note 9)	4kV Emergency Bus Undervoltage Timer (Degraded Voltage non-LOCA)	45 ± 5.0 sec.	2	(Note 5)
29	(1 per 4kV bus) (Note 9)	4kV Emergency Bus Undervoltage Relay (Loss of Voltage)	85 ± 4.25 secondary volts	2	Initiates 4kV Emergency Bus Undervoltage Loss of Voltage Timer. (Notes 4 and 7)
30	(1 per 4kV bus) (Note 9)	4kV Emergency Bus Undervoltage Timer (Loss of Voltage)	2.50 ± 0.05 sec.	2	(Note 5)
31	2	Reactor Low Pressure	285 to 335 psig	4	Permits closure of recirculation pump discharge valve.

TABLE 3.2-2 (Cont'd)

CORE AND CONTAINMENT COOLING SYSTEM INITIATION AND CONTROL INSTRUMENTATION OPERABILITY REQUIREMENTS

NOTES FOR TABLE 3.2-2

1. Whenever any ECCS subsystem is required by Specification 3.5 to be operable, there shall be two operable or tripped trip systems (or in the case of single trip system instrument logics, one operable trip system), except as provided for below:

   a. For each Trip Function with one less than the required minimum number of operable instrument channels, place the inoperable instrument channel in the tripped condition* within 24 hours. Otherwise, declare the associated ECCS inoperable.

   b. For each Trip Function with two or more channels less than the required minimum number of operable instrument channels:

      1) Within one hour, verify sufficient instrument channels remain operable or tripped* to maintain trip capability in the Trip Function, and

      2) Within 6 hours, place the inoperable instrument channel(s) in one trip system** in the tripped condition*, and

      3) Within 24 hours, restore the inoperable instrument channel in the other trip system to an operable status.

      If any of these three conditions cannot be satisfied, declare the associated ECCS inoperable.

   * An inoperable instrument channel need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, if the inoperable instrument channel is not restored to operable status within the required time, declare the associated ECCS inoperable.

   ** This action applies to that trip system with the greatest number of inoperable instrument channels. If both systems have the same number of inoperable instrument channels, the ACTION can be applied to either trip system.

2. When a channel is placed in an inoperable status solely for performance of required surveillances, entry into associated Limiting Conditions For Operation and required actions may be delayed as follows: (a) for up to 6 hours for single channel Trip Functions; or (b) for up to 6 hours for the remaining Trip Functions provided the associated Trip Function maintains ECCS initiation capability.

Table 3.2-2 (Cont'd)

CORE AND CONTAINMENT COOLING SYSTEM INITIATION AND CONTROL INSTRUMENTATION OPERABILITY REQUIREMENTS

3. Refer to Technical Specification 3.5 for Limiting Conditions for Operation. Failure of one (1) instrument channel disables automatic initiation of one (1) pump.

4. Tripping of 2 out of 2 sensors is required for an undervoltage trip. With one operable sensor, operation may continue with the inoperable sensor in the tripped condition.

5. The 4kV Emergency Bus Undervoltage Timers (degraded voltage LOCA, degraded voltage non-LOCA, and loss-of-voltage) initiate the following: starts the Emergency Diesel-Generators; trips the normal/reserve tie breakers and trips all 4kV motor breakers (in conjunction with 75 percent Emergency Diesel-Generator voltages); initiates diesel-generator breaker close permissive (in conjunction with 90 percent Emergency Diesel-Generator voltages) and; initiates sequential starting of vital loads in conjunction with low-low-low reactor water level or high drywell pressure.

6. A secondary voltage of 110.6 volts corresponds to approximately 93% of 4160 volts on the bus.

7. A secondary voltage of 85 volts corresponds to approximately 71.5% of 4160 volts on the bus.

8. Only one trip system.

9. Single channel trip systems.

TABLE 3.2-3

CONTROL ROD BLOCK INSTRUMENTATION REQUIREMENTS

Minimum No. of Operable Instrument Channels Per Trip Function (Notes 1 and 3)	Trip Function	Trip Level Setting	Total Number of Instrument Channels Provided By Design	Action (Note 2)
4	APRM Flow Referenced Neutron Flux	(Note 9)	6	A
4	APRM Neutron Flux-Start-up	$\leq$ 12%	6	A
4	APRM Downscale	$\geq$ 2.5 indicated on scale	6	A
2 (Note 7)	Rod Block Monitor (Flow Biased)	(Note 9)	2	B
2 (Note 7)	Rod Block Monitor (Downscale)	$\geq$ 2.5 indicated on scale	2	B
6	IRM Detector not in Start-up Position	(Note 8)	8	A
6	IRM Upscale	$\leq$ 86.4% (108/125) of full scale	8	A
6	IRM Downscale (Note 4)	$\geq$ 2% (2.5/125) of full scale	8	A
3	SRM Detector not in Start-up Position	(Note 5)	4	A
3 (Note 6)	SRM Upscale	$\leq 10^5$ counts/sec	4	A
2	Scram Discharge Instrument Volume High Water Level	$\leq$ 26.0 gallons per instrument volume	2	C (Note 10)

TABLE 3.2-3 (Cont'd)

CONTROL ROD BLOCK INSTRUMENTATION REQUIREMENTS

NOTES FOR TABLE 3.2-3

1. The trip functions shall be operable in the Startup and Run modes except as follows:

   a) SRM and IRM: Startup mode only.
   b) RBM: Run mode and ≥ 30% reactor power only.
   c) APRM Neutron Flux-Startup: Startup mode only.
   d) APRM Flow Referenced Neutron Flux: Run mode only.

2. Actions:

   Action A: If the number of operable instrument channels is:

   a) one less than the required minimum number of operable instrument channels per trip function, restore the inoperable instrument channel to operable status within 7 days, or place the inoperable instrument channel in the tripped condition within the next hour.

   b) two or more channels less than the required minimum number of operable instrument channels per trip function, place at least one inoperable instrument channel in the tripped condition within one hour.

   Action B: If the number of operable instrument channels is:

   a) one less than the required minimum number of operable instrument channels per trip function, verify that the reactor is not operating on a Limiting Control Rod Pattern, and within 7 days restore the inoperable instrument channel to operable status; otherwise, place the inoperable instrument channel in the tripped condition within the next hour. See Specification 3.3.B.5.

   b) two channels less than the required minimum number of operable instrument channels per trip function, place at least one inoperable instrument channel in the tripped condition within one hour. See Specification 3.3.B.5.

   Action C:

   If the number of operable instrument channels is less than the required minimum number of operable instrument channels per trip function, place the inoperable instrument channel in the tripped condition within 12 hours.

Table 3.2-3 (Cont'd)

CONTROL ROD BLOCK INSTRUMENTATION REQUIREMENTS

NOTES FOR TABLE 3.2-3 (Cont'd)

3. When a channel is placed in an inoperable status solely for performance of required surveillances, entry into associated Limiting Conditions for Operation and required actions may be delayed for up to 6 hours provided the associated Trip Function maintains CRB initiation capability.

4. IRM downscale is bypassed when it is on its lowest range.

5. This function is bypassed when the count rate is $\geq$ 100 cps.

6. This SRM Function is bypassed when the IRM range switches are on range 8 or above.

7. RBM is required when reactor power is greater than or equal to 30%.

8. This function is bypassed when the Mode Switch is placed in Run.

9. The APRM Flow Referenced Neutron Flux and Rod Block Monitor trip level setpoint shall be less than or equal to the limit specified in the Core Operating Limits Report.

10. When the reactor is subcritical and the reactor water temperature is less than 212°F, the control rod block is required to be operable only if any control rod in a control cell containing fuel is not fully inserted.

TABLE 3.2-7

ATWS RECIRCULATION PUMP TRIP INSTRUMENTATION REQUIREMENTS

Minimum Number of Operable Instrument Channels Per Trip System (Notes 1 & 2)	Trip Function	Trip Level Setting	Applicable Modes
2	Reactor Pressure - High	$\leq$ 1120 psig	Run
2	Reactor Water Level - Low Low	$\geq$ 126.5 in. above TAF	Run

NOTES FOR TABLE 3.2-7

See next page for Notes 1 and 2.

TABLE 3.2-7 (cont'd)

ATWS RECIRCULATION PUMP TRIP INSTRUMENTATION REQUIREMENTS

NOTES FOR TABLE 3.2-7

1. There shall be two operable or tripped trip systems for each Trip Function, except as provided for below:

   a. For each Trip Function with one less than the required minimum number of operable instrument channels, place the inoperable instrument channel and/or its associated trip system in the tripped condition* within 72 hours. Otherwise, place the reactor in the start-up/hot standby mode within the next 6 hours.

   b. For each Trip Function with two or more channels less than the required minimum number of operable instrument channels:

      1) Within one hour, verify sufficient instrument channels remain operable or tripped* to maintain trip capability in the Trip Function, and

      2) Within 6 hours, place the inoperable instrument channel(s) in one trip system and/or that trip system** in the tripped condition*, and

      3) Within 24 hours, restore the inoperable instrument channel in the other trip system to an operable status.

   If any of these three conditions cannot be satisfied, place the reactor in the start-up/hot standby mode within the next 6 hours.

   * An inoperable instrument channel or trip system need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, if the inoperable instrument channel is not restored to operable status within the required time, place the reactor in the start-up/hot standby mode within the next 6 hours.

   ** This action applies to that trip system with the greatest number of inoperable instrument channels. If both systems have the same number of inoperable instrument channels, the ACTION can be applied to either trip system.

2. When a channel is placed in an inoperable status solely for performance of required surveillances, entry into associated Limiting Conditions for Operation and required actions may be delayed for up to 6 hours provided the associated Trip Function maintains ATWS RPT initiation capability.

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TABLE 4.2-1

PRIMARY CONTAINMENT ISOLATION SYSTEM INSTRUMENTATION TEST AND CALIBRATION REQUIREMENTS

	Instrument Channel (Note 8)	Instrument Functional Test	Calibration Frequency	Instrument Check (Note 4)
1)	Reactor High Pressure (Shutdown Cooling Isolation)	Q	Q	NA
2)	Reactor Low-Low-Low Water Level	Q (Note 5)	R (Note 15)	D
3)	Main Steam High Temperature	Q (Note 5)	R (Note 15)	D
4)	Main Steam High Flow	Q (Note 5)	R (Note 15)	D
5)	Main Steam Low Pressure	Q (Note 5)	R (Note 15)	D
6)	RWCU Area High Temperature	Q	Q (Note 16)	NA
7)	Condenser Low Vacuum	Q (Note 5)	R (Note 15)	D
8)	Main Steam Line High Radiation	Q (Note 5)	Q/R (Note 11)	D
9)	HPCI & RCIC Steam Line High Flow	Q (Note 5)	R (Note 15)	D
10)	HPCI & RCIC Steam Line/ Area High Temperature	Q (Note 5)	R (Note 15)	D
11)	HPCI & RCIC Steam Line Low Pressure	Q (Note 5)	R (Note 15)	D
12)	HPCI & RCIC High Exhaust Diaphragm Pressure	Q	Q	NA

NOTE: See notes following Table 4.2-5.

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TABLE 4.2-1 (Cont'd)

PRIMARY CONTAINMENT ISOLATION SYSTEM INSTRUMENTATION TEST AND CALIBRATION REQUIREMENTS

Logic System Functional Test (Notes 7 & 9)	Frequency
1) Main Steam Line Isolation Valves Main Steam Line Drain Valves Reactor Water Sample Valves	SA
2) RHR - Isolation Valve Control Shutdown Cooling Valves	SA
3) Reactor Water Cleanup Isolation	SA
4) Drywell Isolation Valves TIP Withdrawal Atmospheric Control Valves	SA
5) Standby Gas Treatment System Reactor Building Isolation	SA
6) HPCI Subsystem Auto Isolation	SA
7) RCIC Subsystem Auto Isolation	SA

NOTE: See notes following Table 4.2-5.

TABLE 4.2-2

CORE AND CONTAINMENT COOLING SYSTEM INSTRUMENTATION TEST AND CALIBRATION REQUIREMENTS

	Instrument Channel	Instrument Functional Test	Calibration Frequency	Instrument Check (Note 4)
1)	Reactor Water Level	Q (Note 5)	SA / R (Note 15)	D
2a)	Drywell Pressure (non-ATTS)	Q	Q	NA
2b)	Drywell Pressure (ATTS)	Q (Note 5)	SA / R (Note 15)	D
3a)	Reactor Pressure (non-ATTS)	Q	Q	NA
3b)	Reactor Pressure (ATTS)	Q (Note 5)	SA / R (Note 15)	D
4)	Auto Sequencing Timers	NA	R	NA
5)	ADS - LPCI or CS Pump Disch.	Q	Q	NA
6)	Trip System Bus Power Monitors	Q	NA	NA
7)	Core Spray Sparger d/p	Q	Q	D
8)	HPCI & RCIC Suction Source Levels	Q	Q	NA
9)	4kV Emergency Bus Under-Voltage (Loss-of-Voltage, Degraded Voltage LOCA and non-LOCA) Relays and Timers.	R	R	NA
10)	LPCI Cross Connect Valve Position	R	NA	NA

NOTE: See notes following Table 4.2-5.

TABLE 4.2-2 (Cont'd)

CORE AND CONTAINMENT COOLING SYSTEM INSTRUMENTATION TEST AND CALIBRATION REQUIREMENTS

	Logic System Functional Test	Frequency
1)	Core Spray Subsystem	SA (Notes 7 & 9)
2)	Low Pressure Coolant Injection Subsystem	SA (Notes 7 & 9)
3)	Containment Cooling Subsystem	SA
4)	HPCI Subsystem	SA (Notes 7 & 9)
5)	ADS Subsystem	SA (Notes 7 & 9)

NOTE: See notes following Table 4.2-5.

TABLE 4.2-3

CONTROL ROD BLOCK INSTRUMENTION
TEST AND CALIBRATION REQUIREMENTS

	Instrument Channel	Instrument Functional Test (Note 5)	Calibration	Instrument Check (Note 4)
1)	APRM - Downscale	Q	Q	D
2)	APRM - Upscale	Q	Q	D
3)	IRM - Upscale	S/U (Note 2)	Q (Notes 3 & 6)	D
4)	IRM - Downscale	S/U (Note 2)	Q (Notes 3 & 6)	D
5)	IRM - Detector Not in Startup Position	S/U (Note 2)	NA	NA
6)	RBM - Upscale	Q	Q	D
7)	RBM - Downscale	Q	Q	D
8)	SRM - Upscale	S/U (Note 2)	Q (Notes 3 & 6)	D
9)	SRM - Detector Not in Startup Position	S/U (Note 2)	NA	NA
10)	Scram Discharge Instrument Volume - High Water Level (Group B Instruments)	Q	Q	D

	Logic System Function Test (Notes 7 & 9)	Frequency
1)	System Logic Check	SA

NOTE: See notes following Table 4.2-5.

NOTES FOR TABLES 4.2-1 THROUGH 4.2-5

1. Initially once every month until acceptance failure rate data are available; thereafter, a request may be made to the NRC to change the test frequency. The compilation of instrument failure rate data may include data obtained from other boiling water reactors for which the same design instruments operate in a environment similar to that of JAFNPP.

2. Functional tests are not required when these instruments are not required to be operable or are tripped. Functional tests shall be performed within seven (7) days prior to each startup.

3. Calibrations are not required when these instruments are not required to be operable or are tripped. Calibration tests shall be performed within seven (7) days prior to each startup or prior to a pre-planned shutdown.

4. Instrument checks are not required when these instruments are not required to be operable or are tripped.

5. This instrumentation is exempt from the functional test definition. The functional test will consist of injecting a simulated electrical signal into the measurement channel.

6. These instrument channels will be calibrated using simulated electrical signals once every three months.

7. Simulated automatic actuation shall be performed once each operating cycle.

8. Reactor low water level, and high drywell pressure are not included on Table 4.2-1 since they are listed on Table 4.1-2.

9. The logic system functional tests shall include a calibration of time delay relays and timers necessary for proper functioning of the trip systems.

10. (Deleted)

11. Perform a calibration once per operating cycle using a radiation source. Perform an instrument channel alignment once every 3 months using the built-in current source.

12. (Deleted)

13. (Deleted)

14. (Deleted)

15. Sensor calibration once per operating cycle. Master/slave trip unit calibration once per 6 months.

16. The quarterly calibration of the temperature sensor consists of comparing the active temperature signal with a redundant temperature signal.

TABLE 4.2-7

ATWS RECIRCULATION PUMP TRIP INSTRUMENTATION TEST AND CALIBRATION REQUIREMENTS

FUNCTION	CHANNEL CHECK	CHANNEL FUNCTIONAL TEST	TRIP UNIT CALIBRATION	CHANNEL CALIBRATION	SIMULATED AUTO ACTUATION & LOGIC FUNCTIONAL TEST
Reactor Pressure-High	D	Q	SA	R	R
Reactor Water Level-Low Low	D	Q	SA	R	R

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7.0 REFERENCES

(1) E. Janssen, "Multi-Rod Burnout at Low Pressure," ASME Paper 62-HT-26, August 1962.

(2) K.M. Backer, "Burnout Conditions for Flow of Boiling Water in Vertical Rod Clusters," AE-74 (Stockholm, Sweden), May 1962.

(3) FSAR Section 11.2.2.

(4) FSAR Section 4.4.3.

(5) I.M. Jacobs, "Reliability of Engineered Safety Features as a Function of Testing Frequency," Nuclear Safety, Vol. 9, No. 4, July-August 1968, pp 310-312.

(6) Deleted

(7) I.M. Jacobs and P.W. Mariott, APED Guidelines for Determining Safe Test Intervals and Repair Times for Engineered Safeguards - April 1969.

(8) Bodega Bay Preliminary Hazards Report, Appendix 1, Docket 50-205, December 28, 1962.

(9) C.H. Robbins, "Tests of a Full Scale 1/48 Segment of the Humbolt Bay Pressure Suppression Containment," GEAP-3596, November 17, 1960.

(10) "Nuclear Safety Program Annual Progress Report for Period Ending December 31, 1966, Progress Report for Period Ending December 31, 1966, ORNL-4071."

(11) Section 5.2 of the FSAR.

(12) TID 20583, "Leakage Characteristics of Steel Containment Vessel and the Analysis of Leakage Rate Determinations."

(13) Technical Safety Guide, "Reactor Containment Leakage Testing and Surveillance Requirements," USAEC, Division of Safety Standards, Revised Draft, December 15, 1966.

(14) Section 14.6 of the FSAR.

(15) ASME Boiler and Pressure Vessel Code, Nuclear Vessels, Section III. Maximum allowable internal pressure is 62 psig.

(16) 10 CFR 50.54, Appendix J, "Reactor Containment Testing Requirements."

(17) 10 CFR 50, Appendix J, February 13, 1973.