

INDEX

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

<u>SECTION</u>	<u>PAGE</u>
3/4.0 APPLICABILITY.....	3/4 0-1
3/4.1 REACTIVITY CONTROL SYSTEMS	
3/4.1.1 SHUTDOWN MARGIN.....	3/4 1-1
3/4.1.2 REACTIVITY ANOMALIES.....	3/4 1-2
3/4.1.3 CONTROL RODS	
Control Rod Operability.....	3/4 1-3
Control Rod Maximum Scram Insertion Times.....	3/4 1-6
Control Rod Average Scram Insertion Times.....	3/4 1-7
Four Control Rod Group Scram Insertion Times.....	3/4 1-8
Control Rod Scram Accumulators.....	3/4 1-9
Control Rod Drive Coupling.....	3/4 1-11
Control Rod Position Indication.....	3/4 1-13
Control Rod Drive Housing Support.....	3/4 1-15
3/4.1.4 CONTROL ROD PROGRAM CONTROLS	
Rod Worth Minimizer.....	3/4 1-16
Rod Sequence Control System.....	3/4 1-17
Rod Block Monitor.....	3/4 1-18
3/4.1.5 STANDBY LIQUID CONTROL SYSTEM.....	3/4 1-19
Figure 3.1.5-1 Sodium Pentaborate Solution Volume/ Concentration Requirements.....	3/4 1-21
3/4.2 POWER DISTRIBUTION LIMITS	
3/4.2.1 AVERAGE PLANAR LINEAR HEAT GENERATION RATE.....	3/4 2-1

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INDEX

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

<u>SECTION</u>	<u>PAGE</u>
3/4.9.11 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION	
High Water Level.....	3/4 9-17
Low Water Level.....	3/4 9-18
<u>3/4.10 SPECIAL TEST EXCEPTIONS</u>	
3/4.10.1 PRIMARY CONTAINMENT INTEGRITY.....	3/4 10-1
3/4.10.2 ROD SEQUENCE CONTROL SYSTEM	3/4 10-2
3/4.10.3 SHUTDOWN MARGIN DEMONSTRATIONS.....	3/4 10-3
3/4.10.4 RECIRCULATION LOOPS.....	3/4 10-4
3/4.10.5 OXYGEN CONCENTRATION.....	3/4 10-5
3/4.10.6 TRAINING STARTUPS.....	3/4 10-6
3/4.10.7 SPECIAL INSTRUMENTATION - INITIAL CORE LOADING.....	3/4 10-7
3/4.10.8 INSERVICE LEAK AND HYDROSTATIC TESTING.....	3/4 10-8
<u>3/4.11 RADIOACTIVE EFFLUENTS</u>	
3/4.11.1 LIQUID EFFLUENTS	
Concentration.....	3/4 11-1
Table 4.11.1.1.1-1 Radioactive Liquid Waste Sampling and Analysis Program...	3/4 11-2
Dose.....	3/4 11-5
Liquid Waste Treatment.....	3/4 11-6
Liquid Holdup Tanks.....	3/4 11-7
3/4.11.2 GASEOUS EFFLUENTS	
Dose Rate.....	3/4 11-8
Table 4.11.2.1.2-1 Radioactive Gaseous Waste Sampling and Analysis Program...	3/4 11-9
Dose - Noble Gases.....	3/4 11-12
Dose - Iodine-131, Iodine-133, Tritium and Radionuclides in Particulate Form.....	3/4 11-13
Gaseous Radwaste Treatment.....	3/4 11-14
Ventilation Exhaust Treatment System.....	3/4 11-15

WORTH MINIMIZER

INDEX

BASES

<u>SECTION</u>	<u>PAGE</u>
<u>3/4.10 SPECIAL TEST EXCEPTIONS</u>	
3/4.10.1 PRIMARY CONTAINMENT INTEGRITY	B 3/4 10-1
3/4.10.2 ROD SEQUENCE CONTROL SYSTEM	B 3/4 10-1
3/4.10.3 SHUTDOWN MARGIN DEMONSTRATIONS	B 3/4 10-1
3/4.10.4 RECIRCULATION LOOPS	B 3/4 10-1
3/4.10.5 OXYGEN CONCENTRATION	B 3/4 10-1
3/4.10.6 TRAINING STARTUPS	B 3/4 10-1
3/4.10.7 SPECIAL INSTRUMENTATION - INITIAL CORE LOADING	B 3/4 10-1
3/4.10.8 INSERVICE LEAK AND HYDROSTATIC TESTING	B 3/4 10-2
<u>3/4.11 RADIOACTIVE EFFLUENTS</u>	
3/4.11.1 LIQUID EFFLUENTS	
Concentration	B 3/4 11-1
Dose	B 3/4 11-1
Liquid Radwaste Treatment System	B 3/4 11-2
Liquid Holdup Tanks	B 3/4 11-2
3/4.11.2 GASEOUS EFFLUENTS	
Dose Rate	B 3/4 11-2
Dose - Noble Gases	B 3/4 11-3
Dose - Iodine-131, Iodine-133, Tritium, and Radionuclides in Particulate Form	B 3/4 11-3
Gaseous Radwaste Treatment System and Ventilation Exhaust Treatment Systems	B 3/4 11-4
Main Condenser	B 3/4 11-5
Venting or Purging	B 3/4 11-5
3/4.11.3 SOLID RADIOACTIVE WASTE TREATMENT	B 3/4 11-5
3/4.11.4 TOTAL DOSE	B 3/4 11-5

WORTH MINIMIZER

2.2 LIMITING SAFETY SYSTEM SETTINGS

BASES

2.2.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

The Reactor Protection System instrumentation setpoints specified in Table 2.2.1-1 are the values at which the reactor trips are set for each parameter. The Trip Setpoints have been selected to ensure that the reactor core and reactor coolant system are prevented from exceeding their Safety Limits during normal operation and design basis anticipated operational occurrences and to assist in mitigating the consequences of accidents. Operation with a trip set less conservative than its Trip Setpoint but within its specified Allowable Value is acceptable on the basis that the difference between each Trip Setpoint and the Allowable Value is an allowance for instrument drift specifically allocated for each trip in the safety analyses.

1. Intermediate Range Monitor, Neutron Flux - High

The IRM system consists of 8 chambers, 4 in each of the reactor trip systems. The IRM is a 5 decade 10 range instrument. The trip setpoint of 120 divisions of scale is active in each of the 10 ranges. Thus as the IRM is ranged up to accommodate the increase in power level, the trip setpoint is also ranged up. The IRM instruments provide for overlap with both the APRM and SRM systems.

The most significant source of reactivity changes during the power increase is due to control rod withdrawal. In order to ensure that the IRM provides the required protection, a range of rod withdrawal accidents have been analyzed. The results of these analyses are in Section 15.4 of the FSAR. The most severe case involves an initial condition in which THERMAL POWER is at approximately 1% of RATED THERMAL POWER. Additional conservatism was taken in this analysis by assuming the IRM channel closest to the control rod being withdrawn is bypassed. The results of this analysis show that the reactor is shutdown and peak power is limited to 21% of RATED THERMAL POWER with the peak fuel enthalpy well below the fuel failure threshold of 170 cal/gm. Based on this analysis, the IRM provides protection against local control rod errors and continuous withdrawal of control rods in sequence and provides backup protection for the APRM.

2. Average Power Range Monitor

For operation at low pressure and low flow during STARTUP, the APRM scram setting of 15% of RATED THERMAL POWER provides adequate thermal margin between the setpoint and the Safety Limits. The margin accommodates the anticipated maneuvers associated with power plant startup. Effects of increasing pressure at zero or low void content are minor and cold water from sources available during startup is not much colder than that already in the system. Temperature coefficients are small and control rod patterns are constrained by the RSCS and RWM. Of all the possible sources of reactivity input, uniform control rod withdrawal is the most probable cause of significant power increase.

REACTIVITY CONTROL SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION (Continued)

2. If the inoperable control rod(s) is inserted, within one hour disarm the associated directional control valves** either:
 - a) Electrically, or
 - b) Hydraulically by closing the drive water and exhaust water isolation valves.Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.
3. The provisions of Specification 3.0.4 are not applicable.
- c. With more than 8 control rods inoperable, be in at least HOT SHUTDOWN within 12 hours.
- d. With one scram discharge volume vent valve and/or one scram discharge volume drain valve inoperable and open, restore the inoperable valve(s) to OPERABLE status within 24 hours or be in at least HOT SHUTDOWN within the next 12 hours.
- e. With any scram discharge volume vent valve(s) and/or any scram discharge volume drain valve(s) otherwise inoperable, restore the inoperable valve(s) to OPERABLE status within 8 hours or be in at least HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.1.3.1.1 The scram discharge volume drain and vent valves shall be demonstrated OPERABLE by:

- a. At least once per 24 hours verifying each valve to be open,* and
- b. At least once per 31 days cycling each valve through at least one complete cycle of full travel.

4.1.3.1.2 *When above the low power setpoint of the RWM and RSCS, all withdrawn control rods not required to have their directional control valves disarmed

*These valves may be closed intermittently for testing under administrative controls.

**May be rearmed intermittently, under administrative control, to permit testing associated with restoring the control rod to OPERABLE status.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD DRIVE COUPLING

LIMITING CONDITION FOR OPERATION

3.1.3.6 All control rods shall be coupled to their drive mechanisms.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2 and 5*.

ACTION:

- a. In OPERATIONAL CONDITION 1 and 2 with one control rod not coupled to its associated drive mechanism, within 2 hours:
 1. If permitted by the RWM ~~and RSCS~~, insert the control rod to accomplish recoupling and verify recoupling by withdrawing the control rod, and:
 - a) Observing any indicated response of the nuclear instrumentation, and
 - b) Demonstrating that the control rod will not go to the overtravel position.
 2. If recoupling is not accomplished on the first attempt or, if not permitted by the RWM ~~or RSCS~~, then until permitted by the RWM ~~and RSCS~~, declare the control rod inoperable, insert the control rod and disarm the associated directional control valves** either:
 - a) Electrically, or
 - b) Hydraulically by closing the drive water and exhaust water isolation valves.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.
- b. In OPERATIONAL CONDITION 5* with a withdrawn control rod not coupled to its associated drive mechanism, within 2 hours either:
 1. Insert the control rod to accomplish recoupling and verify recoupling by withdrawing the control rod and demonstrating that the control rod will not go to the overtravel position, or
 2. If recoupling is not accomplished, insert the control rod and disarm the associated directional control valves** either:
 - a) Electrically, or
 - b) Hydraulically by closing the drive water and exhaust water isolation valves.
- c. The provisions of Specification 3.0.4 are not applicable.

*At least each withdrawn control rod. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

**May be rearmed intermittently, under administrative control, to permit testing associated with restoring the control rod to OPERABLE status.

REACTIVITY CONTROL SYSTEMS

CONTROL ROD POSITION INDICATION

LIMITING CONDITION FOR OPERATION

3.1.3.7 The control rod position indication system shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2 and 5*.

ACTION:

a. In OPERATIONAL CONDITION 1 or 2 with one or more control rod position indicators inoperable, within 1 hour:

1. Determine the position of the control rod by ~~utilizing the RSCS substitute position display within preset power level~~, or:

Using an alternate method

- a) Moving the control rod, by single notch movement, to a position with an OPERABLE position indicator,
- b) Returning the control rod, by single notch movement, to its original position, and
- c) Verifying no control rod drift alarm at least once per 12 hours, or

2. Move the control rod to a position with an OPERABLE position indicator, or

3. When THERMAL POWER is:

a) Within the preset power level of the RSCS, declare the control rod inoperable.

RWM

b) Greater than the preset power level of the RSCS, declare the control rod inoperable, insert the control rod and disarm the associated directional control valves** either:

- 1) Electrically, or
- 2) Hydraulically by closing the drive water and exhaust water isolation valves.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

b. In OPERATIONAL CONDITION 5* with a withdrawn control rod position indicator inoperable, move the control rod to a position with an OPERABLE position indicator or insert the control rod.

c. The provisions of Specification 3.0.4 are not applicable.

*At least each withdrawn control rod. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

**May be rearmed intermittently, under administrative control, to permit testing associated with restoring the control rod to OPERABLE status.

REACTIVITY CONTROL SYSTEMS

3/4.1.4 CONTROL ROD PROGRAM CONTROLS

ROD WORTH MINIMIZER

LIMITING CONDITION FOR OPERATION

3.1.4.1 The rod worth minimizer (RWM) shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2*[#], when THERMAL POWER is less than or equal to 20% of RATED THERMAL POWER, the minimum allowable low power setpoint.

ACTION: ^{10%} after the first 12 control rods are fully withdrawn, operation may continue provided that ^{are verified}

a. With the RWM inoperable, verify control rod movement and compliance with the prescribed control rod pattern by a second licensed operator or other technically qualified member of the unit technical staff who is present at the reactor control console. Otherwise, control rod movement may be only by actuating the manual scram or placing the reactor mode switch in the Shutdown position.

INSERT
A

SURVEILLANCE REQUIREMENTS

4.1.4.1 The RWM shall be demonstrated OPERABLE:

- In OPERATIONAL CONDITION 2 within 8 hours prior to withdrawal of control rods for the purpose of making the reactor critical, and in OPERATIONAL CONDITION 1 within 8 hours prior to RWM automatic initiation when reducing THERMAL POWER, by verifying proper indication of the selection error of at least one out-of-sequence control rod.
- In OPERATIONAL CONDITION 2 within 8 hours prior to withdrawal of control rods for the purpose of making the reactor critical, by verifying the rod block function by demonstrating inability to withdraw an out-of-sequence control rod.
- In OPERATIONAL CONDITION 1 within one hour after RWM automatic initiation when reducing THERMAL POWER, by verifying the rod block function by demonstrating inability to withdraw an out-of-sequence control rod.
- By verifying that the control rod patterns and sequence input to the RWM computer are correctly loaded following any loading of the program into the computer.

* Entry into OPERATIONAL CONDITION 2 and withdrawal of selected control rods is permitted for the purpose of determining the OPERABILITY of the RWM prior to withdrawal of control rods for the purpose of bringing the reactor to criticality.

#See Special Test Exception 3.10.2.

INSERT B

REACTIVITY CONTROL SYSTEMS

ROD SEQUENCE CONTROL SYSTEM

LIMITING CONDITION FOR OPERATION

~~3.1.4.2 The rod sequence control system (RSCS) shall be OPERABLE.~~

~~APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2*[#], when THERMAL POWER is less than or equal to 20% RATED THERMAL POWER, the minimum allowable low power setpoint.~~

ACTION:

- ~~a. With the RSCS inoperable, control rod movement shall not be permitted, except by a scram.~~
- ~~b. With an inoperable control rod(s), OPERABLE control rod movement may continue by bypassing the inoperable control rod(s) in the RSCS provided that:~~
 - ~~1. The position and bypassing of inoperable control rods is verified by a second licensed operator or other technically qualified member of the unit technical staff, and~~
 - ~~2. There are not more than 3 inoperable control rods in any RSCS group.~~

SURVEILLANCE REQUIREMENTS

~~4.1.4.2 The RSCS shall be demonstrated OPERABLE by:~~

- ~~a. Performance of a system diagnostic function:~~
 - ~~1. Within 8 hours prior to each reactor startup, and~~
 - ~~2. Prior to movement of a control rod after rod inhibit mode automatic initiation when reducing THERMAL POWER.~~
- ~~b. Attempting to select and move an inhibited control rod:~~
 - ~~1. After withdrawal of the first insequence control rod for each reactor startup, and~~
 - ~~2. Within one hour after rod inhibit mode automatic initiation when reducing THERMAL POWER.~~

~~*See Special Test Exception 3.10.2~~

~~#Entry into OPERATIONAL CONDITION 2 and withdrawal of selected control rods is permitted for the purpose of determining the OPERABILITY of the RSCS prior to withdrawal of control rods for the purpose of bringing the reactor to criticality.~~

SPECIAL TEST EXCEPTIONS

WORTH MINIMIZER

3/4.10.2 ROD SEQUENCE CONTROL SYSTEM

LIMITING CONDITION FOR OPERATION

3.10.2 The sequence constraints imposed on control rod groups by the rod worth minimizer (RWM) per Specification 3.1.4.1 and by the rod sequence control system (RSCS) per Specification 3.1.4.2 may be suspended by means of bypass switches for the following tests provided that control rod movement prescribed for this testing is verified by a second licensed operator or other technically qualified member of the unit technical staff present at the reactor console:

- Shutdown margin demonstrations, Specification 4.1.1.
- Control rod scram, Specification 4.1.3.2.
- Control rod friction measurements.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2.

When THERMAL POWER is less than or equal to 10% of RATED THERMAL POWER

ACTION:

With the requirements of the above specification not satisfied, verify that the RWM and/or the RSCS is OPERABLE per Specifications 3.1.4.1 and 3.1.4.2, respectively.

SURVEILLANCE REQUIREMENTS

4.10.2 When the sequence constraints imposed by the ~~RSCS and/or~~ RWM are bypassed, verify:

- That movement of the control rods from 75% ROD DENSITY to the ~~RSCS~~ low power setpoint is limited to the approved control rod withdrawal sequence during scram and friction tests.
- That movement of control rods during shutdown margin demonstrations is limited to the prescribed sequence per Specification 3.10.3.
- Conformance with this specification and test procedures by a second licensed operator or other technically qualified member of the unit technical staff.

RWM

REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.4 CONTROL ROD PROGRAM CONTROLS

Control rod withdrawal and insertion sequences are established to assure that the maximum insequence individual control rod or control rod segments which are withdrawn at any time during the fuel cycle could not be worth enough to result in peak fuel enthalpy greater than 280 cal/gm in the event of a control rod drop accident. The specified sequences are characterized by homogeneous, scattered patterns of control rod withdrawal. When THERMAL POWER is greater than ~~20%~~ 10% of RATED THERMAL POWER, there is no possible rod worth which, if dropped at the design rate of the velocity limiter, could result in a peak enthalpy of 280 cal/gm. Thus requiring the ~~RSCS and/or~~ RWM to be OPERABLE when THERMAL POWER is less than or equal to 20% of RATED THERMAL POWER provides adequate control.

The ~~RSCS and~~ RWM provide automatic supervision to assure that out-of-sequence rods will not be withdrawn or inserted.

The analysis of the rod drop accident is presented in Section 15.4.9 of the FSAR and the techniques of the analysis are presented in a topical report, Reference 1, and two supplements, References 2 and 3. ~~INSERT C~~

The RBM is designed to automatically prevent fuel damage in the event of erroneous rod withdrawal from locations of high power density during high power operation. Two channels are provided. Tripping one of the channels will block erroneous rod withdrawal soon enough to prevent fuel damage. This system backs up the written sequence used by the operator for withdrawal of control rods.

REACTIVITY CONTROL SYSTEMS

BASES

rate, solution concentration or boron equivalent to meet the ATWS Rule must not invalidate the original system design basis. Paragraph (c)(4) of 10 CFR 50.62 states that:

"Each boiling water reactor must have a Standby Liquid Control System (SLCS) with a minimum flow capacity and boron control equivalent in control capacity to 86 gallons per minute of 13 weight percent sodium pentaborate solution (natural boron enrichment)."

The described minimum system parameters (82.4 gpm, 13.6 percent concentration and natural boron equivalent) will ensure an equivalent injection capability that exceeds the ATWS Rule requirement. The stated minimum allowable pumping rate of 82.4 gallons per minute is met through the simultaneous operation of both pumps.

1. C. J. Paone, R. C. Stirn and J. A. Woolley, "Rod Drop Accident Analysis for Large BWR's", G. E. Topical Report NEDO-10527, March 1972
2. C. J. Paone, R. C. Stirn and R. M. Young, Supplement 1 to NEDO-10527, July 1972
3. J. M. Haun, C. J. Paone and R. C. Stirn, Addendum 2, "Exposed Cores", Supplement 2 to NEDO-10527, January 1973

← INSERT D

3/4.10 SPECIAL TEST EXCEPTIONS

BASES

3/4.10.1 PRIMARY CONTAINMENT INTEGRITY

The requirement for PRIMARY CONTAINMENT INTEGRITY is not applicable during the period when open vessel tests are being performed during the low power PHYSICS TESTS.

3/4.10.2 ROD ~~SEQUENCE CONTROL SYSTEM~~

WORTH MINIMIZER

In order to perform the tests required in the technical specifications it is necessary to bypass the sequence restraints on control rod movement. The additional surveillance requirements ensure that the specifications on heat generation rates and shutdown margin requirements are not exceeded during the period when these tests are being performed and that individual rod worths do not exceed the values assumed in the safety analysis.

3/4.10.3 SHUTDOWN MARGIN DEMONSTRATIONS

Performance of shutdown margin demonstrations during open vessel testing requires additional restrictions in order to ensure that criticality is properly monitored and controlled. These additional restrictions are specified in this LCO.

3/4.10.4 RECIRCULATION LOOPS

This special test exception permits reactor criticality under no flow conditions and is required to perform certain PHYSICS TESTS while at low THERMAL POWER levels.

3/4.10.5 OXYGEN CONCENTRATION

The material originally contained in this Technical Specification was deleted with the issuance of Amendment No. 35. However, to maintain the historical reference to this specification, this section has been intentionally left blank.

3/4.10.6 TRAINING STARTUPS

This special test exception permits training startups to be performed with the reactor vessel depressurized at low THERMAL POWER and temperature while controlling RCS temperature with one RHR subsystem aligned in the shutdown cooling mode in order to minimize contaminated water discharge to the radioactive waste disposal system.

3/4.10.7 SPECIAL INSTRUMENTATION - INITIAL CORE LOADING

The material originally contained in Bases Section 3/4.10.7 was deleted with the issuance of Amendment No. 14. However, to maintain the historical reference to this section, Bases Section 3/4.10.7 is intentionally left blank.