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INSTRUMENTATION3/4.3.10 NEUTRON FLUX MONITORING INSTRUMENTATIONLIMITING CONDITION FOR OPERATION

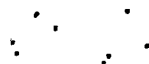
- 3.3.10 The APRM and LPRM* neutron flux noise levels shall not exceed three (3) times their established baseline value.

APPLICABILITY: OPERATIONAL CONDITION 1~~XX~~ ^{DELETE ASTERISKS} with two reactor coolant system recirculation loops in operation with THERMAL POWER greater than the limit specified in Figure 3.3.10-1 and total core flow less than 45% of rated total core flow or with one reactor coolant system recirculation loop not in operation with THERMAL POWER greater than the limit specified in Figure 3.3.10-1.

ACTION: With the APRM or LPRM* neutron flux noise level greater than three (3) times their established baseline noise levels, initiate corrective action within 15 minutes to restore the noise levels to within the required limits within 2 hours or reduce THERMAL POWER to less than or equal to the limit specified in Figure 3.3.10-1 within the next 2 hours.

SURVEILLANCE REQUIREMENTS

- 4.3.10.1 The provisions of Specification 4.0.4 are not applicable.
- 4.3.10.2 With two reactor coolant system recirculation loops in operation, establish a baseline APRM and LPRM* neutron flux noise level value within 2 hours upon entering the APPLICABLE OPERATIONAL CONDITION of Specification 3.3.10 provided that baselining has not been performed since the most recent CORE ALTERATION.
- 4.3.10.3 With one reactor coolant system recirculation loop not in operation, establish a baseline APRM and LPRM* neutron flux noise level value with THERMAL POWER less than or equal to the limit specified in Figure 3.3.10-1 prior to entering the APPLICABLE OPERATIONAL CONDITION of Specification 3.3.10 provided baselining has not been performed with one reactor coolant system recirculation loop not in operation since the most recent CORE ALTERATION.#



SURVEILLANCE REQUIREMENTS

4.3.10.4 The APRM and LPRM* neutron flux noise levels shall be determined to be less than or equal to the limit of Specification 3.3.10 when operating within the APPLICABLE OPERATIONAL CONDITION of Specification 3.3.10:

- a. At least once per 8 hours, and
- b. Within 30 minutes after completion of a THERMAL POWER increase of at least 5% of RATED THERMAL POWER.

*Detector levels A and C of one LPRM string per core octant plus detector levels A and C of one LPRM string in the center of the core should be monitored.

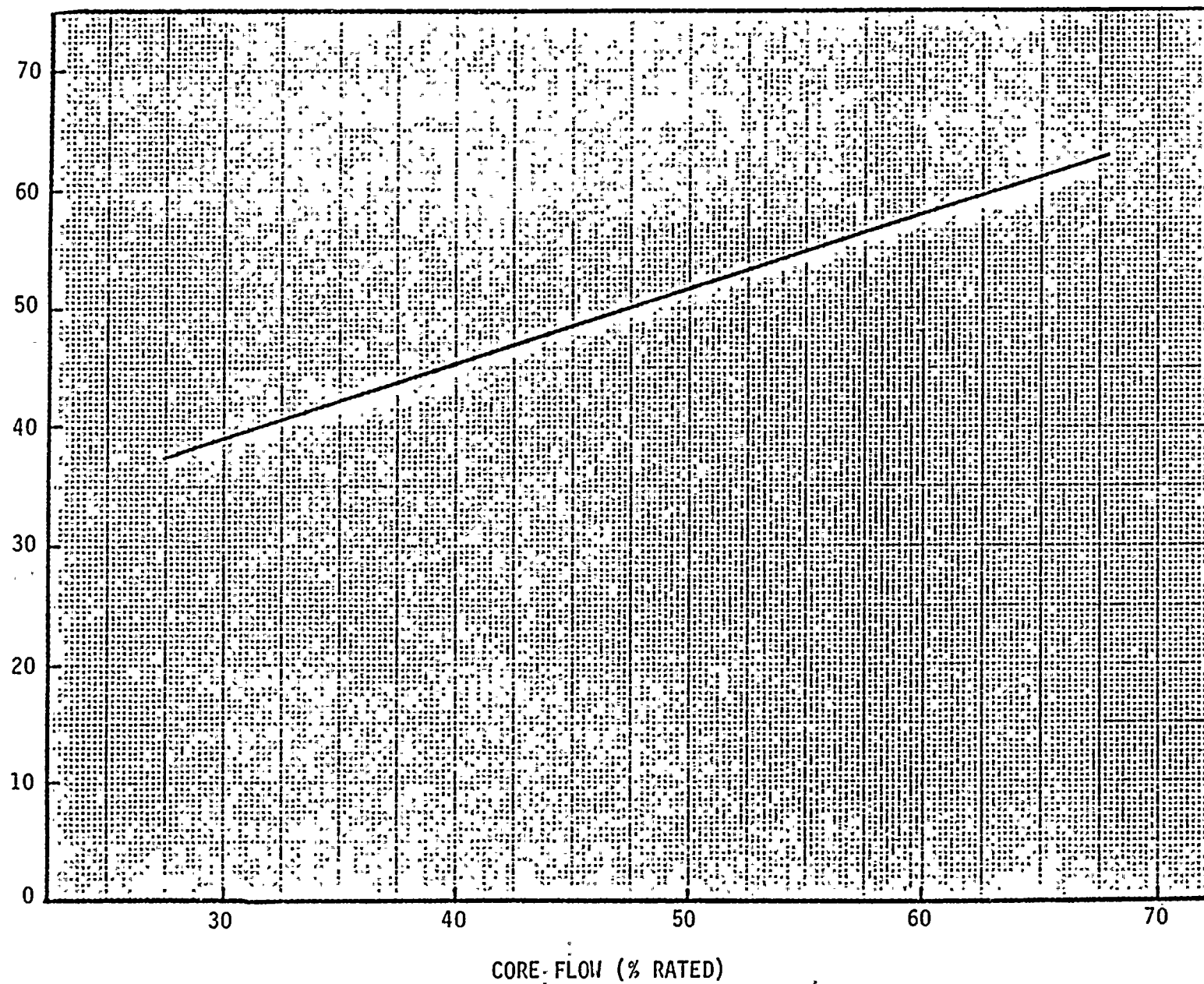
DELETE

~~**See Special Test Exception 3.10.4~~

#The baseline data obtained in Specification 4.3.10.3 is applicable to operation with one reactor coolant system recirculation loop not in operation and THERMAL POWER greater than the limits specified in Figure 3.3.10-1.

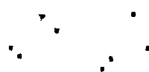
FIGURE 3.3.10-1

THERMAL POWER LIMITS OF SPECIFICATION 3.3.10-1



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INSTRUMENTATION

BASES

MONITORING INSTRUMENTATION (Continued)

3/4.3.7.12 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. This instrumentation also includes provisions for monitoring and controlling the concentrations of potentially explosive gas mixtures in the WASTE GAS HOLDUP SYSTEM. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

3/4.3.8 TURBINE OVERSPEED PROTECTION SYSTEM

This specification is provided to ensure that the turbine overspeed protection system instrumentation and the turbine speed control valves are OPERABLE and will protect the turbine from excessive overspeed. Protection from turbine excessive overspeed is required since excessive overspeed of the turbine could generate potentially damaging missiles which could impact and damage safety-related components, equipment or structures.

3/4.3.9 FEEDWATER SYSTEM/MAIN TURBINE TRIP SYSTEM ACTUATION INSTRUMENTATION

The feedwater system/main turbine trip system actuation instrumentation is provided to initiate the feedwater system/main turbine trip system in the event of reactor vessel water level equal to or greater than the level 8 setpoint associated with a feedwater controller failure.

ADDED → 3/4.3.10 NEUTRON FLUX MONITORING INSTRUMENTATION

At the high power/low flow corner of the operating domain, a small probability of limit cycle neutron flux oscillations exists depending on combinations of operating conditions (e.g., rod patterns, power shape). To provide assurance that neutron flux limit cycle oscillations are detected and suppressed, APRM and LPRM neutron flux noise levels should be monitored while operating in this region.

Stability tests at operating BWRs were reviewed to determine a generic region of the power/flow map in which surveillance of neutron flux noise levels should be performed. A conservative decay ratio of 0.6 was chosen as the bases for determining the generic region for surveillance to account for the plant to plant variability of decay ratio with core and fuel designs. This generic region has been determined to correspond to a core flow of less than or equal to 45% of rated core flow and a thermal power greater than that specified in Figure 3.4.1.1-1 (Reference).



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INSTRUMENTATION

BASES

MONITORING INSTRUMENTATION (Continued)

NEUTRON FLUX MONITORING INSTRUMENTATION (Continued)

Neutron flux noise limits are also established to ensure early detection of limit cycle neutron flux oscillations. BWR cores typically operate with neutron flux noise caused by random boiling and flow noise. Typical neutron flux noise levels of 1-12% of rated power (peak-to-peak) have been reported for the range of low to high recirculation loop flow during both single and dual recirculation loop operation. Stability tests at operating BWRs have demonstrated that when stability related neutron flux limit cycle oscillations occur they result in peak-to-peak neutron flux limit cycles of 5-10 times the typical values. Therefore, actions taken to reduce neutron flux noise levels exceeding three (3) times the typical value are sufficient to ensure early detection of limit cycle neutron flux oscillations.

Typically, neutron flux noise levels show a gradual increase in absolute magnitude as core flow is increased (constant control rod pattern) with two reactor recirculation loops in operation. Therefore, the baseline neutron flux noise level obtained at a specific core flow can be applied over a range of core flows. To maintain a reasonable variation between the low flow and high flow ends of the flow range, the range over which a specific baseline is applied should not exceed 20% of rated core flow with two recirculation loops in operation. Data from tests and operating plants indicate that a range of 20% of rated core flow will result in approximately a 50% increase in neutron flux noise level during operation with two recirculation loops. Baseline data should be taken near the maximum rod line at which the majority of operation will occur. However, baseline data taken at lower rod lines (i.e., lower power) will result in a conservative value since the neutron flux noise level is proportional to the power level at a given core flow.

In the case of single loop operation (SLO), the normal neutron flux noise may increase more rapidly when reverse flow occurs in the inactive jet pumps. This justifies a smaller flow range under high flow SLO conditions. Baseline data should be taken at flow intervals which correspond to less than a 50% increase in APRM neutron flux noise level. If baseline data is not specifically available for SLO, then baseline data with two recirculation loops in operation can be conservatively applied to SLO since for the same core flow SLO will exhibit higher neutron flux noise levels than operation with two loops. However, because of reverse flow characteristics of SLO, the core flow/drive flow relationship is different than the two loop relationship and therefore the baseline data for SLO should be based on the active loop recirculation drive flow, and not the core flow. Because of the uncertainties involved in SLO at high reverse flows, baseline data should



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INSTRUMENTATION

BASES

MONITORING INSTRUMENTATION (Continued)

NEUTRON FLUX MONITORING INSTRUMENTATION (Continued)

be taken at or below the power specified in Figure 3.4.1.1-1. This will result in approximately a 25% conservative baseline value if compared to baseline data taken near the rated rod line and will therefore not result in an overly restrictive baseline value, while providing sufficient margin to cover uncertainties associated with SLO.

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3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 RECIRCULATION SYSTEM

RECIRCULATION LOOPS

LIMITING CONDITION FOR OPERATION

3.4.1.1 Two reactor coolant system recirculation loops shall be in operation.

APPLICABILITY: OPERATIONAL CONDITIONS 1* and 2*.

ACTION:

a. With one reactor coolant system recirculation loop not in operation:

1. Within 4 hours:

a) Place the recirculation flow control system in the Local Manual (Position Control) mode, and

~~DELETE~~ → ~~b) Reduce THERMAL POWER to $\leq 50\%$ of RATED THERMAL POWER, and,~~

c) Increase the MINIMUM CRITICAL POWER RATIO (MCPR) Safety Limit by 0.01 to 1.07 per Specification 2.1.2, and,

d) Reduce the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) limit to a value of 0.84 times the two recirculation loop operation limit per Specification 3.2.1, and,

e) Reduce the Average Power Range Monitor (APRM) Scram and Rod Block and Rod Block Monitor Trip Setpoints and Allowable Values to those applicable for single recirculation loop operation per Specifications 2.2.1, 3.2.2, and 3.3.6.

ADD NEW "b" AS FOLLOWS:

f) Reduce the volumetric flow rate of the operating recirculation loop to $\leq 45,000^{**}$ gpm. 41,725

b) The THERMAL POWER shall be less than or equal to the limit specified in Fig. 3.4.1.1-1 or the provisions of Spec 4.3.10.3 are satisfied. With one reactor coolant system recirculation loop not in operation and with THERMAL POWER greater than the limit specified in Fig. 3.4.1.1-1, and the provisions of Spec. 4.3.10.3 having not been satisfied, initiate action within 15 minutes to reduce THERMAL POWER to less than or equal to the limit specified in Fig. 3.4.1.1-1 within 4 hours. The provisions

*See Special Test Exception 3.10.4.

**This value represents the ^{actual} volumetric recirculation loop flow which produces 100% core flow at 100% THERMAL POWER. ^{This} ~~The actual value to be~~ applied will be determined during the Startup Test Program.

was

of Spec. 4.3.10.3 must be satisfied prior to resuming power operation above the limit specified in Fig. 3.4.1.1-1.

REACTOR COOLANT SYSTEM

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

- g) Perform Surveillance Requirement 4.4.1.1.2 if THERMAL POWER is $\leq 30\%$ *** of RATED THERMAL POWER or the recirculation loop flow in the operating loop is $\leq 30\%$ *** of rated loop flow. ²⁵ ₁₀

DELETE \rightarrow h) ~~Reduce recirculation loop flow in the operating loop until the APRM flux noise does not deviate from the established flux noise patterns at 50% power by more than 50% when averaged over a 30-minute period.~~

ADD NEW
PARA "I"
(SEE ATT'D)

^h*) Reduce recirculation loop flow in the operating loop until the core plate ΔP noise does not deviate from the established core plate ΔP noise patterns ~~at 50% power~~ by more than ~~50%~~ ^{100%}

2. The provisions of Specification 3.0.4 are not applicable.
3. Otherwise, be in at least HOT SHUTDOWN within the next 12 hours.

- b. With no reactor coolant system recirculation loops in operation, immediately initiate measures to place the unit in at least HOT SHUTDOWN within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.4.1.1.1 With one reactor coolant system recirculation loop not in operation, at least once per ~~8~~ ³ hours verify that:

DELETE \rightarrow a. ~~Reactor THERMAL POWER is $\leq 50\%$ of RATED THERMAL POWER,~~

^{x.a} The recirculation flow control system is in the Local Manual (Position Control) mode, and

^{x.b} The volumetric flow rate of the operating loop is $\leq 41,725$ ~~45,000~~ gpm.**

**This value represents the ^{actual} ~~design~~ volumetric recirculation (loop flow which produces 100% core flow at 100% THERMAL POWER. ~~The actual value to be applied will be determined during the Startup Test Program.~~ ^{This}

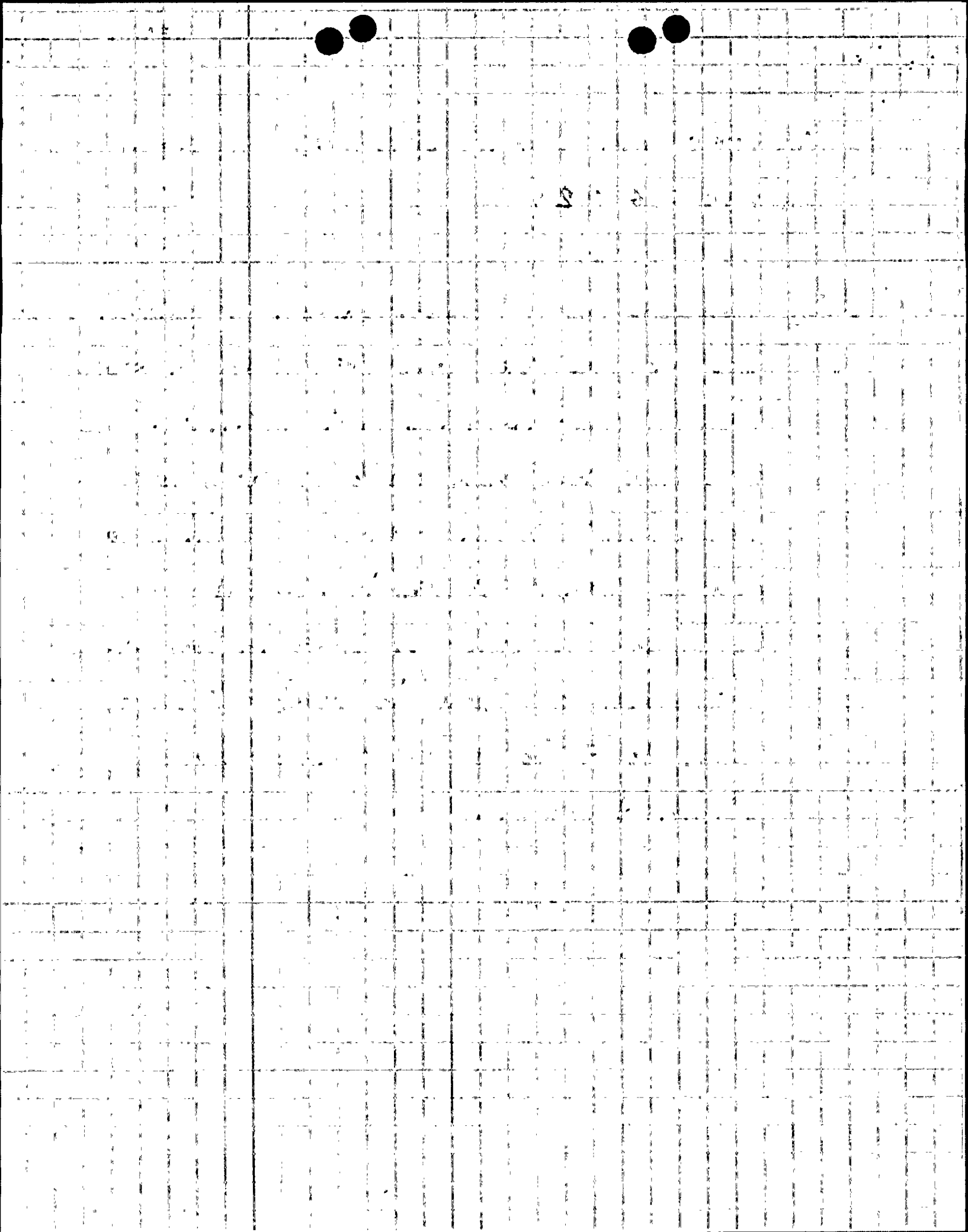
***~~Initial values.~~ ^{were} Final values ^{were} ~~to be~~ determined during Startup Testing based upon ~~the threshold~~ THERMAL POWER and recirculation loop flow which will sweep the cold water from the vessel bottom head preventing stratification.

^{actual}

ADD NEW PARA. TO ACTION STATEMENT(S) FOR 3.4.1.1

ON PAGE 3/4 4-2:

- i) With one reactor coolant system recirculation loop not in operation and THERMAL POWER greater than the limit specified in Fig. 3.4.1.1-1 and core flow less than 39% of rated core flow, initiate action within 15 minutes to reduce THERMAL POWER to less than or equal to the limit specified in Fig. 3.4.1.1-1 or increase core flow to greater than or equal to 39% of rated core flow within 4 hours.



REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

DELETE ~~d. The APRM flux noise when averaged over a 30 minute period is less than 150% of the established APRM flux noise patterns.~~

~~c.~~ The core plate ΔP noise is less than ~~200%~~ of the established core plate ΔP noise patterns. ~~200%~~

ADD NEW
PARA "d",
SEE BELOW.

d. 4.4.1.1.2 With one reactor coolant system recirculation loop not in operation, within no more than 15 minutes prior to either THERMAL POWER increase or recirculation loop flow increase, verify that the following differential temperature requirements are met if THERMAL POWER is $\leq 30\%^{***}$ of RATED THERMAL POWER or the recirculation loop flow in the operating recirculation loop is $\leq 30\%^{***}$ of rated loop flow: ~~25~~ ~~10~~

- $\leq 145^{\circ}\text{F}$ between reactor vessel steam space coolant and bottom head drain line coolant;
- $\leq 50^{\circ}\text{F}$ between the reactor coolant within the loop not in operation and the coolant in the reactor pressure vessel, and
- $\leq 50^{\circ}\text{F}$ between the reactor coolant within the loop not in operation and the operating loop.

The differential temperature requirements of Specification 4.4.1.1.2b. and c. do not apply when the loop not in operation is isolated from the reactor pressure vessel.

4.4.1.1.3 Each reactor coolant system recirculation loop flow control valve shall be demonstrated OPERABLE at least once per 18 months by:

- Verifying that the control valve fails "as is" on loss of hydraulic pressure (at the hydraulic control unit), and
- Verifying that the average rate of control valve movement is:
 - Less than or equal to 11% of stroke per second opening, and
 - Less than or equal to 11% of stroke per second closing.

~~Initial values~~ ^{were} Final values ~~to be~~ determined during Startup Testing based upon ~~the threshold~~ THERMAL POWER and recirculation loop flow which will sweep the cold water from the vessel bottom head preventing stratification.
~~actual~~

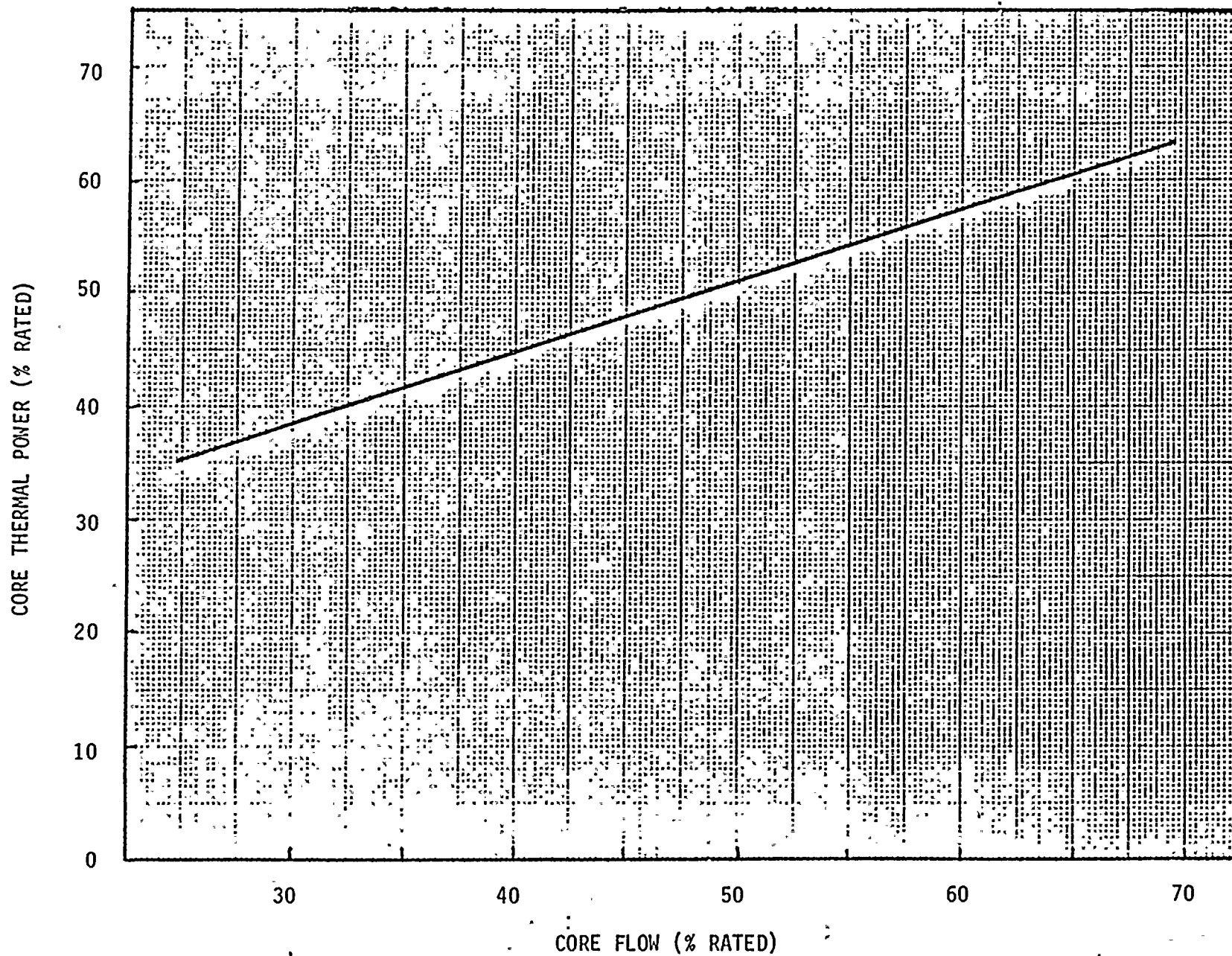
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[ADD ABOVE
TO 4.4.1.1.1]
d. Core flow is greater than or equal to 39% of rated core flow when core THERMAL POWER is greater than the limit specified in Fig. ~~3.4.4.1.1-1~~
3.4.1.1-1.

FIGURE 3.4.1.1-1

THERMAL POWER LIMITS OF SPECIFICATION 3.4.1.1-1



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