Washington Public Power Supply System
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50-397

August 12, 1983
G02-83-731

Mr. J. B. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, California 94596

Subject: NUCLEAR PROJECT NO. 2
10CFR50.55(e) REPORTABLE CONDITIONS: #216, RHR RELIEF VALVE VENTS; #270, INDETERMINATE GRADE MATERIAL ON ECCS PUMPS

Reference: 1) Telecon L.C. Floyd to J. Elin, dated October 22, 1982.

2) Telecon QA2-83-176, dated July 7, 1983, L.C. Floyd to D. Haist.

In accordance with the provisions of 10CFR50.55(e), your office was informed, by telephone, of the above subject conditions. Attachment I and II provide the Project's interim reports on these conditions. We will continue to provide your office with quarterly updates. The next report will be submitted on or before November 3, 1983.

If you have any questions regarding this subject, please contact Roger Johnson, WNP-2 Project QA Manager, at (509) 377-2501, extension 2712.

C. S. Carlisle

C. S. Carlisle
Program Director, WNP-2

LCF/kd

Attachments: (2) As stated

cc: W.S. Chin, BPA
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Document Control Desk, NRC

Attachment 1

Attachment I

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
NUCLEAR PROJECT NO. 2
DOCKET NO. 50-397
LICENSE NO. CPPR-93
10CFR50.55(e) CONDITION #216
RHR RELIEF VALVE VENTS

INTERIM REPORT

Description of Deficiency

There are 4 RHR relief valves which have a 2" vent hole on the valve body. The valves are RHR-V-55A, RHR-V-95A, RHR-V-55B, and RHR-V-95B. These valves are situated such that the failure of a single motor operated valve, RCIC-V-113, would allow an open leakage path from the wetwell (primary containment) directly to the reactor building (secondary containment).

The attached sketch illustrates the situation. Containment penetration X-116 is an open path into the wetwell's gaseous volume. In the steam condensing mode, RHR-V-55A (or B) and RHR-V-95A (or B) protect the RHR heat exchanger from over-pressurization. In order to accommodate condensation in the line between these valves and containment, a vacuum breaker has been installed that consists of penetration X-116, RCIC-V-113, RHR-V-102, RHR-V-101A (or B), RHR-V-103A (or B), and RHR-V-179A (or B).

All of these valves are normally open. Upon a containment isolation signal, the only valve to close would be RCIC-V-113. If it failed to close, and a LOCA had occurred, the wetwell would pressurize, and the wetwell atmosphere would vent down this path. Details of the RHR relief valve show that a flow path exists which would allow the wetwell atmosphere to vent directly to secondary containment.

Safety Implication

Burns and Roe has estimated the gaseous release from these four paths at 5.2 x10 scfm during the first 450 seconds after a LOCA and at a rate of 4.9 x 10 scfm thereafter. This can be compared to the allowable release rate for primary containment of approximately 1.7 scfm.

Cause for the Deficiency

The condition exists because the engineer did not recognize the relief valve had to serve a containment isolation boundary function, besides being a relief valve for RHR system equipment. Vendor drawings were evaluated only for the code related relief valve function without recognizing the hole in the bonnet constituted a containment leakage path.

Corrective Action

After a review of possible corrective actions, including incorporation of a bellows seal, the Project has decided to remove the relief valves, eliminate the containment leakage path, and deactivate the steam condensing mode of the RHR system. Supply System and Burns and Roe Engineering are preparing the necessary Project Engineering Directives and FSAR changes to implement the corrective action. We will continue to provide your office with quarterly updates on this subject. The next report will be submitted by November 1, 1983.

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5.4.6.1.2 Reliability, Operability, and Manual Operation

5.4.6.1.2.1 Reliability and Operability (Also see 5.4.6.2.4)

The RCIC system as noted in Table 3.2-1 is designed commensurate with the safety importance of the system and its equipment. Each component is individually tested to confirm compliance with system requirements. The system as a whole is tested during both the startup and preoperational phases of the plant to set a base mark for system reliability. To confirm that the system maintains this mark, functional and operability testing is performed at predetermined intervals throughout the life of the reactor plant.

A design flow functional test of the RCIC system may be performed during normal plant operation by drawing suction from the condensate storage tank and discharging through a full flow test return line to the condensate storage tank. The discharge valve to the head cooling spray nozzle remains closed during the test, and reactor operation remains undisturbed. All components of the RCIC System shall be capable of individual functional testing during normal plant operation. System control shall provide automatic return from test to operating mode if system initiation is required. There are three exceptions: 1) Auto/manual initiation on the flow controller. This feature is required for operator flexibility during system operation. 2) Steam inboard/outboard isolation valves. Closure of either or both of these valves requires operator action to properly sequence their opening (see 4.4.3). An alarm sounds when either of these valves leaves the fully open position. 3) Major system component's inoperability or bypassing condition shall be automatically indicated in the control room at the system level. Other system components require manual operability status checking.

5.4.6.1.2.2 Manual Operation (Also see 5.4.6.2.5.2 and 5.4.6.2.5.3)

In addition to the automatic operational features, provisions have been included for remote-manual startup, operation, and shutdown of the RCIC System, provided initiation or shutdown signals have not been actuated.

After the RHR system is placed in the steam condensing mode, the operator will select the condensate discharge from the RHR steam condensing heat exchangers as the RCIC pump suction supply. The steam condensing mode of the RHR System is manually placed in operation. Once steam condensing has been established, water level in the RHR heat exchangers is automatically maintained by means of a regulating valve in

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the condensate discharge line. Initially, the condensate discharge is directed to the suppression pool. After proper water quality is obtained, the condensate discharge may be directed to the RCIC pump suction. The level control for the RHR heat exchangers shall be independent from the RCIC control system. The operator selects the flow set point of the RCIC System to match the condensate flow rate from the RHR heat exchangers.

5.4.6.1.3 Loss of Offsite Power

The RCIC System power is derived from a highly reliable source that is maintained by either onsite or offsite power. (Refer to 5.4.6.1.1)

5.4.6.1.4 Physical Damage

The system is designed to the requirements of Table 3.2-1. commensurate with the safety importance of the system and its equipment. The RCIC is physically located in a different quadrant of the reactor building and utilizes different divisional power (and separate electrical routings) than its redundant HPCS system described in 5.4.6.1.1 and 5.4.6.2.4.

5.4.6.1.5 Environment

The system operates for the time intervals and the environmental conditions specified in 3.11.

5.4.6.2 System Design

5.4.6.2.1 General

5.4.6.2.1.1 Description

The Reactor Core Isolation Cooling System consists of a turbine, pump, piping, valves, accessories, and instrumentation designed to assure that sufficient reactor water inventory is maintained in the reactor vessel to permit adequate core cooling to take place. This prevents reactor fuel overheating during the following conditions:

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a. Should the vessel be isolated and maintained in the hot standby condition.

a. ~~b.~~ Should the vessel be isolated and accompanied by loss of coolant flow from the reactor feedwater system.

b. ~~c.~~ Should a complete plant shutdown under conditions of loss of normal feedwater system be started before the reactor is depressurized to a level

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where the shutdown coolant system can be placed into operation.

Following a reactor scram, steam generation will continue at a reduced rate due to the core fission product decay heat. At this time the turbine bypass system will divert the steam to the main condenser, and the feedwater system will supply the make-up water required to maintain reactor vessel inventory.

In the event the reactor vessel is isolated, and the feedwater supply is unavailable, relief valves are provided to automatically (or remote manually) maintain vessel pressure within desirable limits. The water level in the reactor vessel will drop due to continued steam generation by decay heat.

Upon reaching a predetermined low level, the RCIC System is initiated automatically. The turbine driven pump will supply demineralized make-up water from the condensate storage tank to the reactor vessel. The suction line from this source is provided with an in-line reserve with appropriate safety-related level instrumentation. In the event that the water supply from the condensate storage tank becomes exhausted, the level instrumentation in the in-line reserve initiates an automatic switchover to the suppression pool as the water source for the RCIC pump. The in-line reserve has sufficient volume to maintain the minimum required RCIC pump NPSH plus a two foot margin while the switchover occurs, thus assuring a water supply for continuous operation of the RCIC system. The turbine will be driven with a portion of the decay heat steam from the reactor vessel, and will exhaust to the suppression pool.

During RCIC operation, the suppression pool shall act as the heat sink for steam generated by reactor decay heat. This will result in a rise in pool water temperature. Heat exchangers in the Residual Heat Removal System are used to maintain pool water temperature within acceptable limits by cooling the pool water directly. or by condensing generated steam prior to entering the suppression pool. When using the steam condensing mode, the condensate discharge from the heat exchangers may be used as RCIC pump suction supply. DELETE

5.4.6.2.1.2 Diagrams

The following diagrams are included for the RCIC Systems.

a. A schematic "Piping and Instrumentation Diagram" (Figure 5.4-9) shows all components, piping, points where interface system and subsystems tie

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l. High and low inlet RCIC steam line drain pot levels, respectively, open and close F054.

m. The combined signal of low flow plus discharge pressure open and with increased flow closes F019. Also see items e and f above.

n. the signal of in-line reserve tank low water level opens valve F031.

5.4.6.2.2 Equipment and Component Description

5.4.6.2.2.1 Design Conditions

Operating parameters for the components of the RCIC Systems, defined below, are shown on Figure 5.4-10.

a. One 100% capacity turbine and accessories

b. One 100% capacity pump assembly and accessories

c. Piping, valves, and instrumentation for:

1. Steam supply to the turbine

~~2. Steam supply to RHR condensing heat exchanger~~ DELETE

2 ~~3~~. Turbine exhaust to the suppression pool

3 ~~4~~. Make-up supply from the condensate storage tank to the pump suction

4 ~~5~~. Make-up supply from the suppression pool to the pump suction

~~6. Make-up supply from the RHR steam condensing heat exchangers~~ DELETE

5 ~~7~~. Pump discharge to the head cooling spray nozzle, including a test line to the condensate storage tank, a minimum flow bypass line to the suppression pool, and a coolant water supply to accessory equipment.

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p. Follow steps n through s of 5.4.6.2.5.1.

5.4.6.2.5.3 Steam Condensing (Hot Standby) Operation

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This mode of operation is manually initiated by the operator as follows:

a. Verification made in steps a through j of 5.4.6.2.5.1 shall be completed.

b. When the reactor water level is going to be maintained in the hot standby mode and the level starts to drop the RCIC system can be started by manually pushing the RCIC "Manual Initiation" push button. See 5.4.6.2.5.1(k) for RCIC subsequent starts. Concurrently, the RHR System water quality should be readied for vessel injection, see 5.4.7.2.6(b).

c. Adjust controller so it may be switched to manual mode and maintain same flow at pressure condition established by step b above. Then switch to manual mode.

d. Adjust flow controller set point as required to maintain desired reactor water level.

e. When RHR water is ready for vessel injection open RHR suction valve to RCIC System pump. During steam condensing operation if the RHR produces more condensate than required to maintain reactor level, the excess may be dumped to the suppression pool via the RHR system. Also, if more flow is required than supplied from the RHR head exchangers it will come from the condensate storage tank.

f. When steam condensing is completed and the RCIC system is no longer required, close the RHR suction valve, manually trip the RCIC system, and turn flow controller back to automatic.

g. Follow steps n through s of 5.4.6.2.5.1.

5.4.6.2.5.4 Limiting Single Failure

The most limiting single failure in the combined function of RCIC and HPCS systems is the failure of HPCS. If the capacity of RCIC System is adequate to maintain reactor water level, the operator follows 5.4.6.2.5.1. If however, the RCIC capacity is inadequate 5.4.6.2.5.1 applies, but additionally the operator may also initiate the ADS system described in 6.3.2.

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5.4.6.3 Performance Evaluation

The analytical methods and assumptions used in evaluating the RCIC system are presented in Chapter 15, "Accident Analyses," and Appendix A to Chapter 15, "Plant Nuclear Safety Operational Analyses." The RCIC system provides the flows required by the analysis (see Figure 5.4-10) within a 30-second interval based upon considerations noted in 5.4.6.2.4.

5.4.6.4 Preoperational Testing

The preoperational and initial startup test program for the RCIC system is presented in Chapter 14, "Initial Test Program."

5.4.6.4 Safety Interfaces

The balance-of-plant/GE nuclear steam supply system safety interfaces for the reactor core isolation cooling system are: (1) preferred water supply from the condensate storage tanks; (2) all associated wire, cable, piping, sensors, and valves which lie outside the nuclear steam supply system scope of supply; and (3) air supply for testable check and solenoid actuated valve(s).

5.4.7 RESIDUAL HEAT REMOVAL SYSTEM

5.4.7.1 Design Bases

The RHR system is comprised of three independent loops. Each loop contains its own motor-driven pump, piping, valves, instrumentation, and controls. Each loop has a suction source from the suppression pool and is capable of discharging water to the reactor vessel via a separate nozzle, or back to the suppression pool via a full flow test line. In addition, the A and B loops have heat exchangers which are cooled by standby service water. Loops A and B can also take suction from the reactor recirculation system suction, and can discharge into the reactor recirculation discharge or to the suppression pool and drywell spray spargers. Spoolpiece interties are provided to permit the RHR heat exchangers to be used to supplement the cooling capacity of the fuel pool cooling system. The A and B loops also have connections to reactor steam via the RCIC steam line and can discharge condensate to the RCIC pump suction or to the suppression pool. LaSalle 1 and 2, and Zimmer 1 are nuclear plants which employ similar RHR systems and which are in the process of being licensed. DELETE Insert A1

5.4.7.1.1 Functional Design Basis

The RHR system has five subsystems, each of which has its own functional requirements. Each subsystem will be discussed

Insert A1

The A and B loops also have connections to the RCIC steam line. However, these are not being used because the steam condensing mode has been eliminated, see 5.4.6.2.5.3.

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5.4.7.1.1.3 Suppression Pool Cooling Mode

The functional design basis for the suppression pool cooling mode is that it shall have the capacity to ensure that the suppression pool temperature immediately after a blowdown shall not exceed 170°F.

5.4.7.1.1.4 Containment Spray Cooling Mode

The functional design basis for the containment spray cooling mode is that there should be two redundant means to spray into the drywell and suppression pool vapor space to reduce internal pressure to below design limits.

INSERT B 5.4.7.1.1.5 Reactor Steam Condensing Mode

The functional design basis for the reactor steam condensing mode is that the heat exchanger in one loop of the RHR system, in conjunction with the RCIC turbine, shall be able to condense all of the steam generated after a reactor scram 1-1/2 hours after scram. DELETE

5.4.7.1.2 Design Basis for Isolation of RHR System from Reactor Coolant System

The low pressure portions of the RHR system are isolated from full reactor pressure whenever the primary system pressure is above the RHR system design pressure. See 5.4.7.1.3 for further details. In addition, automatic isolation may occur for reasons of vessel water inventory retention which is unrelated to line pressure rates. (See 5.2.5 for an explanation of the Leak Detection System and the isolation signals.)

The RHR pumps are protected against damage from a closed discharge valve by means of automatic minimum flow valves, which open when the main line flow is less than 550 gpm and close when the main line flow is greater than 550 gpm.

5.4.7.1.3 Design Basis for Pressure Relief Capacity

The relief valves in the RHR system are sized ~~on one of three bases:~~ STET TWO

a. Thermal relief only

b. Valve bypass leakage only

c. ~~Control valve failure and the subsequent uncontrolled flow which results.~~ DELETE

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Transients are treated by items a and c; item b. above results from an excessive leak past isolation valves. E12-F055 and RHR-RV-98 are sized to maintain upstream piping at 500 psig and 10 percent accumulation with E12-F051 or E12-F087 fully open and a reactor pressure equal to the lowest Nuclear Boiler safety/relief valve spring set point. E12-F036 are sized to maintain upstream pressure at 75 psig and 10 percent accumulation with both PCV E12-F065 A&B failed open. E12-F005, F025, F088, and F030 are set at the design pressure specified in the process data drawing plus 10 percent accumulation. RHR-RV-98 is installed across E12-F009 to prevent thermal overpressurization between E12-F008 and E12-F009.

Redundant interlocks prevent opening valves to the low pressure suction piping when the reactor pressure is above the shutdown range. These same interlocks initiate valve closure on increasing reactor pressure.

A pressure interlock prevents connecting primary the discharge piping to the primary system whenever the pressure ~~difference across the discharge valve~~ is greater than the design ~~differential.~~ value. In addition a high pressure check valve will close to prevent reverse flow if the pressure should increase. Relief valves in the discharge piping shall be sized to account for leakage past the check valve.

5.4.7.1.4 Design Basis With Respect to General Design Criteria 5

The RHR system for this unit does not share equipment or structures with any other nuclear unit.

5.4.7.1.5 Design Basis for Reliability and Operability

The design basis for the Shutdown Cooling mode of the RHR system is that this mode is controlled by the operator from the control room. The only operation performed outside of the control room for a normal shutdown is manual operation of a local flushing water admission valve, which is the means of assuring that the suction line of the shutdown portions of the RHR system is filled and vented.

Two separate shutdown cooling loops are provided; and although both loops are required for shutdown under normal circumstances, the reactor coolant can be brought to 212°F in less than 20 hours with only one loop in operation. With the exception of the shutdown suction, shutdown return, and steam supply and condensate discharge lines, the entire RHR system is part of the ECCS and containment cooling systems, and is therefore designed with redundancy, flooding protection, piping protection, power separation, etc. required of such ECC systems. (See 6.3 for an explanation of the design bases for ECC~~S~~ systems.) Shutdown suction and discharge valves are required to be powered from both offsite and standby emergency power for purposes of isolation and shutdown following a loss of offsite power. In the event that the outboard shutdown cooling suction supply valve (E12-F008) fails to open from the control room, an operator is sent to open the valve by hand. If the attempt to open the outboard valve (F008) proves unsuccessful, or the inboard shutdown cooling suction supply valve (E12-F009) fails to open, the operator will establish an alternate cooling path as described in the notes to Figure 15.2-11, Activity C1 or C2. ECC

5.4.7.1.6 Design Basis for Protection from Physical Damage

The RHR system is designed to the requirements of Table 3.2-1. With the exception of the common shutdown cooling line, redundant components of the RHR system are physically located in different quadrants of the reactor building, and are supplied from independent and redundant electrical divisions. Further discussion on protection from physical damage is provided in Chapter 3.

5.4.7.2 Systems Design

5.4.7.2.1 System Diagrams

All of the components of the RHR system are shown in the P&ID Figure 5.4-13. A description of the controls and instrumentation is presented in 7.3.1.1.1, "Emergency Core Cooling Systems (ECCS) Instrumentation and Controls."

A process diagram and process data are shown in Figures 5.4-14a through 5.4-14c. All of the sizing modes of the system are shown in the process data. The FCD for the RHR system is provided in Chapter 7.

Interlocks are provided: (a) to prevent drawing vessel water to the suppression pool; (b) to prevent opening vessel suction valves above the suction line design pressure, or the discharge line design pressure with the pump at shutoff head; (c) to prevent inadvertant opening of drywell spray valves while in shutdown; ~~(d) to prevent opening low pressure steam supply valve F087 when vessel pressure is above line design rating; and~~ (~~e~~ d) to prevent pump start when suction valve(s) are not open. DELETE

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5.4.7.2.2 Equipment and Component Description

a. System Main Pumps

The RHR main system pumps are motor-driven deep-well pumps with mechanical seals and cyclone separators. The pumps are sized on the basis of the LPCI mode (Mode A) and the minimum flow mode (Mode G) of the Process Data Figure 5.4-14b. Design pressure for the pump suction structure is 220 psig with a temperature range from 40°F to 360°F. Design pressure for the pump discharge structure is 500 psig. The bases for the design temperature and pressure are maximum shutdown cut-in pressures and temperature, minimum ambient temperature, and maximum shutoff head. The pump pressure vessel is carbon steel, the shaft is stainless steel. A comparison between the required NPSH obtained from the pump characteristic curves provided in Figures 6.3-10a, b and c) and the NPSH ~~needed~~ in the Process Diagram Figure 5.4-14b (Note 8) demonstrates ~~the required NPSH is adequate~~. Available NPSH is calculated per Regulatory Guide 1.1.

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b. Heat Exchangers

The RHR system heat exchangers are sized on the basis of the duty for the shutdown cooling mode (Mode E of the Process Data). All other uses of these exchangers, including steam condensing, require less cooling surface. DELETE

Flow rates are 7450 gpm (rated) on the shell side and 7400 gpm (rated) on the tube side (service water side). Rated inlet temperature is 95°F tube side. The overall heat transfer coefficient is 195 BTU per hour square foot. The exchangers contain 7641 ft^2 of effective surface. Design temperature range of both shell and tube sides are 40°F to 480°F. Design pressure is 500 psig on both sides. Fouling ~~factors~~ are 0.0005 shell side and 0.002 tube side. The construction materials are carbon steel for the pressure vessel with stainless steel tubes and stainless steel clad tube sheet.

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c. Valves

All of the directional valves in the system are conventional gate, globe, and check valves designed for nuclear service. The injection valves, reactor coolant isolation valves, and pump minimum flow valves are high speed valves, as operation for LPCI injection or vessel isolation requires. Valve pressure ratings are specified as necessary to provide the control or isolation function; i.e., all vessel isolation valves are rated as Class 1 nuclear valves rated at the same pressure as the primary system.

Steam pressure-reducing valves are designed to regulate steam flow into the heat exchangers from full reactor pressure to maintain downstream pressure at 200 psig. However, these valves are deactivated, see 5.4.6.2.5.3.

d. ECCS Portions of the RHR System

The ECCS portions of the RHR system include those sections described through Mode A-1 of Figure 5.4-14a.

The route includes suppression pool suction strainers, suction piping, RHR pumps, discharge piping injection valves, and drywell piping into the vessel nozzles and core region of the reactor vessel.

~~Steam condensing components include steam supply piping and valves, heat exchangers, and condensate piping.~~ DELETE

Suppression pool cooling components include pool suction strainers, suction piping, pumps, heat exchangers and pool return lines.

Containment spray components are the same as suppression pool cooling except that the spray headers replace the pool return lines.

5.4.7.2.3 Controls and Instrumentation

Controls and instrumentation for the RHR system are described in Chapter 7.

RHR system relief valve capacities and settings are given in 5.4.7.1.3. Discharge from the relief valves is directed to the suppression pool.

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The manual actions required for the most limiting failure are discussed in 5.4.7.1.5.

INSERT C

b. Steam Condensing

DELETE

The operator closes the heat exchanger inlet and outlet valves, starts the service water pumps, opens the service water valve, and actuates the drain valve logic, which opens the drain valve to the suppression pool. The heat exchanger water level drains to a preset value and the level controller shuts the outlet valve. The operator admits steam slowly to the heat exchangers by opening the steam supply valve partially. The automatic pressure regulator controls steam flow to maintain steam pressure in the exchanger. The operator regulates the opening of noncondensible relief valves to prevent a buildup of non-condensibles in the exchanger. When condensate quality attains the appropriate level, the operator switches condensate from the pool to RCIC pump suction. All operations are made from the control room.

5.4.7.3 Performance Evaluation

Thermal performance of the RHR heat exchangers is based on the residual heat generated at 20 hours after rod insertion, a 125°F vessel outlet (exchanger inlet) temperature, and the flow of two loops in operation. Because shutdown is usually a controlled operation, maximum service water temperature less 10°F is used as the service water inlet temperature. These are nominal design conditions; if the service water temperature is higher, the exchanger capabilities are reduced and the shutdown time may be longer or vice versa.

5.4.7.3.1 Shutdown With All Components Available

No typical curve is included here to show vessel cooldown temperatures versus time due to the infinite variety of such curves that may be due to: (1) clean steam systems that may allow the main condenser to be used as the heat sink when nuclear steam pressure is insufficient to maintain steam air ejector performance; (2) the condition of fouling of the exchangers; (3) operator use of one or two cooling loops; (4) coolant water temperature; and (5) system flushing time. Since the exchangers are designed for the fouled condition with relatively high service water temperature, the units have excess capability to cool when first cut in at high vessel temperatures. Total flow and mix temperature are

INSERT A (pg 5.4-35)

The steam condensing mode of RHR for WNP-2 has been deactivated. However, the major pieces of equipment are installed with the exception of the steam supply relief valves, RHR-RV-55A & B and RHR-RV-95A & B, and are shown on the RCIC and RHR P&ID's (Figures 5.4-9a & b and 5.4-13a & b, respectively). That equipment which is dedicated to the steam condensing mode will be identified on these figures with reference to the notes identifying this portion as being deactivated. WNP-2 operating procedures have been revised to reflect this deactivation. Deletion of this mode of operation for RCIC and RHR will not adversely affect either systems' capability to bring the reactor to cold shutdown should it be required.

INSERT B (pg 5.4-38)

The reactor steam condensing mode of RHR has been deactivated and will no longer be utilized for WNP-2, see 5.4.6.2.5.3.

INSERT C (pg 5.4-44)

This mode of operation for RHR will not be utilized at WNP-2, see 5.4.6.2.5.3.

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TABLE 5.4-4

SAFETY AND RELIEF VALVES FOR PIPING SYSTEMS CONNECTED TO THE RCPB

Safety and/or Relief Valve Identification	Description
B22F013A-H	Main Steam Line Safety/Relief Valves
B22F013J-N	Main Steam Line Safety/Relief Valves
B22F013P	Main Steam Line Safety/Relief Valves
B22F013R-S	Main Steam Line Safety/Relief Valves
B22F013U-V	Main Steam Line Safety/Relief Valves
E51F017	RCIC System Suction Line
E51F018	RCIC Lube Oil Cooler Supply Line
E51F033	RCIC Vacuum Tank
E12F055A,B	RHR Condensing Mode Steam Supply Line
RHR-RV-95A,B	RHR Condensing Mode Steam Supply Line
E12F036*	RHR Condensing Mode Return Line to RCIC
E12F005	Shutdown Cooling Supply Line
E12F025A,B	Shutdown Cooling Return Line
E12F088A,B,C	Suppression Pool Supply for RHR
E12F030	RHR Flush Line
RHR-RV-1A,B	RHR Heat Exchanger (Shell side)
RWCU-RV-1	RWCU Regenerative Heat Exchanger (Shell side)
RWCU-RV-2	RWCU Non-Regenerative Heat Exchanger (Tube side)
RWCU-RV-3	RWCU Regenerative Heat Exchanger (Tube side)
G33F036	RWCU Blowdown to Radwaste System or Condenser
E22F014	High Pressure Core Spray Suction Line
E22F035	High Pressure Core Spray Pump Discharge Line
E21F018	Low Pressure Core Spray Pump Discharge Line
E21F031	Low Pressure Core Spray Suction Line
C41F029A,B	Standby Liquid Control Pump Discharge Line

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* this relief valve serves no over pressure protection function, however, it does serve a containment isolation function. this is the result of deactivation of the steam condensing mode of RHR, see 5.4.6.2.5.3.

TABLE 6.2-16 (Continued)

LINE DESCRIPTION	Pent. No.	FSAR Fig. Nos.	GDC	Outb Op. (12)	Valve No.	Valve Type	Loc.	Pwr. to Open (5)	Pwr. to Close (5)	Sig. (9)	Back Up	Norm Pos. (10)	Shut-down Pos.	Post LOCA	Fail. Pos. (6)	Vlv. Sz. (14)	Close. Time (7) (11)	Dist. to Pent.	Leads to ESF Sys.	Proc. Fld.	Leak Bar. (13)	Term. Zone (13)	Pot. Bypass Leak. (SCFH)	Notes
IW Service Line	92	9.2-4 6.2-31L	56	B	IW-V-157	Gate	I	Manual	Manual	-	-	LC	LC	LC	-	2	-		No	W	Vlvs.	S.B.	.13	
					IW-V-156	Gate	O	Manual	Manual	-	-	LC	LC	LC	-	2	-	5						
RHR Condensing Mode Steam Supply	21	3.2-8 6.2-31e	55	A	RCIC-V-63	MO Gate	I	AC	AC	K	RM	O	O/C	O/C	AS-IS	10	16	-	Yes	S	Vlvs.	R.B.	No	
					RCIC-V-76	MO Globe	I	AC	AC	K	RM	C	C	C	AS-IS	1	5	-						
					RCIC-V-64	MO Gate	O	Manual	Manual	-	-	LC	LC	LC	AS-IS	10	--	2						39
RCIC Turbine Steam Supply	45	3.2-8 6.2-31e	55	A	RCIC-V-63	MO Gate	I	AC	AC	K	RM	O	O/C	O/C	AS-IS	10	16	-	No	S	Vlvs.	R.B.	No	
					RCIC-V-76	MO Globe	I	AC	AC	K	RM	C	C	C	AS-IS	1	5	-						
					RCIC-V-8	MO Gate	O	DC	DC	X	RM	O	O/C	O/C	AS-IS	4	Std	2						
RCIC Pump Minimum Flow	65	3.2-8 6.2-31h	56	B	RCIC-V-19	MO Globe	O	DC	DC	33	RM	C	C	O/C	AS-IS	2	5	7	No	W	Vlvs.	R.B.	No	22
RCIC Turbine Exhaust	4	3.2-8 6.2-31n	56	B	RCIC-V-68	MO Gate	O	DC	DC	35	RM	O	O	O/C	AS-IS	10	Std	10	No	S	Vlvs.	R.B.	No	22
			56	B	RCIC-V-40	Check	O	Process	Process	-	-	O	C	O/C	-	10	-	17	No	S	Vlvs.	R.B.	No	49
RCIC Turbine Exhaust Vacuum Breaker	116	3.2-8 6.2-31u	56	B	RCIC-V-110	MO Gate	O	DC	DC	N	RM	O	O	O/C	AS-IS	2	Std	9	No	A	Vlvs.	R.B.	No	17,49
					RCIC-V-113	MO Gate	O	DC	DC	N	RM	O	O	O/C	AS-IS	2	Std	5						
RCIC Vacuum Pump Discharge	61	3.2-8 6.2-31q	56	B	RCIC-V-69	MO Gate	O	DC	DC	36	RM	O	O	O/C	AS-IS	1-1/2	Std	3	No	W	Vlvs.	R.B.	No	22
			56	B	RCIC-V-28	Check	O	Process	Process	-	-	C	O	O/C	-	1-1/2	-	5	No	W	Vlvs.	R.B.	No	
RCIC Pump Suction from Suppression Pool	33	3.2-8 6.2-31n	56	B	RCIC-V-31	MO Gate	O	DC	DC	32	RM	C	O	O/C	AS-IS	8	Std	2	No	W	Vlvs.	R.B.	No	48
RPV Head Spray	2	3.2-8 6.2-31e	55	A	RCIC-V-65	Check	I	Process	Process	-	-	C	O	O/C	-	6	-	-	No	W	Vlvs.	R.B.	No	3
					RCIC-V-13	MO Gate	O	DC	DC	34	RM	C	O/C	O/C	AS-IS	6	15	21	No	W	Vlvs.	R.B.	No	
					RHR-V-23	MO Globe	O	AC	AC	L,U, M,R	RM	C	O/C	C	AS-IS	6	Std	28	Yes	W	Vlvs.	R.B.	No	
					RCIC-V-742	Globe	O	Manual	Manual	-	-	LC	LC	LC	-	3/4	-	3	No	W	Vlvs.	R.B.	No	

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TABLE 6.2-16 (Continued)

LINE DESCRIPTION	Valve No.	Valve Type	Loc.	Pwr. to Open (5)	Pwr. to Close (5)	Iso. Sig. (9)	Back Up	Norm Pos. (10)	Shut-down Pos.	Post LOCA	Fail. Pos. (6)	Vlv. Sz. (14)	Close. Time (7) (11)	Dist. to Pent.	Leads to ESF Sys.	Proc. Fld.	Leak Bar. (13)	Term. Zone (13)	Pot. By-pass Leak. (SCFH)	Notes
heat exch. condensate	RHR-V-11B	MO Gate	0	Manual	Manual	—	—	LC	LC	LC	AS-IS	4	—	15	Yes	W	Valves	R.B.	No	18, 39
pump minimum flow	RHR-FCV-64B	MO Globe	0	AC	AC	38	RM	C	C	O/C	AS-IS	3	15	22	Yes	W	Valves	R.B.	No	18
flush line relief	RHR-RV-30	Relief	0	PP	Spring	-	-	C	C	C	-	2	-	34	Yes	W	Valves	R.B.	No	18, 19
heat exch. thermal relief	RHR-RV-1B	Relief	0	PP	Spring	-	-	C	C	C	-	1-1/2	-	189	Yes	W	Valves	R.B.	No	18, 19
heat exch. vent	RHR-V-73B	MO Globe	0	AC	AC	39	Manual	C	O/C	C	AS-IS	2	Std	190	Yes	A	Valves	R.B.	No	18
CAC system loop B drain	RHR-V-134B	MO Gate	0	AC	AC	37	Manual	C	C	O/C	AS-IS	2	Std	44	Yes	W	Valves	R.B.	No	18
pump B suction relief	RHR-RV-88B	Relief	0	PP	Spring	-	-	C	C	C	-	1	-	30	Yes	W	Valves	R.B.	No	18

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TABLE 6.2-16 (Continued)

Line Description	Pent. No.	FSAR Fig. Nos.	GDC	Gsin Gp. (12)	Valve No.	Valve Type	Loc.	Pwr. to Open (5)	Pwr. to Close (5)	Iso. Sig. (9)	Back Up	Norm Pos. (10)	Shut-down Pos.	Post LOCA	Fail. Pos. (6)	Vlv. Sz. (14)	Close Time (7) (11)	Dist. to Pent.	Leads to ESF Sys.	Proc. Fld.	Leak Bar. (13)	Term. Zone (13)	Pot. By-pass Leak. (SCFH)	Notes
RHR loop A:	47	5.2-6	56	B																				
pump test line		6.2-31p			RHR-V-24A	MO Globe	O	AC	AC	F,V	RM	C	C	C	AS-IS	18	Std	12	Yes	W	Valves	R.B.	No	2, 18, 24
discharge header relief					RHR-RV-25A	Relief	O	PP	Spring	-	-	C	C	C	-	2	-	33	Yes	W	Valves	R.B.	No	18, 19
heat exch. steam relief					RHR-RV-55A	Relief	O	PP	Spring	-	-	C	C	C	-	10	-	22	Yes	S	Valves	R.B.	No	18, 19
heat exch. condensate					RHR-V-11A	MO Gate	O	Manual	Manual	-	-	LC	LC	LC	AS-IS	4	-	18	Yes	W	Valves	R.B.	No	18, 39
heat exch. condensate relief					RHR-RV-36	Relief	O	PP	Spring	-	-	C	C	C	-	8	-	20	Yes	W	Valves	R.B.	No	18, 20
pump minimum flow					RHR-FCV-64A	MO Globe	O	AC	AC	38	RM	C	C	O/C	AS-IS	3	15	22	Yes	W	Valves	R.B.	No	48
heat exch. thermal relief					RHR-RV-1A	Relief	O	PP	Spring	-	-	C	C	C	-	1-1/2	-	188	Yes	W	Valves	R.B.	No	18, 19
heat exch. vent					RHR-V-73A	MO Globe	O	AC	AC	39	RM	C	O/C	C	AS-IS	2	Std	175	Yes	A	Valves	R.B.	No	18
FPC system inter-tie					RHR-V-121	Gate	O	Manual	Manual	-	-	LC	C	LC	-	3	-	6	No	W	Valves	R.B.	No	
					RHR-V-120	Check	O	Process	Process	-	-	C	C	C	-	3	-	7	No	W	Valves	R.B.	No	
CAC system loop A drain					RHR-V-134A	MO, Gate	O	AC	AC	37	RM	C	C	O/C	AS-IS	2	Std	44	Yes	W	Valves	R.B.	No	18
pump A suction relief					RHR-RV-88A	Relief	O	PP	Spring	-	-	C	C	C	-	1	-	30	Yes	W	Valves	R.B.	No	18
RHR loop B	46	5.2-6	56	B																				
pump test line		6.2-31p			RHR-V-24B	MO Globe	O	AC	AC	F,V	RM	C	C	C	AS-IS	18	Std	12	Yes	W	Valves	R.B.	No	2, 18, 24
discharge header relief					RHR-RV-25B	Relief	O	PP	Spring	-	-	C	C	C	-	2	-	30	Yes	W	Valves	R.B.	No	18, 19
heat exch. steam relief					RHR-RV-55B	Relief	O	PP	Spring	-	-	C	C	C	-	10	-	20	Yes	S	Valves	R.B.	No	18, 19
pump A&B suction relief					RHR-RV-5	Relief	O	PP	Spring	-	-	C	C	C	-	2	-	20	Yes	W	Valves	R.B.	No	18, 19

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TABLE 6.2-16 (Continued)

38. The minimum flow valve for an ECCS pump is open only between time of ECCS initiation and the time at which the system flow to the RPV exceeds 640 gpm. The valve is shut at all other times. Should a leak occur when the valve is open, it will be detected by a high level alarm in the appropriate reactor building sump.

39. ~~Valve is open only during steam condensing mode. Valve position is provided in main control room to provide the operator confirmation of valve status.~~ Insert →

40. Normally closed. Signalled to open if reactor building pressure exceeds wetwell pressure by 0.5 psid. Valves automatically reshut when the above condition no longer exists. Operator to use valve position indicator as confirmation of valve status.

41. Indication of containment air compressor discharge header pressure and a low pressure alarm exist in the main control room. The operator can remote-manually shut valve CIA-V-20 should the containment air compressors become unavailable. The isolation check valve, CIA-V-21, provides immediate isolation.

42. Indication of nitrogen bottle header pressure and a low pressure alarm exist in the main control room. The operator can remote-manually shut valve CIA-V-30(A, B,) should the nitrogen bottle bank pressure decrease below the alarm setpoint. The isolation check valves, CIA-V-31(A, B) provide immediate isolation.

43. The operator's indication that remote-manual closure of the TIP shear valves is required, is failure of the TIP ball valves to close as monitored on Panel S.

44. Normally closed. Opened only when testing wetwell-to-drywell vacuum breakers.

45. The isolation valve can be remote-manually closed upon indication that the CRD or the RRC pumps have been tripped. The isolation check valves, RRC-V-13 (A, B,), provide immediate isolation.

[These valves . serve as isolation valves for the steam condensing mode for RHR which has been deactivated for WNP-2. These valves are shown as motor operated, however, the power leads to the motors have been disconnected and the handwheels have been chained and padlocked in the closed position.]

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4. The following normally closed valves are signalled closed to ensure proper system lineup:

DELETE

a) The RHR heat exchanger discharge to RCIC valves MO F026 A, B, and AO F065 AB,

b) The RHR heat exchanger flush to suppression pool valves MO F011 A, B,

c) The RHR heat exchanger steam pressure reducing valves AO F051 A, B,

d) The RHR heat exchanger steam inlet isolation valves MO F052 A, B and MO F087 A, B,

a e) The test return line to the suppression pool valves MO F024 A, B and MO F021,

b f) The suppression pool spray valves MO F027 A, B.

5. The normally open heat exchanger bypass valves MO F048 A, B are signaled open. The open signal is automatically removed 10 minutes after system initiation to allow operator control of the valve for throttling purposes.

Each LPCI pump discharge flow is monitored by a differential pressure switch which, when the pump is running and following an 8-second time delay, opens the minimum flow return line valve MO F064 A, B, C if flow is low enough that pump overheating may occur. The valve is automatically closed if flow is normal. The 8-second time delay is provided to prevent reactor vessel inventory loss during the shutdown cooling mode of the RHRS (see 5.4.7.2.6(a)).

The three RHR pump suction from the suppression pool valves MO F004 A, B, C and the RHR heat exchanger inlet and outlet valves MO F047 A, B and MO F003 A, B have their control switches keylocked in the open position, and thus require no automatic open signal for system initiation.

The two series service water crosstie valves MO F093 and MO F094 have their control switches keylocked in the close position, and thus require no automatic close signal for system initiation.

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14.2.12.3.37 Test Number 71 - Residual Heat Removal System

14.2.12.3.37.1 Purpose

The purpose of this test is to demonstrate the ability of the Residual Heat Removal (RHR) System to (1) remove heat from the reactor system so that the refueling and nuclear system servicing can be performed, and 2) condense steam while the reactor is isolated from the main condenser. DELETE

14.2.12.3.37.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.37.3 Description

With the reactor at power, the condensing mode of the RHR system will be demonstrated. Condensing heat exchanger performance characteristics will be demonstrated. Final demonstration of the condensing mode will be done from an isolated condition. This test will optimize the controls for this mode of operation. DELETE

During the first suitable reactor cooldown, the shutdown cooling mode of the RHR system will be demonstrated. Unfortunately, the decay heat load is insignificant during the startup test period. Use of this mode with low core exposure could result in exceeding the 100°F/hr cooldown rate of the vessel if both RHR heat exchangers are used simultaneously, therefore, the demonstration is limited by the cooldown rate.

14.2.12.3.37.4 Criteria

Level 1

The transient response of any system-related variable to any test input must not diverge.

Level 2

The RHR system shall be capable of operating in the steam condensing, suppression pool cooling and shutdown cooling modes (with both one and two heat exchangers). System-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25.

DELETE

The time to place the RHR heat exchangers in the steam condensing mode and commence operation shall be one-half hour or less.

DELETE

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Q. 211.024
(5.4.7)

It is our position for all light-water-reactors that the RHR system shall be capable of bringing the reactor to a cold shutdown condition using only safety-grade systems. Confirm that this requirement is satisfied for the WNP-2 facility. In responding to this request, include a consideration of the capability of the air supply system which is used to operate the RCIC steam and condensate control valves located at the RHR heat exchanger, when the RHR system is in the steam condensing mode.

Response:

All portions of the RHR system required to function in bringing the reactor to a cold shutdown condition are safety grade and redundant except for the shutdown cooling suction line. If this line were unavailable due to a single failure of a suction valve, a safety grade alternate shutdown cooling path can be established through the ADS valves as described in the notes to Figure 15.2-11, Activity C1 or C2.

The steam condensing mode ~~is used only to maintain hot standby condition should the vessel be isolated from the main condenser. Specifically, it allows for maintenance on the turbine generator set without first requiring a cold shutdown of the RPV or continued opening of the main steam relief valves to the suppression pool.~~

~~No analysis has been performed which demonstrates that the steam condensing can be used to bring the reactor to a safe, cold shutdown. No credit has been taken for the steam condensing mode in any safety analysis, accordingly, it is permissible to use non-safety air for E12-F051 (RHR-PCV-51) and E12-F065 (RHR-LCV-65). On a loss of air these valves fail-shut, the desired position during accident conditions.~~ DELETE

will not be utilized at WNP-2 including all piping, valves and equipment dedicated to the steam condensing mode. No credit has been taken for the steam condensing mode in any safety analysis.

(see 5.4.6.2.5.3)

Q. 211.025

It is also our position for all light-water reactors that the RHR system shall be capable of bringing the reactor to a cold shutdown condition with only on-site or off-site power available, assuming the most limiting single failure. In this regard, while we note that Figure 15.2-10 of the FSAR shows a number of available success paths to achieve a cold shutdown condition, vessel depressurization using the RHR system in the steam condensing mode is not shown. (This latter mode is one of the success paths when off-site power is not available.) Either correct this figure or justify this omission. If vessel depressurization were to be achieved by manual actuation of the relief valve, indicate how many valves would have to be actuated. Describe your plans for testing the alternate modes to achieve shutdown cooling. Demonstrate that adequate passage of water through the safety/relief valves can be achieved and maintained when the alternate method is in use. Indicate the quantity of air supplied, its source, and the time interval before the air is exhausted.

Response:

The omission of the steam condensing mode is justified because there is no requirement for the steam condensing mode to be used to bring the reactor to a cold shutdown. Steam condensing is not a safety grade means to depressurize the reactor. The steam condensing mode of RHR has been deactivated for WNP-2 and will not be utilized, see 5.4.6.2.5.3.
If vessel depressurization were to be achieved by manual actuation of relief valves, three valves would need to be actuated to pass sufficient steam flow to depressurize the vessel.

WNP-2 is a member of the BWR Owners' Group which performed a low pressure liquid flow test to demonstrate the operational adequacy of the safety/relief valves (SRVs) to pass sufficient water flow to meet the requirements of the alternate shutdown cooling mode. The results of this test program are presented in NEDE-24988-P which was transmitted to the NRC by a letter from T. J. Dente (BWR Owners' Group) to D. G. Eisenhut (NRC), dated September 25, 1981. WNP-2 believes that this test program adequately demonstrates the ability to use the SRVs in the alternate shutdown cooling mode and does not plan to perform any additional testing.

~~For~~ Info Only

Additionally, WNP-2 has performed calculations to demonstrate that adequate passage of water through SRVs in the alternate shutdown cooling mode can be achieved at the WNP-2 plant. The results of these calculations are summarized below.

In the alternate shutdown cooling mode, with one RHR pump in operation, the total system resistance head was calculated to be 550 feet using one SRV valve. Line losses, static head, heat exchanger losses, inlet and outlet losses at the pump, and strainers and losses through the SRV (calculated from experimental data obtained from the B&W Owners' Group tests) were considered in establishing this total system resistance head. At this calculated head, the pump capacity is 4000 gpm and the reactor pressure is 160 psig.

no change

Following normal reactor depressurization (i.e., 100°F/hr.), an alternate shutdown coolant flow rate of 2600 gpm would be required to bring the reactor to a shutdown condition. For WNP-2, this flow capacity can be achieved by using one ADS valve as demonstrated above, although three valves are always available.

The air supply for the ADS valves is discussed in the response to Question 211.048.

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Q. 211.027
(5.4.7)

In Section 5.4.7.1.3 of the FSAR, you indicate the specific RHR relief valves and the RHR design pressures used as the basis for providing relief capacity. Expand your discussion by indicating the relief valve capacity, the nominal setpoints, the setpoint tolerance, and the ASME class designation of these valves and lines. In addition, discuss the vulnerability of the RHR system to malfunctions which could result in overpressurization of low pressure piping. Support your evaluation by providing an outline of all operating procedures required to bring the plant to a cold shutdown condition from hot standby and the procedures for plant startup from cold shutdown.

Response:

The relief valves protecting the RHR system are listed below (Reference Figures 5.4-13a and 5.4-13b):

Relief Valve	Nominal Setpoint/Capacity	Location	Piping Design Pressure
RHR-RV-88 ~~F088~~	125 psig/10 gpm	RHR pump suction from suppression pool	125 psig (Loop C) 220 psig (Loops A and B)
RHR-RV-5 ~~F005~~	220 psig/25 gpm	RHR pump suction from recirc pipe	220 psig
RHR-RV-25 ~~F025~~	500 psig/25 gpm	RHR discharge	500 psig
RHR-RV-30 ~~F030~~	125 psig/10 gpm	RHR flush line to radwaste	125 psig
RHR-RV-36* ~~F036*~~	75 psig/1750 gpm	RHR HX condensate to suppression pool or RCIC pump suction	125 psig
~~F055~~	~~500 psig/330,000 lb/hr~~	~~Steam supply to RHR heat exchanger~~	~~500 psig~~ DELETE

* RHR-RV-36 no longer provides overpressure protection; however, it does serve a containment isolation function. This is the result of deactivation of the steam condensing mode of RHR, see 5.4.6.2.5.3.

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DELETE

Relief Valve	Nominal Setpoint/Capacity	Location	Piping Design Pressure
RHR-RV-95*	500 psig/300,000 lb/hr	Steam supply to RHR heat exchanger	500 psig

*RHR-RV-95 is currently not shown in Figures 5.4-13a and 5.4-13b but is shown on Figure 3.2-6, Zones E-13 and E-4.

All RHR relief valves are purchased to ASME Section III, Class 2 requirements to match the requirements of the piping they are protecting. As such, the setpoint tolerance is + 3%, per ASME Section III, Paragraph NC-7614.2.

The RHR system is connected to higher pressure piping at: (1) shutdown suction; (2) shutdown return; (3) LPCI injection; and (4) head spray; and (5) heat exchanger steam supply. DELETE The vulnerability to overpressurization of each location is discussed in the following paragraphs.

Shutdown sucion has two gate valves (F008 and F009) in series which have independent pressure interlocks to prevent opening at high inboard pressure (135 psig reactor pressure). No single active failure or operator error will result in overpressurization of the lower pressure piping. With the RHR pumps normally lined up to the suppression pool (F006 closed), the shutdown cooling suction line is protected for thermal expansion or from leakage past F008 by F005. With all the RHR suction valves closed, the suction piping is protected for thermal expansion or leakage past the discharge check valves by F088.

The shutdown return line has a swing check valve (F050) to protect it from higher vessel pressures. Additionally, a globe valve (F053) is locate in series and has a pressure interlock to prevent opening at high inboard pressures (135 psig reactor pressure). No single active failure or operator error will result in overpressurization of the lower pressure piping.

The LPCI injection line has an air testable swing check valve (F051) to protect it from higher vessel pressures. The air operator on the testable check valve is only capable of opening the testable check valve if the differential pressure is less than 2.0 psid. Additionally, Revise for [redacted] SCN 83-36

a gate valve (F042) is located in series and has pressure interlocks to prevent opening at high differential pressure (nominally 750 psid). No single active failure or operator error will result in overpressurization of the lower pressure piping.

The head spray piping has three swing check valves in series (two belonging to the RCIC system and one (F019) belonging to the RHR system), to protect it from higher vessel pressures. Two of the swing check valves have air operators but they are only capable of opening the testable check valve if the differential pressure is less than 2.0 psid. Additionally, a globe valve (F023) is located in series and has a pressure interlock to prevent opening at high inboard pressures (135 psig reactor pressure). No single active failure or operator error will result in the overpressurization of the lower pressure piping.

Overpressurization protection of the RHR discharge piping for thermal expansion or from leakage past the head spray, shutdown injection, and LPCI isolation valves is provided by F025.

The heat exchanger steam supply line has a globe valve (F052) for shutoff. The operator admits steam through F052 and sets the pressure regulating valve (F051) to limit heat exchanger pressure to about 200 psig. Also, F087 can be opened when the steam supply pressure is below the pressure interlock (500 psig) to provide additional steam flow rate to the heat exchangers. Two relief valves (F055) and RHR-RV-95 with a combined capacity of 660,000 lbs/hr are provided downstream of F051 and F087 to protect the low pressure piping should F051 fail open. The maximum calculated steam flow rate (sonic flow) with F051 and F052 failed open is 600,000 lbs/hr, so there is adequate relief valve capacity to handle this failure. The Class 1E leak detection system, which monitors steam flow rate to the RHR heat exchangers, will isolate the steam supply (close F076, F063 and F064 per Figure 5.4-9a) when the steam flow reaches approximately 360,000 lbs/hr (175% decay heat steam generation rate 1/2 hour after scram). No single active failure nor operator error will cause overpressurization of the lower pressure piping.

DELETE

~~During steam condensing mode, with the RHR heat exchanger at 200 psig, the condensate is dumped to either the suppression pool or the RCIC pump suction. F036 provides protection to this low pressure piping should both level control valves F065A and F065B fail open.~~ DELETE

F030 protects the drain piping from the RHR system to radwaste from thermal expansion or from leakage past the isolation valves F071 and F072.

OUTLINE OF OPERATING PROCEDURE AND RHR OVERPRESSURIZATION SAFEGUARDS

1. Plant Shutdown to Cold Shutdown from Hot Standby* With Safety Grade Systems

Reactor Condition	Operating Mode Used	RHR Overpressurization Safeguard
Depressurization from hot standby to 135 psig the suppression pool depressurizes vessel	o Main steam relief valve discharge to	RHR isolated.
	o Initiate and operate pool cooling mode of RHR system	Low pressure mode, no safeguard required.
Cooldown from 135 psig to cold shutdown	o Initiate and operate shutdown cooling mode of RHR	Redundant pressure interlocks on F008 and F009 close valve above pressure interlock setpoint.

2. Plant Startup from Cold Shutdown

Reactor coolant RPV head replaced valves above pressure interlock setpoint.	o Terminate shut- and isolate RHR	Redundant pressure and F009 close
Remainder of startup	o Standard	RHR isolated.

* Normally, the main condenser is the heat sink during hot standby, but, because of larger RHR interface, it is assumed that the main condenser is unavailable.

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Q. 211.039
(5.4.7)

Operation of the RHR system in the steam condensing mode involves partial draining of one or both RHR heat exchangers and introduction of reactor steam into lines and heat exchangers which are initially cold. Describe the methods (e.g., valve operation or air introduction) and the provisions you propose to prevent the occurrence of water hammer during initiation of operation in this mode and in the change to the pool cooling mode. Indicate whether the jocket pump system shown in Figure 5.4-13a of the FSAR can fill the lines to the injection valve in the core spray lines and the RHR lines (i.e., valves F016 and F042, respectively) when the RHR is in the steam condensing mode using one or both heat exchangers. If not, indicate what procedure you propose to prevent water hammer following startup of the core spray or RHR pumps.

Response:

DELETE

Refer to Figure 5.4-13a for valve numbers. The methods used to prevent the occurrence of water hammer during steam condensing initiation are:

a. lowering the heat exchanger water level using low pressure steam (approximately 10 psig) by cracking open steam pressure control valve bypass valve F087;

b. initially admitting steam at a low pressure and slowly increasing steam pressure to 200 psig to avoid high pressure surges; and

c. opening all valves slowly to avoid sudden flow surges.

The methods used to prevent the occurence of water hammer following steam condensing termination and change to the pool cooling mode are:

a. closing the heat exchanger condensate discharge;

b. opening the valves connecting the heat exchanger to the main pump loop (F003 and F047); and

c. opening the high point vent and filling the heat exchanger shell and connecting piping using the condensate supply valve.

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When the RHR system is used for steam condensing, the LPCI injection loop is isolated from the heat exchanger steam flow by closing F003 and F047. Use of steam condensing mode has no effect on the jockey pumps' ability to fill the lines to the injection valves in the core spray or RHR lines because the heat exchanger bypass valve F048 is open. Therefore, the jockey pumps can fill these lines.

DELETE

The steam condensing mode of RHR will no longer be utilized for WNP-2 so there is no concern for water hammer during initiation of this mode. Deactivation of the steam condensing mode has no effect on the jockey pumps' ability to fill, or keep full, the RHR piping system.

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Q. 211.040
(5.4.7)

Those pressure relief valves and lines which are designed to prevent overpressurization of the RHR system, are routed outside the containment before being returned to the suppression pool. Discuss the design provisions incorporated into the WNP-2 facility to minimize the potential for water hammer in these lines. State whether these relief lines are capable of withstanding both seismic and dynamic blowdown loads without suffering a loss of structural integrity.

Response:

DELETE

Except where noted below, the RHR relief valves are installed to accommodate thermal expansion and leakage across closed valves in isolated piping systems (see response to Question 211.027 for additional information on RHR relief valves). Pressure buildups in isolated lines will be slow and discharges from the relief valves in these lines will be small. Water hammer and other hydrodynamic loads are not considered a potential problem in those lines.

DELETE

RHR-RV-55A and B and RHR-RV-95A and B (reference Figure 3.2-6, zones E, 4 and E, 14) are steam relief valves which protect the RHR heat exchangers from overpressure in case RHR-PCV-51A and B fail during the RHR steam condensing mode. There is no potential for water hammer in the discharge line of RHR-RV-95A and B, which have their own discharge line into the suppression pool. Since the discharge lines for RHR-RV-55A and for RHR-RV55B share a common pipe with several other RHR lines which could fill the discharge lines with water during other modes of RHR operation, e.g., system test, an automatic vacuum breaker is being added to ensure that the water level in these discharge lines is at the suppression pool water level during the steam condensing mode.

In addition, these steam relief valves have an automatic drain pot to prevent any water from accumulating ahead of the valves.

DELETE

RHR-RV-36 (Figure 3.2-6, zone G, 13) is a water relief valve which protects the lower pressure rated PCIC suction piping in case of either or both RHR-LCV-65A and RHR-LCV-65B failing open during the steam condensing mode. The discharge line for RHR-RV-36 uses the same pipe as RHR-RV-55A, where an automatic vacuum breaker guarantees that there is no water in the pipe.

DELETE

DELETE

It should be noted that the probability of the RHR steam relief valves or RHR-RV-36 actuating is extremely low. These relief valves can actuate only during the RHR steam condensing mode which is expected to be used only eight hours per year. In addition, RHR-PCV-51A and B and RHR-LCV-65A and B are designed to fail closed.

RHR relief lines (identified by their value tag numbers RHR-RV-36, RHR-RV-55A, RHR-RV-55B, RHR-RV-95A, and RHR-RV-95B) are capable of withstanding both seismic and dynamic blowdown loads without suffering a loss of structural integrity.

RHR-RV-36 is a water relief valve which originally was intended to protect the RCIC suction piping from overpressurization while in the steam condensing mode. However, since the steam condensing mode has been deactivated, RHR-RV-36 now serves only a containment isolation function. There is no longer any potential of overpressurizing the RCIC suction line due to steam condensing mode operation.

Q. 211.076
(6.3)

Some of the ECCS relief valve discharge lines penetrate primary containment and have outlets below the surface of the suppression pool. Since these lines are part of the primary containment boundary, we are concerned that excessive dynamic loads resulting from water hammer during actuation of the relief valves may cause cracking or rupture of these lines. Accordingly, identify these lines which penetrate the primary containment. Provide information concerning the measures you are taking to prevent line damage due to water hammer.

Response:

The ECCS relief valves shown on Table 211.076-1 have discharge lines which penetrate the primary containment and have discharges below the suppression pool water level (Reference Figures 5.4-13a, 5.4-13b, 6.3-1, 6.3-5).

All relief valves shown on this Table Section are purchased on ASME III, Class 2 requirements to match the requirements of the piping they are protecting. As such, the setpoint tolerance is +3%, per ASME, Section III, Paragrpah NC-7614.2.

For discussion on dynamic lods resulting from water hammer for RHR-RV-55(A, B) (E12-F055A, B), RHR-RV-95(A, B), and RHR-RV-36 (E12-F036) see response to Question 211.040. The remaining relief valves are installed to accommodate thermal expansion and leakage across closed valves in isolated piping systems. Pressure buildups in isolated lines will be slow and discharges from the relief valves in these lines will be small. Water hammer and other hydrodynamic loads are not considered a potential problem in these lines.

DELETE

Table 211.076-1

Relief Valve	Setpoint/Capacity	Location	Piping Design Pressure
LPCS-RV-18 ~~E21-F018~~	550 psig/100 gpm	LPCS Discharge Leg Relief	550 psig
LPCS-RV-31 ~~E21-F031~~	100 psig/ 10 gpm	LPCS Suction Leg Relief	100 psig
HPCS-RV-35 ~~E22-F035~~	1575 psig/25 gpm	HPCS Discharge Leg Relief	1575 psig
HPCS-RV-14 ~~E22-F014~~	100 psig/ 10 gpm	HPCS Suction Leg Relief	100 psig
RHR-RV-25 (A,B,C) ~~E12-F025(A,B,C)~~	500 psig/ 25 gpm	RHR Discharge Leg Relief	500 psig
RHR-RV-88 (A,B,C) ~~E12-F088(A,B,C)~~	125 psig/ 10 gpm	RHR Suppression Pool Suction Relief	220 psig - A,B 125 psig - C
RHR-RV-5 ~~E12-F005~~	220 psig/ 25 gpm	RHR Shutdown Cooling Suction Relief	220 psig
RHR-RV-30 ~~E12-F030~~	125 psig/ 10 gpm	RHR Flush Line Relief	125 psig
~~E12-F055(A,B)~~	~~500 psig/330,000 lb/hr~~	~~RHR Heat Exchanger Steam Relief~~	~~500 psig~~
~~RHR-RV-95(A,B)*~~	~~500 psig/330,000 lb/hr~~	~~RHR Heat Exchanger Steam Relief~~	~~500 psig~~
RHR-RV-1(A,B)(**) ~~*~~	500 psig/ 20 gpm	RHR Heat Exchanger Thermal Relief	500 psig
RHR-RV-36 ~~E12-F036~~ **	75 psig/1750 gpm	RHR Heat Exchanger Condensate Relief	125 psig

DELETE

~~* RHR-RV-95A,B are not currently shown on Figures 5.4-13a and 5.4-13b, but are shown on Figure 3.2-6, Zones E,H and E,13.~~

DELETE

(**) ~~*~~ RHR-RV-1A,B are shown on Figures 5.4-13a and 5.4-13b (thermal relief valve on heat exchangers RHR-HX-1A,B) but are not designated by tag number.

** RHR-RV-36 does not serve a pressure relief function. However, it does serve a containment isolation function since the RHR steam condensing mode has been deactivated, see 5.4.6.2.5.3.

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Q. 211.143
(5.4.6.4)

Show how the preoperational initial startup test programs for the RCIC system in Section 14.2.12.1.8 meet the intent of applicable sections in Regulatory Guide 1.68.

Response:

The applicable sections of Regulatory Guide 1.68 which delineate requirements for tests of RCIC include sections 1.d (5) and (6); 1.j (19); 4.k and q; 5.1, dd and mm of Appendix A.

The specific areas of concern that these sections address are, respectively: verification of operability and design features of the RCIC system and the RHR/RCIC system interface in the steam condensing mode during the preoperational phase of the WNP-2 initial startup test program; operability and design verification of the RCIC control instrumentation on the remote shutdown panel again during the preop program; demonstration of RCIC and RHR steam condensing mode operability during low power operation when sufficient steam exists to utilize these plant design features; and finally, to demonstrate the design capability of RCIC during major plant transients such as the remote shutdown capability demonstration and the main steam line isolation valve (MSIV) full isolation test. DELETE DELETE

The WNP-2 initial startup test program provides for extensive tests in each of these areas. Sections 14.2.12.1.8, 14.2.12.1.26, 14.2.12.3.14, 14.2.12.3.25, 14.2.12.3.28, and 14.2.12.3.37 briefly describe, in general terms, the tests which will be performed to provide assurance that the RCIC system is fully operational in each of its modes or conditions in which it is expected to perform. Specifically, during the preop phase such RCIC component tests as valve operability, initiation/interlock/trip logic checks, flow path verification, control and instrumentation calibration, and pump/turbine vibration measurements are conducted. In addition, the control and instrumentation calibration on the remote shutdown panel and the system interface with RHR in the steam condensing mode are checked for proper operation. During low power operation the ability of the RCIC system to initiate, then deliver, rated flow within 30 seconds is demonstrated at three points within the range of 150 psig to rated reactor pressure. Also, following tune-up of the RHR heat exchanger level and inlet pressure controllers, the adequacy of the RCIC control system is confirmed when the system is coupled with the RHR system in the steam condensing mode. The final confirmation of proper RCIC system performance is achieved by challenging the system to perform during anticipated tran- DELETE

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sients. The ability of RCIC to maintain reactor water level when controlled from the remote shutdown panel is demonstrated by actual testing. The ability of the system to meet its primary design function is demonstrated during the MSIV full isolation test when it is the main source of water for maintenance of vessel inventory.

The combination of component tests during the preop phase and the control system tune-up/overall operability demonstrations during the power ascension phase of the startup test program satisfy the requirement of Regulatory Guide 1.68.

no change

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Q. 211.144
(5.4.6)

The ASME Boiler and Pressure Vessel Code, Section III, Article NB-7000 requires that individual pressure relief devices be installed to protect lines and components that can be isolated from normal system overpressurization protection. With reference to appropriate P&ID, identify those portions of the RCIC system that can be isolated from normal system overpressure protection. Discuss the relief devices provided or provide the basis for deciding that relief devices are not required.

Response:

Referring to Figures 5.4-9a and 5.4-9b, there are ~~five~~ four RCIC pipe lines that have a low design pressure and, therefore, require relief devices or some other basis for addressing overpressure protection. They are:

- RCIC Pump Suction Line
- RCIC Turbine Exhaust Line
- ~~RCIC Steam Condensing Supply Line Downstream of F064~~ DELETE
- Portions of the RCIC Minimum Flow Line Downstream of F019
- Portions of the RCIC Cooling Water Line Downstream of PCV-F015

The design pressure of the other major pipe lines is equal to the vessel design pressure and subject to the normal overpressure protection system. Below are the overpressure protection bases for the low pressure piping lines.

a. RCIC Pump Suction Line

A relief valve (F017) is located on the pump suction line on Figure 5.4-9b to accommodate any potential leakage through the isolation valves (F013 and F066). A high pump suction pressure alarm is provided in the control room. Also, the pump suction pipe is protected from overpressurization from the RHR system during steam condensing mode by F036 (Figure 5.4-13a) should both the RHR heat exchanger level control valves F065A and F065B (Figure 5.4-13a)

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fail open while dumping condensate to the RCIC pump suction.

b. RCIC Turbine Exhaust Line

This line is normally vented to the suppression pool and is not subject to reactor pressure during normal operation. Rupture discs D001 and D002, as shown on Figure 5.4-9b, are installed on this line to prevent exceeding piping design pressure should the exhaust line isolation valve F068 be closed when the RCIC turbine is operating. The RCIC system will automatically isolate if the rupture discs were to blow open.

~~c. RCIC Steam Condensing Supply Line Downstream of F064~~

~~In the steam condensing mode, high pressure steam is routed to the RHR heat exchangers via F064. The RHR piping is protected from overpressurization by relief valves F055 and F095 as discussed in Question 271.027.~~

DELETE

c ~~d~~. Portions of the RCIC Minimum Flow Line Downstream of ~~F019~~ STET

This line is normally vented to the suppression pool and is separated from reactor pressure by the pump discharge isolation valves ~~(F013, F065, and F066)~~ STET and one additional normally closed isolation valve in the minimum flow line (F019) as shown on Figure 5.4-9a.

d ~~e~~. Portions of the RCIC Cooling Water Line Downstream of PCV-F015.

In the standby condition this line is separated from reactor pressure by the pump discharge valves (F013, F065 and F066) and one additional normally closed shut-off valve in the cooling water line (F046) as shown on Figure 5.4-9b. During system operation a relief valve (F018) is provided to prevent overpressurizing piping, valves, and equipment in the coolant loop in the event of failure of pressure control valve PCV-F015 as shown on Figure 5.4-9b.

[illegible]