.. Pressurizer Power-Operated Relief Valves (PORV) and PORV Block Valves

If a unit is placed in the HOT SHUTDOWN condition in accordance with the requirements of Specifications a(1) through a(5) below, then the reactor coolant sysem temperature should be maintained greater than the minimum pressurization temperature for the inservice pressure test as defined in Figure 15.3.1-1. If cooldown to less than this temperature is required in order to take action to restore the inoperable component(s) to service, then the requirements of Specification 15.3.15 apply.

a. Two PORVs and their associated block valves shall be operable.

~~(1) If a PORV is inoperable due to leakage in excess of that allowed in Specification 15.3.1.D, the PORV shall be restored to an operable condition within one hour or the associated block valve shall be closed.~~

(1) If one or both PORVs are INOPERABLE due to seat leakage in excess of that allowed in Specifications 15.3.1.D, within one hour either restore the PORVs to an operable status or close the associated block valves(s). If these conditions cannot be met, place the unit in a HOT SHUTDOWN condition within the next six hours.

~~(2) If a PORV is inoperable due to a channel functional test failure, the associated PORV control switch shall be placed and maintained in the closed position or the associated block valve shall be closed within one hour.~~

(2) If one PORV is INOPERABLE due to causes other than excessive seat leakage, within one hour either restore the PORV to OPERABLE status or close its associated block valve and remove power from the block valve. If the PORV cannot be restored to operable status within 72 hours, place the unit in a HOT SHUTDOWN condition within the next six hours.

~~(3) If a PORV block valve is inoperable, the block valve shall be restored to an operable condition within one hour or the block valve shall be closed with power removed from the block valve; otherwise, the unit shall be in shutdown within the next six hours.~~

(3) If both PORVs are INOPERABLE due to causes other than excessive seat leakage, within one hour restore at least one PORV to OPERABLE status. If this condition cannot be met, close the associated block valves, remove power from the block valves and place the unit in a HOT SHUTDOWN condition within the next six hours.

(4) If one block valve is inoperable, within one hour either restore the block valve to OPERABLE status or place the associated PORV in manual control. Restore the block valve to OPERABLE status within 72 hours. If these conditions cannot be met, place the unit in a HOT SHUTDOWN condition within the next six hours.

(5) If both block valves are inoperable, restore the block valves to OPERABLE status within one hour or place the associated PORVs in manual control. Restore at least one block valve to OPERABLE status within the next hour. If these conditions cannot be met, then place the unit in a HOT SHUTDOWN condition within the next six hours.

6. The pressurizer shall be operable with at least 100 KW of pressurizer heaters available and a water level greater than 10% and less than 95% during steady-state power operation. At least one bank of pressurizer heaters shall be supplied by an emergency bus power supply.

7. Reactor Coolant Gas Vent System

These Specifications are not applicable during cold or refueling shutdown conditions:

a. At least one Reactor Coolant Gas Vent System vent path to the pressurizer relief tank (PRT) or containment atmosphere shall be operable from each of the following locations:

(1) Reactor vessel head

(2) Pressurizer

Each vent path from these locations to the common header includes two closed valves in parallel powered from emergency buses. The common header vents to the PRT and the containment atmosphere each contain a closed valve powered from an emergency bus which provides series isolation.

b. When unable to vent from the common header to the PRT or the containment atmosphere, reactor startup and/or power operations may continue provided that the series isolation valve in the inoperable vent path is maintained closed with power removed from the valve actuator.

c. If a vent path from the reactor vessel head or the pressurizer to the common header becomes inoperable, reactor startup and/or power operations may continue provided that the paralleled isolation valves in the inoperable vent path from that location to the common header are maintained closed with power removed from the valve actuator. This does not necessitate removing power from the PRT or containment atmosphere isolation valves. The inoperable vent path shall be restored to operable status within thirty days, or the reactor shall be placed in hot shutdown within six hours and in cold shutdown within the following thirty hours.

d. If the vent paths from both the reactor vessel head and the pressurizer to the common header are inoperable or the vent paths from the common header to both the PRT and the containment atmosphere are inoperable, then maintain all the inoperable vent path valves closed with power removed from the valve actuators of all the valves in the inoperable vent paths. Restore at least one of the vent paths from the reactor vessel head or pressurizer to the containment atmosphere or the PRT to operable status within 72 hours or be in hot shutdown within six hours and in cold shutdown within the following thirty hours.

<u>Basis</u>

When the boron concentration of the reactor coolant system is to be reduced, the process must be uniform to prevent sudden reactivity changes in the reactor. Mixing of the reactor coolant will be sufficient to maintain a uniform boron concentration if at least one reactor coolant pump or one residual heat removal pump is running while the change is taking place. The residual heat removal pump will circulate the primary system volume in approximately one-half hour. The pressurizer is of little concern because of the lower pressurizer volume and because pressurizer boron concentration normally will be higher than that of the rest of the reactor coolant.

Specification 15.3.1.A.1 requires that at least one reactor coolant pump must be operating whenever the average reactor coolant temperature is above 350°F unless the listed restrictions are established. This is required so that the FSAR zero power transients (rod withdrawal from subcritical and rod ejection) are addressed from conservative conditions. With the reactor subcritical, with required shutdown margin, and with the trip breakers open, a single rod ejection will not result in criticality being reached. With the reactor subcritical and the average reactor coolant temperature above 350°F, a single reactor coolant pump provides sufficient decay heat removal capability. Heat transfer analyses[1] show that reactor heat equivalent to 3.5% of the rated power can be removed with natural circulation only.

Items 15.3.1.A.1.a.(2) permits an orderly reduction in power if a reactor coolant pump is lost during operation between 3.5% and 50% of rated power.

Above 50% power, an automatic reactor trip will occur if either pump is lost. The power-to-flow ratio will be maintained equal to or less than 1.0, which ensures that the minimum DNB ratio increases at lower flow since the maximum enthalpy rise does not increase above its normal full-flow maximum value.[2]

Specification 15.3.1.A.3 provides limiting conditions for operation to ensure that redundancy in decay heat removal methods is provided. A single reactor coolant loop with its associated steam generator and a reactor coolant pump or a single residual heat removal loop provides sufficient heat removal capacity for removing the reactor core decay heat; however, single failure considerations require that at least two decay heat removal methods be available. Operability of a steam generator for decay heat removal includes two sources of water, water level indication in the steam generator, a vent path to atmosphere, and the Reactor Coolant System filled and vented so thermal convection cooling of the core is possible. If the steam generators are not available for decay heat removal, this Specification requires both residual heat removal loops to be operable unless the reactor system is in the refueling shutdown condition with the refueling cavity flooded and no operations in progress which could cause an increase in reactor decay heat load or a decrease in boron concentration. In this condition, the reactor vessel is essentially a fuel storage pool and removing a RHR loop from service

provides conservative conditions should operability problems develop in the other RHR loop. Also, one residual heat removal loop may be temporarily out of service due to surveillance testing, calibration, or inspection requirements. The surveillance procedures follow administrative controls which allow for timely restoration of the residual heat removal loop to service if required.

Each of the pressurizer safety valves is designed to relieve 288,000 lbs per hour of saturated steam at setpoint. If no residual heat is removed by any of the means available, the amount of steam which could be generated at safety valve relief pressure would be less than half the valves' capacity. One valve, therefore, provide adequate defense against overpressurization. Below 350°F and 400 psig in the Reactor Coolant System, the residual heat removal system can remove decay heat and thereby control system temperature and pressure.

A PORV is defined as OPERABLE if leakage past the valve is less than that allowed in Specification 15.3.1.D and the most recent associated channel test, as specified in Table 15.4.1-1. is acceptable. Additionally, the PORV must have the capability of operating manually to relieve reactor coolant system pressure increases.

A block valve is defined as OPERABLE if the valve can operate manually and if it can control identified PORV leakage.

When a PORV is INOPERABLE due to excessive seat leakage, the block valve is shut with power maintained to the block valve so that the block valve(s) is readily available and may be used to allow the PORV to control reactor pressure. Excessive primary system leakage is defined in specification 15.3.1.D. The block valve may remain shut to isolate the leaking PORV for a limited period of time not to exceed the next refueling shutdown. When a PORV is INOPERABLE for reasons other than excessive seat leakage, the block valve is shut with power removed; this precludes any inadvertent opening of the block valve.

When a block valve is INOPERABLE, the associated PORV is placed in manual control; this precludes the undesired automatic opening of the PORV.

The requirement that 100 KW of pressurizer heaters and their associated controls be capable of being supplied electrical power from an emergency bus provides assurance that these heaters can be energized during a loss of offsite power condition to maintain pressure control and natural circulation at hot shutdown.

The requirement to have a reactor coolant system gas vent operable from the reactor vessel or the pressurizer steam space assures that non-condensible gases can be released from the Reactor Coolant System if necessary. The Reactor Coolant Gas Vent System (RCGVS) provides an orificed vent path from the pressurizer steam space and an orificed vent path from the reactor vessel. Both vent paths include two parallel solenoid-operated isolation valves which are powered from emergency buses and vent to a common header. From the common header, gases may be vented via separate lines, each with a single solenoid operated isolation valve powered from the emergency bus to the pressurizer relief tank or containment atmosphere. The orifice in these vent lines restricts leakage so that, in the event of a pipe break or isolation valve failure, makeup water for the leakage can be provided by a single coolant charging pump. If a RCGVS vent path from either the pressurizer or reactor vessel head is inoperable, Specification 15.3.1.A.7.c requires the remotely operable valves in that inoperable path to be shut with power removed. If a vent path from the common header to the pressurizer relief tank or containment atmosphere is inoperable, the isolation valve in that path must be shut but reactor operations may continue. If both vent paths to or both vent paths from the common header are inoperable, the RCGVS is inoperable and the steps in specification 15.3.1.A.7.d must be taken.

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(1) FSAR Section 14.1.11.

(2) FSAR Section 7.2.3.

15.3.15 OVERPRESSURE MITIGATING SYSTEM OPERATIONS

Applicability

Applies to operability of the overpressure mitigating system when the reactor coolant system temperature is less than the minimum temperature for the inservice pressure test.

Objective

To specify functional requirements and limiting conditions for operation on the use of the pressurizer power operated relief valves when used as part of the overpressure mitigating system and to specify further limiting conditions for operation when the reactor coolant system is operated without a pressure absorbing volume in the pressurizer.

Specification

A. System Operability

1. Except as specified in 15.3.15.A.2 below, the overpressurization mitigating system shall be operable whenever the reactor coolant system is not open to the atmosphere and the temperature is less than the minimum pressurization temperature for the inservice pressure test, as specified in Figure 15.3.1-1. Operability requirements are:

   a. Both pressurizer power operated relief valves operable at a setpoint of ≤425 psig.

   ~~b. The upstream isolation valves to both power operated relief valves are open.~~

~~2. The requirements of 15.3.15.A.1 may be modified to allow one of the two power operated relief valves to be inoperable for a period of not more than seven days.~~

~~3. If the inoperable power operted relief valves connot be made operable within seven days, the reactor coolant system must be depressurized and vented to the pressurizer relief tank within eight hours.~~

   b. Both power operated relief valve block valves are open.

2. The requirements of 15.3.15.A.1 may be modified as specified below:

a. With one PORV inoperable while reactor coolant system temperature is >200°F but less than the minimum pressurization temperature for the inservice pressure test, either restore the inoperable PORV to operable status within 7 days, or depressurize reactor coolant system to atmosphere within the next 8 hours.

b. With one PORV inoperable while reactor coolant system temperature is ≤200°F, either restore the inoperable PORV to operable status within 24 hours, or depressurize the reactor coolant system to the atmosphere within a total of 32 hours.

~~4. If both power operated relief valves are inoperable, the reactor coolant system must be depressurized and vented to the pressurizer relief tank within eight hours.~~

c. With both power operated relief valves inoperable while the reactor coolant system temperature is less than the minimum pressurization temperature for the inservice pressure test, the reactor coolant system must be depressurized and opened to the atmosphere within 32 hours.

3. If the reactor coolant system is open to atmosphere per Specification 15.3.15.A.2.a, b, or c, the atmosphere pathway must be verified at least once every 31 days when it is provided by a non-isolable atmosphere pathway or by a valve(s) that is locked, sealed, or otherwise secured in the open position; otherwise, verify the atmosphere pathway every 12 hours.

B. Additional Limitations

1. When the reactor coolant system is not open to the atmosphere and the temperature of one or both reactor coolant system cold legs is ≤275°F, no more than one high pressure safety injection pump shall be operable. The second high pressure safety injection pump shall be demonstrated inoperable whenever the temperature of one or both reactor coolant system cold legs is ≤275°F by verifying that the motor circuit breakers have been removed from their electrical power supply circuits or by verifying that the discharge valves from the high pressure safety injection pumps to the reactor coolant system are shut and that power is removed from their operators.

2. A reactor coolant pump shall not be started when the reactor coolant system temperature is less than the minimum temperature for the inservice pressure test unless:
    a. There is a pressure absorbing volume in the pressurizer or in the steam generator tubes or
    b. The secondary water temperature of each steam generator is less than 50°F above the temperature of the reactor coolant system.

Basis

The Overpressurization Mitigating System consists of a diverse means of relieving pressure during periods of water solid operation and when the system temperature is below the value permitted to perform the primary system leak test. This method

of water relief utilizes the pressurizer power operated relief valves (PORV's). The PORV's are made operational for low pressure relief by utilizing a dual set-point where the low pressure circuit is energized and de-energized by the operator with a keylock switch depending on plant conditions. The logic required for the low pressure setpoint is in addition to the existing PORV actuation logic and will not interfere with existing automatic or manual actuation of the PORV's. The OPERABILITY of the PORVs is determined on the basis of their being capable of automatically mitigating an overpressure event during low temperature operation.

During plant cooldown prior to reducing reactor coolant system temperature below the minimum temperature allowable for the inservice pressure test, the operator under administrative procedures shall place the keylock switch in the "Low Pressure" position. This action enables the Overpressure Mitigating System. The redundant PORV channels shall remain enabled and operable ~~while the reactor coolant system is not open to the atmosphere and the temperature is less than the minimum pressurization temperature for the inservice pressure test, except that one PORV may be out of service for a period of up to seven days.~~ the Overpressure Mitigation system is required to be in operation.

The reactor coolant system is defined as open to the atmosphere if there is an opening in the reactor coolant system pressure boundary that has an equivalent system pressure relieving capability as a PORV. Some examples of such openings include a blocked open or removed PORV, open steam generator or pressurizer manways, a removed pressurizer safety valve, and the top of the reactor vessel when the reactor vessel head has been unbolted or removed.

The mass input transient used to determine the PORV setpoint assumed a worse case transient of a single high pressure safety injection pump discharging to the reactor coolant system while the system is solid. Therefore, when the reactor coolant system is less than 275°F, only one high pressure safety injection pump shall be operable at any time except when the reactor coolant system is open to the atmosphere.

The heat input transient used to determine the PORV setpoint assumes a temperature difference between the reactor coolant system and the steam generator of 50°F. Therefore, before starting a reactor coolant pump when the reactor coolant system is solid, the operator shall insure that the secondary temperature of each steam generator is less than 50°F above the temperature of the reactor coolant system unless a pressure absorbing volume has been verified to exist in the pressurizer or steam generator tubes.

No.	Channel Description	Check	Calibrate	Test	Remarks
40.	Containment High Range Radiation	S **	R	M **	Calibration to be verification of response to a source.
41.	Containment Hydrogen Monitor	D	R/Q	N.A.	Gas Calibration - Q, Electronic Calibration - R Sample gas for calibration at 2% and 6% hydrogen.
42.	Reactor Vessel Fluid Level System	M	R	N.A.	
43.	In-Core Thermocouple	M	R	N.A.	Calibration to be verification of response to a source.

S - Each Shift
D - Daily
W - Weekly
B/W - Biweekly
Q - Quarterly

M - Monthly
P - Prior to each startup if not done previous week.
R - Each Refueling interval (But not to exceed 18 months).
N.A. - Not applicable.

**Not required during periods of refueling shutdown, but must be performed prior to starting up if it has not been performed during the previous surveillance period.

***During cold or refueling shutdown, a check of one pressure channel per steam generator is required when the steam generator could be pressurized.

****When used for the overpressure mitigating system each PORV shall be demonstrated operable by:

a. Performance of a channel functional test on the PORV actuation channel, but excluding valve operation, within 31 days prior to entering a condition in which the PORV is required operable and at least once per 31 days thereafter when the PORV is required operable.

b. ~~Testing valve operation in accordance with the inservice test requirements of the ASME Boiler and Pressure Vessel Code, Section XI.~~

TABLE 15.4.1-2

MINIMUM FREQUENCIES FOR EQUIPMENT AND SAMPLING TESTS

		Test	Frequency
1.	Reactor Coolant Samples	Gross Beta-gamma activity (excluding tritium)	5/week[7]
		Tritium activity	Monthly
		Radiochemical Ē Determination	Semiannually [2] [10]
		Isotopic Analysis for Dose Equivalent I-131 Concentration	Every two weeks[1]
		Isotopic Analysis for Iodine including I-131, I-133, and I-135	a.) Once per 4 hours whenever the specific activity exceeds 1.0μCi/gram Dose Equivalent I-131 or 100/Ē μCi/gram.[6] b.) One sample between 2 and 6 hours following a thermal power change exceeding 15% of rated power in a one-hour period.
		Chloride Concentration	5/week[8]
		Diss. Oxygen Conc.	5/week[6]
		Fluoride Conc.	Weekly
2.	Reactor Coolant Boron	Boron Concentration	Twice/week
3.	Refueling Water Storage Tank Water Sample	Boron Concentration	Weekly[6]
4.	Boric Acid Tanks	Boron Concentration	Twice/week
5.	Spray Additive Tank	NaOH Concentration	Monthly
6.	Accumulator	Boron Concentration	Monthly
7.	Spent Fuel Pit	Boron Concentration	Monthly

TABLE 15.4.1-2 (Continued)

		Test	Frequency
8.	Secondary Coolant	Gross Beta-gamma Activity or gamma isotopic analysis	Weekly (6)
		Iodine concentration	Weekly when gross Beta-gamma activity equals or exceeds 1.2 μCi/cc (6)
9.	Control Rods	Rod drop times of all full length rods (3)	Each refueling or after maintenance that could affect proper functioning (4)
10.	Control Rod	Partial movement of all rods	Every 2 weeks (6)
11.	Pressurizer Safety Valves	Set point	Every five years (11)
12.	Main steam Safety Valves	Set Point	Every five years (11)
13.	Containment Isolation Trip	Functioning	Each refueling shutdown
14.	Refueling System Interlocks	Functioning	Each refueling shutdown
15.	Service Water System	Functioning	Each refueling shutdown
16.	Primary System Leakage	Evaluate	Monthly (6)
17.	Diesel Fuel Supply	Fuel inventory	Daily
18.	Turbine Stop and Governor Valves	Functioning	Annually (6)
19.	Low Pressure Turbine Rotor Inspection (5)	Visual and magnetic particle or liquid penetrant	Every five years
20.	Boric Acid System	Storage Tank Temperature	Daily
21.	Boric Acid System	Visual observation of piping temperatures (all $\geq$ 145°F)	Daily
22.	Boric Acid Piping Heat Tracing	Electrical circuit operability	Monthly
23.	PORV Block Valves	a. Complete Valve Cycle	Quarterly (6) (12)
		b. Open position check	Every 72 hours (13)

TABLE 15.4.1-2 (Continued)

		Test	Frequency
24.	Integrity of Post Accident Recovery Systems Outside Containment	Evaluate	Each refueling cycle
25.	Containment Purge Supply and Exhaust Isolation Valves	Verify valves are locked closed	Monthly [9]
26.	Reactor Trip Breakers	a. Verify independent operability of automatic shunt and undervoltage trip functions.	Monthly [9]
		b. Verify independent operability of manual trip to shunt and undervoltage trip functions.	Each refueling shutdown
27.	Reactor Trip Bypass Breakers	a. Verify operability of the undervoltage trip function.	Prior to breaker use
		b. Verify operability of the shunt trip functions.	Each refueling shutdown
		c. Verify operability of the manual trip to undervoltage trip functions.	Each refueling shutdown
28.	Power Operated Relief Valves (PORVs), PORV Solenoid Air Control Valves, and Air System Check	Operate[15]	Each shutdown [14]

(1) Required only during periods of power operation.
(2) Ē determination will be started when the gross activity analysis of a filtered sample indicates ≥10μCi/cc and will be redetermined if the primary coolant gross radioactivity of a filtered sample increases by more than 10μCi/cc.
(3) Drop test shall be conducted at rated reactor coolant flow. Rods shall be dropped under both cold and hot condition, but cold drop tests need not be timed.
(4) Drop tests will be conducted in the hot condition for rods on which maintenance was performed.
(5) As accessible without disassembly of rotor.
(6) Not required during periods of refueling shutdown.
(7) At least once per week during periods of refueling shutdown.
(8) At least three times per week (with maximum time of 72 hours between

samples) during periods of refueling shutdown.

(9) Not required during periods of cold or refueling shutdown.

(10) Sample to be taken after a minimum of 2 EFPD and 20 days power operation since the reactor was last subcritical for 48 hours or longer.

(11) An approximately equal number of valves shall be tested each refueling outage such that all valves will be tested within a five year period. If any valve fails its tests, an additional number of valves equal to the number originally tested shall be tested. If any of the additional tested valves fail, all remaining valves shall be tested.

(12) Not required if the block valve is shut to isolate a PORV that is inoperable for reasons other than excessive seat leakage.

(13) Only applicable when the overpressure mitigation system is in service.

(14) Required to be performed only if conditions will be established, as defined in Specification 15.3.15, where the PORVs are used for low temperature overpressure protection. The test must be performed prior to establishing these conditions.

(15) Test valve operation in accordance with the inservice test requirements of the ASME Boiler and Pressure Vessel Code, Section XI.