

THREE MILE ISLAND NUCLEAR STATION
UNIT #1 EMERGENCY PROCEDURE 1202-29
PRESSURIZER SYSTEM FAILURE

PORC CHAIRMAN
UNIT 1

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Unit 2 Staff Recommends Approval

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Unit 2 Superintendent Approval

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Manager Generation Quality Assurance Approval

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THREE MILE ISLAND NUCLEAR STATION
UNIT #1 EMERGENCY PROCEDURE 1202-29
PRESSURIZER SYSTEM FAILURE

SECTION A
Leaking Pilot Operated (Electromatic) Relief Valve RC-RV2

29.A.1 Symptoms

1. Relief valve discharge line temperature exceeding the normal 130⁰F. Alarms on computer at 200⁰±.
2. RC drain tank temperature/pressure above normal on the control room radioactive waste panel. (Pressure alarm at 1.5-2.0 psig.) (Temperature >110⁰F).
3. RC system makeup flow above normal for the variable letdown flow and RC pump seal in leakage conditions.
4. Pressurizer heaters on an abnormal amount of the time.
5. Abnormal decrease in Makeup Tank Level.
6. Pressurizer boron concentration abnormally high compared with RCS boron concentration.

29.A.2 Immediate Actions

A. Automatic Actions

1. None

B. Manual Actions

1. Close the electromatic relief Block Valve, RC-V2.

29.A.3 Follow-Up Action

Objective:

To ensure that appropriate plant management is aware of the isolated valve.

1. Notify duty superintendent that the electromatic relief valve is leaking and has been isolated.

SECTION B
Inoperative Pilot Operated (Electromatic) Relief Valve, RC-RV2

29.B.1 Symptoms

1. RC system pressure is above 2450 psig and RC-RV2 fails to open.
2. RC system pressure is below 2400 psig and valve fails to close.
3. RC-RV2 discharge line temperature is above the 200^oF alarm. (Normal line temperature; 130^oF.)
4. The RC drain tank temperature/pressure is above normal as indicated on the control room radioactive waste panel. (Pressure alarm at 1.5 - 2.0 psig) (Temperature >170^oF)
5. RC drain tank level increasing. (High level alarm at 110 inches.)
6. Decreasing pressurizer temperature.
7. Decreasing RCS pressure.
8. RCS approaching saturation.

NOTE 1: The PORV position indicator lights do not provide direct status of the valve position. The light indicates the position of the solenoid operator on the PORV. Therefore, the indicator lights might not indicate a stuck open PORV.

NOTE 2: With a stuck open PORV, pressurizer level may not be a reliable indication of inventory conditions in the RCS.

29.B.2 Immediate Action

A. Automatic Action

1. For a failed close RC-RV2
 - a. Spray valve RC-V1 is open above 2205 psig.
 - b. Reactor trip occurs at 2300 psig.
 - c. Pressurizer code relief valves open at 2500 psig.
2. For a failed open RC-RV2
 - a. All pressurizer heater banks on full below 2105 psig.
 - b. Reactor trips at 1800 psig. (Possible reactor trip on Variable-Pressure Temperature.)
 - c. High pressure injection is actuated at 1500 psig.

B. Manual Action

1. For a failed closed RC-RV2
 - a. Shift spray valve RC-V1 switch on center console to Manual and open further for additional spray flow if necessary to control pressure.
2. For a failed open RC-RV2
 - a. Close RC-V2 block valve

29.B.3 Follow-Up Action

Objective:

The objective of this procedure is to conserve reactor coolant inventory.

1. If a reactor trip has not occurred, attempt to restore the RCS to normal temperature, pressure and pressurizer level using makeup flow and pressurizer heaters.

2. If a reactor trip has occurred follow EP 1202-4, "Reactor Trip". If 50°F subcooling cannot be maintained in the RCS, initiate high pressure injection.
3. If high pressure injection has been initiated, follow the operating guidance for high pressure injection in EP 1202-6, "Loss of Reactor Coolant/Reactor Coolant Pressure".

SECTION C
Leaking Code Relief Valve, RC-RV1A or RC-RV1B

29.C.1 Symptoms

1. Code relief valve discharge line temperature(s) exceeding the computer normal of approximately 130⁰F. (Computer alarms at 200⁰F.)
2. RC drain tank temperature/pressure above normal (ambient) on the control room radioactive waste panel. (Pressure alarms at 1.5-2.0 psig.) (Temperature >110⁰F)
3. RC system increased makeup flow is above normal for the variable letdown flow and RC pump seal in leakage conditions.
4. Pressurizer heaters on an abnormal amount of the time.
5. Abnormal decrease in Makeup Tank level.
6. Pressurizer boron concentration abnormally high compared with RCS boron concentration.

29.C.2 Immediate Action

A. Automatic Action

1. None

B. Manual Action

1. Determine RC leakage according to SP 1303-1.1, "Daily Surveillance Checks".

29.C.3 Follow-Up Action

Objective:

To make space available for the leakage, and to determine whether shutdown is required.

1. If RC system identified leakage is in excess of Tech. Spec. 3.1.6, the reactor plant must be shutdown within 24 hours.

2. Assure RC drain tank pump is operating and cooler is in service.
3. If RC drain tank temperature exceeds 120⁰F and sufficient liquid waste capacity is available, alternately add demin water and drain down the drain tank to reduce temperature.

SECTION D
Inoperative Code Relief Valve, RC-RV1A or RC-RV1B

29.D.1 Symptoms

1. Code relief valve(s) fail to open when above 2500 psig or fails to close when below 2275 psig.
2. Relief valve discharge line temperature is above the 200⁰F alarm (normal - 130⁰F), the RC drain tank temperature/pressure is above normal (pressure alarm at 1.5 - 2.0 psig; Temperature >110⁰F) and the RC system makeup flow is above normal for the letdown and RC pump seal in leakage.
3. RC drain tank level increasing.
4. Decreasing pressurizer temperature.
5. Decreasing RCS pressure.
6. RCS approaching saturation.

29.D.2 Immediate Action

A. Automatic Action

1. Reactor trip from high or low system pressure.
2. HP injection if valve fails to close.

B. Manual Action

1. If code valve(s) fail to open at 2500 psig place spray valve on manual at console center and open. Verify pressurizer heaters are off at console right. Verify RC-V2 and RC-RV2 are open.
2. If code valves fail to close, follow EP 1202-6, "Loss of Reactor Coolant/Reactor Coolant Pressure".

29.D.3 Follow-Up Action

Objective:

Shutdown the plant if a code safety valve is stuck shut.

1. If valve failed to lift, proceed with cooldown.

SECTION E
Inoperative Pressurizer Heaters

29.E.1 Symptoms

1. Heater banks fail to energize or de-energize if RC pressure is at heater bank setpoint.

	<u>Bank 1</u>	<u>Bank 2</u>	<u>Bank 3</u>	<u>Bank 4</u>	<u>Bank 5</u>	<u>Units</u>
ON	2135	2135	2135	2120	2105	PSIG
OFF	2155	2155	2147	2140	2125	PSIG

NOTE: Banks 1, 2, and 3 are full on at 2135 psig.

2. Pressurizer level Lo-Lo alarm at 80 inches. (Heater cutoff)
3. Pressurizer heater power supply ground alarm.
4. Abnormal console indicating lights for the heating groups.
5. High 2255 psig or low 2055 psig pressure alarms.
6. High or low pressurizer temperature. (Normal $\approx 650^{\circ}\text{F}$)

29.E.2 Immediate Action

A. Automatic Action

1. For energized heaters and rising pressure
 - a. Spray valve RC-V1 opens (red and green console jog button lights).
2. For loss of heaters and decreasing pressure.
 - a. None

B. Manual Action

1. Place heater controller in manual control if control malfunction is suspected.
2. For energized heaters/rising pressure, attempt to de-energize all heaters (at console right) except group 1 or 2.

3. For loss of heaters/decreasing pressure, attempt to energize backup heaters from console CR. If unsuccessful, start reducing unit load.

29.E.3 Follow-Up Action

Objective:

The objective of this procedure is to maintain pressure control and to ensure conservation of RCS inventory.

1. For energized heaters, open heater breakers in question at the pressurizer heater control centers except for group 1 or 2.
2. Control RC pressure at normal 2155 psig setpoint with RC-V1 spray valve in manual.
3. For de-energized heaters, determine cause and if a minimum of one heater group is not operable, continue load reduction to shutdown and cooldown.

NOTE: With no heaters, the rate of pressure reduction will be determined by heat losses from the pressurizer.

4. Monitor RCS pressure and assure the reactor trips if setpoints are reached.
5. During the shutdown from 15% power, or if the reactor trips, increase makeup to stop the decrease in pressurizer level.

NOTE: This action is to preserve the mass of hot water stored in the pressurizer which is providing the margin to saturation after loss of pressurizer heaters.

6. Close RC-V3 to stop bypass flow. Reopen RC-V3 periodically to maintain spray line temperature within 250°F of pressurizer temperature.
7. After reactor is shutdown, monitor RCS pressure and saturation pressure. If the 50°F subcooled limit is approached, increase the rate of cooldown to keep ahead of pressurizer cooldown and increase makeup to keep pressurizer level constant.

SECTION F
Malfunction In Pressurizer Level Indication Or Control

- 29.F.1 Symptoms
1. Disagreement between the console recorder level readouts of more than 12 inches.
 2. Rapid change in indicated/recorded level due to loss of compensation or loss of power or d/p cell failure or other malfunction.
- 29.F.2 Immediate Action
- A. Automatic Action
1. If indication fails low
 - a. Pressurizer heaters trip @ 80 inches, makeup valve MU-V17 opens, and RC pressure increases.
 2. If indication fails high
 - a. Makeup valve MU-V17 closes.
- B. Manual Action
1. Take hand control of MU-V17 and select alternate transmitter(s) for indication.
 2. Verify heaters re-energize if tripped due to 80 inch low level interlock.
- 29.F.3 Follow-Up Action
- Objective:
- Select an operable instrument and return system parameters to normal.
1. If switching level transmitters has not rectified the condition, switch to the alternate temperature detector.

2. If pressurizer level recorder indication is lost, use the computer for level indication. If computer level indication is selected be sure to select temperature compensated pressurizer level (Pt. #1720, 1721 and 1722).

NOTE: Each of these points is temperature compensated by the temperature detector opposite the one selected for control.

3. Restore RCS pressure and temperature and pressurizer level to normal.

SECTION G
Pressurizer Spray Valve Failure

29.G.1 Symptoms

1. RC-V1 spray valve fails to open when the RC system pressure is greater than 2205 psig.
2. RC-V1 spray valve is open when the RCS system is less than 2155 psig.

29.G.2 Immediate Action

A. Automatic Action

1. RCS pressure greater than 2300 trips the reactor.
2. RC system pressure greater than 2450 psig activates RC-RV2 electromatic relief.
3. RC-V1 spray valve fails open (in auto) causes a Low pressure reactor trip in about 5 minutes even with all heaters "ON". Failure when manually opened beyond the automatic limit position causes a more rapid pressure decrease.

B. Manual Action

1. Control RC-V1 opening or closing in manual with jog buttons.
2. If the spray valve has failed open, control pressure by closing the spray block valve RC-V3.

NOTE: If the "Block" valve RC-V3 is closed, it must be periodically cycled to keep the spray line warm. Cycle RC-V3 open as necessary to keep RC pressurizer spray

line temperature within 250⁰F of pressurizer temperature. (Computer Pt. 520)

CAUTION: Do not exceed at ΔT of 410⁰F between pressurizer temperature and reactor coolant hot leg temperature.

3. Reduce rate of ICS load change to less than 1% per minute.

29.G.3 Follow-Up Action

Objective:

Limit pressure transients while attempting to restore RC-V1 to operation.

1. Continue plant operation with reduced rate of load change.
2. Check thermal overload and molded case circuit breaker for RC-V1 (IAES MCC Unit 9B).
 - a. Reset thermal OL if tripped.
 - b. Notify Electrical Maintenance if molded case breaker is tripped.
3. If the spray valve can not be repaired on line, shutdown and repair.