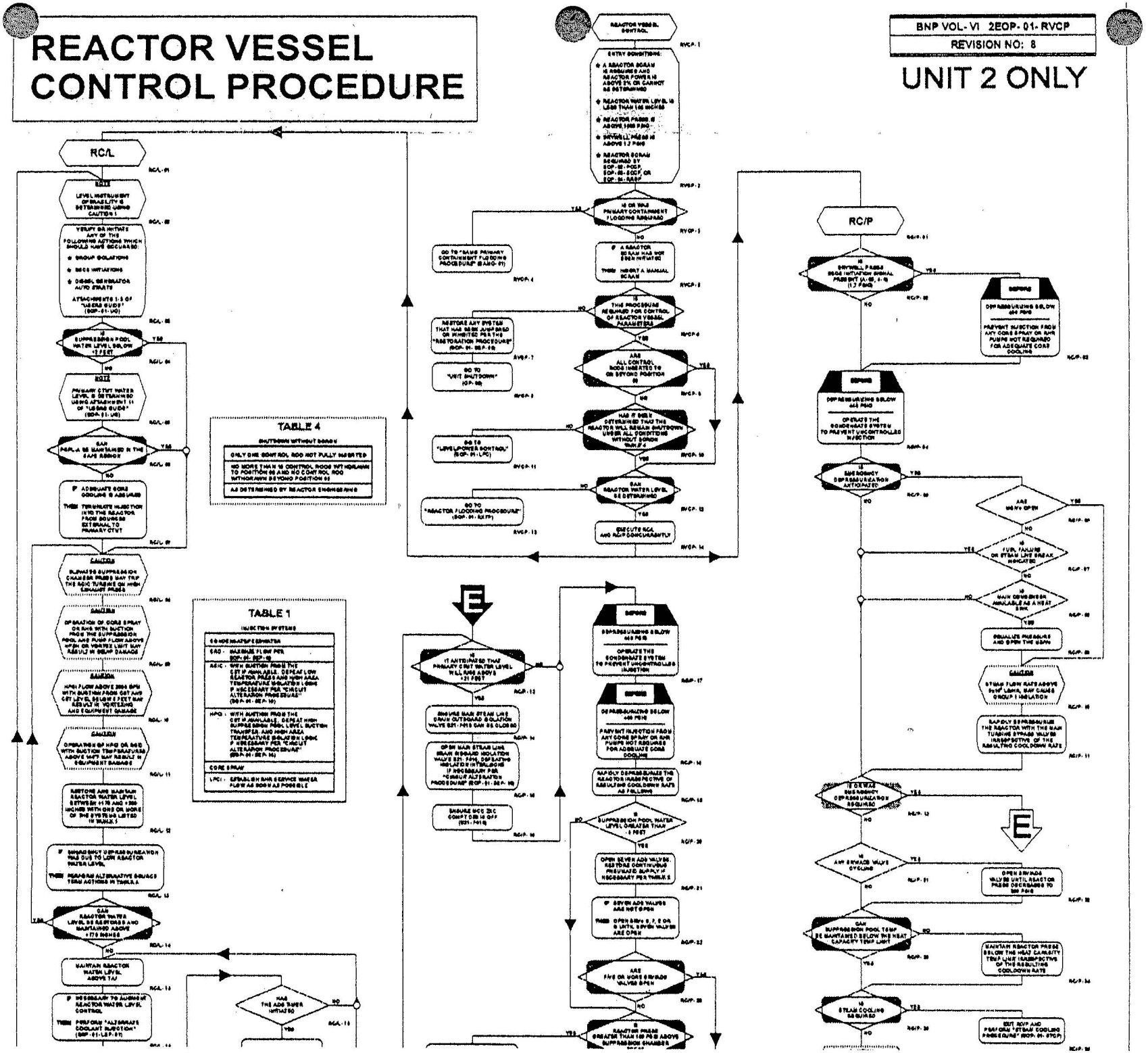
REACTOR VESSEL CONTROL PROCEDURE

BNP VOL- VI 2EOP- 01- RVCP

REVISION NO: 8

UNIT 2 ONLY



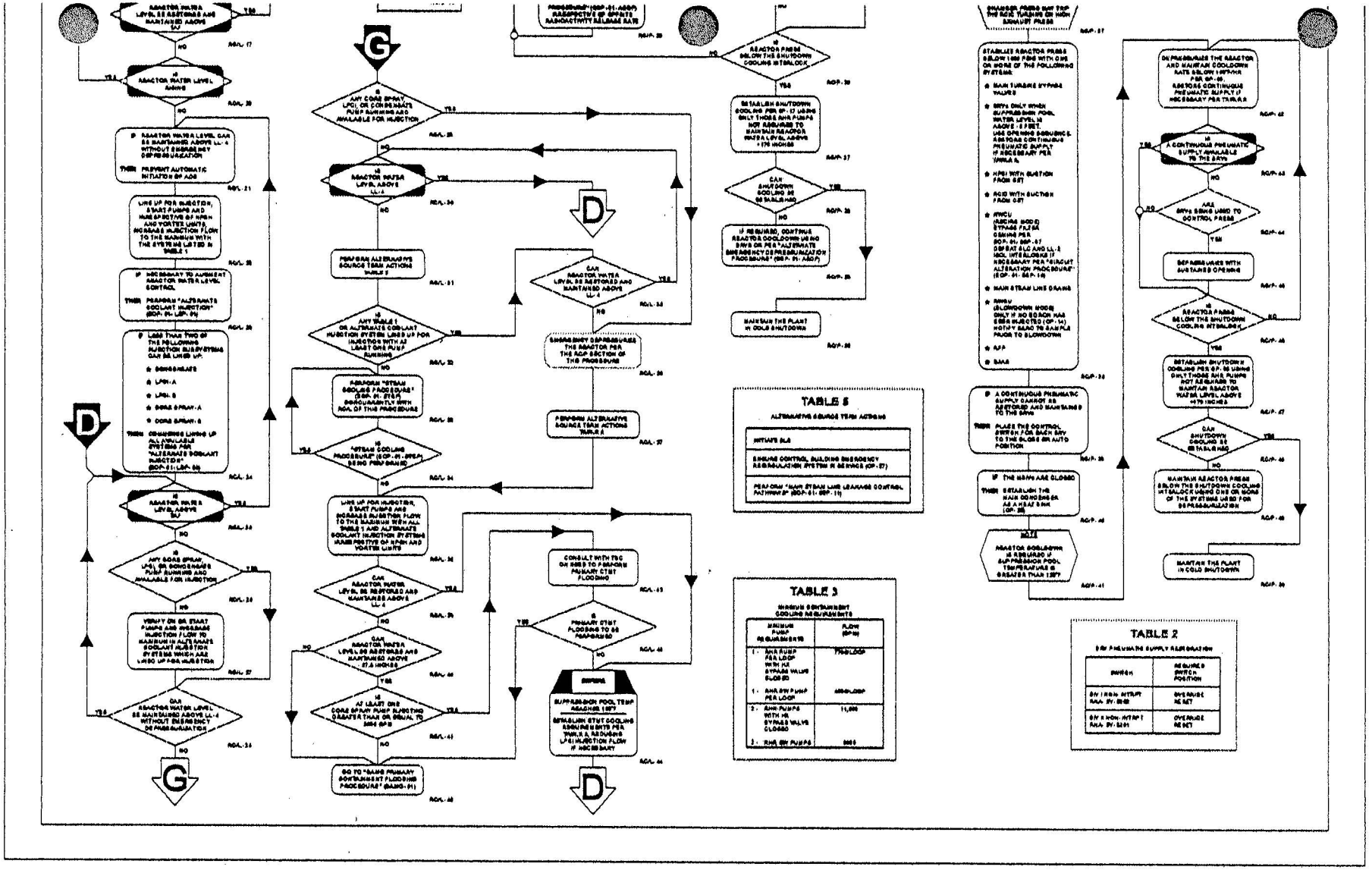
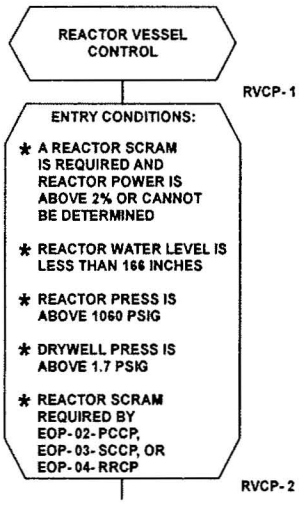


TABLE 5
TABLE 3
TABLE 2

3.0 STEP BASES

STEPS RVCP-1 and RVCP-2



STEP BASES:

The Reactor Vessel Control Procedure (RVCP) is entered from the Reactor Scram Procedure (RSP). The RVCP is entered from the Steam Cooling Procedure, Primary Containment Control Procedure, Secondary Containment Control Procedure, or Radioactivity Release Control Procedure when Emergency Depressurization is required. In addition the Steam Cooling Procedure returns the operator to the RC/P leg, while the Reactor Flooding Procedure returns the operator to the RVCP when reactor water level can be determined.

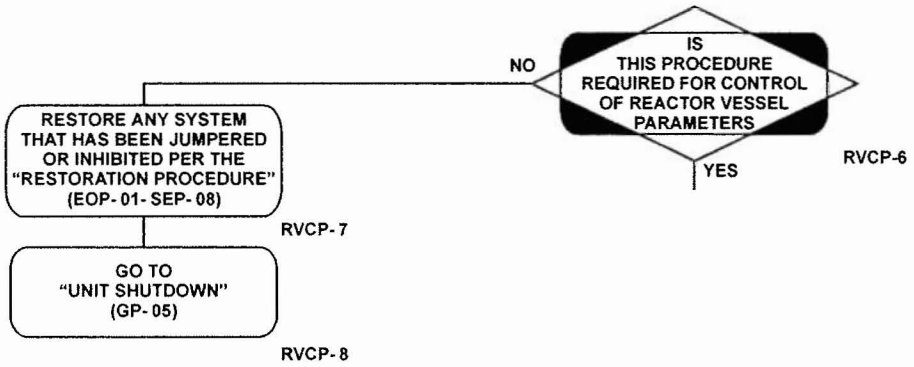
The conditions which require entry to the RVCP are symptomatic of an emergency or conditions which, if not corrected, could degrade into an emergency. The entry conditions relate directly to the key parameters controlled in the RPV Control Guideline. The low reactor water level and high reactor pressure entry conditions are directly related to the sections for controlling these same two parameters. The high drywell pressure entry condition is indicative of a line break occurring in the drywell and thus relates to reactor water level control. A condition which requires a reactor scram coincident with the reactor not shutdown is indicative of a failure to scram, and thus relates directly to reactor power control. The reactor scram required by the Primary Containment Control Procedure, the Secondary Containment Control Procedure, or the Radioactivity Release Control Procedure, entry condition, allows the operator to enter the RPV Control Guidelines and stabilize plant conditions in anticipation of further degradation of containment parameters or radioactivity release that may lead to emergency depressurization.

STEPS RVCP-1 and RVCP-2 (continued)

This set of entry conditions is sufficient to assure that the procedure(s) developed from the RPV Control Guideline will be entered for the various transients and accidents which comprise the design and licensing basis for Brunswick and for those additional events which have been evaluated as significant with respect to emergency response actions.

Each entry condition has been chosen so as to be simple, operationally significant, unambiguous, readily identifiable, and familiar to plant operators.

STEPS RVCP-6 through RVCP-8

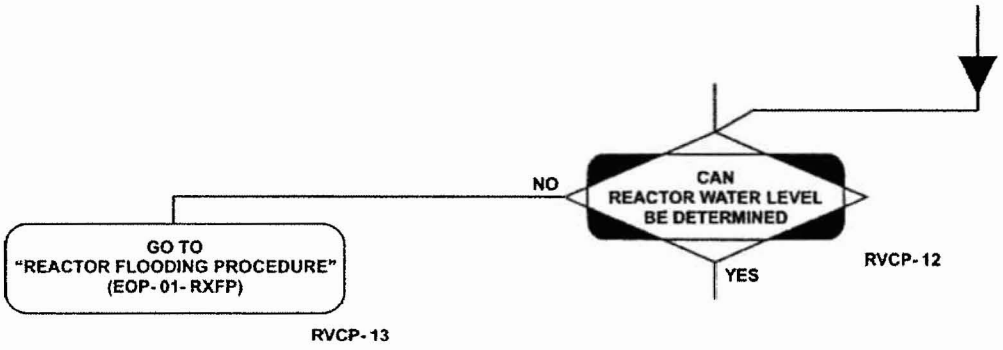


STEP BASES:

Since the entry condition for the Reactor Scram Procedure is "Any condition that requires or has initiated a reactor scram," it is possible that the actions taken in the Reactor Scram Procedure will be sufficient to stabilize plant conditions such that the actions of the Reactor Vessel Control Procedure will not be needed. If plant conditions are such that this procedure is not required for control of reactor vessel parameters when entering the Reactor Vessel Control Procedure, then the operator is directed to shut down and cool down the reactor in accordance with GP-05. If this procedure is required for control of reactor vessel parameters, the operator will continue with actions of the Reactor Vessel Control Procedure until its actions are no longer required.

Since the actions in the Reactor Vessel Control Procedure may authorize the defeat of interlocks and actuations, a step has been added to ensure that these defeated interlocks and actuations are restored prior to exiting the EOPs.

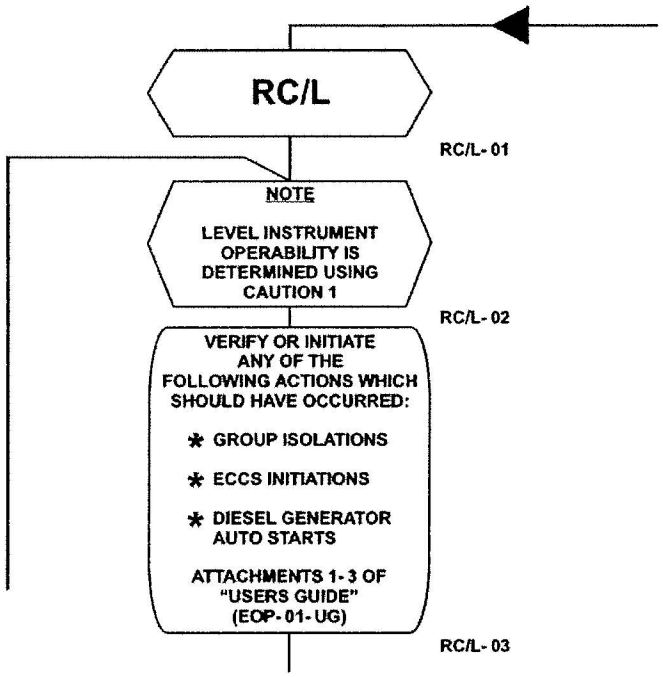
STEPS RVCP-12 and RVCP-13



STEP BASES:

If reactor water level cannot be determined, the actions specified in the subsequent steps cannot be performed since reactor water level and water level trend information is required for determining which actions to take. Transferring control of reactor water level and reactor pressure from the Reactor Vessel Control Procedure to the Reactor Flooding Procedure is necessary to assure continued adequate core cooling under conditions where reactor water level cannot be determined.

STEPS RC/L-01 through RC/L-03



STEP BASES:

Step RC/L-03 assures initiation of those automatic actions most important for controlling reactor coolant inventory. Other automatic actions of lesser importance are subordinate to those directly affecting reactor water level control, and their initiation need not be assured at this point.

Isolation actions terminate loss of reactor coolant inventory and simplify reactor water level control. Included within the scope of "isolations" are those valved lines that connect directly to the reactor vessel and penetrate Primary Containment (e.g. main steam lines, RWCU, and shutdown cooling suction lines, etc.).

Initiation of ECCS aligns sources of makeup water and starts pumps for injecting water into the reactor vessel. More detailed instructions regarding the operation of these systems to establish and maintain control of reactor water level are provided in subsequent steps of the EOPs.

The statement "which should have . . ." encompasses conditions for which automatic action should have occurred but failed to. In such a case, manual operator action to initiate the appropriate action is required.

STEPS RC/L-01 through RC/L-03 (continued)

The operator actions specified for controlling reactor water level are predicated upon current and reliable information on this parameter, both its value and trend. The identified applicability of Caution No. 1 emphasizes this requirement.

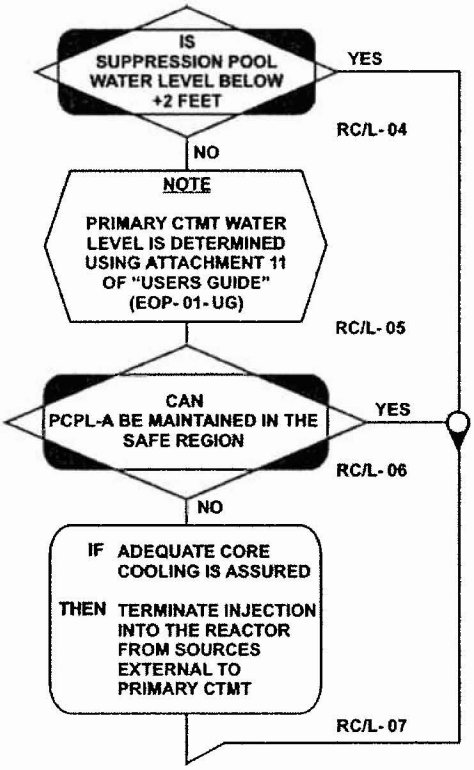
Factors inherent in the design of BWR reactor water level measurement systems make the validity of information supplied by these instruments contingent upon the value of reactor pressure and Primary and Secondary Containment temperatures. Caution No. 1 identifies these specific conditions.

Water in the reactor water level instrument legs is maintained in a liquid state by the cooling action of the surrounding atmosphere and the pressure in the reactor vessel. The water in the instrument legs will boil, however, if its temperature exceeds the saturation temperature for the existing reactor pressure.

Boiling is a concern in both horizontal and vertical reference and variable instrument leg runs. Boiloff of the reference leg water inventory reduces the reference head of water, decreases the dP sensed by the instrument, and results in an erroneously high indicated reactor water level. Boiling in an instrument's variable leg exerts increased pressure on that side of the dP cell, also resulting in a lower sensed dP and an erroneously high indicated reactor water level.

For each of the reactor water instruments which provide indication on the RTGB panels, a calculation has been performed to determine the Maximum Drywell and Reactor Building Instrument Run Temperatures at which the instrument will indicate reactor water level at the bottom of the instrument scale when reactor water level is actually at the elevation of the instrument variable leg tap. The calculation also determines the Minimum Indicated Level which results from off-calibration instrument run temperature conditions when reactor water level is actually at the elevation of the instrument variable leg tap. The results of these calculations have been incorporated into Caution 1. The graphs and other information found in Caution 1 provide information as to when the level instruments can be used to provide information with respect to the value of reactor water level and its trend.

STEPS RC/L-04 through RC/L 07



STEP BASES:

For Suppression Pool water levels below +2 feet, Primary Containment water level can be monitored with Suppression Pool water level instrumentation. For Primary Containment water levels above +2 feet, changes in Primary Containment water level may not result in equal changes of Suppression Pool water level, so the operator is sent to Attachment 11 of the User's Guide where Primary Containment water level is calculated.

The Suppression Pool water level at this time should be at approximately the elevation of the internal vacuum breakers. In the event Primary Containment Level continues to rise above this elevation, the gases in the Suppression Chamber space cannot be vented and will become compressed. Under these conditions the normal Suppression Pool Water Level instruments will not provide valid indication.

STEPS RC/L-04 through RC/L-07 (continued)

With a nonisolated primary system break inside the drywell, injection into the reactor vessel from sources external to the Primary Containment will cause Primary Containment water level to increase when reactor water level reaches the elevation of the break.

The primary containment pressure limit is the lesser of:

a. The pressure capability of the primary containment.

b. The maximum primary containment pressure at which vent valves sized to reject all decay heat from the containment can be opened and closed.

c. The maximum primary containment pressure at which SRVs can be opened and will remain open.

d. The maximum primary containment pressure at which reactor vessel vent valves can be opened and closed.

The design of the primary containment is such that the limiting component for the Primary Containment Pressure Limit A is not a structural component. The limits for structural components is not exceeded with a drywell airspace pressure of 70 psig and primary containment water level at 68.5 feet (elevation of the drywell vent above TAF which will remove the 10 minute decay heat from the containment). Therefore the primary containment pressure limit is based upon drywell pressure. The limit of 70 psig is based upon the drywell airspace pressure which will allow operation of the SRVs and of the drywell vent valve located at the 68.5 foot elevation.

Primary containment pressure limit is evaluated using the drywell pressure indication. The limit is adjusted using the height of water above the instrument tap. The pressure limit is limited by the calculation based upon the water providing a back pressure to the exhaust of the SRV solenoids.

If an unisolable break exists inside the drywell, continued reactor vessel injection form sources external to the primary containment will increase primary containment water level after the reactor vessel water level reaches the elevation of the break. The increasing primary containment water level will , in turn increase the pressure exerted on submerged primary containment components and compress the primary containment airspace, thereby increasing the atmospheric pressure. The combination of these effects tends to decrease the margin to PCPL-A as the water level rises. If primary containment water level and suppression chamber pressure cannot be maintained below PCPL-A, injection into the reactor vessel from external sources is therefore terminated, provided adequate core cooling can still be assured.

STEP RC/L-12

RESTORE AND MAINTAIN REACTOR WATER LEVEL BETWEEN +170 AND +200 INCHES WITH ONE OR MORE OF THE SYSTEMS LISTED IN TABLE 1

RC/L-12

TABLE 1

INJECTION SYSTEMS

CONDENSATE/FEEDWATER	
CRD -	MAXIMIZE FLOW PER EOP-01-SEP-09
RCIC -	WITH SUCTION FROM THE CST IF AVAILABLE. DEFEAT LOW REACTOR PRESS AND HIGH AREA TEMPERATURE ISOLATION LOGIC IF NECESSARY PER "CIRCUIT ALTERATION PROCEDURE" (EOP-01-SEP-10)
HPCI -	WITH SUCTION FROM THE CST IF AVAILABLE. DEFEAT HIGH SUPPRESSION POOL LEVEL SUCTION TRANSFER AND HIGH AREA TEMPERATURE ISOLATION LOGIC IF NECESSARY PER "CIRCUIT ALTERATION PROCEDURE" (EOP-01-SEP-10)
CORE SPRAY	
LPCI -	ESTABLISH RHR SERVICE WATER FLOW AS SOON AS POSSIBLE

STEP BASES:

Available systems are listed in Table 1 to simplify the step.

This step defines the preferred range in which reactor water level should be established and maintained and specifies the preferred systems to use in doing so. Maintaining reactor water level below the high end of the identified control band preserves the availability of steam-driven equipment (HPCI, RCIC, feedwater). Maintaining reactor water level above the low end of the identified control band permits the scram to be reset (barring the existence of other scram signals), and allows the use of the normal shutdown cooling system to establish and maintain cold shutdown conditions.

The wide reactor water level control band permitted by this step is sufficient to assure adequate core cooling yet avoids unwarranted demands on an operator's attention. If unnecessarily constrained within narrower limits, an operator may be less effective in performing concurrent duties.

STEP RC/L-12 (continued)

Most of the listed systems start or operate automatically and in many cases an operator need only verify system lineups when this step is reached. If, for example, reactor water level is low due to shrink following a turbine trip, the Feedwater System is capable of restoring water level automatically. If a break occurs with the reactor at high pressure, HPCI is designed to automatically inject.

This step is purposely written to provide an operator with the flexibility to control available systems as appropriate for existing plant conditions. As a transient progresses, the most effective modes of system operation may change. (For example: all ECCS pumps may inject following a large pipe break, but a single pump may be sufficient to maintain reactor water level once it is restored within the specified range.) Continued manual control and adjustment of system lineups and injection flows may thus be required in order to remain within the preferred reactor water level control band.

Included in this step is a list of motor-driven and steam-driven injection systems appropriate for controlling reactor water level. The listed systems include both those used for reactor water level control during normal plant operations at power and those categorized as emergency makeup. Since symptom-oriented procedures must address a full spectrum of initial plant conditions and postulated transients, this step does not unconditionally prioritize use of one system over another.

Suction for HPCI and RCIC is aligned to the Condensate Storage Tank (CST) if it is available. The HPCI automatic suction transfer logic can be defeated to allow this lineup if necessary provided suppression pool temperature is approaching 140°F. Prior to approaching this temperature HPCI is run on the suppression pool to preclude raising the water level in the suppression pool. With the suppression pool temperature below 140°F adequate cooling is provided for the HPCI lubricating and control oil system and does not present a challenge to HPCI NPSH requirements. When HPCI and RCIC are aligned to the CST auxiliary systems and lineups may be required to maintain water level in the CST. The defeat of the high area temperature isolation is allowed provided an actual steam leak does not exist and HPCI operation is required for adequate core cooling.

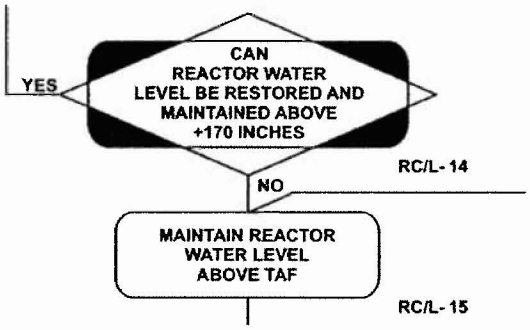
The low reactor pressure isolation interlock for RCIC may be defeated because some injection into the reactor vessel can still be sustained above the design turbine stall pressure (however, the higher steam demand required for HPCI operation prevents sustained operation at low pressure). The defeat of the high area temperature isolation is allowed provided an actual steam leak does not exist and RCIC operation is required for adequate core cooling.

STEP RC/L-12 (continued)

Directing RHR Service Water flow as soon as possible promotes rapid removal of decay heat from the Primary Containment, thus minimizing Suppression Pool heatup and prolonging the availability of the Suppression Pool as a heat sink.

As used here, the phrase "as soon as possible" means the earliest practicable time within the constraints imposed by system conditions, valve control logic, and concurrently required operator actions.

STEPS RC/L-14 and RC/L-15



STEP BASES:

If reactor water level cannot be maintained above +170 inches, an alternate control band with a lower limit is defined. The widened reactor water level control band provides added operational flexibility while still assuring adequate core cooling through core submergence. By establishing the broadened reactor water level control band, additional time may be available to place injection systems not yet operating in service. The widened control band also accommodates controlling reactor water level without employing additional contingency actions for a condition where:

a. A break exists between a low reactor water level of +170 inches and the top of the active fuel and

b. Break flow cannot be overcome by injection flow.

STEP RC/L-16

IF NECESSARY TO AUGMENT REACTOR WATER LEVEL CONTROL

THEN PERFORM "ALTERNATE COOLANT INJECTION" (EOP-01-LEP-01)

RC/L-16

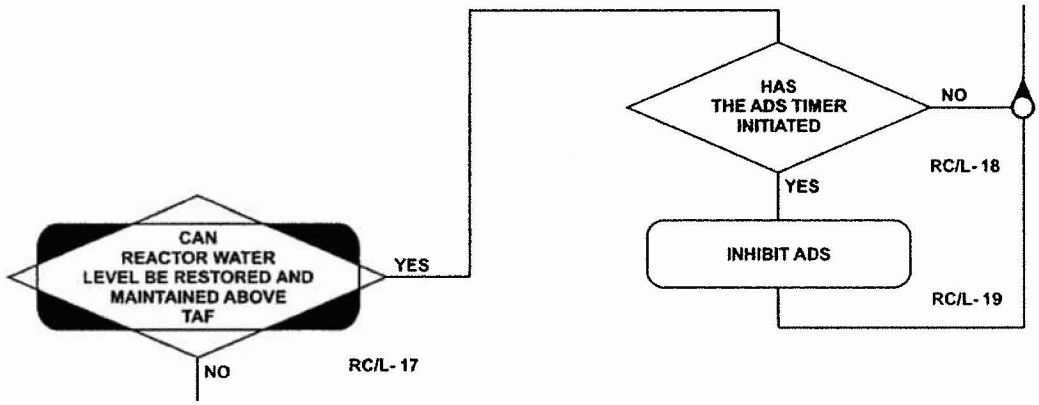
STEP BASES:

Any one or combination of the systems listed in EOP-01-LEP-01 may be lined up and placed in service to maintain water level in the widened reactor water level control band. Included are those alternate systems which supply water of relatively low quality and those which entail more complex injection lineups (as compared to the preferred systems discussed previously).

Since the preferred reactor water level control band (+170 inches to +200 inches) and the alternate reactor water level control band (TAF to +200 inches) have both been established, reactor water level should be restored to and maintained within the preferred band whenever system availability makes this possible.

The term "to augment" is not explicit direction that requires use of the additional alternate systems. Subsequent steps specify the conditions under which there remains no option regarding injection from available "lower quality" alternate injection systems.

STEPS RC/L-17 through RC/L-19



STEP BASES:

If it has been determined that reactor water level can be restored and maintained above the top of the active fuel with available injection sources, emergency depressurization is unnecessary. Automatic initiation of ADS is therefore prevented.

Permitting automatic ADS initiation may be undesirable for the following reasons:

a. ADS actuation can impose a severe thermal transient on the reactor vessel and may complicate efforts to control reactor water level.

b. If only steam-driven systems are available for injection, ADS actuation may directly lead to loss of adequate core cooling and subsequent core damage.

c. The conditions assumed in the design of the ADS actuation logic (e.g., no operator action for 10 minutes after event initiation) may not exist when the actions specified in this step are being performed.

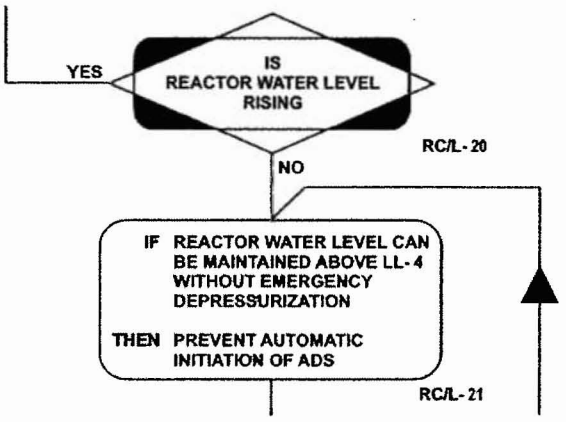
d. The operating crew can draw on much more information than is available to the ADS logic (e.g., equipment out of service for maintenance, operating experience with certain systems, probability of restoration of off-site power, etc.) and can better judge, based on instructions contained in the EOPs, when and how to depressurize the reactor vessel.

STEPS RC/L-17 through RC/L-19 (continued)

ADS initiation is prevented in this step, however, only if reactor water level can be restored and maintained above the top of the active fuel and the ADS timer initiates. If reactor water level cannot be restored and maintained above the top of the active fuel, the instruction is not applicable. Placing the ADS inhibit switches to "INHIBIT" is the preferred method of preventing ADS. If the timer does not initiate, the ADS logic is not defeated so that the system will still provide an automatic backup for high pressure injection in small break loss of coolant accidents.

Subsequent steps provide explicit and detailed instructions for controlling reactor water level and pressure and specify when emergency depressurization is appropriate.

STEPS RC/L-20 and RC/L-21



STEP BASES:

The purpose of the subsequent steps is to reverse a decreasing level trend. If level starts increasing, the previous steps provide the appropriate actions for continued reactor level control.

If reactor water level can be maintained above LL-4 without an emergency depressurization, then the operator is directed to prevent automatic initiation of the ADS. This is an operator judgment based upon the systems which are available for injection and the rate of reactor water level decrease. If it is decided that reactor water level cannot be maintained above LL-4 without emergency depressurization, then the automatic function is allowed to proceed. If it is decided that reactor water level can be maintained above LL-4 without emergency depressurization, then the defeat of the ADS initiation precludes unnecessary and unwanted automatic initiations during the performance of subsequent steps of the procedure. The authorization to defeat the logic is not dependent upon ADS timer initiation. Since however, reactor water level cannot be restored and maintained above the top of the active fuel, it is implied that level is, or soon will be, below the ADS initiation setpoint. Placing the ADS inhibit switches to "INHIBIT" is the preferred method of preventing ADS.

STEPS RC/L-20 and RC/L-21 (continued)

The prevention of ADS is allowed under these conditions for the following reasons:

a. ADS actuation can impose a severe thermal transient on the reactor vessel and may complicate efforts to control reactor water level.

b. If only steam-driven systems are available for injection, ADS actuation may directly lead to loss of adequate core cooling and subsequent core damage.

c. The conditions assumed in the design of the ADS actuation logic (e.g., no operator action for 10 minutes after event initiation) may not exist when the actions specified in this step are being performed.

d. The operating crew can draw on much more information than is available to the ADS logic (e.g., equipment out of service for maintenance, operating experience with certain systems, probability of restoration of off-site power, etc.) and can better judge, based on instructions contained in the EOPs, when and how to depressurize the reactor vessel.

Subsequent steps provide explicit and detailed instructions for controlling reactor water level and specify when emergency depressurization is appropriate.

STEPS RC/L-22 through RC/L-24

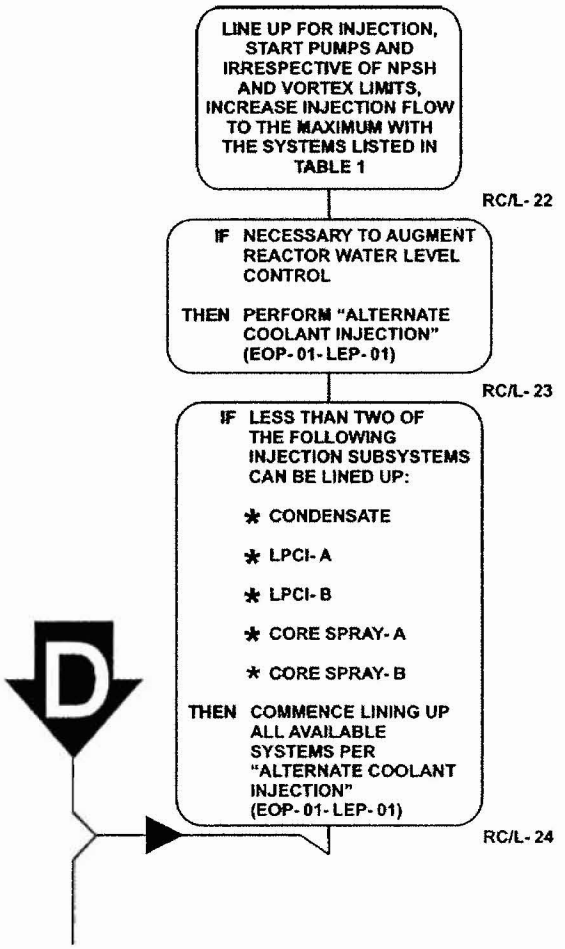


TABLE 1

INJECTION SYSTEMS

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HPCI -	WITH SUCTION FROM THE CST IF AVAILABLE. DEFEAT HIGH SUPPRESSION POOL LEVEL SUCTION TRANSFER AND HIGH AREA TEMPERATURE ISOLATION LOGIC IF NECESSARY PER "CIRCUIT ALTERATION PROCEDURE" (EOP-01-SEP-10)
CORE SPRAY	
LPCI -	ESTABLISH RHR SERVICE WATER FLOW AS SOON AS POSSIBLE

STEP BASES:

The systems listed in Table 1 are defined to be injection "systems". Step RC/L-11 of this procedure permits use of "*one or more*" of these same systems; here, however, an explicit direction to "*increase injection flow to the maximum*" is included and the systems are used "*irrespective of pump NPSH and vortex limits.*"

The direction to maximize injection into the reactor vessel ensures that all available normal and ECCS injection sources are used before other, less desirable methods of core cooling are employed. While injection from low pressure ECCS may not be possible if reactor pressure remains high, available systems should be aligned such that maximum flow will be delivered to the reactor as soon as pressure drops below the system shutoff heads and injection interlock setpoints.

STEPS RC/L-22 through RC/L-24 (continued)

The injection system pumps may now be operated irrespective of NPSH and vortex limits, since restoration of adequate core cooling takes precedence over adherence to normal operating limits. The undesirable consequences of uncovering the reactor core outweigh the risk of equipment damage which could result if NPSH or vortex limits are exceeded. Immediate and catastrophic pump failure is not expected to occur should operation beyond these limits be required.

Suction for HPCI and RCIC is aligned to the Condensate Storage Tank (CST) if it is available. The HPCI automatic suction transfer logic can be defeated to allow this lineup if necessary provided suppression pool temperature is approaching 140°F. Prior to approaching this temperature HPCI is run on the suppression pool to preclude raising the water level in the suppression pool. With the suppression pool temperature below 140°F adequate cooling is provided for the HPCI lubricating and control oil system and does not present a challenge to HPCI NPSH requirements. When HPCI and RCIC are aligned to the CST auxiliary systems and lineups may be required to maintain water level in the CST. The defeat of the high area temperature isolation is allowed provided an actual steam leak does not exist and HPCI operation is required for adequate core cooling.

The low reactor pressure isolation interlock for RCIC may be defeated because some injection into the reactor vessel can still be sustained above the design turbine stall pressure (however, the higher steam demand required for HPCI operation prevents sustained operation at low pressure). The defeat of the high area temperature isolation is allowed provided an actual steam leak does not exist and RCIC operation is required for adequate core cooling.

The purpose of lining up and starting pumps in two or more low pressure systems is to provide the appropriate assurance that water will be injected into the reactor vessel during and following reactor depressurization. A requirement for at least two subsystems is specified in this step to accommodate the possibility that one subsystem may not operate properly or that a break may exist in the injection flow path of one subsystem.

The listed injection subsystems are limited to those having motor-driven pumps. Steam-driven systems are not classified as low pressure systems because they may not be available following depressurization of the reactor vessel.

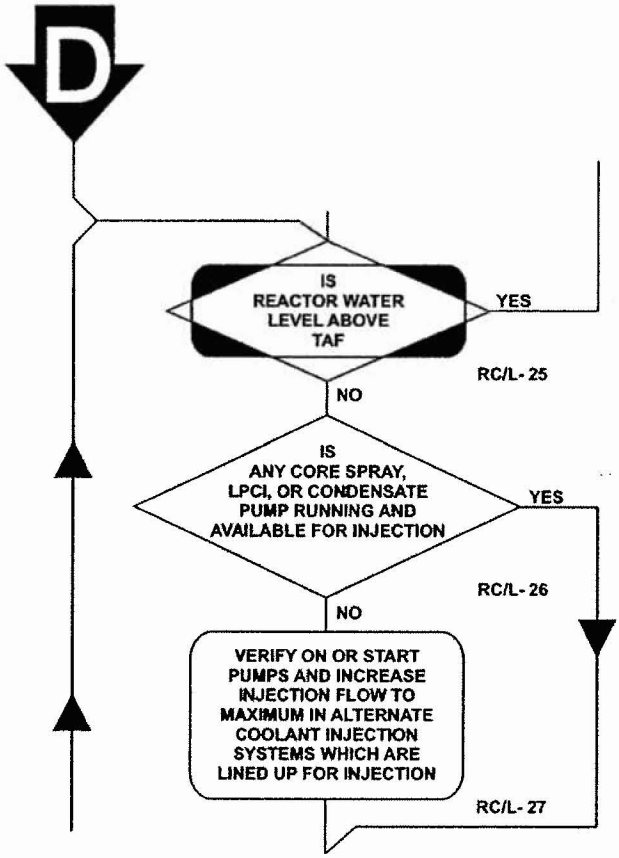
If less than two low pressure injection subsystems can be lined up, use of alternate injection systems is required to assure that water will be injected into the reactor vessel following depressurization. When at least two low pressure systems can be lined up with pumps running, an operator's time is better spent attempting to establish or increase high pressure injection rather than to establish additional alternate lineups.

STEPS RC/L-22 through RC/L-24 (continued)

Included in the alternate injection subsystems are those systems and system interconnections capable of injecting water into the reactor vessel that are not normally utilized for this purpose because of low water quality, the relative difficulty of establishing the injection lineup, or because the lineup may not be permitted during normal plant operation. The alternate injection paths include SLC, RHR-A, RHR-B, CS-A, CS-B, and Condensate. Since less than two low pressure systems are running and available for injection, the remainder of the low pressure injection paths are available for alternate coolant injection.

This step directs the operator to "commence lining up" alternate injection systems. Lineup need not be completed before proceeding to subsequent steps since injection will not be required until later in the procedure.

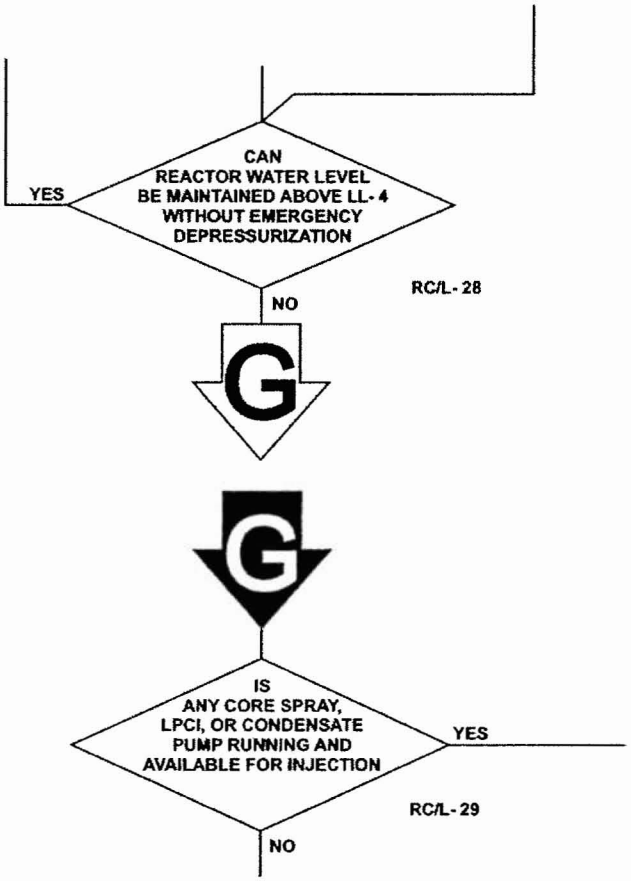
STEPS RC/L-25 through RC/L-27



STEP BASES:

The actions of previous steps lined up alternate coolant injection systems for injection. If reactor vessel water level drops to TAF and no low pressure injection systems are running, pumps are started and injection is maximized in alternate injection systems in an effort to reverse the decreasing level trend.

STEPS RC/L-28 and RC/L-29



STEP BASES:

Emergency depressurization permits injection from low head systems, maximizes the total injection flow, and minimizes the flow through any primary system break. If any high volume low pressure injection source is available, emergency depressurization is directed if reactor vessel water level cannot be maintained above LL-4 (Minimum Steam Cooling Reactor Water Level) and the following conditions are satisfied:

a. Available injection systems are *not* believed to be capable of restoring and maintaining reactor vessel water level above LL-4 if a blowdown is *not* performed, and

b. Available injection systems *are* believed to be capable of restoring and maintaining reactor vessel water level above LL-4 if a blowdown *is* performed.

STEPS RC/L-28 and RC/L-29 (continued)

Emergency depressurization is not permitted in this step before reactor vessel water level drops to TAF because:

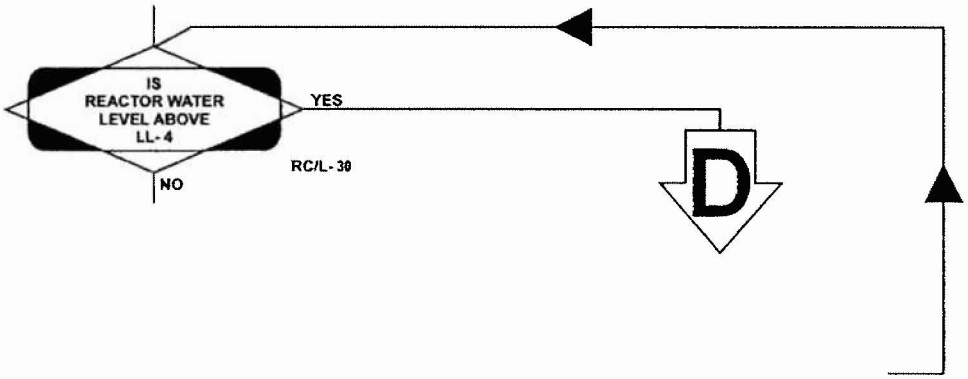
a. Adequate core cooling exists so long as reactor water level remains above LL-4.

b. The time before reactor water level drops to TAF is best used by attempting to line up additional injection sources. If the decreasing reactor water level trend can be reversed, emergency depressurization will be unnecessary.

LL-4 is the lowest reactor water level at which the covered portion of the reactor core will generate sufficient steam to preclude any clad temperature in the uncovered portion of the core from exceeding 1500°F.

A Core Spray, LPCI, or Condensate pump has been determined to be the pumps which are capable of restoring and maintaining reactor water level above LL-4 following a blowdown.

STEPS RC/L-30



STEP BASES:

If the decreasing reactor water level trend cannot be reversed before reactor water level drops to LL-4, and at least one source of injection into the reactor is available, emergency depressurization is performed to maximize the injection flowrate from any operating sources of injection. In addition, once reactor water level drops below LL-4, actions required by the Alternative Source Term analyses are initiated. LL-4 is used as the initiation point for the Alternative Source Term analyses actions since the fuel temperature (1500°F) associated with this reactor water level is just below that at which cladding perforation is initiated (1600°F based on document EAS-62-1088, Brunswick Steam Electric Plant Loss-of-Coolant Accident Engineering Analysis Description). In addition, the EPGs do not address action times in the various action steps. Since two of the Alternative Source Term actions are time dependent, a parameter value which would be reached before the time frame for action was met, was chosen.

STEPS RC/L-32, RC/L-35 and RC/L-36

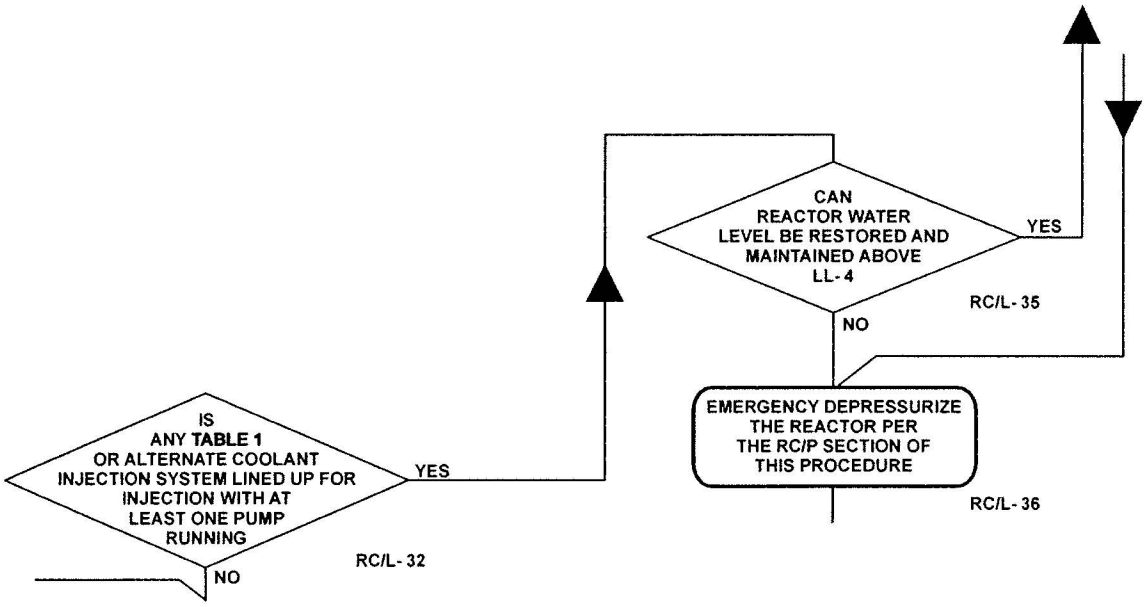


TABLE 1

INJECTION SYSTEMS

CONDENSATE/FEEDWATER	
CRD -	MAXIMIZE FLOW PER EOP-01-SEP-09
RCIC -	WITH SUCTION FROM THE CST IF AVAILABLE. DEFEAT LOW REACTOR PRESS AND HIGH AREA TEMPERATURE ISOLATION LOGIC IF NECESSARY PER "CIRCUIT ALTERATION PROCEDURE" (EOP-01-SEP-10)
HPCI -	WITH SUCTION FROM THE CST IF AVAILABLE. DEFEAT HIGH SUPPRESSION POOL LEVEL SUCTION TRANSFER AND HIGH AREA TEMPERATURE ISOLATION LOGIC IF NECESSARY PER "CIRCUIT ALTERATION PROCEDURE" (EOP-01-SEP-10)
CORE SPRAY	
LPCI -	ESTABLISH RHR SERVICE WATER FLOW AS SOON AS POSSIBLE

STEPS RC/L-32, RC/L-35 and RC/L-36 (continued)

STEP BASES:

If reactor water level cannot be restored and maintained above LL-4 and at least one source of injection into the reactor is available, emergency depressurization is performed to maximize the injection flowrate from operating sources of injection.

The emergency depressurization should be performed even if HPCI or RCIC is the only source of injection to the reactor. HPCI operation will itself depressurize the reactor to the HPCI low pressure isolation setpoint, ultimately resulting in loss of the system even if emergency depressurization is not performed. RCIC operation can continue even after the reactor has been depressurized, since the low pressure isolation may be defeated. The system can sustain some flow as long as reactor pressure is above the value at which the turbine stalls.

Emergency depressurization is not initiated until reactor water level has dropped to LL-4 because:

a. Adequate core cooling exists so long as reactor water level remains above LL-4.

b. The time required for reactor water level to decrease to LL-4 can best be used to line up and start pumps, attempting to reverse the decreasing reactor water level trend before reactor depressurization is required.

The emergency depressurization requirement in this step is predicated upon three conditions:

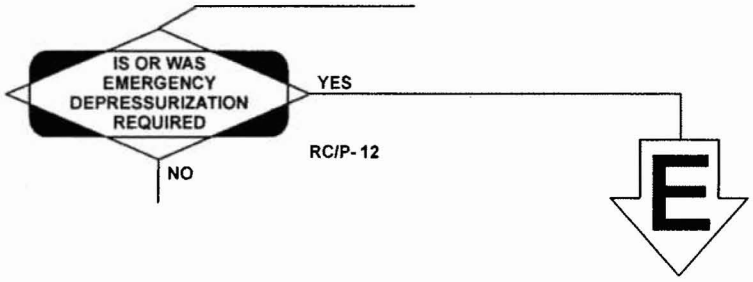
a. Reactor water level has dropped to LL-4.

b. At least one injection source is available.

c. The available injection sources cannot restore and maintain reactor water level above LL-4 if a blowdown is not performed.

Immediate emergency depressurization is thus not required, even with reactor water below LL-4, if available injection sources can restore and maintain reactor water level above LL-4.

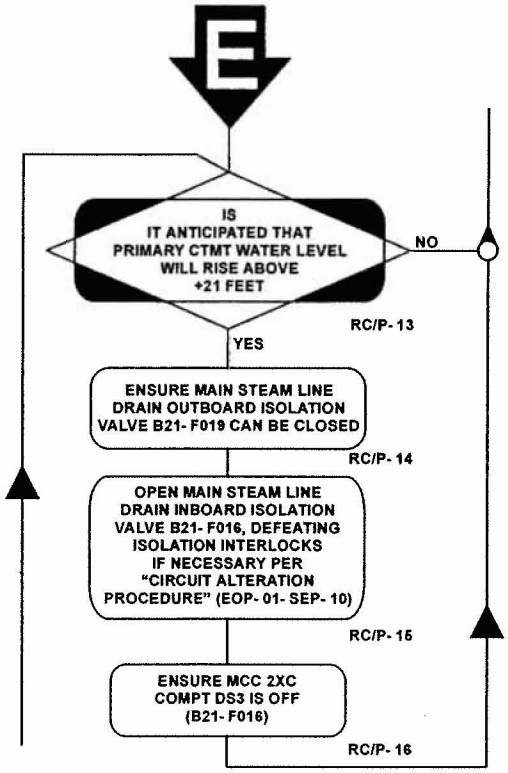
STEP RC/P-12



STEP BASES:

The consequences of not depressurizing the reactor vessel under conditions which require Emergency Depressurization could include a loss of adequate core cooling or failure of the Primary Containment. Thus, actions to rapidly depressurize the reactor vessel take precedence over the pressure control actions. The wording of this step ensures that once emergency depressurization is required, the appropriate pressure control actions remain in effect.

STEPS RC/P-13 through RC/P-16



STEP BASES:

If primary containment water level rises above the elevation of the SRV solenoids, the SRVs may no longer be operable. Other methods must then be used to control reactor pressure and prevent repressurization. Opening the inboard main steam line drain valve preserves the main steam line drains for future use. Since the valve must be opened before its motor operator is flooded, the action level specified in this critical step is the lower of the elevations of the motor operator and the lowest SRV solenoid.

Isolation interlocks may be defeated if necessary to permit opening the inboard main steam line drain valve. Under the conditions requiring emergency depressurization, depressurizing the reactor and maintaining it in a depressurized state is of overriding importance. The outboard valve can still be used to isolate the drain line.

If the inboard main steam line drain valve cannot be opened before its motor operator is submerged, the main steam line drain path may not be available. Other alternate depressurization methods identified in subsequent steps would then have to be used.

STEPS RC/P-13 through RC/P-16 (continued)

Before the inboard valve is opened the outboard valve is verified to be able to be closed. After the inboard valve is opened, its power supplies are de-energized. For Unit 1, the inboard valve also has an ASSD power supply on MCC XD that must be de-energized. This additional Unit 1 step negates the step numbering differences between the Unit 1 and 2 flowcharts created at Step RC/P-10.

STEPS RC/P-19 through RC/P-22

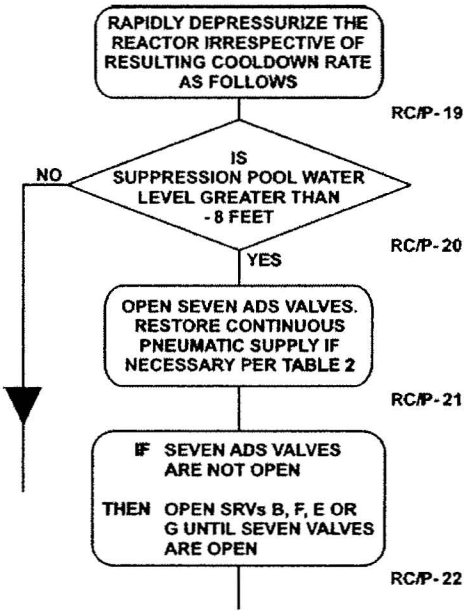


TABLE 2

SRV PNEUMATIC SUPPLY RESTORATION

SWITCH	REQUIRED SWITCH POSITION
DIV I NON-INTRPT RNA-SV-5262	OVERRIDE RESET
DIV II NON-INTRPT RNA-SV-5261	OVERRIDE RESET

STEP BASES:

The objective of these steps is to depressurize the reactor as rapidly as possible, yet within the limits of plant design. Two separate aspects must be considered in deciding how this is to be accomplished: the means for releasing the energy from the reactor vessel and the capacity of the heat sink utilized to absorb this energy.

Depressurization of the reactor is most easily and rapidly performed by opening SRVs; thus instructions for operation of these valves are specified first, in preference to steps directing the use of other depressurization systems and mechanisms.

Of the SRVs, those dedicated to the ADS function are generally the most reliable because of their qualifications, pneumatic supply systems, the design and operation of initiation circuitry, or the availability of control power. Additionally, the relative location of their discharge devices uniformly distributes the heat load around the Suppression Pool.

STEPS RC/P-19 through RC/P-22 (continued)

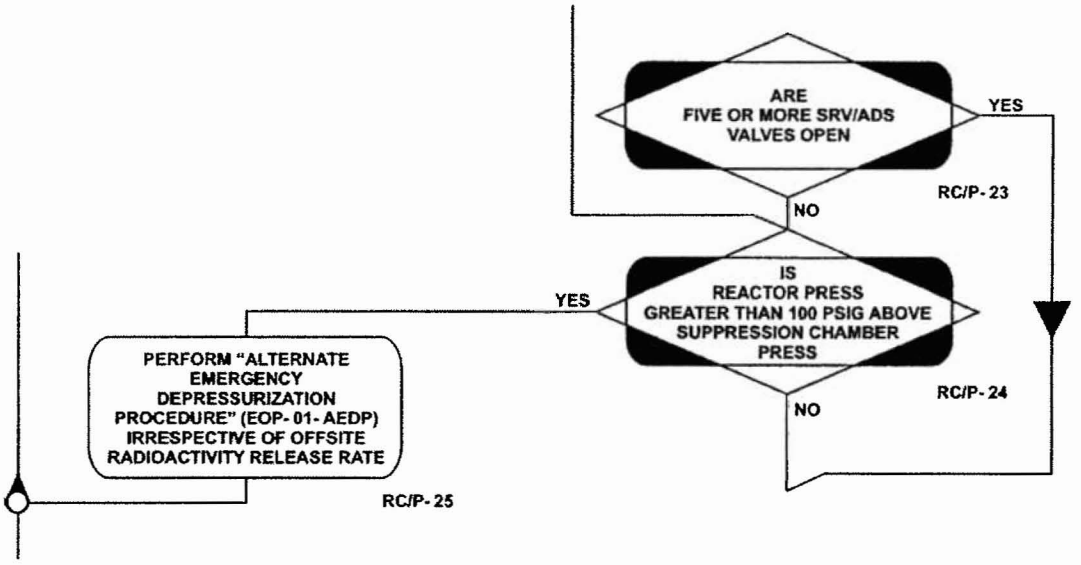
Concurrent opening of all ADS valves is within analyzed plant design limits. Other steps in the EOPs provide instructions for maintaining sufficient Suppression Pool heat capacity to accommodate simultaneous opening of all ADS valves at any reactor pressure. If one or more ADS valves cannot be opened, other SRVs are then opened to effect the desired reactor depressurization until the total number of open SRVs equals 7 (number of SRVs dedicated to ADS). If a non-ADS SRV is stuck open, 7 ADS valves should be opened, resulting in a total of 8 open SRVs. This provides the requisite depressurization rate without exceeding any design criteria.

An SRV opening sequence is not specified in this step because of the desire to reduce reactor pressure as rapidly as possible.

If Suppression Pool water level is below the top of the SRV discharge devices (-8 feet), opening an SRV will cause direct pressurization of the Suppression Chamber airspace. Since the extent of this pressurization cannot be predicted and may exceed the pressure capability of the Primary Containment, such operation is prohibited.

Guidance is provided for reestablishing the continuous pneumatic supply to the SRVs by defeating the Group 10 isolation of the system.

STEPS RC/P-23 through RC/P-25



STEP BASES:

The Minimum Number of SRVs Required for Emergency Depressurization (5) is defined to be the least number of SRVs which correspond to a Minimum Alternate Reactor Flooding Pressure sufficiently low that the ECCS with the lowest head will be capable of making up the SRV steam flow at the corresponding Minimum Alternate Reactor Flooding Pressure.

The Minimum SRV Re-opening Pressure is the lowest reactor pressure at which an SRV will remain fully open with its control switch in the open position. The accuracy of the re-opening pressure and the indication available to determine reactor pressure result in conditions such that the SRVs are not always open when the pressure indicated is 50 psig. One hundred psig has been selected as a value which can be used to determine the SRVs have failed to function. When reactor pressure is below this value, depressurization is considered complete and reactor pressure reduction need not be augmented by use of additional systems even if less than the minimum number of SRVs are open. If the number of SRVs specified cannot be opened, the reactor must be depressurized by other means. A list of alternate systems that can be used for depressurizing the reactor is included in the Alternate Emergency Depressurization Procedure, EOP-01-AEDP. However, since event independence must be maintained and specific plant conditions cannot be presumed, no priority regarding system use is indicated. This approach provides an operator the flexibility of being able to use whatever system(s) may be most appropriate under current plant conditions.