# 18A Emergency Procedure Guidelines

This appendix contains the ABWR Emergency Procedure Guidelines (EPGs). The purposes of the ABWR EPGs are for human factors evaluation in support of the man-machine interface systems design in the main control room, to assure that the controls and displays required during emergency conditions are properly provided, and to provide the bases of operator actions for the probabilistic risk assessment (PRA).

The ABWR EPGs are developed based upon the U.S. BWR Owner's Group Emergency Procedure Guidelines, Revision 4, which have been approved by the NRC*, by deleting from the BWROG Guidelines inapplicable systems, design features, and strategies, and by applying ABWR systems, design features and strategies applicable for the ABWR. A list of differences, and basis for differences between the ABWR EPGs and the BWROG EPGs Revision 4 are provided in Appendix 18B. Operator instructions and strategies for utilization of design features to mitigate the consequence of severe accidents, such as the firewater addition system and the containment overpressure protection system have been incorporated. These instructions are beyond the scope of BWROG EPGs Revision 4. The bases for these instructions are given also in Appendix 18B. Appendix 18D contains the input parameters used for calculation of operation limits in the EPGs and the results of these calculations.

This set of EPGs is intended to be used for development of plant-specific technical guidelines for plants whose license applications reference the ABWR Standard Plant. The COL applicant is required to develop detailed plant-specific Emergency Operating Procedures (EOPs) in accordance with requirements of NUREG-0737, Supplement 1. The EOPs developed from the EPGs are to be used for verification and validation of the MCR system design using a simulator to be provided by the applicant referencing the ABWR design.

* NRC letter, A.C. Thadani to D. Grace, Safety Evaluation of "BWR Owner's Group-Emergency Procedure Guidelines, Revision 4," dated September 12, 1988 (NEDO-31331, March 1987).

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## 18A.2 INTRODUCTION

INTRODUCTION

The following generic symptomatic emergency procedure guidelines have been developed:

(1) RPV Control Guideline

(2) Primary Containment Control Guideline

(3) Secondary Containment Control Guideline

(4) Radioactivity Release Control Guideline

The RPV Control Guideline maintains adequate core cooling, shuts down the reactor, and cools down the RPV to cold shutdown conditions. This guideline is entered whenever low RPV water level, high RPV pressure, or high drywell pressure occurs, or whenever a condition which requires reactor scram exists and reactor power is above the APRM downscale trip or cannot be determined.

The Primary Containment Control Guideline maintains primary containment integrity, protects equipment in the primary containment, and limits radioactivity release from the primary containment with respect to the consequences of all mechanistic events including the consequences of severe accidents and hydrogen generation in the ABWR containment. This guideline is entered whenever suppression pool temperature, drywell temperature, drywell pressure, suppression pool water level, or primary containment hydrogen concentration is above its high operating limit or suppression pool water level is below its low operating limit.

The Secondary Containment Control Guideline protects the secondary containment, limits radioactivity release to the secondary containment, and either maintains secondary containment integrity or limits radioactivity release from the secondary containment. This guideline is entered whenever a secondary containment temperature, radiation level, or water level is above its maximum normal operating value or secondary containment differential pressure reaches zero.

The Radioactivity Release Control Guideline limits radioactivity release into areas outside the primary and secondary containments. This guideline is entered whenever offsite radioactivity release rate is above that which requires an Alert.

Table I is a list of the abbreviations used in the guidelines.

At various points throughout these guidelines, operator precautions are indicated by the symbol ☞ and a number referring to a numbered “Caution” contained in the Operator Precautions section. These "Cautions" are brief and succinct red flags for the operator.

Brackets [ ] indicate plant unique setpoints, design limits, pump shutoff pressures, etc, to be determined on a plant-specific basis, and the parentheses ( ) within brackets indicate the source or definition for the enclosed variable. At various points throughout these guidelines, limits for operations are specified. The basis and calculational methods for these limits are defined in the BWROG Emergency Procedure Guidelines, Revision 4, Appendices A and C, respectively. These limits are specified beyond which certain actions are required. While conservative, these limits are derived from engineering analyses utilizing best-estimate (as opposed to licensing) models. Consequently, these limits are generally not as conservative as the limits specified in a plant's Technical Specifications. This is not to imply that operation beyond the Technical Specifications is recommended in any emergency. Rather, such operation is required and is now permitted under certain degraded conditions in order to safely mitigate the consequences of those degraded conditions. The limits specified in the guidelines establish the boundaries within which continued safe operation of the plant can be assured. Therefore, conformance with the guidelines does not ensure strict conformance with a plant's Technical Specifications or other licensing bases.

At other points within these guidelines, defeating safety system interlocks and initiation logic is specified. This is also required in order to safely mitigate the consequences of degraded conditions, and it is generally specified only when conditions exist for which the interlock or logic was not designed. Bypassing other interlocks may also be required due to instrument failure, etc., but these interlocks cannot be identified in advance and are therefore not specified in the guidelines.

The entry conditions for these emergency procedure guidelines are symptomatic of both emergencies and events which may degrade into emergencies. The guidelines specify actions appropriate for both. Therefore, entry into procedures developed from these guidelines is not conclusive that an emergency has occurred.

Each procedure developed from these emergency procedure guidelines is entered whenever any of its entry conditions occurs, irrespective of whether that procedure has already been entered or is presently being executed. The procedure is exited and the operator returns to non-emergency procedures when either one of the exit conditions specified in the procedure is satisfied or it is determined that an emergency no longer

exists. For example, the procedure developed from the RPV Control Guideline specifies cooldown to cold shutdown conditions by various methods and exit after the shutdown cooling interlocks have cleared, but entry into this procedure does not require any cooldown if it can be determined that an emergency no longer exists prior to establishing the conditions required to commence the cooldown as specified in the procedure. After a procedure developed from these guidelines has been entered, subsequent clearing of all entry conditions for that procedure is not, by itself, conclusive that an emergency no longer exists.

Procedures developed from these emergency procedure guidelines specify symptomatic operator actions which will maintain the reactor plant in a safe condition and optimize plant response and margin to safety irrespective of the initiating event. However, for certain specific events (e.g., earthquake, tornado, blackout, or fire), emergency response and recovery can be further enhanced by additional auxiliary event-specific operator actions which may be provided in supplemental event-specific procedures intended for use in conjunction with the symptomatic procedures. As with actions specified in any other procedure intended for use with the symptomatic procedures, these event-specific operator actions must not contradict or subvert the symptomatic operator actions specified in the symptomatic procedures and must not result in loss or unavailability of equipment the operation of which is specified in these procedures.

BWROG EPG step numbering is maintained in this document. Where an EPG step has been removed, the step number is left in place with an explanation in ( ) in order to maintain continuity of step sequence.

Water levels in this document have the following reference points:
RPV Water Level: 0 cm = Top of Active Fuel (TAF)
Suppression Pool and Primary Containment Water Level:
0 m = Bottom of Suppression Pool

The values for Table 1, Operating Values of Secondary Containment Parameters, are developed from the equipment environmental specification. The area water level Maximum Normal Operating Values were arbitrarily chosen at the hi alarm or 5 cm above the floor where visual inspection was the mode of detection. The areas in the secondary containment have sills to prevent movement of water from area to area. These sills are assumed to be 20 cm high. The area water level Maximum Safe Operating Values were developed based on the elevation of the bottom of pump motors in the area or greater than the top of the sill surrounding the area. The COL applicant will be required to re-evaluate these values as an “interface requirement” when plant specific installation details are completed.

TABLE 1
ABWR EPG ABBREVIATIONS

| | | |
|---|---|---|
| ADS | — | Automatic Depressurization System |
| APRM | — | Average Power Range Monitor |
| ARI | — | Alternate Rod Insertion |
| CAMS | — | Containment Air Monitoring System |
| CRD | — | Control Rod Drive |
| CUW | — | Reactor Water Cleanup |
| ECCS | — | Emergency Core Cooling System |
| FAS | — | Firewater Addition System |
| F/D | — | Filter/Demineralizer |
| FMCRD | — | Fine Motion Control Rod Drive |
| FPC | — | Fuel Pool Cooling |
| HCU | — | Hydrualic Control Unit |
| HPCF | — | High Pressure Core Flooder |
| HVAC | — | Heating, Ventilating and Air Conditioning |
| LCO | — | Limiting Condition for Operation |
| LPCF | — | Low Pressure Core Flooder mode of RHR System |
| MSIV | — | Main Steamline Isolation Valves |
| NPSH | — | Net Positive Suction Head |
| RBHVAC | — | Reactor Building HVAC |
| RCIC | — | Reactor Core Isolation System |
| RHR | — | Residual Heat Removal |
| RIP | — | Reactor Internal Pump |
| RPS | — | Reactor Protection System |
| RPV | — | Reactor Pressure Vessel |
| RSCS | — | Rod Sequence Control System |

ABWR I-4

TABLE 1
ABWR EPG ABBREVIATIONS (Continued)

| | | |
|---|---|---|
| RWM | — | Rod Worth Minimizer |
| SGTS | — | Standby Gas Treatment System |
| SLC | — | Standby Liquid Control |
| SPCU | — | Suppression Pool Cleanup |
| SRV | — | Safety Relief Valve |
| TIP | — | Transverse Incore Probe |

## 18A.3 OPERATOR PRECAUTIONS

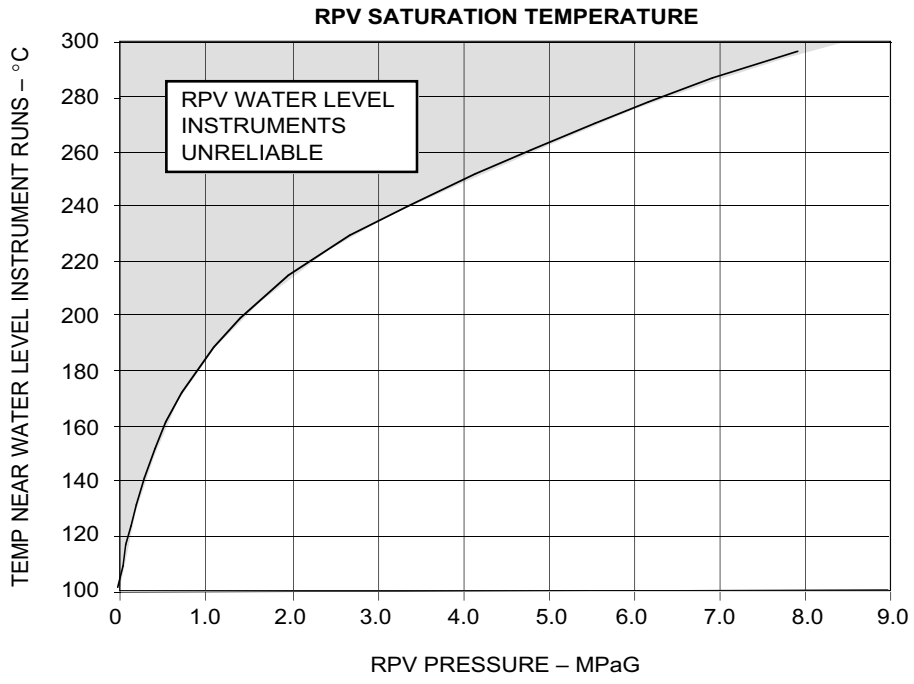
OPERATOR PRECAUTIONS

This section lists "Cautions" which are applicable at one or more specific points within the guidelines. Where a "Caution" is applicable, it is identified with the symbol, ☞, at the right side of a paragraph.

CAUTION #1

An RPV water level instrument may be used to determine RPV water level only when all the following conditions are satisfied for that instrument:

1. The temperatures near all the instrument runs are below the RPV Saturation Temperature.



2. For each of the following instruments, the instrument reads above the Minimum Indicated Level associated with the highest temperature near an instrument reference leg vertical run:

   a. Narrow Range (355.5 to 508.0 cm)

| Highest Drywell Run Temperature (°C) Between | | Minimum Indicated |
|---|---|---|
| Low | High | Level (cm) |
| – | 65.6 | 361.7 |
| 65.6 | 287.8 | 355.5 |

   b. Shutdown Range (355.5 to 1282.5 cm)

| Highest Drywell Run Temperature (°C) Between | | Minimum Indicated |
|---|---|---|
| Low | High | Level (cm) |
| – | 65.6 | 402.6 |
| 65.6 | 121.1 | 416.1 |
| 121.1 | 176.7 | 434.3 |
| 176.7 | 232.2 | 458.2 |
| 232.2 | 287.8 | 490.7 |

CAUTION #2

Deleted, not applicable to ABWR.

CAUTION #3

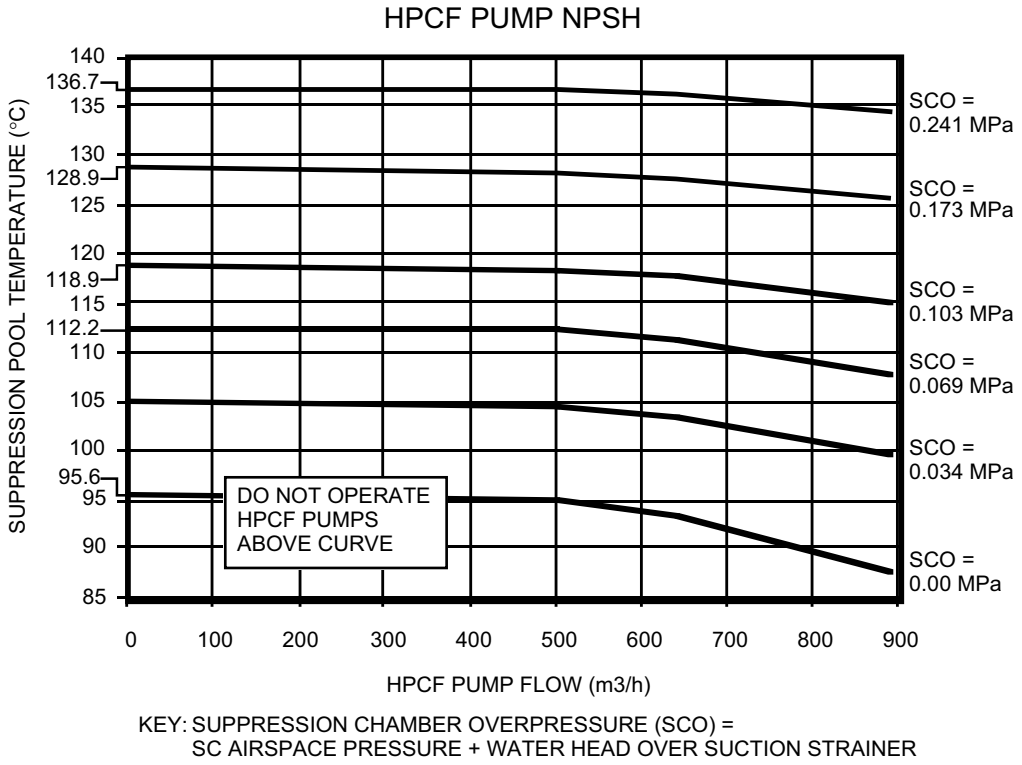
Operating RCIC turbine below [228 rad/s (minimum turbine speed limit per turbine vendor manual)] may result in unstable system operation and equipment damage.

CAUTION #4

Elevated suppression chamber pressure may trip the RCIC turbine on high exhaust pressure.

CAUTION #5

If HPCF is taking suction from the suppression pool and suppression pool temperature exceeds the HPCF Pump NPSH Limit, the pump may be damaged and become inoperable.




KEY: SUPPRESSION CHAMBER OVERPRESSURE (SCO) =
SC AIRSPACE PRESSURE + WATER HEAD OVER SUCTION STRAINER

CAUTION #6

Cooldown rates above [55.6 °C/h (RPV cooldown rate LCO)] may be required to accomplish this step.

CAUTION #7

A rapid increase in injection into the RPV may induce a large power excursion and result in substantial core damage.

## 18A.4 RPV CONTROL GUIDELINE

RPV CONTROL GUIDELINE

PURPOSE

The purpose of this guideline is to:

- Maintain adequate core cooling,
- Shut down the reactor, and
- Cool down the RPV to cold shutdown conditions ([Avg. RPV water
- temperature ≤93.3 °C (cold shutdown conditions)]).

ENTRY CONDITIONS

The entry conditions for this guideline are any of the following:

- RPV water level below [380.8 cm (low level scram setpoint)]
- RPV pressure above [7.35 MPaG (high RPV pressure scram setpoint)]
- Drywell pressure above [0.012 MPaG (high drywell pressure scram setpoint)]
- A condition which requires reactor scram, and reactor power above [5% (APRM downscale trip)] or cannot be determined

OPERATOR ACTIONS

RC-1 If reactor scram has not been initiated, initiate reactor scram.

Irrespective of the entry conditions, execute [Steps RC/L, RC/P, and RC/Q] concurrently.

ABWR RC-1

RC/L Monitor and control RPV water level. ☞ #1

RC/L-1 Initiate each of the following which should have initiated but did not:

- lsolation
- ECCS
- Emergency diesel generator

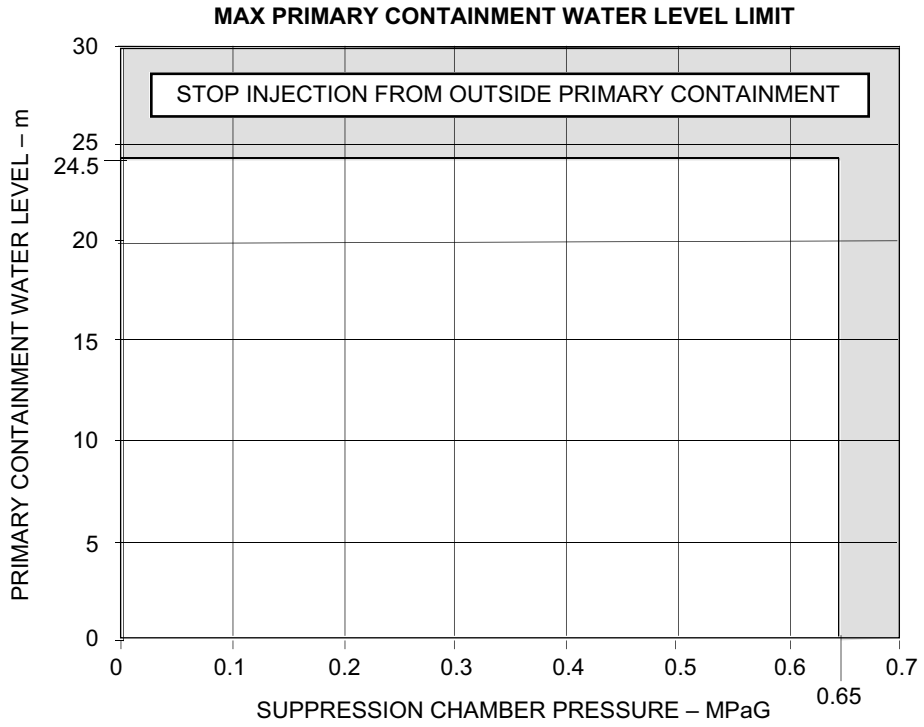
If while executing the following step:

- Any control rod cannot be determined to be inserted to or beyond [4.2%* (Maximum Subcritical Banked Withdrawal Position)] and it has not been determined that the reactor will remain shutdown under all conditions without boron, enter [procedure developed from Contingency #5].
- RPV water level cannot be determined, enter [procedure developed from Contingency #4].

* 0% = fully inserted

ABWR RC-2

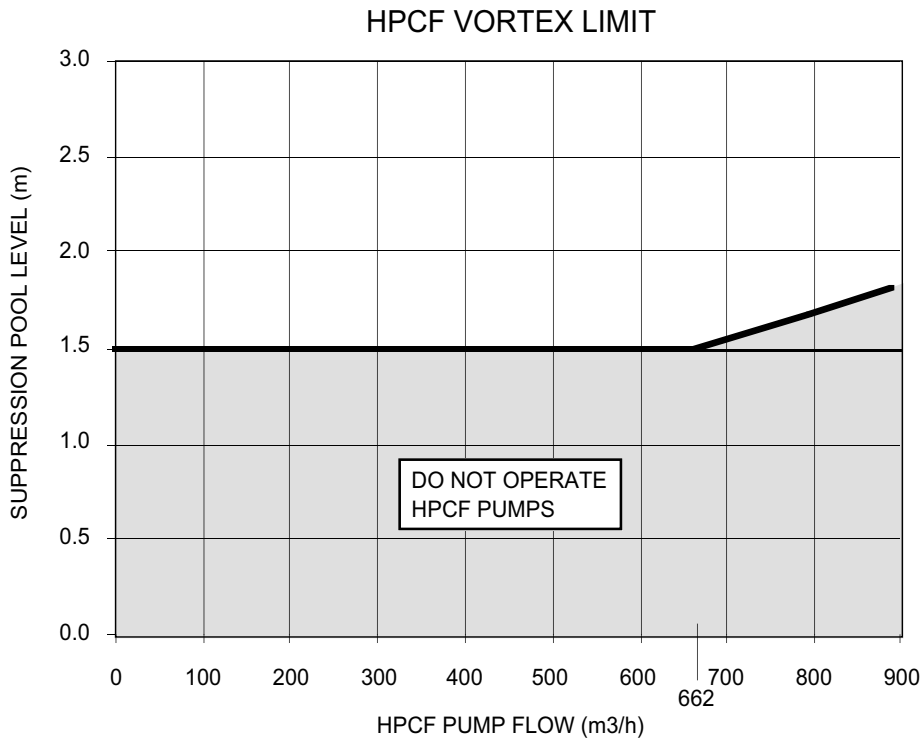
If while executing the following step primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit, then irrespective of whether adequate core cooling is assured terminate injection into the primary containment from sources external to the primary containment until primary containment water level and suppression chamber pressure can be maintained below the Maximum Primary Containment Water Level Limit.



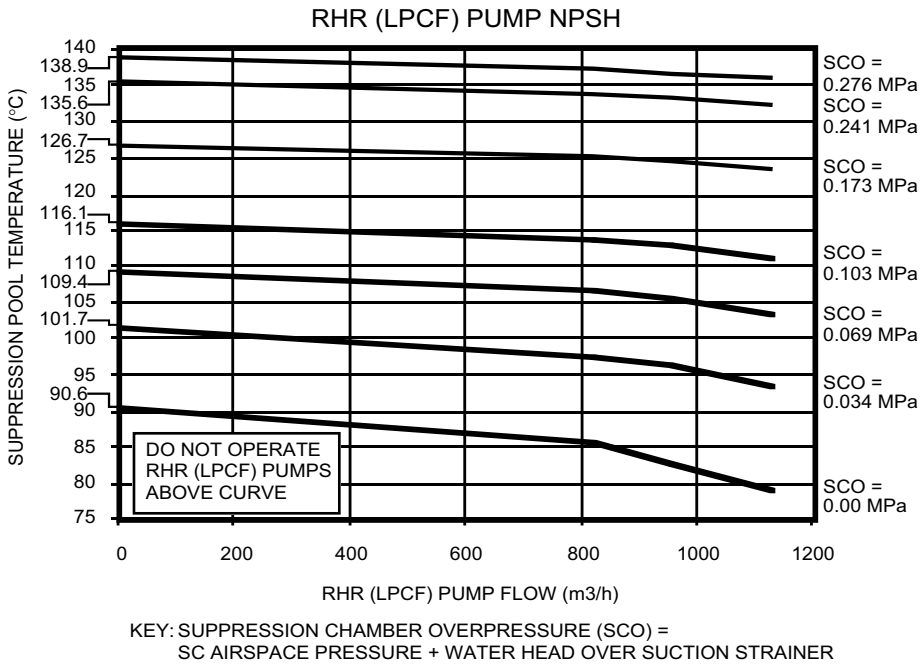

ABWR RC-3

RC/L-2 Restore and maintain RPV water level between [380.8 cm (low level scram setpoint or shutdown cooling RPV water level interlock, whichever is higher)] and [484.4 cm (high level trip setpoint)] with one or more of the following systems:

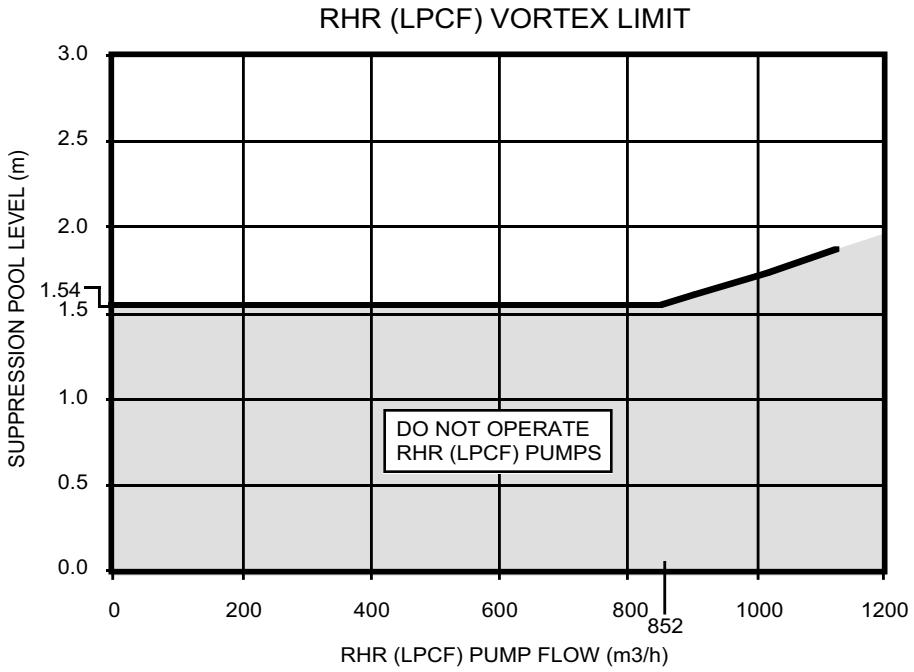
- Condensate/feedwater
- CRD
- RCIC with suction from the condensate storage pool, defeating low RPV pressure and area high temperature isolation interlocks and high suppression pool water level suction transfer logic if necessary. ☞ #3,4
- HPCF; control and maintain pump flow less than [the HPCF Vortex Limit]. ☞ #5



- RHR (LPCF); control and maintain pump flow less than the RHR Pump NPSH Limit and [the RHR Vortex Limit].




KEY: SUPPRESSION CHAMBER OVERPRESSURE (SCO) =
SC AIRSPACE PRESSURE + WATER HEAD OVER SUCTION STRAINER




ABWR RC-5

If RPV water level cannot be restored and maintained above [380.8 cm (low level scram setpoint or shutdown cooling RPV water level interlock, whichever is higher)], maintain RPV water level above [0 cm (top of active fuel)].

RPV water level control may be augmented by one or more of the following systems:

- Fire protection system and the firewater addition mode of RHR(C)
- [• Interconnections with other units]
- ECCS keep-full systems:
  HPCF, RHR
- SLC (test tank)
- Condensate Makeup Water System

If RPV water level can be maintained above [0 cm (top of active fuel)] and the ADS timer has initiated, prevent automatic initiation of ADS.

If RPV water level cannot be maintained above [0 cm (top of active fuel)], enter [procedure developed from Contingency #1].

RC/L-3 When [procedure for cooldown to cold shutdown conditions] is entered from [Step RC/P-5], proceed to cold shutdown in accordance with [procedure for cooldown to cold shutdown conditions].

RC/P Monitor and control RPV pressure.

If while executing the following steps:

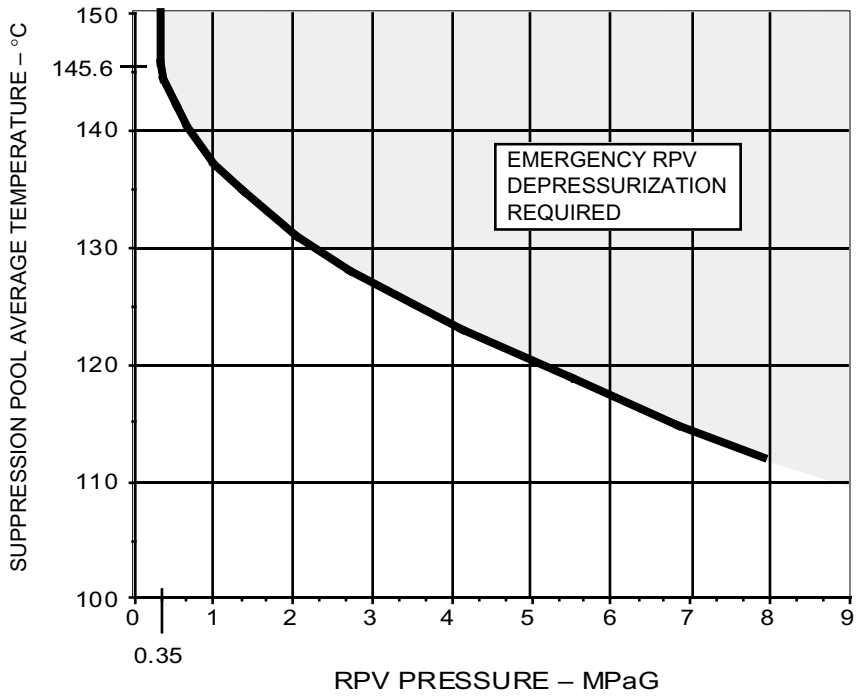
- A high drywell pressure ECCS initiation signal [0.012 MPaG (drywell pressure which initiates ECCS)] exists, prevent injection from those LPCF pumps not required to assure adequate core cooling prior to depressurizing below their maximum injection pressures.
- Emergency RPV Depressurization is anticipated and either all control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)] or it has been determined that the reactor will remain shutdown under all conditions without boron, rapidly depressurize the RPV with the main turbine bypass valves. ☞ #6
- Emergency RPV Depressurization is required and less than [8 (number of SRVs dedicated to ADS)] SRVs are open, enter [procedure developed from Contingency #2].
- RPV water level cannot be determined and less than [8 (number of SRVs dedicated to ADS)] SRVs are open, enter [procedure developed from Contingency #2].
- RPV water level cannot be determined and at least [8 (number of SRVs dedicated to ADS)] SRVs are open, enter [procedure developed from Contingency #4].

RC/P-1 If any SRV is cycling, manually open SRVs until RPV pressure drops to [6.70 MPaG (RPV pressure at which all turbine bypass valves are fully open)].

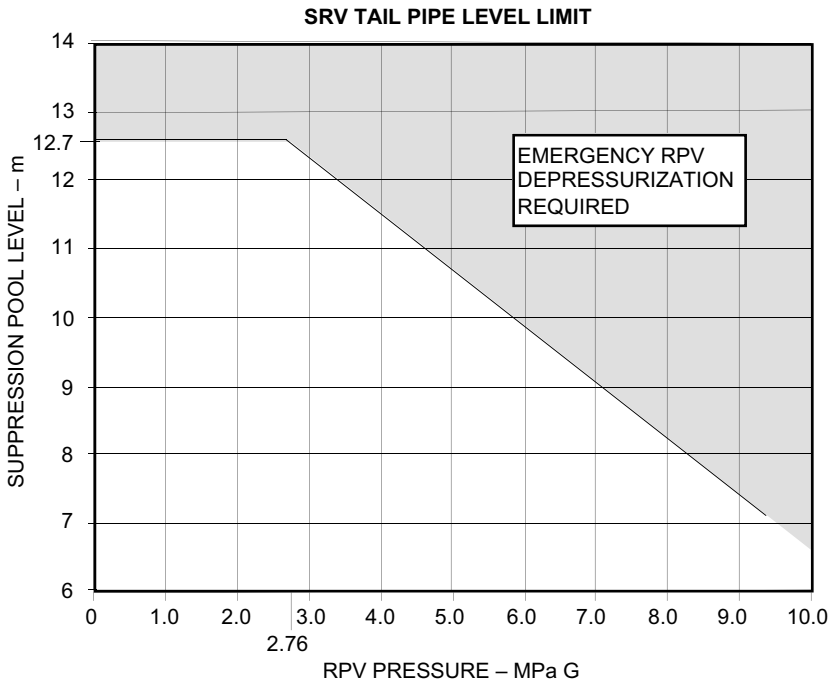
If while executing the following steps:

- Suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit, maintain RPV pressure below the Limit. ☞ #6

**HEAT CAPACITY TEMPERATURE LIMIT**




- Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit, maintain RPV pressure below the Limit. ☞ #6




- Steam Cooling is required, enter [procedure developed from Contingency #3].

If while executing the following steps:

- Boron Injection is required, and
- The main condenser is available, and
- There has been no indication of gross fuel failure or steam line break,

open MSIVs, bypassing low RPV water level isolation interlocks if necessary, to re-establish the main condenser as a heat sink.

RC/P-2 Stabilize RPV pressure at a pressure below [7.35 MPaG (high RPV pressure scram setpoint)] with the main turbine bypass valves.

RPV pressure control may be augmented by one or more of the following systems:

- SRVs only when suppression pool water level is above [2.291 m (elevation of top of SRV discharge device)]; open SRVs in the following sequence if possible: [Table (SRV opening sequence)]; if the continuous SRV pneumatic supply is or becomes unavailable, place the control switch for each SRV in the AUTO mode.

| SRV Opening Sequence | | | | | |
|---|---|---|---|---|---|
| Sequence | Valve No. | Sequence | Valve No. | Sequence | Valve No. |
| 1 | C | 7 | H | 13 | B |
| 2 | L | 8 | R | 14 | M |
| 3 | F | 9 | D | 15 | E |
| 4 | T | 10 | K | 16 | U |
| 5 | A | 11 | G | 17 | J |
| 6 | N | 12 | S | 18 | P |

- RCIC with suction from the condensate storage tank ☞ #3, 4
- [Other steam driven equipment]
- CUW (recirculation mode), bypassing regenerative heat exchangers and filter/demineralizers and, if necessary, defeating SLC and other isolation interlocks.
- Main steam line drains
- CUW (blowdown mode) if no boron has been injected into the RPV; refer to [sampling procedures] prior to initiating blowdown.

If while executing the following steps the reactor is not shut down, return to [Step RC/P-2].

RC/P-3 When either:

- All control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)], or
- It has been determined that the reactor will remain shutdown under all conditions without boron, or
- [541.8 kg (Cold Shutdown Boron Weight)] of boron have been injected into the RPV, or
- The reactor is shutdown and no boron has been injected into the RPV,

depressurize the RPV and maintain cooldown rate below [55.6 °C/h (RPV cooldown rate LCO)].

If one or more SRVs are being used to depressurize the RPV and the continuous SRV pneumatic supply is or becomes unavailable, depressurize with sustained SRV opening.

RC/P-4 When the shutdown cooling RPV pressure interlock clears, initiate shutdown cooling using only those RHR subsytems not required to maintain RPV water level above [380.8 cm (RPV water level shutdown cooling interlock)] by operation in the LPCF mode.

If shutdown cooling cannot be established and further cooldown is required, continue to cool down using one or more of the systems used for depressurization.

RC/P-5 When either:

- All control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)], or
- It has been determined that the reactor will remain shutdown under all conditions without boron, or
- [541.8 kg (Cold Shutdown Boron Weight)] of boron have been injected into the RPV,

proceed to cold shutdown in accordance with [procedure for cooldown to cold shutdown conditions].

RC/Q Monitor and control reactor power.

If while executing the following steps:

- All control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)], terminate boron injection and enter [scram procedure].
- It has been determined that the reactor will remain shutdown under all conditions without boron, terminate boron injection and enter [scram procedure].
- The reactor is shutdown and no boron has been injected into the RPV, enter [scram procedure].

RC/Q-1 Confirm or place the reactor mode switch in SHUTDOWN.

RC/Q-2 If ARI has not initiated, initiate ARI.

RC/Q-3 If the main turbine-generator is on-line, confirm or initiate recirculation pump runback to minimum speed.

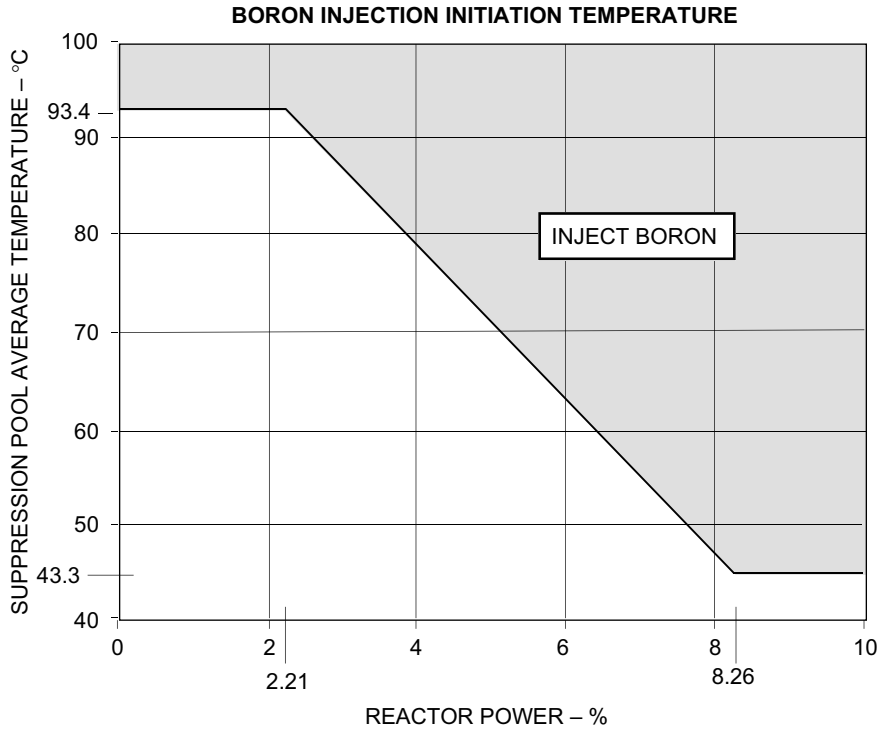
RC/Q-4 If reactor power is above [5% (APRM downscale trip)] or cannot be determined, trip the recirculation pumps.

RC/Q-5 (Deleted, not applicable to ABWR.)

Execute [Steps RC/Q-6 and RC/Q-7] concurrently.

RC/Q-6:

- When periodic neutron flux oscillations in excess of [25% (Large oscillation threshold)] peak-to-peak commence or continue, or
- Before suppression pool temperature reaches the[ (Boron Injection Initiation Temperature)], BORON INJECTION IS REQUIRED; inject boron into the RPV with SLC and prevent automatic initiation of ADS.




If boron cannot be injected with SLC, inject boron into the RPV by one or more of the following alternative methods:

[• CRD]
[• HPCF]
[• CUW]
[• Feedwater]
[• RCIC]

If while executing the following steps SLC tank water level drops to [ 0 m3 (low SLC tank water level)], manually trip the SLC pumps.

RC/Q-6.1 If boron is not being injected into the RPV by CUW and CUW is not isolated, bypass regenerative heat exchangers and filter/demineralizers.

RC/Q-6.2 Continue to inject boron until [541.8 kg (Cold Shutdown Boron Weight)] of boron have been injected into the RPV.

RC/Q-6.3 Enter [scram procedure].

RC/Q-7 Insert control rods as follows:

RC/Q-7.1 Reset ARI, bypassing ARI logic trips if necessary.

RC/Q-7.2 Insert control rods with one or more of the following methods:

- De-energize scram solenoids
- Vent the scram air header
- Reset the scram, bypassing RPS logic trips if necessary, and initiate a manual scram
- Open individual scram test switches
- Drive control rods, defeating RSCS and RWM interlocks if necessary

## 18A.5 PRIMARY CONTAINMENT CONTROL GUIDELINE

PRIMARY CONTAINMENT CONTROL GUIDELINE

PURPOSE

The purpose of this guideline is to:

- Maintain primary containment integrity,
- Protect equipment in the primary containment, and
- Limit radioactivity release from the primary containment.

ENTRY CONDITIONS

The entry conditions for this guideline are any of the following:

- Suppression pool temperature above [35.0 ºC (most limiting suppression pool temperature LCO)]]
- Drywell temperature above [57.2 ºC (drywell temperature LCO or maximum normal operating temperature, whichever is higher)]
- Drywell pressure above [0.012 MPaG (high drywell pressure scram setpoint)]
- Suppression pool water level above [7.1 m (maximum suppression pool water level LCO)]
- Suppression pool water level below [7.0 m (minimum suppression pool water level LCO)]
- Primary containment hydrogen concentration above [Hi Alarm (high hydrogen alarm setpoint)]

OPERATOR ACTIONS

Irrespective of the entry conditions, execute [Steps SP/T, DW/T, PC/P, SP/L, and PC/H] concurrently.

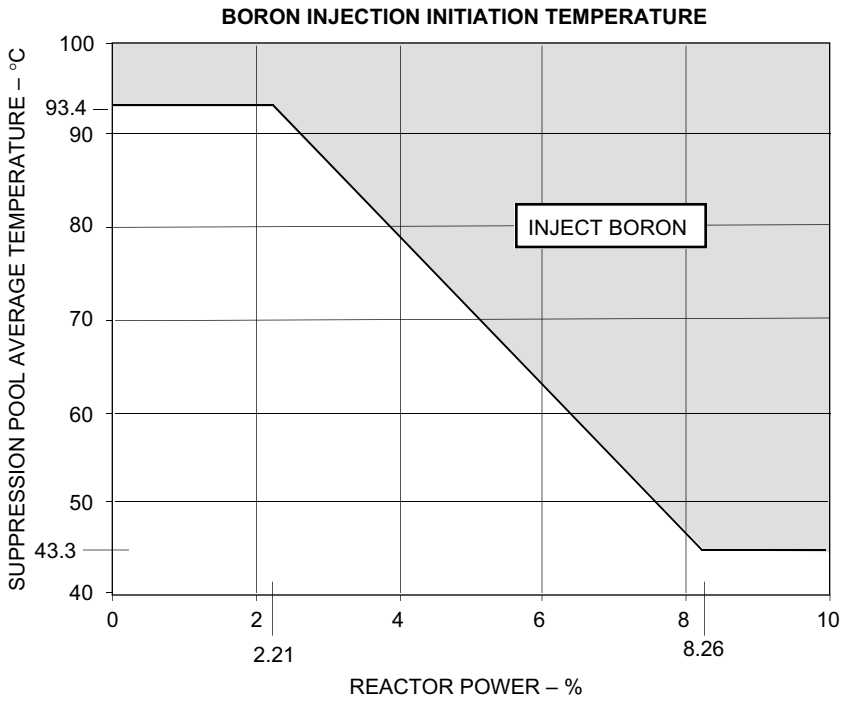
ABWR PC-1

SP/T Monitor and control suppression pool temperature below [35.0 °C (most limiting suppression pool temperature LCO)] using available suppression pool cooling.

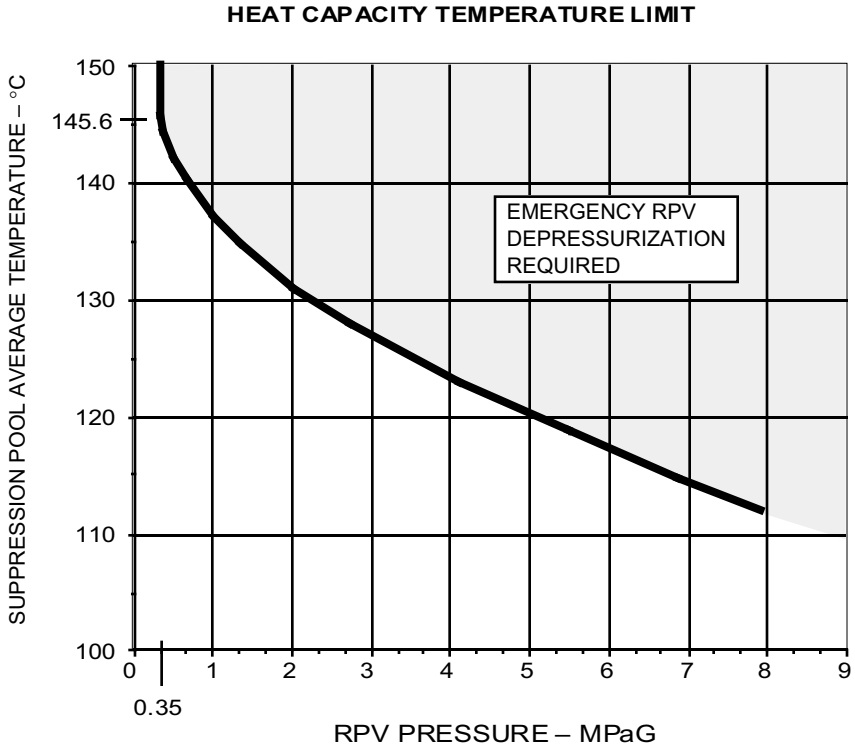
When suppression pool temperature cannot be maintained below [35.0 ° C (most limiting suppression pool temperature LCO)]:

SP/T-1 Operate all available suppression pool cooling using only those RHR pumps not required to assure adequate core cooling by continuous operation in the LPCF mode.

SP/T-2 Before suppression pool temperature reaches the [(Boron Injection Initiation Temperature)], enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.



SP/T-3 When suppression pool temperature and RPV pressure cannot be maintained below the Heat Capacity Temperature Limit, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.



DW/T Monitor and control drywell temperature below [57.2 ºC (drywell temperature LCO or maximum normal operating temperature, whichever is higher)] using available drywell cooling.

When drywell temperature cannot be maintained below [57.2 ºC (drywell temperature LCO or maximum normal operating temperature, whichever is higher)], shut down the reactor. ☞ #1

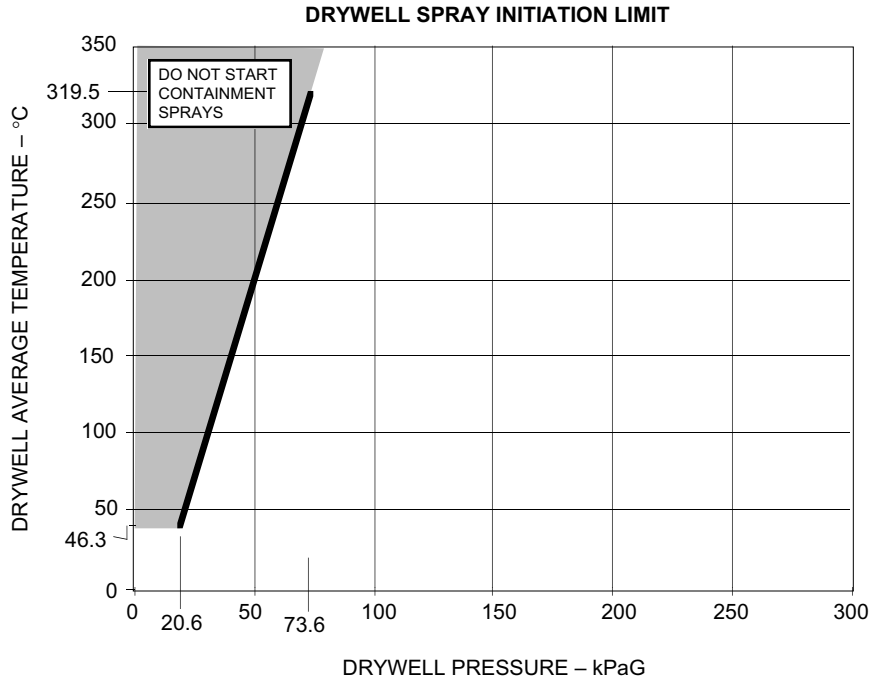
DW/T-1 Operate all available drywell cooling, defeating isolation interlocks if necessary.

When drywell temperature cannot be maintained below [103°C (Saturation temperature corresponding to high drywell pressure scram setpoint)], enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

If while executing the following steps containment sprays have been initiated and suppression chamber or drywell pressure drops below [0.012 MPaG (high drywell pressure scram setpoint)], terminate containment sprays.

DW/T-2 Before drywell temperature reaches [171 °C (maximum temperature at which ADS qualified or drywell design temperature, whichever is lower)] but only if suppression pool water level is below [11.70 m (elevation of bottom of suppression pool-to-lower-drywell vent)] and drywell temperature and pressure are within the Drywell Spray Initiation Limit, shut down drywell cooling fans and initiate containment sprays using only those RHR subsystems (RHR(B), RHR(C)) not required to assure adequate core cooling by continuous operation in the LPCF mode.

If RHR(B) and RHR(C) are not available for containment sprays, initiate containment sprays using the fire protection system and firewater additon mode of RHR(C).



DW/T-3 When drywell temperature cannot be maintained below [171 °C (maximum temperature at which ADS qualified or drywell design temperature, whichever is lower)], EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

PC/P Monitor and control primary containment pressure below [0.012 MPaG (high drywell pressure scram setpoint)] using the ACS drywell bleed, SGTS and RBHVAC only if containment pressure is less than [0.014 MPaG (SGTS and RBHVAC design pressure)]; use [containment pressure control system operating procedures].

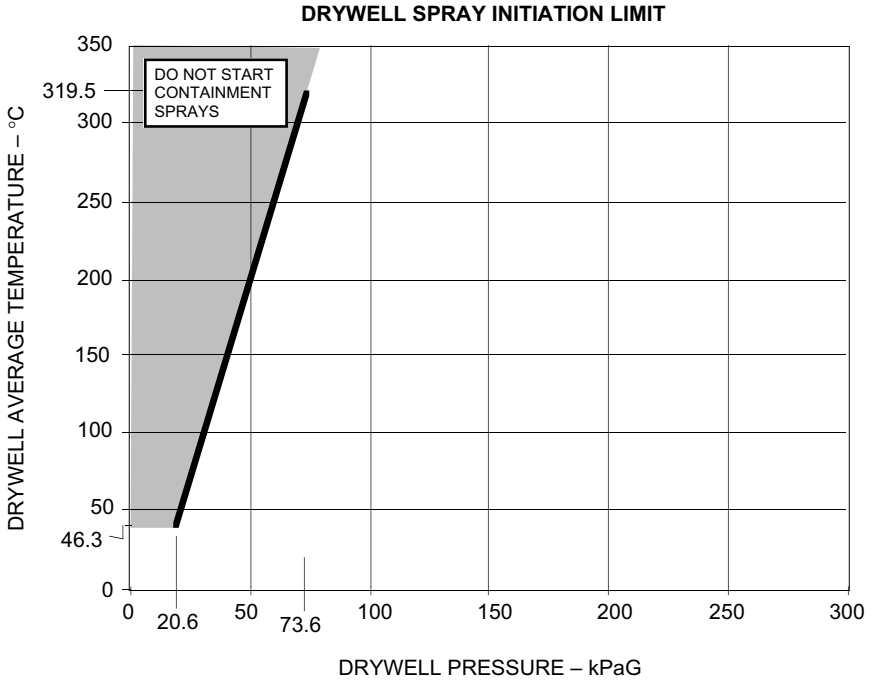
When primary containment pressure cannot be maintained below [0.012 MPaG (high drywell pressure scram setpoint)], or the offsite radioactivity release rate reaches the offsite release rate LCO, isolate the ACS drywell bleed.

If while executing the following steps containment sprays have been initiated and suppression chamber or drywell pressure drops below [0.012 MPaG (high drywell pressure scram setpoint)], terminate containment sprays.

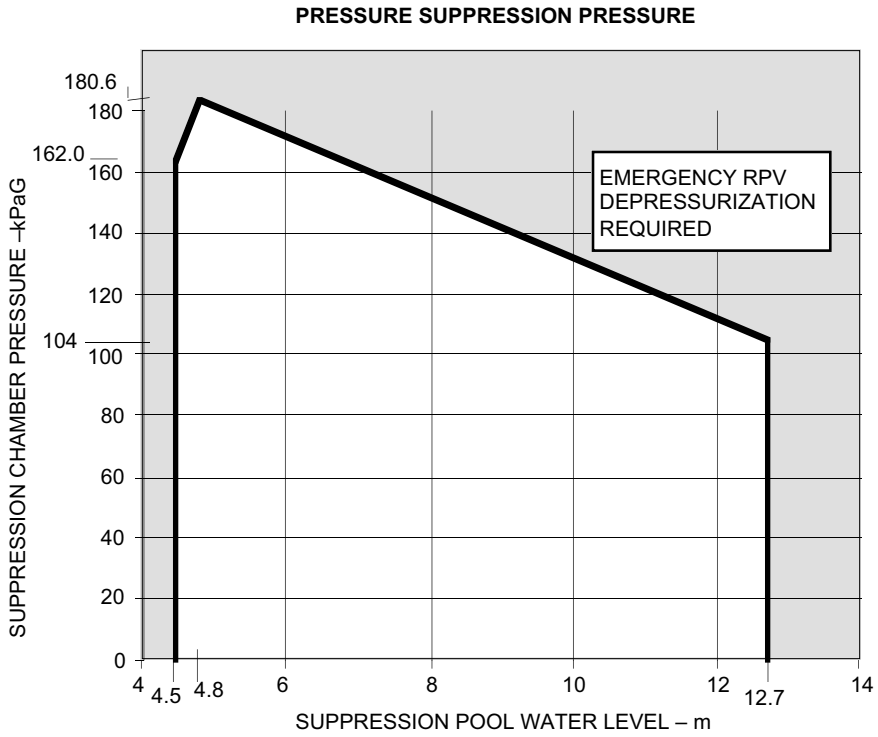
PC/P-1 (Deleted - not applicable to ABWR.)

PC/P-2 When suppression chamber pressure exceeds [0.072 MPaG (Suppression Chamber Spray Initiation Pressure)] but only if suppression pool water level is below [11.70 m (elevation of bottom of suppression pool-to-lower-drywell vent)] and drywell temperature and pressure are within the Drywell Spray lnitiation Limit, shutdown drywell cooling fans and initiate containment sprays using only those RHR subsystems (RHR(B), RHR(C)) not required to assure adequate core cooling by continuous operation in the LPCF mode.

If RHR(B) and RHR(C) are not available for containment sprays, initiate containment sprays using the fire protection system and the firewater addition mode of RHR(C).



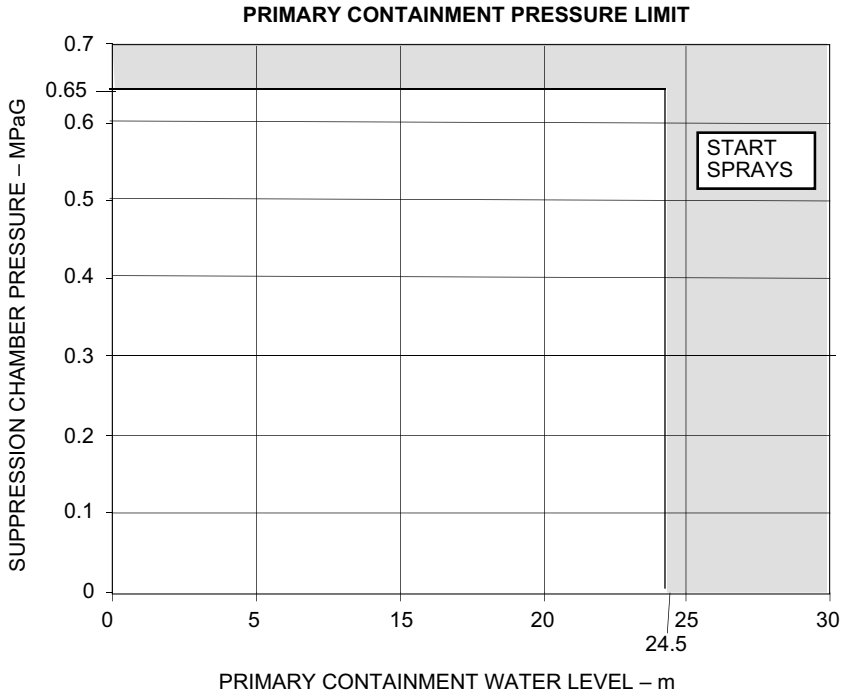
PC/P-3 When suppression chamber pressure cannot be maintained below the Pressure Suppression Pressure, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.




(PC/P-4 Deleted - not applicable to ABWR.)

PC/P-5 When primary containment pressure reaches the range of [ 0.59 - 0.65 MPaG (Rupture diaphragm pressure range)] and the rupture diaphragms are actuated, do not isolate the containment vent path until directed by [procedure developed for post accident recovery].

PC/P-6 When suppression chamber pressure cannot be maintained below [(the Primary Containment Pressure Limit)], then irrespective of whether adequate core cooling is assured:




If suppression pool water level is below [11.70 m (elevation of bottom of suppression pool-to-lower-drywell vent) and drywell temperature and pressure are within the Drywell Spray Initiation Limit, shut down drywell cooling fans and initiate containment sprays. Containment spray may be augmented by the fire protection system and the firewater addition mode of RHR(C) only when suppression chamber pressure is below [0.65 MPaG (pressure capability of the containment)] and primary containment water level is below [24.5 m (elevation of the main steamline penetration centerline)].

SP/L Monitor and control suppression pool water level.

If while executing the following steps Primary Containment Flooding is required, enter [procedure developed from Contingency #6].

SP/L-1 Maintain suppression pool water level between [7.1 m (maximum suppression pool water level LCO)] and [7.0 m (minimum suppression pool water level LCO)]; refer to [sampling procedure] prior to discharging water. If suppression pool water level cannot be maintained above [7.0 m (minimum suppression pool water level LCO)], enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with step [SP/L-2].

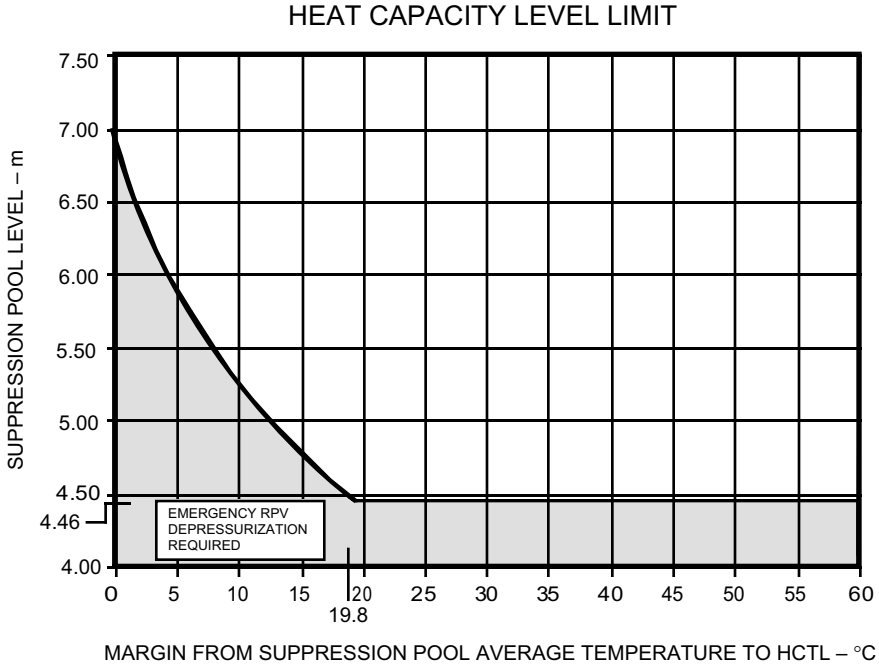
- Use the following systems to makeup to the suppression pool:
  - SPCU
  - RCIC
  - HPCF
  - Fire protection system and firewater addition mode of RHR(C).
- Use the following systems to reject water from the suppression pool:
  - RHR

If suppression pool water level cannot be maintained above [7.0 m (minimum suppression pool water level LCO)], execute [Step SP/L-2].

If suppression pool water level cannot be maintained below [7.1 m (maximum suppression pool water level LCO)], execute [Step SP/L-3].

SP/L-2 SUPPRESSION POOL WATER LEVEL BELOW [7.0 m (minimum suppression pool water level LCO)]

SP/L-2.1 Maintain suppression pool water level above the Heat Capacity Level Limit.




where HCTL Margin = Heat Capacity Temperature Limit - Suppression pool temperature.

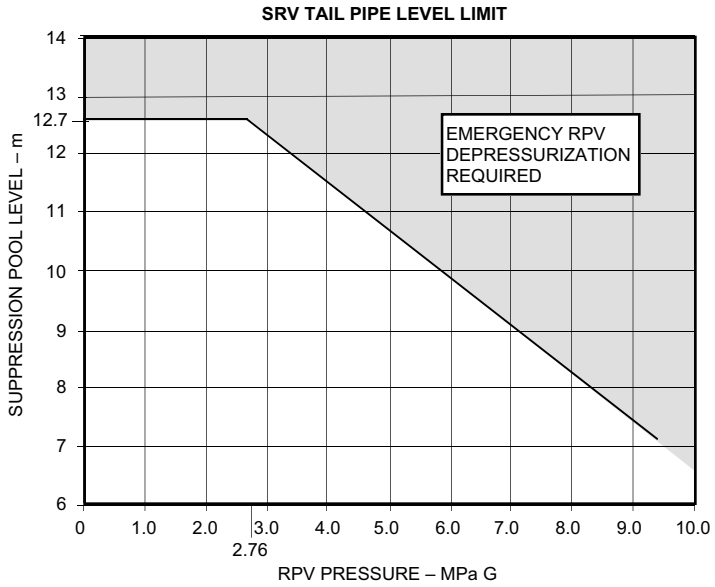
If suppression pool water level cannot be maintained above the Heat Capacity Level Limit, EMERGENCY RPV DEPRESSURIZATION lS REQUIRED.

(SP/L-2.2 Deleted – not applicable to ABWR)

SP/L-3 SUPPRESSION POOL WATER LEVEL ABOVE [7.1 m (maximum suppression pool water level LCO)]

Execute [Steps SP/L-3.1, SP/L-3.2, and SP/L-3.3] concurrently.

SP/L-3.1 Maintain suppression pool water level below the SRV Tail Pipe Level Limit.




If suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit, enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

If suppression pool water level and RPV pressure cannot be maintained below the SRV Tail Pipe Level Limit but only if adequate core cooling is assured, terminate injection into the primary containment from sources external to the primary containment except from boron injection systems and CRD.

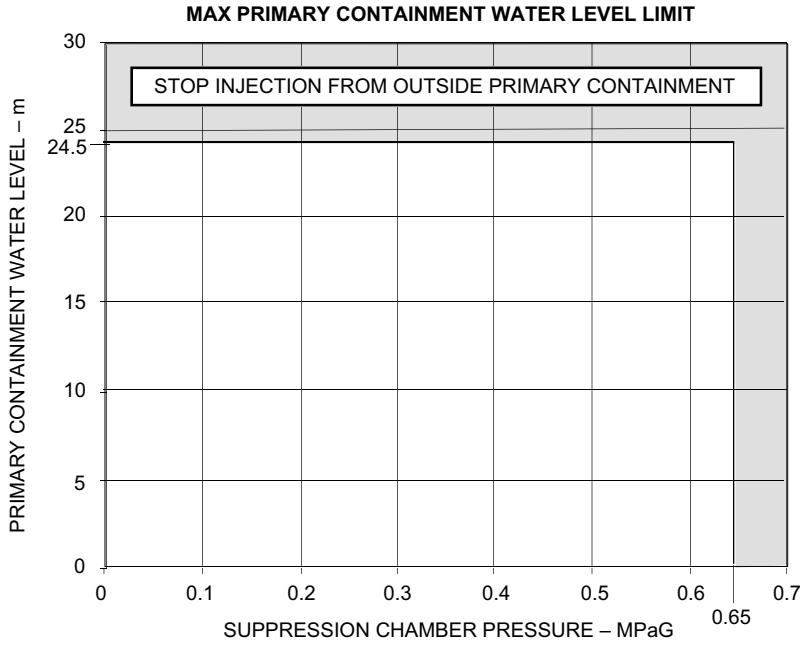
If suppression pool water level and RPV pressure cannot be restored and maintained below the SRV Tail Pipe Level Limit, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SP/L–3.2 Maintain suppression pool water level below 11.70 m (elevation of the bottom of suppression pool-to-lower drywell vent )].

lf suppression pool water level cannot be maintained below [11.70 m (elevation of the bottom of suppression pool-to-lower drywell vent )]:

- Terminate containment sprays.
- If adequate core cooling is assured, terminate injection into the primary containment from sources external to the primary containment except from boron injection systems and CRD.

SP/L-3.3 Maintain primary containment water level below the Maximum Primary Containment Water Level Limit.




If primary containment water level cannot be maintained below the Maximum Primary Containment Water Level Limit, terminate injection into the primary containment from sources external to the primary containment irrespective of whether adequate core cooling is assured.

PC/H Monitor and control hydrogen and oxygen concentrations

If while executing the following steps:

- The hydrogen or oxygen monitoring system is or becomes unavailable, sample the drywell and suppression chamber for hydrogen and oxygen in accordance with [sampling procedure].
- Drywell or suppression chamber hydrogen concentration cannot be determined to be below 6% and drywell or suppression chamber oxygen concentration cannot be determined to be below 5%, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure; and initiate containment sprays in accordance with [Step PC/H-4] until drywell and suppression chamber hydrogen concentrations can be determined to be below 6% or drywell and suppression chamber oxygen concentrations can be determined to be below 5%.

PC/H-1 When drywell or suppression chamber hydrogen concentration reaches [0.1% (minimum detectable hydrogen concentration)], but only if the offsite radioactivity release rate is expected to remain below the offsite release rate LCO and primary containment pressure is below [0.014 MPaG (SGTS and RBHVAC design pressure)], vent and purge the primary containment, bypassing isolation interlocks (except drywell pressure and radiation interlocks) if necessary, to restore and maintain drywell and suppression chamber hydrogen concentrations below [0.1% (minimum detectable hydrogen concentration)] as follows:

If while executing the following steps the offsite radioactivity release rate reaches the offsite release rate LCO, or primary containment pressure exceeds [0.014 MPaG (SGTS and RBHVAC design pressure)], isolate the primary containment vent and purge.

PC/H-1.1 Refer to [sampling procedure].

PC/H-1.2 Vent the primary containment using the ACS bleed line, SGTS and RBHVAC and purge the primary containment with nitrogen in accordance with [procedure for primary containment venting and purging].

PC/H-1.3 (Deleted)

Execute [Steps PC/H-2 and PC/H-3] concurrently.

PC/H-2 Monitor hydrogen and oxygen concentrations in the drywell.

PC/H-2.1 (Deleted)

PC/H-2.2 (Deleted)

PC/H-2.3 Continue in this procedure at [Step PC/H-4].

PC/H-3 Monitor hydrogen and oxygen concentrations in the suppression chamber.

PC/H-3.1 (Deleted)

(PC/H-3.2 Deleted, not applicable to ABWR.)

PC/H-4 When drywell or suppression chamber hydrogen concentration reaches 6% and drywell or suppression chamber oxygen concentration is above 5%, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

If while executing the following steps containment sprays have been initiated and suppression chamber or drywell pressure pressure drops below [0.012 MPaG (high drywell pressure scram setpoint)], terminate containment sprays.

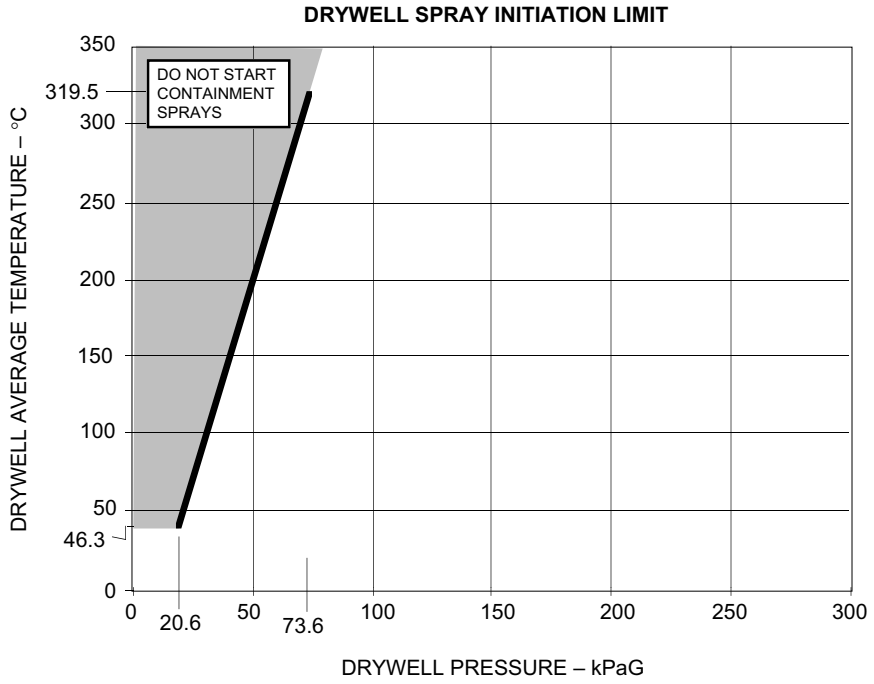
PC/H-4.1 (Deleted - not applicable to ABWR.)

PC/H-4.2 (Deleted - not applicable to ABWR.)

PC/H-4.3 (Deleted - not applicable to ABWR.)

PC/H-4.4 If suppression pool water level is below [11.70 m (elevation of bottom of suppression pool-to-lower-drywell vent)] and drywell temperature, and pressure are within the Drywell Spray lnitiation Limit, shut down drywell cooling fans and initiate containment sprays using only those RHR subsystems (RHR(B), RHR(C)) not required to assure adequate core cooling by continuous operation in the LPCF mode.

If RHR(B) and RHR(C) are not available for containment sprays, initiate containment sprays using the fire protection system and the firewater addition mode of RHR(C).

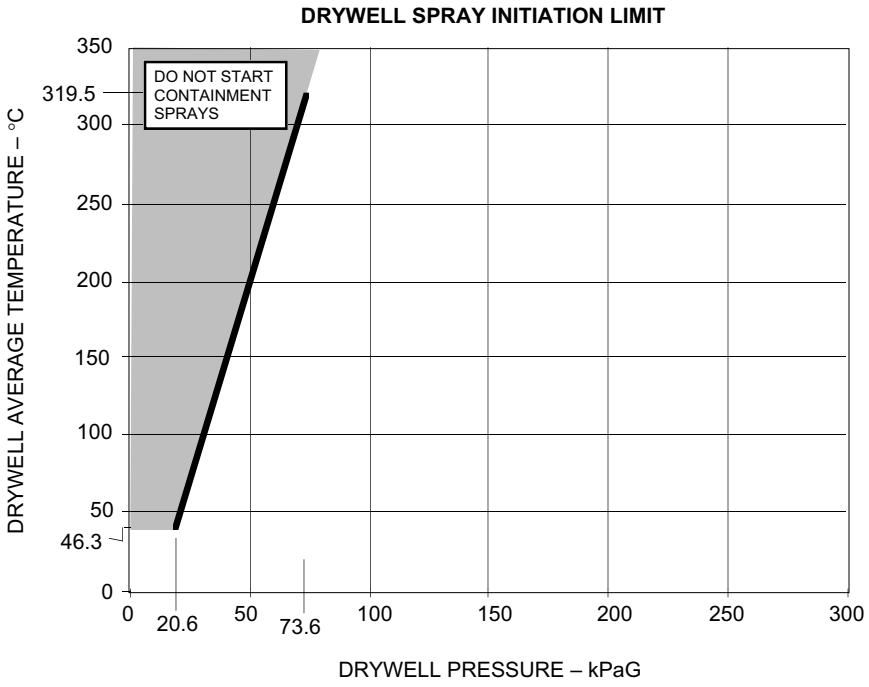


PC/H-5 When drywell or suppression chamber hydrogen concentration cannot be restored and maintained below 6% and drywell or suppression chamber oxygen concentration cannot be restored and maintained below 5%, then irrespective of whether adequate core cooling is assured:

If while executing the following steps containment sprays have been initiated and suppression chamber or drywell pressure drops below [0.012 MPaG (high drywell pressure scram setpoint)], terminate containment sprays.

PC/H-5.1 (Deleted - not applicable to ABWR.)

PC/H-5.2 If suppression pool water level is below [11.70 m (elevation of bottom of suppression pool-to-lower-drywell vent)] and drywell temperature and pressure are within the Drywell Spray Initiation Limit, shut down drywell cooling fans and initiate containment sprays.



## 18A.6 SECONDARY CONTAINMENT CONTROL GUIDELINE

SECONDARY CONTAINMENT CONTROL GUIDELINE

PURPOSE

The purpose of this guideline is to:

- Protect equipment in the secondary containment,
- Limit radioactivity release to the secondary containment, and either:
- Maintain secondary containment integrity, or
- Limit radioactivity release from the secondary containment.

ENTRY CONDITIONS

The entry conditions for this guideline are any of the following secondary containment conditions:

- Differential pressure at or above 0 mm of water
- An area temperature above the maximum normal operating temperature
- A HVAC cooler differential temperature above the maximum normal operating differential temperature
- A HVAC exhaust radiation level above the maximum normal operating radiation level
- An area radiation level above the maximum normal operating radiation level
- A floor drain sump water level above the maximum normal operating water level
- An area water level above the maximum normal operating water level

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OPERATOR ACTIONS

If while executing the following steps secondary containment HVAC exhaust radiation level exceeds [2 μGy/h Reactor Building or 20 μGy/h Fuel Handling Area (secondary containment HVAC isolation setpoint)]:

- Confirm or manually initiate isolation of secondary containment HVAC, and
- Confirm initiation of or manually initiate SGTS.

If while executing the following steps:

- Secondary containment HVAC isolates, and,
- Secondary containment HVAC exhaust radiation level is below [2 μGy/h Reactor Building or 20 μGy/h Fuel Handling Area (secondary containment HVAC isolation setpoint)],

restart secondary containment HVAC, defeating high drywell pressure and low RPV water level isolation interlocks if necessary.

Irrespective of the entry condition, execute [Steps SC/T, SC/R and SC/L] concurrently.

SC/T Monitor and control secondary containment temperatures.

SC/T-1 Operate available area coolers.

SC/T-2 If secondary containment HVAC exhaust radiation level is below [2 μGy/h Reactor Building or 20 μGy/h Fuel Handling Area (secondary containment HVAC isolation setpoint)], operate available secondary containment HVAC.

SC/T-3 When an area temperature exceeds its maximum normal operating temperature, isolate all systems that are discharging into the area except systems required to shut down the reactor, assure adequate core cooling, protect primary containment integrity, or suppress a fire. ☞ #1

Execute [Steps SC/T-4 and SC/T-5] concurrently.

SC/T-4 If a primary system is discharging into secondary containment:

SC/T-4.1 Before any area temperature reaches its maximum safe operating temperature, enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

SC/T-4.2 When an area temperature exceeds its maximum safe operating temperature in more than one area, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SC/T-5 When an area temperature exceeds its maximum safe operating temperature in more than one area, shut down the reactor.

SC/R Monitor and control secondary containment radiation levels.

SC/R-1 When an area radiation level exceeds its maximum normal operating radiation level, isolate all systems that are discharging into the area except systems required to shut down the reactor, assure adequate core cooling, protect primary containment integrity, or suppress a fire.

Execute [Steps SC/R-2 and SC/R-3] concurrently.

SC/R-2 If a primary system is discharging into secondary containment:

SC/R-2.1 Before any area tradiation level reaches its maximum safe operating radiation level, enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

SC/R-2.2 When an area radiation level exceeds its maximum safe operating radiation level in more than one area, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SC/R-3 When an area radiation level exceeds its maximum safe operating radiation level in more than one area, shut down the reactor.

SC/L Monitor and control secondary containment water levels.

SC/L-1 When a floor drain sump or area water level is above its maximum normal operating water level, operate available sump pumps to restore and maintain it below its maximum normal operating water level.

If any floor drain sump or area water level cannot be restored and maintained below its maximum normal operating water level, isolate all systems that are discharging water into the sump or area except systems required to shut down the reactor, assure adequate core cooling, protect primary containment integrity, or suppress a fire.

Execute [Steps SC/L-2 and SC/L-3] concurrently.

SC/L-2 If a primary system is discharging into secondary containment:

SC/L-2.1 Before any area water level reaches its maximum safe operating water level, enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

SC/L-2.2 When an area water level exceeds its maximum safe operating water level in more than one area, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

SC/R-3 When an area water level exceeds its maximum safe operating water level in more than one area, shut down the reactor.

TABLE 1
Operating Values of Secondary Containment Parameters

| Secondary Containment Parameter | Maximum Normal Operating Value | Maximum Safe Operating Value |
|---|---|---|
| Area Temperature | °C | °C |
| El. -8200 T.M.S.L. (Floor 100-B3F) | | |
| • HCU Area - 0° | 40 | 100 |
| • RHR(A) Pump & Hx Room | 65 | 100 |
| • RCIC Room | 65 | 100 |
| • HPCF(C) Pump Room | 65 | 100 |
| • RHR(C) Pump & Hx Room | 65 | 100 |
| • CRD Pump Room | 40 | 100 |
| • HCU Area - 180° | 40 | 100 |
| • RHR(B) Pump & Hx Room | 65 | 100 |
| • HPCF(B) Pump Room | 65 | 100 |
| • CUW Non-Regen. Hx Room | 50 | 100 |
| • CUW Pump Area | 40 | 100 |
| El. -1700 T.M.S.L. (Floor 200-B2F) | | |
| • TIP Area | 40 | 100 |
| • ECCS Pump Maintenance Area | 40 | 100 |
| • Valve Room A | 40 | 100 |
| • Valve Room C | 40 | 100 |
| • FMCRD & RIP Maintenance Area | 40 | 100 |
| • Valve Room B | 40 | 100 |
| • CUW Regen. Hx & Valve Area | 50 | 100 |
| • CUW F/D Valve Area | 40 | 100 |
| El. 4800 T.M.S.L. (Floor 300-B1F) | | |
| • RPV Instrument Area 1 & 3 | 40 | 100 |
| • RPV Instrument Area 2 & 4 | 40 | 100 |
| • CUW/FPC F/D Area | 40 | 100 |
| El. 12300 T.M.S.L. (Floor 400-1F) | | |
| • Valve Room A | 40 | 100 |
| • Valve Room C | 40 | 100 |
| • | | |
| • Valve Room B | 40 | 100 |
| • CUW Valve Area | 40 | 100 |
| El. 18100 T.M.S.L. (Floor 500-2F) | | |
| • Main Steam/FW Tunnel | 55 | 171 |
| • FPC Area | | |
| – Hx Area | 40 | 100 |
| – Pump Area | 65 | 100 |
| – Valve Area | 40 | 100 |

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**Table 1**
**Operating Values of Secondary Containment Parameters**
**(Cont.)**

| Secondary Containment Parameter | Maximum Normal Operating Value | Maximum Safe Operating Value |
|---|---|---|
| Area Temperature | ℃ | ℃ |
| El. 23500 T.M.S.L. (Floor 600-3F) | | |
| • SRV/MSIV Maintenance Room | 40 | 100 |
| • SLC Area | 40 | 100 |
| • SGTS Area | | |
| - Fan Area | 65 | 100 |
| - Filter Train Area | 40 | 100 |
| El. 31700 T.M.S.L. (Floor 800-4F) | | |
| • Dryer/Separator Area | 40 | 100 |
| • Reactor Well Area | 40 | 100 |
| • Spent Fuel Storage Area | 40 | 100 |

TABLE 1
Operating Values of Secondary Containment Parameters
(Cont.)

| Secondary Containment Parameter | Maximum Normal Operating Value | Maximum Safe Operating Value |
|---|---|---|
| HVAC Cooler Differential Temperature | °C | |
| RHR(A) Pump Room | Hi Alarm | N/A |
| RHR(B) Pump Room | Hi Alarm | N/A |
| RHR(C) Pump Room | Hi Alarm | N/A |
| HPCF(B) Pump Room | Hi Alarm | N/A |
| HPCF(C) Pump Room | Hi Alarm | N/A |
| RCIC Pump/Turbine Room | Hi Alarm | N/A |
| FPC(A) | Hi Alarm | N/A |
| FPC(B) | Hi Alarm | N/A |
| SGTS (B) | Hi Alarm | N/A |
| SGTS (C) | Hi Alarm | N/A |
| CAMS(A) | Hi Alarm | N/A |
| CAMS(B) | Hi Alarm | N/A |
| Main Steam/FW Tunnel | Hi Alarm | N/A |
| RIP Handling Machine Control Room A | Hi Alarm | N/A |
| RIP Handling Machine Control Room B | Hi Alarm | N/A |
| CRD Auto Exchanger Control Room A | Hi Alarm | N/A |
| CRD Auto Exchanger Control Room B | Hi Alarm | N/A |
| ISI Room A | Hi Alarm | N/A |
| ISI Room B | Hi Alarm | N/A |
| Primary Containment L/T Measurement Room | Hi Alarm | N/A |
| Plant Outage Workers Room | Hi Alarm | N/A |
| Refueling Machine Control Room | Hi Alarm | N/A |
| CUW Non-Regen. Hx Area | Hi Alarm | N/A |
| CUW Regen. Hx Area | Hi Alarm | N/A |
| CUW Valve Room | Hi Alarm | N/A |

TABLE 1
Operating Values of Secondary Containment Parameters
(Cont.)

| Secondary Containment Parameter | Maximum Normal Operating Value | Maximum Safe Operating Value |
|---|---|---|
| HVAC Exhaust Radiation Level | $10^{-5}$ Gy/h | |
| Reactor building | 0.1 | N/A |
| Refuel floor (Fuel Handling Area) | 1 | N/A |
| Area Radiation Level | $10^{-5}$ Gy/h | $10^{-5}$ Gy/h |
| El. -8200 T.M.S.L. (Floor 100-B3F) | | |
| • HCU Area - 0° | 5 | ___ |
| • RHR(A) Pump & Hx Room | 30 | ___ |
| • RCIC Room | 200 | ___ |
| • HPCF(C) Pump Room | 5 | ___ |
| • RHR(C) Pump & Hx Room | 30 | ___ |
| • CRD Pump Room | 5 | ___ |
| • HCU Area - 180° | 5 | ___ |
| • RHR(B) Pump & Hx Room | 30 | ___ |
| • HPCF(B) Pump Room | 5 | ___ |
| • CUW Non-Regen. Hx Room | 20,000 | ___ |
| • CUW Pump Area | 500 | ___ |
| El. -1700 T.M.S.L. (Floor 200-B2F) | | |
| • TIP Area | 5 | ___ |
| • ECCS Pump Maintenance Area | 5 | ___ |
| • Valve Room A | 5 | ___ |
| • Valve Room C | 5 | ___ |
| • FMCRD & RIP Maintenance Area | 5 | ___ |
| • Valve Room B | 5 | ___ |
| • CUW Regen. Hx & Valve Area | 20,000 | ___ |
| • CUW F/D Valve Area | 5 | ___ |
| El. 4800 T.M.S.L. (Floor 300-B1F) | | |
| • RPV Instrument Area 1 & 3 | 5 | ___ |
| • RPV Instrument Area 2 & 4 | 5 | ___ |
| • CUW/FPC F/D Area | 5 | ___ |
| El. 12300 T.M.S.L. (Floor 400-1F) | | |
| • Valve Room A | 5 | ___ |
| • Valve Room C | 5 | ___ |
| • | | |
| • Valve Room B | 5 | ___ |
| • CUW Valve Area | 5 | ___ |

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**Table 1**
**Operating Values of Secondary Containment Parameters**
**(Cont.)**

| Secondary Containment Parameter | Maximum Normal Operating Value | Maximum Safe Operating Value |
|---|---|---|
| Area Radiation Level | $10^{-5}$ Gy/h | $10^{-5}$ Gy/h |
| El. 18100 T.M.S.L. (Floor 500-2F) | | |
| • Main Steam/FW Tunnel | 5000 | ____ |
| • FPC Area | | |
| - Hx Area | 5 | ____ |
| - Pump Area | 5 | ____ |
| - Valve Area | 5 | ____ |
| El. 23500 T.M.S.L. (Floor 600-3F) | | |
| • SRV/MSIV Maintenance Room | 5 | ____ |
| • SLC Area | 5 | ____ |
| • SGTS Area | | |
| - Fan Area | 5 | ____ |
| - Filter Train Area | 5 | ____ |
| El. 31700 T.M.S.L. (Floor 800-4F) | | |
| • Dryer/Separator Area | 5 | ____ |
| • Reactor Well Area | 5 | ____ |
| • Spent Fuel Storage Area | 5 | ____ |
| • New Fuel Storage Area | 5 | ____ |

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**Table 1**
**Operating Values of Secondary Containment Parameters**
**(Cont.)**

| Secondary Containment Parameter | Maximum Normal Operating Value | Maximum Safe Operating Value |
|---|---|---|
| Floor Drain Sump Water Level | cm | |
| Sump HCU Area - 0° | Hi Hi Alarm | N/A |
| Sump RHR(A) & RCIC Area | Hi Hi Alarm | N/A |
| Sump RHR(C) & HPCF(C) Area | Hi Hi Alarm | N/A |
| Sump HCU Area - 180° | Hi Hi Alarm | N/A |
| Sump RHR(B) & HPCF(B) Area | Hi Hi Alarm | N/A |
| Area Water Level | cm | cm |
| El. -8200 T.M.S.L. (Floor 100-B3F) | | |
| • HCU Area - 0° | 5 | 127 |
| • RHR(A) Pump & Hx Room | 5 | 213 |
| • RCIC Room | 5 | 140 |
| • HPCF(C) Pump Room | 5 | 288 |
| • RHR(C) Pump & Hx Room | 5 | 213 |
| • CRD Pump Room | 5 | 70 |
| • HCU Area - 180° | 5 | 127 |
| • RHR(B) Pump & Hx Room | 5 | 213 |
| • HPCF(B) Pump Room | 5 | 288 |
| • CUW Non-Regen. Hx Room | 5 | >20 |
| • CUW Pump Area | 5 | 85 |
| El. -1700 T.M.S.L. (Floor 200-B2F) | | |
| • TIP Area | 5 | >20 |
| • ECCS Pump Maintenance Area | 5 | >20 |
| • Valve Room A | 5 | * |
| • Valve Room C | 5 | >20 |
| • FMCRD & RIP Maintenance Area | 5 | >20 |
| • Valve Room B | 5 | >20 |
| • CUW Regen. Hx & Valve Area | 5 | >20 |
| • CUW F/D Valve Area | 5 | >20 |
| El. 4800 T.M.S.L. (Floor 300-B1F) | | |
| • RPV Instrument Area 1 & 3 | 5 | >20 |
| • RPV Instrument Area 2 & 4 | 5 | >20 |
| • CUW/FPC F/D Area | 5 | >20 |

* Level of detail not available; should be bottom of MOV elevation.

TABLE 1
Operating Values of Secondary Containment Parameters
(Cont.)

| Secondary Containment Parameter | Maximum Normal Operating Value | Maximum Safe Operating Value |
|---|---|---|
| Area Water Level | cm | cm |
| El. 12300 T.M.S.L. (Floor 400-1F) | | |
| • Valve Room A | 5 | >20 |
| • Valve Room C | 5 | >20 |
| • | | |
| • Valve Room B | 5 | >20 |
| • CUW Valve Area | 5 | >20 |
| El. 18100 T.M.S.L. (Floor 500-2F) | | |
| • Main Steam/FW Tunnel | 5 | 400 |
| • FPC Area | | |
| – Hx Area | 5 | >20 |
| – Pump Area | 5 | 100 |
| – Valve Area | 5 | >20 |
| El. 23500 T.M.S.L. (Floor 600-3F) | | |
| • SRV/MSIV Maintenance Room | 5 | >20 |
| • SLC Area | 5 | 46 |
| • SGTS Area | | |
| – Fan Area | 5 | >20 |
| – Filter Train Area | 5 | >20 |

ABWR SC-12

## 18A.7 RADIOACTIVITY RELEASE CONTROL GUIDELINE

RADIOACTIVITY RELEASE CONTROL GUIDELINE

PURPOSE

The purpose of this guideline is to limit radioactivity release into areas outside the primary and secondary containments

ENTRY CONDITIONS

The entry conditions for this guideline is

- Offsite radioactivity release rate above the offsite release rate which requires an Alert.

OPERATOR ACTIONS

If while executing the following steps turbine building HVAC is shutdown restart turbine building HVAC.

RR-1 Isolate all primary systems that are discharging into areas outside the primary and secondary containments except systems required to assure adequate core cooling or shut down the reactor.

If the radioactivity release rate continues to increase enter [procedure developed from the RPV Control Guideline] at [Step RC-1] and execute it concurrently with this procedure.

RR-2 When offsite radioactivity release rate approaches or exceeds the offsite release rate which requires a General Emergency but only if a primary system is discharging into an area outside the primary and secondary containments, EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

## 18A.8 CONTINGENCY #1, ALTERNATIVE LEVEL CONTROL

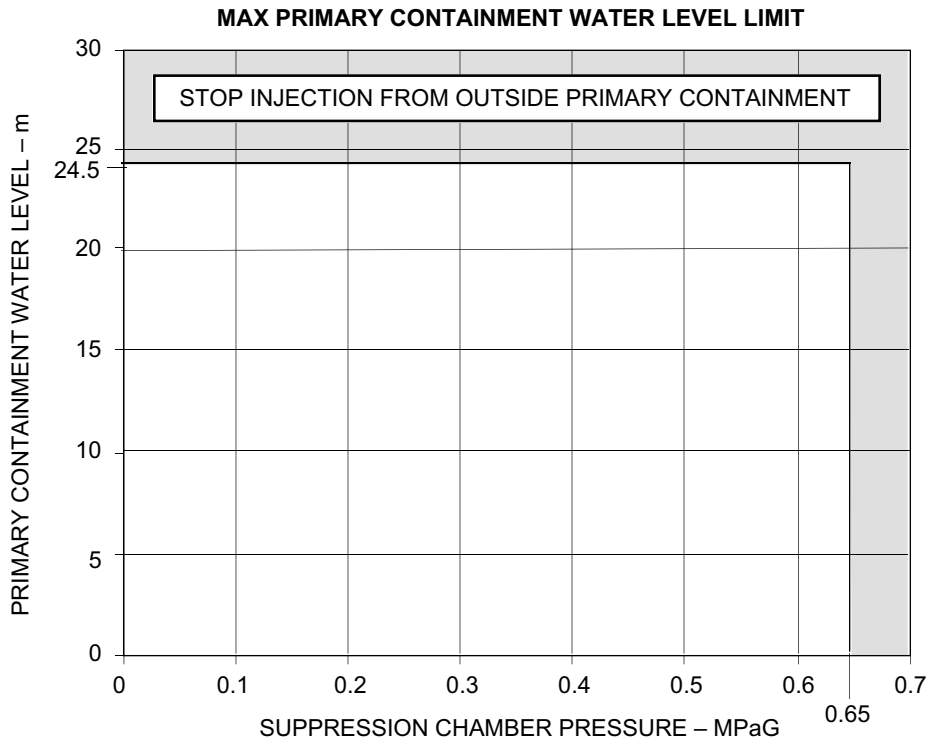
CONTINGENCY#1
ALTERNATIVE LEVEL CONTROL

If while executing the following steps:

- Any control rod cannot be determined to be inserted to or beyond 4.2% (Maximum Subcritical Banked Withdrawal Position)] and it has not been determined that the reactor will remain shutdown under all conditions without boron, enter [procedure developed from Contingency #5].
- RPV water level cannot be determined, enter [procedure developed from Contingency #4].
- RPV water level is increasing, enter [procedure developed from the RPV Control Guideline] at [Step RC/L].
- RPV water level drops below [34.7 cm (ADS initiation setpoint)], prevent automatic initiation of ADS.

ABWR C1-1

If while executing the following steps primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit, then irrespective of whether adequate core cooling is assured terminate injection into the primary containment from sources external to the primary containment until primary containment water level and suppression chamber pressure can be maintained below the Maximum Primary Containment Water Level Limit.



(C1-1 Deleted -- not applicable to ABWR)

C1-2 Line up for injection, start pumps, and irrespective of pump NPSH and vortex limits, increase injection flow to the maximum with 2 or more of the following injection subsystems:

- Feedwater / Condensate
- HPCF(B)
- HPCF(C)
- RHR-A (LPCF)
- RHR-B (LPCF)
- RHR-C (LPCF)

If less than 2 of the injection subsystems can be lined up, commence lining up as many of the following alternate injection subsystems as possible:

- Fire protection system and the firewater addition mode of RHR(C)
- [Interconnections with other units]
- ECCS keep-full systems:
  HPCF, RHR
- SLC (test tank)
- Condensate Makeup Water System

C1-3 If RPV pressure is above [1.37 MPaG (highest RPV pressure at which the shutoff head of a low-water-quality alternate injection subsystem (excluding SLC) is reached)]:

> If while executing the following steps RPV pressure drops below [1.37 MPaG (highest RPV pressure at which the shutoff head of a low-water-quality alternate injection subsystem (excluding SLC) is reached)], continue in this procedure at [Step C1-4].

C1-3.1 If no injection subsystem is lined up for injection with at least one pump running, start pumps in alternate injection subsystems which are lined up for injection.

C1-3.2 When RPV water level drops to [0 cm (top of active fuel)]:

- If any system, injection subsystem or alternate injection subsystem is lined up with at least one pump running, EMERGENCY RPV DEPRESSURIZATION lS REQUIRED.
- If no system, injection subsystem or alternate injection subsystem is lined up with at least one pump running, STEAM COOLING IS REQUIRED.

C1-4 When RPV pressure drops below [1.37 MPaG (highest RPV pressure at which the shutoff head of a low-water-quality alternate injection subsystem (excluding SLC) is reached)]:

C1-4.1 Line up for injection, start pumps, and irrespective of pump NPSH and vortex limits, increase injection flow to the maximum with all systems and injection subsystems.

C1-4.2 When RPV water level drops to [0 cm (top of active fuel)], EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; line up for injection, start pumps, and increase injection flow to the maximum with all alternate injection subsystems.

If RPV water level cannot be restored and maintained above [0 cm (top of active fuel)], PRIMARY CONTAINMENT FLOODING IS REQUIRED; enter [procedure developed from Contingency #6].

## 18A.9 CONTINGENCY #2, EMERGENCY RPV DEPRESSURIZATION

CONTINGENCY#2
EMERGENCY RPV DEPRESSURIZATION

C2-1 When either: ☞ #6

- All control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)], or
- It has been determined that the reactor will remain shutdown under all conditions without boron, or
- All injection into the RPV except from boron injection systems, CRD, and RCIC has been terminated and prevented,

C2-1.1 If a high drywell pressure ECCS initiation signal [0.012 MPaG (drywell pressure which initiates ECCS)] exists, prevent injection from those RHR pumps not required to assure adequate core cooling.

(C2-1.2 Deleted -- Not applicable to ABWR)

C2-1.3 If suppression pool water level is above [2.291 m (elevation of top of SRV discharge device)]:

- Open all ADS valves.
- If any ADS valve cannot be opened, open other SRVs until

  [8 (number of SRVs dedicated to ADS)] valves are open.

ABWR C2-1

Execute Step [C2-1.4 ] and [Step C2-1.5] concurrently.

C2-1.4 If [8 (number of SRVs dedicated to ADS)] SRVs cannot be opened, open the ADS valves using nitrogen stored in bottles of the High Pressure Nitrogen Gas Supply system using [procedure for opening ADS SRVs with nitrogen bottles].

C2-1.5 If less than [6 (Minimum Number of SRVs Required for Emergency Depressurization)] SRVs are open, rapidly depressurize the RPV, defeating isolation interlocks if necessary, using one or more of the following:

- Main condenser
- Main steam line drains
- RCIC steam line
- Head vent
- [Other steam driven equipment]

If RPV water level cannot be determined, enter [procedure developed from Contingency #4].

C2-2 When either:

- All control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)], or
- It has been determined that the reactor will remain shutdown under all conditions without boron, or
- [541.8 kg (Cold Shutdown Boron Weight)] of boron have been injected into the RPV, or
- The reactor is shutdown and no boron has been injected into the RPV,

enter [procedure developed from the RPV Control Guideline] at [Step RC/P-4].

## 18A.10 CONTINGENCY #3, STEAM COOLING

CONTINGENCY#3
STEAM COOLING

C3-1 Perform steam cooling operation as follows:

If while executing this step Emergency RPV Depressurization is required, RPV water level cannot be determined, or any system, injection subsystem, or alternate injection subsystem is lined up for injection with at least one pump running, enter [procedure developed from Contingency #2].

When RPV water level drops to [-111.2 cm (Minimum Zero-lnjection RPV Water Level)] enter [procedure developed from Contingency #2].

## 18A.11 CONTINGENCY #4, RPV FLOODING

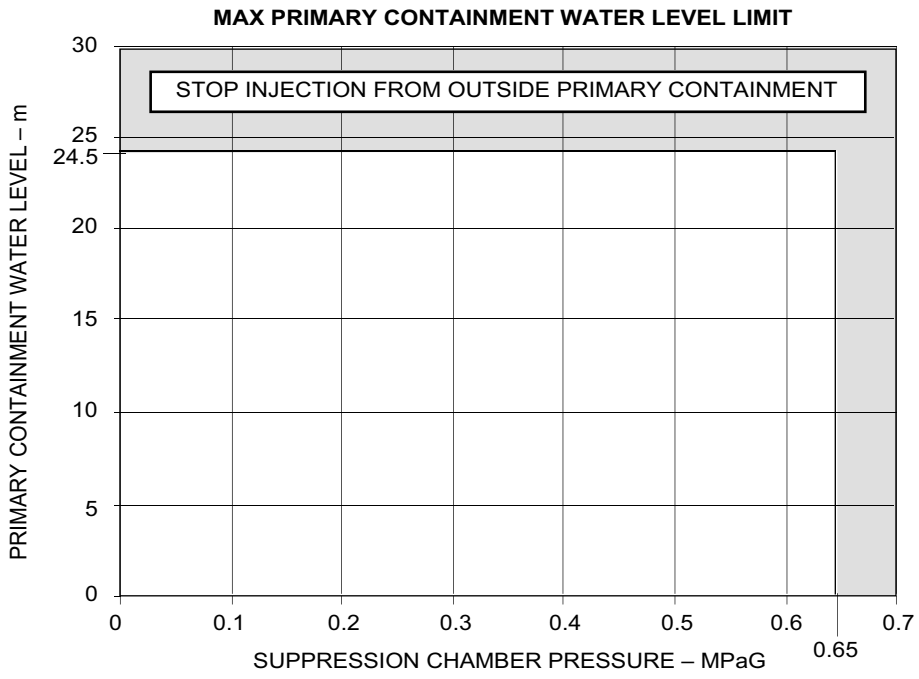
CONTINGENCY #4
RPV FLOODING

If while executing the following steps RPV water level can be determined:

- If any control rod cannot be determined to be inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)] and it has not been determined that the reactor will remain shutdown under all conditions without boron, enter [procedure developed from Contingency #5] and [procedure developed from RPV Control Guideline] at [Step RC/P-4] and execute these procedures concurrently.

- If all control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)] or it has been determined that the reactor with remain shutdown under all conditions without boron, enter [procedure developed from the RPV Control Guideline] at [Steps RC/L and RC/P-4] and execute these steps concurrently.

If while executing the following steps primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit, then irrespective of whether adequate core cooling is assured terminate injection into the primary containment from sources external to the primary containment until primary containment water level and suppression chamber pressure can be maintained below the Maximum Primary Containment Water Level Limit.



C4-1 If any control rod cannot be determined to be inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)] and it has not been determined that the reactor will remain shutdown under all conditions without boron, flood the RPV as follows:

If while executing the following steps either all control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)] or it has be been determined that the reactor will remain shutdown under all conditions without boron but RPV water level cannot be determined, continue in this procedure at [Step C4-2].

C4-1.1 Terminate and prevent all injection into the RPV except from boron injection systems and CRD until RPV pressure is below the Minimum Alternate RPV Flooding Pressure.

| Number of open SRVs | Minimum Alternate RPV Flooding Pressure (MPaG) |
|---|---|
| 8 or more | 0.93 |
| 7 | 1.08 |
| 6 | 1.27 |
| 5 | 1.55 |
| 4 | 1.96 |
| 3 | 2.65 |
| 2 | 4.02 |

If less than [2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure)] SRVs can be opened, continue in this procedure.

C4-1.2 If at least [6 (Minimum Number of SRVs Required for Emergency Depressurization)] SRVs can be opened, close the MSIVs, main steam line drain valves,and RClC isolation valves.

C4-1.3 Commence and, irrespective of pump NPSH and vortex limits, slowly increase injection into the RPV with the following systems until at least [2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure)] SRVs are open and RPV pressure is above the Minimum Alternate RPV Flooding Pressure: ☞ #7

- Motor driven feedwater pumps, defeating high RPV water level isolation interlocks if necessary.
- Condensate pumps
- CRD
- RHR (LPCF)

If less than [2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure)] SRVs are open or RPV pressure cannot be increased to above the Minimum Alternate RPV Flooding Pressure, commence and, irrespective of pump NPSH and vortex limits, slowly increase injection into the RPV with the following systems until at least [2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure)] SRVs are open and RPV pressure is above the Minimum Alternate RPV Flooding Pressure:

- HPCF, defeating high RPV water level isolation interlocks if necessary.
- Fire protection system and the firewater addition mode of RHR(C)
- ECCS keep-full systems
  HPCF, RHR
- Condensate Makeup Water System

If less than [2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure)] SRVs are open or RPV pressure cannot be increased to above the Minimum Alternate RPV Flooding Pressure, PRIMARY CONTAINMENT FLOODING IS REQUIRED; enter [procedure developed from Contingency #6] and [procedure developed from the RPV Control Guideline] at [Step RC/P-4] and execute these procedures concurrently.

C4-1.4 When at least [2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure)] SRVs are open and RPV pressure is above the Minimum Alternate RPV Flooding Pressure, control injection to maintain at least [2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure)] SRVs open and RPV pressure above the Minimum Alternate RPV Flooding Pressure but as low as practicable.

C4-1.5 When all control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)] or it has been determined that the reactor will remain shutdown under all conditions without boron, continue in this procedure.

C4-2 If at least [6 (Minimum Number of SRVs Required for Emergency Depressurization)] SRVs can be opened or if a HPCF or motor driven feedwater pump is available for injection, close the MSIVs, main steam line drain valves, and RCIC isolation valves.

C4-3 Flood the RPV as follows:

C4-3.1 Commence and, irrespective of pump NPSH and vortex limits, increase injection into the RPV with the following systems until at least [6 (Minimum Number of SRVs Required for Emergency Depressurization)] SRVs are open and RPV pressure is not decreasing and is [0.354 MPaG (Minimum RPV Flooding Pressure)] or more above suppression chamber pressure:

- HPCF, defeating high RPV water level isolation interlocks if necessary.
- Motor driven feedwater pumps, defeating high RPV water level isolation interlocks if necessary.
- RHR (LPCF)
- Condensate pumps
- CRD
- Fire protection system and firewater addition mode of RHR(C)
- [Interconnections with other units]
- ECCS keep-full systems
  HPCF, RHR
- SLC (test tank)
- Condensate Makeup Water System

> lf less than [6 (Minimum Number of SRVs Required for Emergency Depressurization)] SRVs are open or RPV pressure cannot be maintained at least [0.354 MPaG (Minimum RPV Flooding Pressure)] above suppression chamber pressure, PRIMARY CONTAINMENT FLOODING IS REQUIRED; enter [procedure developed from Contingency #6] and [procedure developed from the RPV Control Guideline] at [Step RC/P-4] and execute these procedures concurrently.

C4-3.2 When at least [6 (Minimum Number of SRVs Required for Emergency Depressurization)] SRVs are open and RPV pressure can be maintained at least [0.354 MPaG (Minimum RPV Flooding Pressure)] above suppression chamber pressure, control injection to maintain at least [6 (Minimum Number of SRVs Required for Emergency Depressurization)] SRVs open and RPV pressure at least [0.354 MPaG (Minimum RPV Flooding Pressure)] above suppression chamber pressure but as low as practicable.

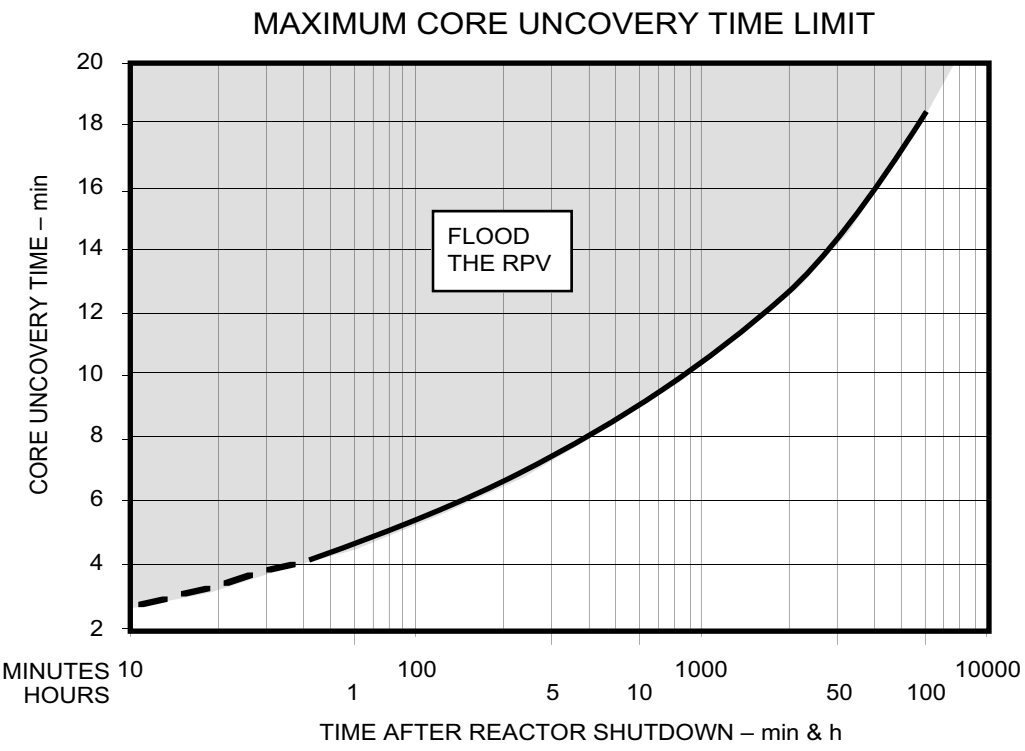
C4-4 When:

- RPV water level instrumentation is available, and
- Temperature[s] [near the cold reference leg instrument vertical runs] are below 100° C, and
- RPV pressure has remained at least [0.354 MPaG (Minimum RPV Flooding Pressure)] above suppression chamber pressure for at least [the Minimum Core Flooding Interval]

| Number of open SRVs | Minimum Core Flooding Interval (Min) |
|---|---|
| 8 or more | 43.5 |
| 7 | 59.4 |
| 6 | 84.3 |

Terminate all injection into the RPV and reduce RPV water level until RPV water level indication is restored.

If RPV water level indication is not restored within the Maximum Core Uncovery Time Limit after commencing termination of injection into the RPV, return to [Step C4-3.1].



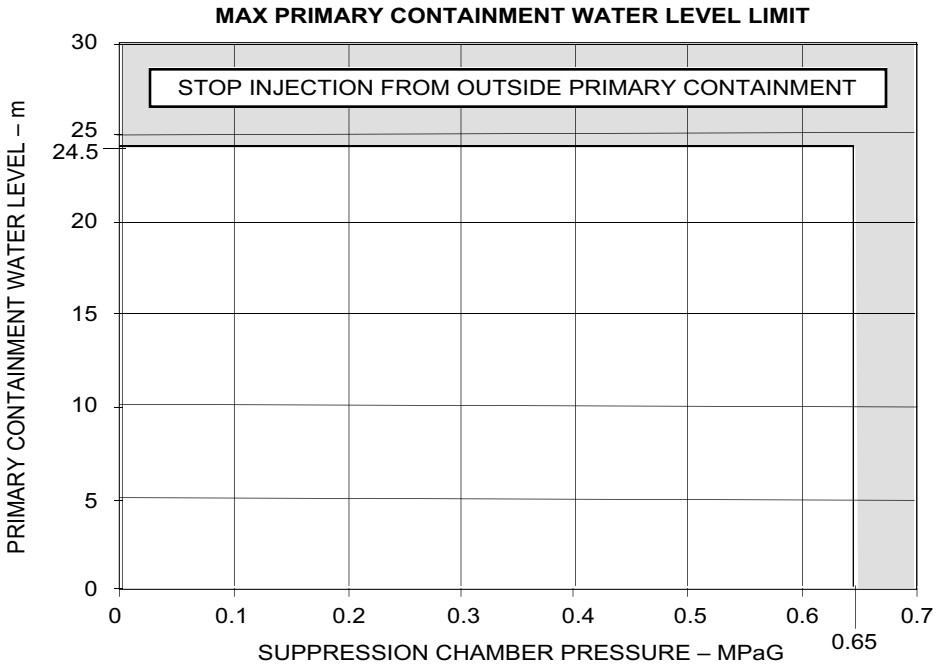

C4-5 Enter [procedure developed from the RPV Control Guideline] at [Steps RC/L and RC/P-4] and execute these steps concurrently.

## 18A.12 CONTINGENCY #5, LEVEL/POWER CONTROL

CONTINGENCY#5
LEVEL POWER CONTROL

If while executing the following steps:

- RPV water level cannot be determined, enter [procedure developed from Contingency #4].
- All control rods are inserted to or beyond [4.2% (Maximum Subcritical Banked Withdrawal Position)] or it has been determined that the reactor will remain shutdown under all conditions without boron, enter [procedure developed from the RPV Control Guideline] at [Step RC/L].
- Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit, then irrespective of whether adequate core cooling is assured terminate injection into the primary containment from sources external to the primary containment until primary containment water level and suppression chamber pressure can be maintained below the Maximum Primary Containment Water Level Limit.



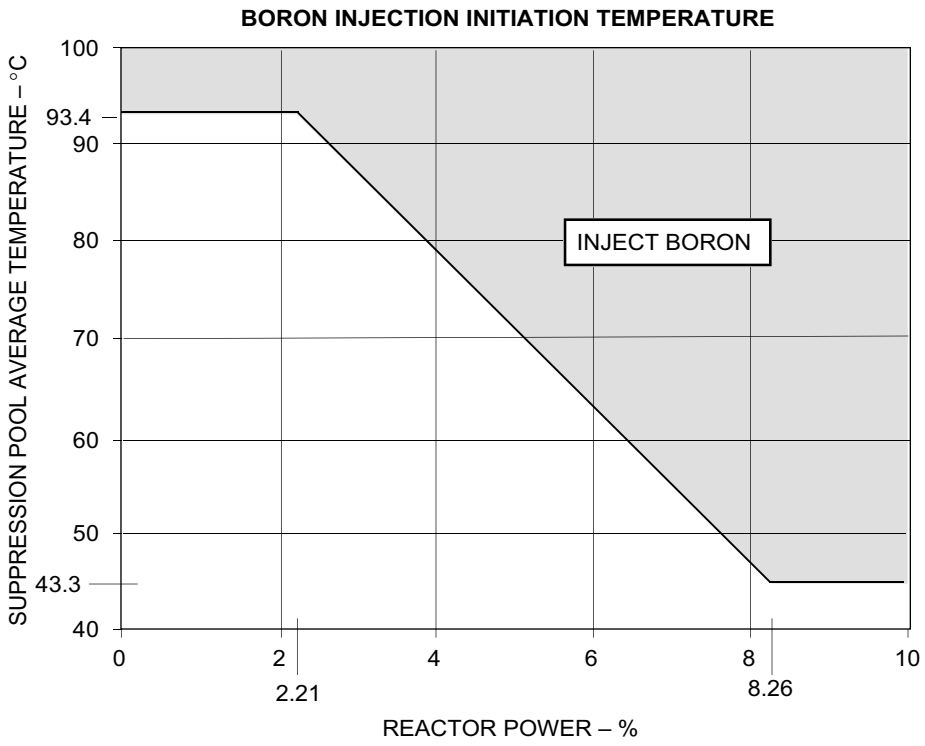

ABWR C5-1

C5-1 Prevent automatic initiation of ADS.

C5-2 If any MSL is not isolated, bypass low RPV water level interlocks to maintain the main Condenser as a heat sink.

C5-3 If:

- Reactor power is above [5% (APRM downscale trip)] or cannot be determined, and
- Suppression pool temperature is above the Boron Injection Initiation Temperature, and




- Either an SRV is open or opens or drywell pressure is above [0.012 MPaG (high drywell pressure scram setpoint)],

C5-3 (continued)

Then:

- Lower RPV water level, irrespective of any reactor power or RPV water level oscillations, by terminating and preventing all injection into the RPV except from boron injection systems and CRD until either:
  - Reactor power drops below [5% (APRM downscale trip)], or
  - RPV water level reaches [0 cm (top of active fuel)], or
  - All SRVs remain closed and drywell pressure remains below [0.012 MPaG (high drywell pressure scram setpoint)].

If while executing the following steps Emergency RPV Depressurization is required, continue in this procedure at [Step C5-5.1].

If while executing the following step:

- Reactor power is above [5% (APRM downscale trip)] or cannot be determined, and
- RPV water level is above [0 cm (top of active fuel)], and
- Suppression pool temperature is above [the Boron Injection lnitiation Temperature], and
- Either an SRV is open or opens or drywell pressure is above [0.012 MPaG (high drywell pressure scram setpoint)],

return to [Step C5-3].

C5-4 If RPV water level is above [164.9 cm (Maximum Power Control RPV Water Level)] and the reactor is not shutdown:

- Lower RPV water level to below [164.9 cm ( Maximum Power Control RPV Water Level)] by terminating and preventing all injection into the RPV except from boron injection systems and CRD.

C5-5 Maintain RPV water level between [-79.5cm (Minimum Steam Cooling RPV Water Level)] and either: ☞ #7

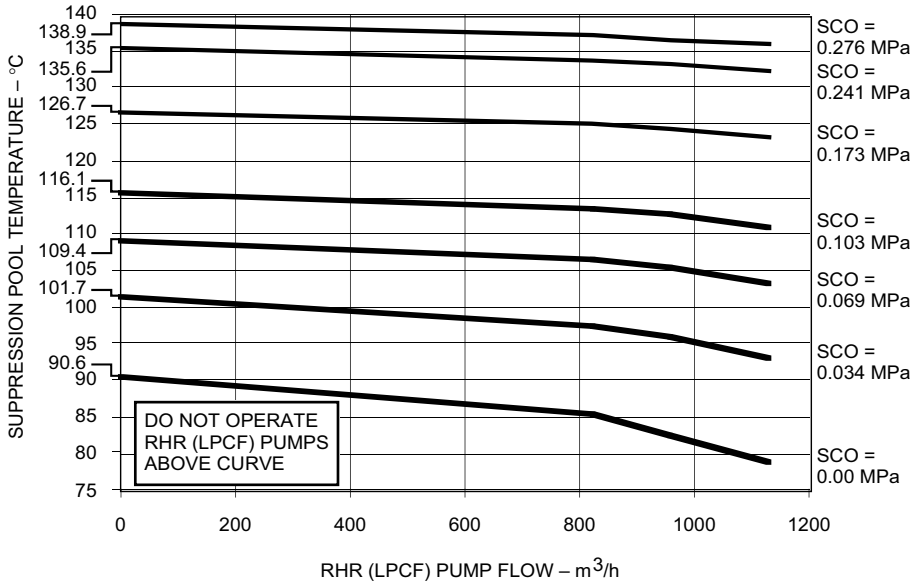
- If RPV water level was deliberately lowered in [Step C5-3 or C5-4], the level to which it was lowered, or
- If RPV water level was not deliberately lowered in [Step C5-3 or C5-4], [484.4 cm (high level trip setpoint)], with the following systems:
  - Condensate/feedwater
  - CRD

- RCIC with suction from the condensate storage tank, bypassing low RPV pressure and area high temperature isolation interlocks and high suppression pool water level suction transfer logic if necessary. ☞ #3,4

- RHR (LPCF)

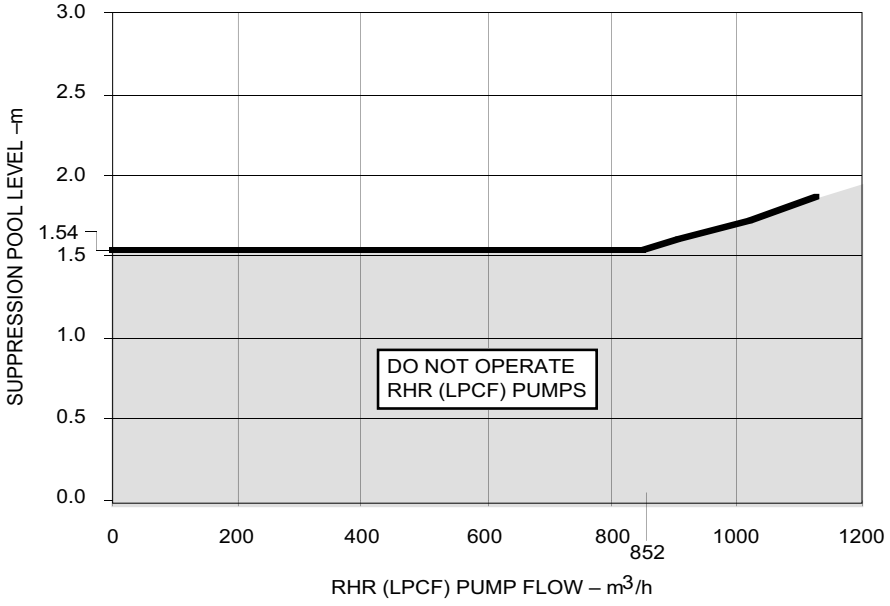
- RHR (LPCF); control and maintain pump flow less than the RHR Pump NPSH Limit and the RHR Vortex Limit.

RHR (LPCF) PUMP NPSH




KEY: SUPPRESSION CHAMBER OVERPRESSURE (SCO) =
SC AIRSPACE PRESSURE + WATER HEAD OVER SUCTION STRAINER

RHR (LPCF) VORTEX LIMIT



If RPV water level cannot be maintained above [-79.5 cm (Minimum Steam Cooling RPV Water Level)], EMERGENCY RPV DEPRESSURIZATION lS REQUIRED:

C5-5.1 Terminate and prevent all injection into the RPV except from boron injection systems, CRD, and RCIC until RPV pressure is below the Minimum Alternate RPV Flooding Pressure.

| Number of open SRVs | Minimum Alternate RPV Flooding Pressure (MPaG) |
|---|---|
| 8or more | 0.93 |
| 7 | 1.08 |
| 6 | 1.27 |
| 5 | 1.55 |
| 4 | 1.96 |
| 3 | 2.65 |
| 2 | 4.02 |

If less than [2 (minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure)] SRVs can be opened, continue in this procedure.

C5-5.2 Commence and, irrespective of pump NPSH and vortex limits, slowly increase injection into the RPV with the following systems to restore and maintain RPV water level above [-79.5 cm (Minimum Steam Cooling RPV Water Level)]: ☞#7

- Condensate/feedwater
- CRD
- RCIC with suction from the condensate storage pool, defeating low RPV pressure isolation and area high temperature interlocks and high suppression pool water level suction transfer logic if necessary.
- RHR (LPCF)

If RPV water level cannot be restored and maintained above [-79.5 cm (Minimum Steam Cooling RPV Water Level)], commence and, irrespective of pump NPSH and vortex limits, slowly increase injection into the RPV with the following systems to restore and maintain RPV water level above [-79.5 cm (Minimum Steam Cooling RPV Water Level)]:

- HPCF
- Fire protection system and firewater addition mode of RHR(C)
- ECCS keep-full systems: HPCF, RHR
- Condensate Makeup Water System

If RPV water level cannot be restored and maintained above [-79.5 cm (Minimum Steam Cooling RPV Water Level)], PRIMARY CONTAINMENT FLOODING IS REQUIRED; enter [procedure developed from Contingency #6].

C5-5.3 When RPV water level can be maintained above [-79.5 cm (Minimum Steam Cooling RPV Water Level)], return to [Step C5-3].

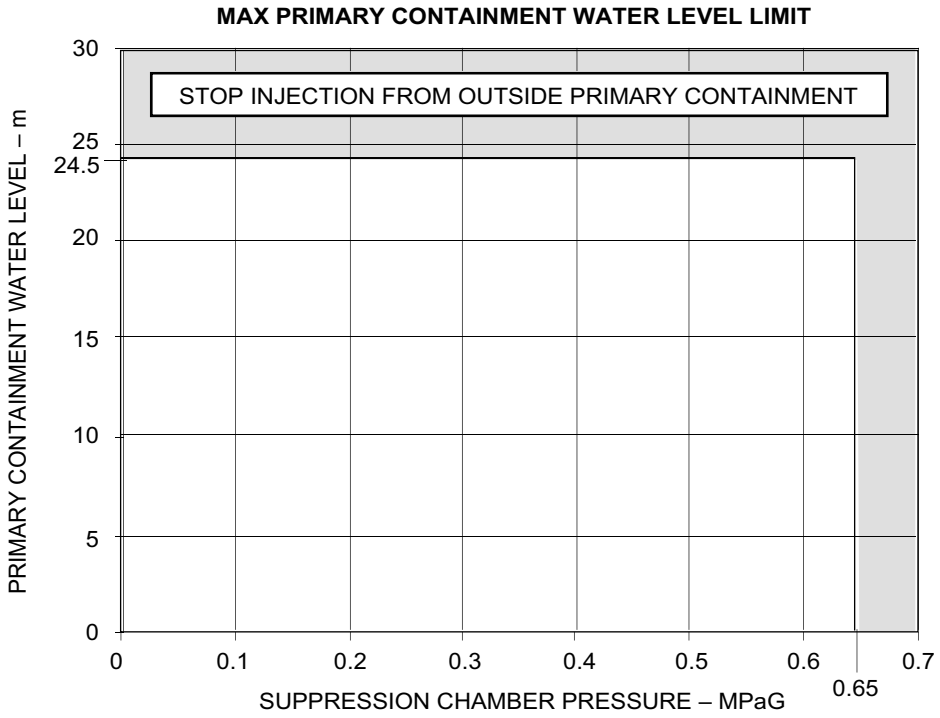
C5-6 When [procedure for cooldown to cold shutdown conditions] is entered from [procedure developed from the RPV Control Guideline] at [Step RC/P-5], proceed to cold shutdown in accordance with [procedure for cooldown to cold shutdown conditions].

## 18A.13 CONTINGENCY #6, PRIMARY CONTAINMENT FLOODING

CONTINGENCY#6
PRIMARY CONTAINMENT FLOODING

If while executing the following steps:

- Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit, then irrespective of whether adequate core cooloing is assured terminate injection into the primary containment from sources external to the primary containment until primary containment water level and suppression chamber pressure can be maintained below the Maximum Primary Containment Water Level Limit.




- RPV water level can be restored and maintained above [0 cm (top of active fuel)] enter [procedure developed from the RPV Control Guideline] at [Step RC/L].

ABWR C6-1

(C6-1 Deleted -- not applicable to ABWR)

If while executing the following step:

Containment radiation is greater than [(Core Damage Radiation Level)], and RPV water level is below [0 cm (top of active fuel)] or cannot be determined, terminate all injection into the primary containment when drywell water level reaches [12.87 m (elevation of the bottom of the RPV)].

C6-2 Operate the following systems:

- HPCF with suction from the condensate storage tank when available
- Feedwater / Condensate
- CRD
- SPCU with suction from the condensate storage tank
- RCIC with suction from the condensate storage tank only, defeating low RPV pressure isolation interlocks and high suppression pool water level suction transfer logic if necessary
- Fire protection system and firewater addition mode of RHR(C), injecting into the RPV
- ECCS keep-full systems:
  HPCF, RHR
- [lnterconnections with other units]
- [Other primary containment fill systems].
- Condensate Makeup Water System

Execute [Steps C6-3 and C6-4] concurrently, only if containment radiation is below [(Core Damage Radiation Level)] or cannot be determined.

C6-3 When primary containment water level reaches [12.87 m (elevation of the bottom of the RPV)], then irrespective of the offsite radioactivity release rate vent the RPV, bypassing isolation interlocks if necessary, until RPV water level reaches [0 cm (top of active fuel)] with one or more of the following:

- MSIVs,
- Main steam line drain,
- RCIC steam line.

C6-4 When primary containment water level reaches [22.2 m (elevation of top of active fuel)], maintain primary containment water level between [22.2 m (elevation of top of active fuel)] and the Maximum Primary Containment Water Level Limit with the following systems taking suction from sources external to the primary containment only when required:

- HPCF
- Feedwater/condensate
- CRD
- SPCU
- RHR (LPCF)
- Head spray
- Fire protection system and firewater addition mode of RHR(C), injecting into the RPV
- ECCS keep-full systems:HPCF, RHR
- [lnterconnections with other units],
- [Other primary containment fill systems]
- Condensate Makeup Water System