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NMP2 EOP BASIS DOCUMENT

(FOR REV. 4 EOPS)

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NMP 2 EOP BASIS DOCUMENT

The following NMP 2 EOP Basis Document has been developed from the BWR Owner's Group Emergency Procedure Guidelines, Appendix A and Appendix B. The generic Appendix A and Appendix B explanations of limits and curves and bases for EOP steps have been restated in plant specific terms for Nine Mile Point 2. This document reflects the EOP flowcharts recently created as a result of incorporating EPGs revision 4. It is provided as a controlled document for the purpose of understanding the basis and technical justification for EOP directed actions. It is not intended to be utilized as a procedure, but rather as support information only. Pictorial representations of flowchart elements and discussions are provided. Shaded steps are provided before and after the step being discussed for ease of locating the subject step. These shaded areas may vary slightly from the actual area in the EOPs.

INDEX OF SECTIONS

EMERGENCY OPERATING PROCEDURE (EOP) TRAINING MATERIALS INTRODUCTION

BOILING WATER REACTOR OWNERS GROUP (BWROG) EMERGENCY PROCEDURE GUIDELINE (EPG) DEVELOPMENT

The Three Mile Island (TMI) accident was a result of numerous material, personnel and administrative problems. Post TMI studies conducted for the United States Nuclear Regulatory Commission (NRC) provided recommendations (many of which have become mandatory) for other plants to follow such that another similar occurrence could be avoided. One of these recommendations involved the generation of emergency procedures based upon symptoms rather than specific causes or events. In response, the plant owners formed groups to develop the procedures. This cooperative effort had both political and monetary advantages and provided the best possible environment for development of the emergency procedures.

The group formed under the Boiling Water Reactor Owners Group (BWROG) (the Emergency Procedures Committee) was composed of representatives from each participating utility with support from General Electric and other organizations. The committee was tasked with developing Emergency Procedure Guidelines (EPGs). The group met about once a month to discuss the result of past work, plan future tasks and develop the EPGs. The required analysis, reviews and information gathering was performed between meetings.

Revision Four (Rev. 4) is the current revision of the EPGs. It has undergone thousands of manhours of effort to achieve the latest stage of development and has undergone innumerable reviews and trials. This revision of the EPGs represents the best generic guidance currently available for operating Boiling Water Reactors with water pool pressure suppression containments under accident conditions. The information is purely generic and does not represent any certain plant or type, although the defined applicability is BWR 1-6 reactors and Mark 1-3 containments.

Each EPG was approved by the NRC for use. Once the NRC acceptance was given, a BWR plant strictly following the guidelines does not have to resubmit a Plant Specific Technical Guidelines (PSTG) or the resulting Emergency Operating Procedure (EOP) to the NRC for further acceptance. This saves considerable time in EOP development and implementation.

One of the development criteria for the EPGs was that they had to work for every participating plant without exception. This criteria has been adhered to with the exception of hydrogen control for the Mark 3 containments (due to their large containments that cannot feasibly be inerted).

Another basis for the design of the BWROG EPGs is that contingency planning should not be based on the probability of an occurrence. Every occurrence which can be postulated to happen (mechanistically possible event), regardless of the probability of occurrence and for which actions can be provided, must be considered. It cannot be said, that because an event will statistically only occur once in 1,000,000 reactor years, that it will not occur tomorrow. Once it happens, the plant has the responsibility to take the appropriate actions. The EPGs are designed to provide the actions to address the problems in a precise, organized and pre-considered manner.

The purpose of plant normal operating procedures (including the event based procedures) is to maintain or to bring the plant back into line within

the licensing and design limits of the plant. The EPGs define the limits beyond which operation is not permitted even under accident circumstances. These limits are generally outside the licensing limits and are based upon best estimate conditions rather than the conservative conditions applied in licensing a reactor design for a particular plant. The EPGs provide actions to restore and maintain parameters within these limits.

EPG Development was based upon providing guidelines that prevent or reduce the release of radioactive material to the public and environment from the reactor. This can be expanded into three tasks:

1. Protection of the Containment Boundary Integrity
   - Fuel Cladding Boundaries
   - Reactor Pressure Vessel Boundaries
   - Primary Containment Boundaries
   - Secondary Containment Boundaries
2. Control of Reactivity
3. Maintenance of the Heat Sink (the suppression pool)

The EPGs address these concerns first and foremost. Only after these are assured and protected, is it appropriate to turn attention to the event cause.

BASIS:There are a limited number of vital plant functions (parameters) required to be maintained within certain limits. These parameters dictate the required response. Stabilization within the limits of these vital parameters has precedence over diagnosis of the event.

SYMPTOMATIC PROCEDURES VERSUS EVENT BASED PROCEDURES

Development of procedures within the nuclear industry began with design basis concepts. The range of possible events was so enormous that some definition had to be made and applied. Extensions of this include the advent of such concepts as maximum credible accident, single or double failure criterion and design bases events. Attempts were also made to define the probability of occurrence for certain events, both design bases as well as beyond design bases.

From the start, the event based way of thinking developed event based procedures. While this was necessary at the beginning, the nuclear industry did not progress past this point until after TMI. Thinking remained design oriented. Procedures were written for design events using data from design analysis.

This event orientation is not common in other professions. Symptom based methods have been recognized and used in other critical professions for many years and is practiced nearly every day. For example:

- Medical Profession - Stabilization of nor mal bodily functions (breathing, circula tion, etc.) take precedence over diagnosis and treatment of illness.
- Aviation Profession - Stabilization of vital parameters (altitude, attitude and direc tion) take precedence over analysis of cause.
- Everyday Driving - Maintenance of move ment within the safe boundaries of the road takes precedence over determining if a tire has gone flat, spindle is broken or other possible cause.

The event based procedure is designed to combat or mitigate the effects of a specific event. Event based procedures, in general, starts with an event and develop actions based upon that event. Event based procedures use indications (symptoms), which are available to the operator, to control the event. However, the main point that distinguishes event based procedures from symptom oriented procedures is that the validity of event based procedures depends upon the occurrence and/or diagnosis of the event. The success of event based procedures depends entirely upon the operators' ability to assimilate the indications and diagnose the event in order to enter the correct procedure.

The EPGs differ from the event based procedures in that no event is postulated in the initial design. The EPGs were developed starting from a definition of the parameters that need to be controlled. The necessary actions are then established to maintain these parameters within prescribed limits. Using the proper choice of parameters and maintaining those parameters within prescribed limits, assures that the reactor can remain safe, regardless of the event.

Then, once the specific event is known, combating that event with event based procedures becomes appropriate. As long as the symptom based procedures are continued to be used to maintain the important parameters within safe limits, use of event based procedures can be possible, and is recommended.

The following two pages describe the PROs and CONs of both types of procedures.

SYMPTOM BASED PROCEDURES

PRO

- Stabilizes the plant during an event

- Diagnosis of the cause is not required to obtain correct actions

- Provides general guidance and sets lim its

- Provides corrective actions while gaining time for the operator to plan additional corrective action or diagnose the event

- Entry into and decisions are based on and unambiguous parameters

- Tolerant to errors made by operator

- Addresses multiple events in multiple sequences

- Actions are appropriate regardless of initiating event

- Not limited to design basis events and licensing requirements

CON

- Does not address recovery

- For a particular event, it may not provide the optimum action

- In some cases it contradicts classical or design basis concepts

EVENT BASED PROCEDURES

PRO

- Provides the best guidance during a particular event once that event is diagnosed

- Addresses recovery from the specific event

- Works hand-in-hand with symptom based procedures once the event is positively identified

CON

- Event must be diagnosed correctly
- Event must follow the scenario it was developed for
- Operator has little assurance that he is taking the proper action unless he is sure the event is correctly diagnosed
- Not all possible events can be addressed due to available resources (time, money, manpower). Thus, the range of events provided for is limited.
- Use of incorrect procedure may reduce capability of plant to recover and may further degrade the existing conditions.
- If multiple events occur, several event based procedures must be used with a high probability that conflicting direction is given.
- Time may be lost trying to diagnose the event when time critical action is required. This often leads to "knee-jerk type" reactions when the cause of the event is not definitely known.

EMERGENCY PROCEDURE GUIDELINES (EPG) RATIONALE

The Emergency Procedure Guidelines (EPGs) provide protection to the public by addressing the individual boundaries, listed in order:

- **Fuel Cladding Boundaries**
- **Reactor Pressure Vessel Boundaries**
- **Primary Containment Boundaries**
- **Secondary Containment Boundaries**
- **Site Boundary**

All mechanistically possible events, regardless of probability of occurrence, which can be practically addressed and mitigated by operator action, are addressed by the EPGs. These include any and all of the following:

- Design basis events
- Events more severe than design basis
- Events less severe than design basis
- Multiple failure events or multiple events beyond design basis including:
- Sequential failure events
- Simultaneous failure events
- Sequential and simultaneous failure events

Each possible event can have an infinite number of variations and every event cannot be foreseen. It is impossible to write event based procedures for every event. Thus, there must be another method of plant control for accident conditions. As a result of the accident at Three Mile Island, the method which is now universally used by BWRs in the United States is the symptom based emergency procedure.

A "symptom" is the sign or indication that an event is beginning or is in progress (e.g., the RPV water level is falling). The "event" is the actual occurrence or cause (e.g., the RPV feedwater pumps tripped) including the resultant transient.

The symptom based procedure maintains control over the critical parameters that define an envelope beyond which continued safety of the plant

cannot be assured. Actions are designated which will mitigate the event based upon the values or trends of these parameters. In effect, the EPG procedures are very simple and they work for a tremendous range of events.

The advantages of this method are:

- There is no need to define or to determine what the event is taking place in order to take correct actions.
- The actions specified by the EPG procedures are appropriate regardless of the initiating event.
- Entry to the EPG procedures is keyed to certain well defined plant parameters rather than events. These "entry conditions" are conditions which are symptomatic of both emergencies and events which may degrade into emergencies.
- Use can be made of existing plant "event based" procedures and is encouraged to mitigate the event once the event is clearly defined.
- There is less need to rely on the operators' memories, perceptions and reasoning powers during the event. The operators have more assurance that their actions are proper. They have more opportunity to determine the overall status of the plant and to take a more objective look at what has happened.
- Any plant systems which can be utilized to respond to emergency events are specified irrespective of the safety classification or qualification of the system, equipment, or its components. If a system is used to accomplish the required action, that system is specified by the EPG even,if it is not a safety system. This is done because it is impossible to determine prior to an event whether the installed safety system will operate properly during the event.
- The current, best operational guidance is specified irrespective of licensing or design basis assumptions or commitments.
- Where it is important that an event be de termined (for example, a failure to scram event), analysis of the parameters is performed by defining the condition, making it unlikely an error or misjudgment will be made.

In many cases, the safety envelope is outside the envelope prescribed by the Technical Specifications or other normal procedural limits. This safety envelope is derived from engineering analysis utilizing best estimates (instead of licensing models). This does not mean that it is permissible to operate outside the administrative limitations in an emergency, nor does it mean that the administrative limitations are inappropriate. It simply defines the absolute limit beyond which safety cannot be assured. Thus, conformance with the EPG procedures does not assure strict conformance with the administrative limits.

The EPGs consists of four basic procedures, each with a certain area of control:

- **Reactor Pressure Vessel (RPV) Control** provides entry and actions based upon certain reactor vessel parameters such as RPV water level, RPV pressure and reactor power.
- **Primary Containment Control** provides entry and actions based upon certain primary containment parameters such as suppression pool and drywell temperature, pressure and water levels.
- **Secondary Containment Control** provides entry and actions based upon certain

secondary containment parameters such as area temperatures, area radiation levels and area water levels.

- **Radioactivity Release Control** provides entry and actions based upon radiation levels used for activation of the Emergency Plan.

Attachments to the EPGs supplement the EPGs and provide operator aids as appropriate. The EPG procedures reference each other as well as other plant procedures as necessary to accomplish the required actions.

There will be a number of events which require actions which previously have been considered unacceptable. In general, the reason they have been unacceptable was because the more severe events were not considered in the design basis of the plant. Since all previous procedures and directions only addressed design basis events, it was not considered necessary to look any further. The Three Mile Island accident and a number of other less significant events pointed out the error in this thinking. One event in particular has brought on massive changes in the operating philosophy of BWRs. That event is the "failure to scram from rated power with coincident or subsequent closure of the main steam lines".

This single event can place an enormous quantity of energy in the primary containment in a very short period of time. The containment could quickly fail due to over pressurization unless proper action is taken. This event requires the following actions which before were previously considered unacceptable:

- **Lowering RPV water level to below the top of active fuel.**

This is done to reduce reactor power such that containment limits are approached slowly, giving the operators time to protect the containment and shut the reactor down by other methods.

- **Venting the primary containment regardless of radioactive release rates.**

Venting the containment assures that the containment can again be closed up to prevent further radioactive material release. Failure to do this can have serious consequences including: almost certain failure of the containment; loss of the pressure suppression function; loss of long term cooling capability; and possible loss of capability to provide any core cooling. It is preferred to release a measured amount of radioactive material for a relatively short time, than to lose the capability to cool the core and at the same time lose the ability to isolate the containment. Without initially venting the primary containment, a serious accident resulting in considerable release of radioactive material to the environment could result. Venting also helps ensure that all releases are via elevated and monitored vent paths, thus enhancing post accident monitoring.

Some of the other conditions and actions that are provided in the EPGs include:

- Specific conditions under which boron injection is required.
- Additional methods for boron injection if the Standby Liquid Control (SBLC) system cannot function.
- Additional methods of assuring adequate core cooling when RPV water level indication is lost.
- Control of hydrogen in the primary containment.
- Conditions under which Automatic Depressurization System (ADS) automatic initiation may (in some cases must) be prevented.

- Conditions under which ADS must be initiated.
- Use of steam cooling to cool the core if required.
- Alternate methods of inserting control rods.
- Flooding primary containment and venting the RPV in a final effort to raise water level above the fuel in the RPV.
- Proper control of a marginally shutdownreactor to prevent fuel damage if and when criticality occurs.

DEVELOPMENT OF EOPs FROM EPGs

The development of specific procedures to be used in a plant control room is performed in an Emergency Operating Procedure (EOP) implementation program that consists of the following tasks:

- Calculation of plant specific limits per the EPG Appendix C.
- Creating a Plant Specific Technical Guideline (PSTG)
- Development of an EOP Writer's Guide
- Validation and Verification of draft EOP procedures

It is intended that the above documents and procedures faithfully reflect the bases upon which the NRC has approved the use of the generic EPGs. Plant specific terminology, systems and operating philosophies should be incorporated in a manner that does not contradict the intent of the EPGs. Deviations from the EPGs that are more than just changes in wording for plant specific terminology, generally require justification, since the NRC has only approved the EPG guidance. Substantial changes would require notification to the NRC via a 10 CFR 50.59 safety evaluation for procedure changes made after the initial implementation effort has been completed.

EMERGENCY OPERATING PROCEDURES (EOP) FLOW-CHARTS and SYMBOLS

This section provides a background for understanding the construction of the flowcharts, the logic symbols used to represent the flowpaths, definitions of key EOP concepts and terminology, as well as, detailed discussion of EOP entry, override statements and EOP cautions.

EOP FLOWCHART LAYOUT

The EOPs are written in a flowchart form. One flowchart is created for each procedure. When space allows, more than one flowchart is placed on a single page. In all cases, each flowchart procedure is wholly contained on a single page.

The flowchart elements are laid out in an aesthetically appealing arrangement. Procedure flowpaths are readily apparent and, generally, proceed from top to bottom and from left to right. Whenever possible crossovers of the lines connecting flowchart elements was avoided.

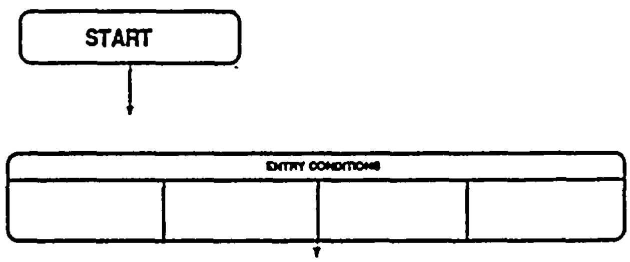
The flowcharts (procedures) with parallel parameter control paths (RPV Control, Primary Containment Control, and Secondary Containment Control) are divided into sections, with each major branch designated as a sectional division. Sectional divisions are placed side-by-side on the page, spaced such that each parameter control path is clearly demarcated. Each section is labeled with a title placed above the corresponding region of the flowchart.

Each page has a title block in the lower right hand corner of the page. If the page contains more than one EOP flowchart, the title block lists the titles and numbers of all procedures (flowcharts) on that page.

Figures and large tables referred to within a procedure are placed on the same page, below or to the side of the flowchart. Small tables are placed immediately adjacent to the flowchart elements which refer to them. Both figures and tables are labeled as Figures on the flowcharts to avoid duplication of designation numbers.

SYMBOLOGY and GRAPHIC DESIGN

ENTRY POINTS



Each EOP begins with an easily identified entry point. Depending upon the nature of the procedure, the entry point is either an entry block or a start block.

Those procedures that are entered as a result of reaching pre-defined limits begin with a rounded, heavy bordered rectangle labeled "ENTRY CONDITIONS". The parameters of concern and the respective actions levels are listed within individual boxes arranged across the bottom of the rectangle. The parameter name is in the box along with its respective value.

Procedures that are only entered as a result of branches from other flowcharts begin with a rounded rectangle containing the word "START".

Sectional divisions discussed earlier also start with a rounded rectangle around the first step in the flowchart section.

EXIT POINTS

> Exit Section RP of this procedure and proceed to cold shutdown in accordance with OP-101C.

Instructions constituting exits from procedures or procedure sections are enclosed in rounded rectangles. EXIT instructions are worded as follows:

Exit [name of current flowpath] and enter [name of target flowpath (and point of entry)].

This signifies that the operator must exit the flowpath currently being executed and enter one or more new flowpaths. If more than one target flowpath is specified, all flowpaths identified are to be entered and executed concurrently.

ACTION STATEMENTS

Procedure steps that are simply direct instructions are enclosed in individual rectangles.

> Control injection to maintain at least 4 SRVs open and RPV pressure at least 61 psig above suppression chamber pressure but as low as practicable.

Procedure steps that have multiple tasks have each discrete task listed as a sub-step. If the sub-steps are meant to be performed in quick succession or are meaningful only when read together, the sub-step are placed in a single rectangle and formatted as indented, numbered paragraphs.

> Close the following valves:
> - MSIVs
> - Main steam line drain valves
> - RCIC / RHR steam line isolation valves

Primary steps identifying systems to be used to accomplish specified actions have an itemized list of system names. The systems are arranged in a separate rectangle attached at the lower edge of the rectangle containing the primary step.

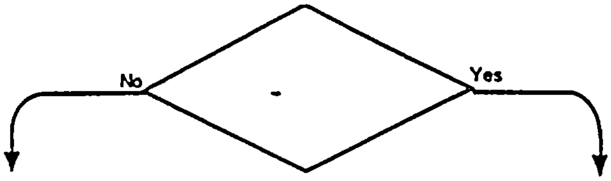
> Commence and, irrespective of pump NPSH and vortex limits, raise injection into the RPV with the following systems until:
> - At least 4 SRVs are open
>
>   AND
> - RPV pressure is not dropping and is 61 psig or more above suppression chamber pressure

> - HPCS
>   - ☛ Defeat high RPV water level isolation interlocks, if necessary by placing E22A-S26 to TEST
> - Feedwater pumps
>   - ☛ Defeat high RPV water level trip interlocks, if necessary (EOP-6, Att 20)
> - LPCS
> - LPCI with injection through the heat exchangers as soon as possible.
> - Condensate pumps
> - CRD (OP-30, Section H.7)
> - RHR Service Water crosstie (EOP-6, Att 5)
> - Fire system (EOP-6, Att 6)
> - ECCS Keep-Full systems (EOP-6, Att 7)
> - SLC (test tank) (EOP-6, Att 9)
> - SLC (boron tank) (OP-36A, Section H.1)
> - Condensate Transfer (EOP-6, Att 8)

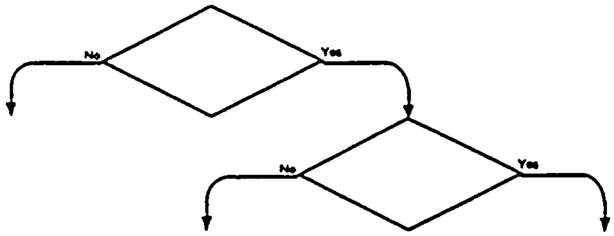
Supplemental notes, and detailed operating instructions are identified with pointers (hand symbol) and indented immediately below the respective primary steps or system names.

MAJOR DECISION POINTS

Major decision points leading to divergent branches are presented as "YES/NO" questions enclosed in diamonds. Arrows extend from the diamond to depict the appropriate "YES/NO" response paths. Preferably, the arrows are oriented such that the "YES" path extends from the right point of the diamond and the "NO" path extends from the left.



Complex decisions comprising two or more conditional clauses joined by the conjunctions "AND" or "OR" are presented as a chain of simple "YES/NO" questions. The diamonds are linked together by connecting arrows such that the arrangement reflects the logical structure of the decision step.

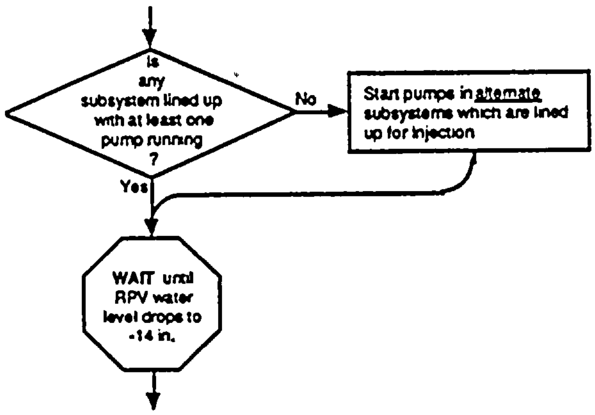


CONDITIONAL STEPS

Conditional steps are represented in the following various formats.

Diamond-rectangle combination

The conditional clause is expressed as a "YES/NO" question in a diamond with the contingent actions enclosed in rectangles. The diamonds are preferably configured such that the "YES" path extends from the bottom of the diamond and the "NO" path extends from the right. Complex conditional clauses are represented as multiple diamonds linked to reflect the appropriate logic structure.



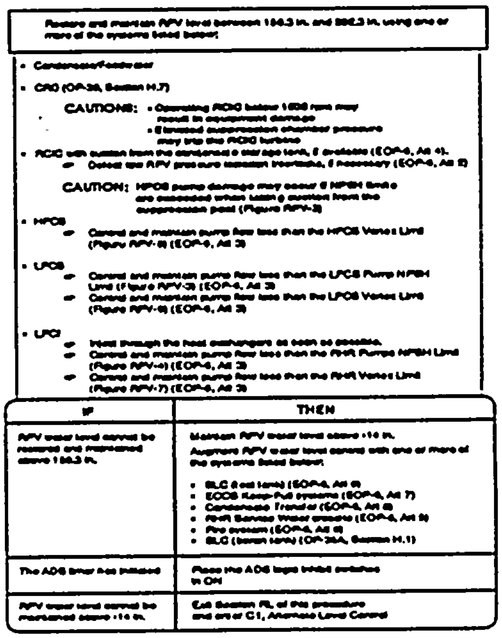
Rectangular decision tables

These decision tables have the conditional and contingent clauses of the instructions separated into columns headed by the appropriate logic terms (IF, THEN; AND, OR). This format is used when: several related conditional steps must be evaluated concurrently; a series of consecutive conditional statements are consolidated into tabular format; the procedure comprises a series of contingent responses to successive or alternate action levels; or one or more decisions must be continuously or repetitively evaluated.

IF	THEN
RPV water level cannot be restored and maintained above -14 in.	PRIMARY CONTAINMENT FLOODING IS REQUIRED : exit this procedure and enter C6, Primary Containment Flooding

Contingency Steps

Steps that consist of a primary, direct instruction followed by one or more contingency actions are represented as rectangle-decision table combinations. Primary instructions are contained in rectangles, contingent actions in rounded decision tables contiguous with the bottom and sides of the rectangles.



Overrides

Conditional statements that modify the primary procedure flowpath and which must be continuously evaluated during the execution of a series of procedure steps are herein designated as "overrides". Overrides are formatted as rounded decision tables with double-line borders. The following wording is to be centered and bolded, "While executing the following steps:". Each override is placed immediately before the first of the elements to which the override applies. The procedure steps to which overrides apply are graphically defined by the width of the decision tables. All elements below a rounded decision table and within its horizontal span are subject to the qualifying instructions of the respective override.

Overrides applicable to an entire procedure need not be stretched horizontally. Instead, the override is worded as follows: "While executing the following procedure:".

While executing the following steps:	
IF	THEN
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C4-1)	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 curve.
RPV water level can be restored and maintained above +14 in	Enter RPV Control at (A)

Flags and Linked Overrides

When a condition in one parameter control flowpath (independent) requires that a contingent branch be executed in another flowpath (dependent), the two flowpaths are linked and cross-referenced. The action necessitated by the triggering condition is stated as a requirement flag (e.g., EMERGENCY RPV DEPRESSURIZATION IS REQUIRED). The requirement is enclosed within a rectangle with a cross reference symbol adjacent to the rectangle. The branch instruction in the dependent flowpath shall be structured as an override statement conditioned upon whether the flag in the independent flowpath is set (e.g., IF EMERGENCY RPV DEPRESSURIZATION IS REQUIRED....). The dependent override displays the cross-reference symbol adjacent to the override statement.

The following flags and symbols are utilized:

FLAG	SYMBOL
EMERGENCY DEPRESSURIZATION IS REQUIRED	✻
PRIMARY CONTAINMENT FLOODING IS REQUIRED	✪
BORON INJECTION IS REQUIRED	❖
STEAM COOLING IS REQUIRED	▲

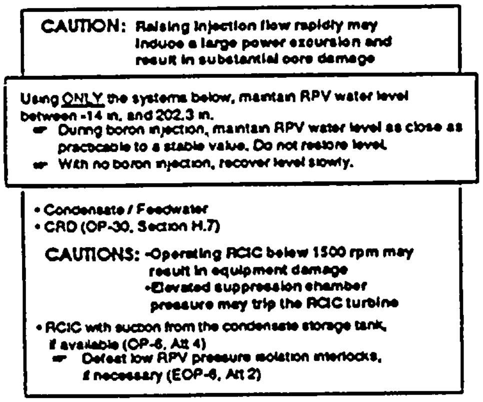
Determinate Flowpath Transfers

Determinate flowpath transfers occurring within the same procedure section as the triggering condition are explicitly prescribed immediately following the requirement flag (e.g. PRIMARY CONTAINMENT FLOODING IS REQUIRED; exit Section RL of this....).

IF	THEN	
RPV water level cannot be maintained above -45.2 in.	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; Continue at (A)	✻ RPV Control Section RP

CAUTIONS

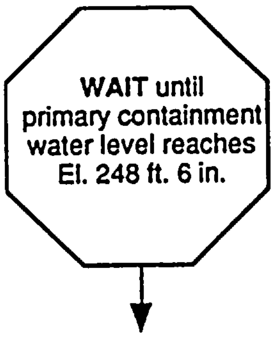
Cautions are integrated into the flowchart and placed immediately before the instructions to which they apply. Cautions applicable to a single step are placed within the flowchart element containing the step. Cautions applicable to a series of steps are placed in separate rectangles.



Cautions are used to identify potential hazards to personnel or equipment and do not contain explicit action statements. In some cases cautions are incorporated directly into the action step.

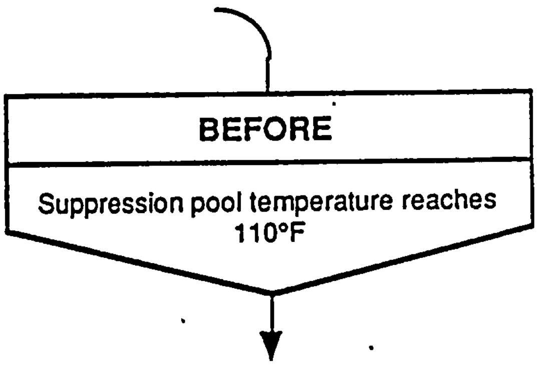
HOLD POINTS

Instructions suspending execution of a procedure flowpath until certain conditions exist are designated as hold points. Hold points are formatted as octagons having the words "WAIT until" at the beginning of the statement. Complex hold points can utilize logical connectors (AND, OR) within the octagon.



BEFORE STATEMENTS

Actions which must be completed by the time a specified limit is reached, but which may be performed in advance of that time if deemed appropriate by the operator, are preceded by BEFORE symbols. Each BEFORE symbol consists of an irregular pentagon and oriented to resemble a downward pointing arrow. The limit of concern is contained in the point of the arrow. The word BEFORE is centered at the top of the pentagon and is separated from the limit of concern text with a horizontal line. The nature of the subsequent actions are noted in parentheses outside and to the right of the pentagon.



Connecting Lines

Flowchart elements are connected by lines depicting the procedure flowpaths.

- Arrowheads indicate the direction of flow and are placed at termination points.
- Corners formed where lines change direction are rounded.
- Confluent lines are curved into their junctures so as to merge with downstream flowpaths.
- Crossovers, where unavoidable, are formed by breaking one line at the point of intersection.

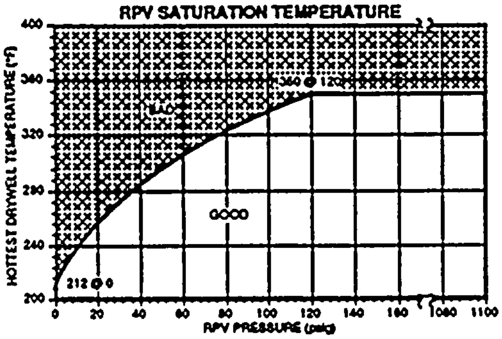
- Dotted lines are used to link flowchart elements to external tables or supplementary information.
- Branching points leading to two or more concurrent flowpaths are marked with filled circles. Arrows, indicating the direction of flow in each branch, are placed adjacent to the circles, showing the direction of flow of the branch lines.

Flowchart Line and Element Intersection Conventions

	Entry Point		Exit point	
Symbol	Preferred	Alternate	Preferred	Alternate
Rectangle	Top	Left Side	Bottom	Right Side
Diamond	Top	Left Side	"YES", bottom "NO", right	"YES", right "NO", left
Overrides	Top	------------	Bottom	---------------
Decision Tables	Top	------------	Bottom	---------------
Octagons	Top	Left Side	Bottom	Right side

Graphs

FIGURE RPV-1
RPV SATURATION TEMPERATURE



Graphs are used to depict variable parameter limits expressed as functions of other parameters. The following design conventions are generally observed:

- Each figure is assigned a numerical identifier and a title. The numerical identifer consists of a prefix, corresponding to the procedure code, followed by a hyphen and a sequential number (e.g., the second figure in EOP-RPV would be designated as "Figure RPV-2"). Neither the symbol "#" nor the abbreviation "No." is included. A separate sequence of numbers is used for each procedure.
- Figure numbers and titles are printed in upper-case, boldface type. Centered on two lines above the figure, the figure numbers are on the first line, and titles are on the second line.

- Graphs are designed to permit interpolation of values with reasonable accuracy and ease.

- Each axis is labeled with the assigned parameter and units of measurement. The units of measurement correspond to those used on the respective control room instruments. Standard numerical progression is used.

- Grid lines are used for major divisions, tick marks for minor divisions. Major divisions are numbered using standard numerical progressions; minor divisions are un-numbered.

- Prohibited or undesirable operating regions are shaded or hatched.

Tables

MINIMUM ALTERNATE RPV FLOODING PRESSURE

NUMBER OF OPEN SRVs	MINIMUM ALTERNATE RPV FLOODING PRESSURE (psig)
7 or more	135
6	160
5	195
4	247
3	334
2	508
1	1031

Tables are used where appropriate to organize, correlate, or subdivide lists of systems, values, sensors, or data. The following design conventions listed below are generally observed:

- Each table is assigned a numerical identifier and title. (Numerical identifiers and titles need not be provided for small tables immediately adjacent to the flowchart elements referring to them.) The numerical identifier consists of a prefix, corresponding to the procedure code, followed by a hyphen and a sequential number (e.g., the first table in EOP-C6 would be designated "Table C6-1"). Neither the symbol "#" nor the abbreviation "No." is included. A separate sequence of numbers is used for each procedure.

- Table numbers and titles are printed in uppercase, boldface type. Centered on two lines above the table, the table numbers are on the first line, and the titles (if any) are on the second line.

- Tabular data is arranged in columns divided by vertical lines and enclosed in a box.

- A heading is provided for each table column. Headings are centered above their respective columns, printed in upper-case, boldface type. The heading region is separated from the body of the table by a horizontal line.

- Horizontal lines separate table entries (except when a table contains only a few entries).

- Units of measurement are specified for all numerical values.

- Tables are designated as figures on the flowcharts to prevent duplication of numbers.

Logical Connectives

Logical connectives are selected and used consistent with the following:

IF	Indicates that the action prescribed in the step is contingent upon the stated conditions.
THEN	Separates conditional and action clauses.

AND — Indicates a combination of condi tions. Identifies the second and subsequent elements of a set of conditions.

OR — Designates alternative combina tions of conditions. Indicates that the action is to be performed if any one of the specified condi tions occur. (Always used in the inclusive sense.)

Branch Instructions

Branch instructions provided for the transfer between portions of a flowpath. Branch instructions can also direct transfer to concurrent execution of one or more flowcharts.

EXIT

Signifies that the operator must leave the flowpath currently being executed and enter one or more new flowpaths. If more than one flowpath is specified, exit the current flowpath and enter all identified flowpaths and executed concurrently.

Exit [name of current flowpath] and enter [name of target flowpaths (and point of entry)].

ENTER

Signifies that the operator must enter a new flowpath and execute it concurrently with the flowpath containing the instruction. If more than one flowpath is specified, all identified flowpaths should be entered and executed concurrently, including the flowpath containing the instruction.

Enter [name of target flowpath (and point of entry)] and execute it concurrently with this procedure.

CONTINUE

Signifies a forward branch within the same procedure.

Continue at [target location].

RETURN

Signifies a return branch within the same procedure.

Return to [target location].

The destinations of the above intra-procedure and inter-procedure branches are labeled with circled letters. Intra-procedure branches are connected by a lighter connecting line showing the flowpath to be followed. For inter-procedure branches duplicate markers are placed inside the left border of the flowchart page, horizontally aligned with the branch destinations, and accompanied by shadowed arrows specifying the branch origins.

EMERGENCY OPERATING PROCEDURES (EOP) USAGE, CURVES AND LIMITS

EOP STRUCTURE

The Nine Mile Point-2 EOPs are comprised of five top level procedures and six associated contingencies as follows:

- N2-EOP-RPV RPV CONTROL
- N2-EOP-PC PRIMARY CONTAINMENT CONTROL
- N2-EOP-SC SECONDARY CONTAINMENT CONTROL
- N2-EOP-RR RADIOACTIVITY RELEASE CONTROL
- N2-EOP-MSL MSIV LEAKAGE CONTROL
- N2-EOP-C1 ALTERNATE LEVEL CONTROL
- N2-EOP-C2 EMERGENCY RPV DEPRESSURIZATION
- N2-EOP-C3 STEAM COOLING
- N2-EOP-C4 RPV FLOODING
- N2-EOP-C5 LEVEL/POWER CONTROL
- N2-EOP-C6 PRIMARY CONTAINMENT FLOODING

The purpose, entry conditions and operator actions of each EOP are individually discussed in subsequent sections of this training document.

PROCEDURE USE

The purpose of this section is to provide guidance on the interpretation and use of EOPs. This section does not supersede any steps in any SORC approved procedure or approved lesson plan, but comprises the best techniques noted during training sessions. It has been developed in part from and supersedes N2-ODI 1.09, EOP User's Guide, Revision 4. Where appropriate, this guidance is contained in applicable sections of this basis book.

<u>Communications</u>:

Communications must be done using the guidance of ODI 1.06 to the maximum extent possible.

Repeat backs are vital to assure that instructions and information are accurately transferred. Repeat backs must be given prior to taking action in order to ensure that the intended action is what was ordered. There is a direct correlation that has been noted between use of repeat back and improved shift performance.

All indications that do not appear to make sense must be communicated to the SSS.

Acknowledgement and silencing of annunciators is important, especially when the SSS is giving updates and/or direction to the crew.

ROs need to continue giving trends when asked for parameter values.

ROs must make recommendations to the SSS based on their knowledge of current and/or anticipated plant conditions.

When in the simulator, operators are never to assume that the simulator is malfunctioning unless the specific malfunction has been discussed in the pre-scenario briefing. All indications are to be treated as real, and indications that do not appear to make sense must be communicated to the SSS. Teamwork is essential for proper shift emergency control. If you have a question about an indication or action, bring it to the attention of the SSS and work as a team to resolve it.

Operators must not talk simultaneously to the SSS, but must interrupt the SSS when critical information must be transmitted immediately, such as an EOP entry or action condition is observed, or a reactor scram is imminent.

Operators must challenge orders that they do not understand or could lead to further degraded plant conditions. Operators must also provide critical plant parameter data, without being asked, that is vital to the SSS's implementation to EOPs.

Command Control:

The SSS must ensure that he is in control of the station.

He must be loud and clear and unambiguous in giving direction.

All orders must be directed to an operator by name.

The SSS must ensure that his orders were heard and complied with by requiring repeat backs and follow up communications when the task is completed.

During EOP actions, the SSS must maintain overall plant control. The SSS may under extremely urgent conditions manipulate controls when his immediate action is necessary to mitigate the accident. Any changes must be communicated to the Control Room team.

Operators must ensure that the information they are giving the SSS about the plant conditions is received and understood by repeating the SSS's name and the information until an acknowledgment is received.

EOP related actions must be ordered by the SSS. The STA, when assisting the SSS in reading the EOPs, must go through the SSS, or as a minimum, clear the actions he wants to order through the SSS prior to giving them.

Non-EOP related actions may be ordered by the CSO, such as securing the turbine following a trip. When doing so, the CSO must inform the SSS of his intentions in general terms.

Read appropriate overrides out loud so that the operators can watch for and communicate the conditions in the override.

Updates must be given at the following times:

1. At each lull in the action
2. At each major decision point
3. At each transition between procedures

Updates should contain:

1.The SSS's understanding of the overall plant status (i.e. the "big picture")

2. The general direction the SSS is intending to go

3. Any conditions that could arise that would perturb that intended direction, (e.g. override statements)

4. A question directed to the crew regarding any condition that conflicts with the update information

SROs can improve contingency planning by

briefing the crew as to what is being planned and what individuals will be required to do.

Place Keeping:

The SSS and STA will use different colored pens to write information on the EOP plexiglas.

Old data should be crossed out when new data is added.

The step the SRO is on should be marked. When waiting for a condition, that box should be circled.

Log the names of operators dispatched into the plant and the task they are dispatched for on a clear area of the plexiglas. This log is required by the EPPs for personnel accountability, and it helps in re-prioritizing in-plant tasks when conditions change.

Log the times that time-dependent conditions occur, such as a fire or loss of 115KV so that the emergency class can be declared at the appropriate time.

Use of Non-Licensed Personnel:

Non-licensed personnel should not be used to manipulate switches in the Control Room. They will be used to perform EOP support actions outside the Control Room.

Radwaste operators will be trained to be communications aides, one will be designated for each shift to act as the primary communication aide. If the primary communication aide is unavailable or additional communication aides are required, a non-licensed operator may be the designed communication aide.

Non-licensed personnel may be posted to read indicators, but ensure that they know what to read, follow the ODI communications standards, and are practiced at giving repeat backs.

The designed communication aide, when initially reporting to the Control Room, should be briefed on plant/event status by the SEPC.

Use of Other Procedures:

Whenever reducing reactor power with recirculation flow, use the OP-101D flow chart posted for the restricted zone and existing rodline, and monitor for power oscillations. Take actions as directed by OP-101D.

Whenever time exists to review the operating procedure prior to manipulating a control, the procedure must be used. When time is of the essence, perform he manipulation from memory, but when time exists later on, go back and ensure that the procedure was performed properly.

First Things First:

When entering the EOPs, the most important things are in order:

1. Sound the station alarm and if time permits, make a short verbal announcement to describe the situation such as "Reactor Scram". This will inform in-plant personnel of the emergency and bring all of the shift personnel back to the Control Room so that they are available for necessary tasks.

2. Take immediate plant actions to stabilize the plant

3. Classify the emergency

4. Announce the classification

Overrides:

Pay particular attention to the overrides in the EOPs.

As stated previously, reading the overrides out loud to the crew keeps them informed and helps keep them in mind.

Only an SRO (SSS) can authorize overriding an automatic safety function.

Use of Cross Reference Symbols:

Cross reference symbols are symbols used to aid the operator. They identify which other EOPs, or sections of EOPs, contain override statements which are applicable to a specific existing plant condition.

PROBLEMS NOTED DURING TRAINING SESSIONS:

General:

When in a wait statement, set up to take the subsequent action so that there is no delay when the conditions to proceed exist.

Assign an operator to monitor level and pressure, and specify the bands to be maintained. ROs should not be hesitant to challenge the SSS on incorrect or non-specific orders.

SSS must prioritize actions. Everything cannot be done at once, i.e. stabilize the plant, then work on Emergency Planning.

SROs need to recognize that when RPV flooding is required that Emergency Depressurization is also required. This is accomplished by use of overrides and the addition of a note on C4 to remind the operator of this requirement.

The ASSS functioning as the STA should not become "trapped" at the SPDS console but shall provide independent assessment and EOP support to the SSS at necessary.

ROs are not taking enough responsibility to insert control rods during ATWS situations. Once directed to utilize EOP-6, Attachment 4, the RO should take all necessary and appropriate steps to insert control rods without specific direction from the SSS. However, this does not relieve the RO from keeping the SSS apprised of his activities.

The RO on the Reactor Panel (P603) can dramatically improve the crew's initial response to a casualty. The ROs must immediately provide the following:

1. Reactor Power - Above or below 4%
2. Reactor Level - Value and trend
3. Reactor Pressure - Value and trend
4. Control Rod Status - Rod movement and final position (e.g. "All rods are full in"). Note: this may take a short time but should not interfere with the operator's immediate scram response per OP-101C.

ROs need to be cognizant if all ECCS Systems Status, including RCIC, following all initiation/trip signals. This includes verifying pump status and injection flows and conveying this information to the SSS and the crew. Again, keep the SSS apprised of system status.

If a valid RRCS signal results in an automatic SLC initiation than Boron Inject is required and all appropriate actions as directed by the EOPs must be taken.

The statement in EOPs to "Terminate and Prevent Injection" means to take the most direct action which will stop and preclude the injection flow into the RPV. They may include, as appropriate, closing the injection valve, tripping the pump, de-energizing the electrical power

supplying system components. System interlocks and plant conditions may dictate that some methods of terminating and preventing are more desirable than others for existing conditions. Assuming normal system configurations, the following is a listing of preferred methods of terminating and preventing injection.

HPCS - Placing the pump control switch in PTL is preferable to closing the injection valve due to the inability to remotely close the injection valve when RPV level is lowered to L2.

LP ECCS - Placing the pump control switch in PTL is preferred. The injection valve override will not work if a sealed in initiation signal does not exist.

RCIC - Tripping the turbine from the Control Room is preferred. It can be readily reset and restarted if need be from the Control Room.

Placing the pump control switch in P-T-L is the preferred method when another system lineup is not desired (e.g. Suppression Pool Cooling, Containment Sprays). In those cases where it is not practical to place the control switch in P-T-L, overriding the injection valve is acceptable. Note, however, if a divisional initiation signal is not present, a manual initiation signal must be inserted and the injection valve SIMULTANEOUSLY overridden to "Prevent" it from opening.

A tabulation of methods available by systems is provided as a guide at the end of this section.

The statement in EOP C4 "RPV water level instrumentation is available" means the RPV water level instruments are intact (piping, instrument power, line-ups, etc.), the reference columns have been filled (if required), the drywell temperature is below the RPV saturation temperature, however, the indicators may be off-scale high.

The statement "RPV water level can be determined" is meant to allow the SSS to utilize any method(s) of level determination available to him. This may be a direct or indirect method utilized alone or in conjunction with other methods. Conservatively, the SSS could wait until "RPV water level instrumentation is available". However, other methods could be, but are not limited to, flow through the SRVs, temperature stratification in the vessel or use of neutron monitoring instrumentation. Recognize, however, that neutron monitoring instrumentation methods will not be useful for determining level as far as actions in C4. If SRVs are being used to determine level, this method will be lost when flooding is secured, thus, it is appropriate to stay in C4.

ROs and SROs need to improve their board awareness and response on the Electrical Distribution Panel (P852). We must be able to look at the big picture and not get focused in on an individual symptom/failure.

ROs and SROs need improvement on verifying that required isolations do occur on their various setpoints.

Primary responsibility for making emergency announcements lies with the CSO. If the SEPC is available, he may be used to make announcements as an aid to the CSO.

Gross fuel failure is defined as either condition listed below for use as designated in the EOPs.

1. A reading of or greater than three times normal full power background as read on the main steam line radiation monitors or,

2. A cladding failure which results in a coolant activity increase of at least three times normal full power levels.

Entry and Re-entry

Occurrence of any entry condition requires entry into the appropriate procedure. Additionally, entry conditions which subsequently occur after a procedure has been entered, require that the procedure be re-entered at the beginning. An entry condition which has cleared and subsequently re-occurs, requires re-entry into that procedure at the beginning. Exceeding entry conditions for more than one EOP requires concurrent entry into and execution of each EOP for which an entry condition has been exceeded.

As the status or condition of a specific parameter degrades and either approaches or exceeds limiting values, control of that parameter may be transferred to a contingency or from one contingency to another. This transfer is accomplished in two ways:

- By explicit direction stating that entry to a contingency is required

IF	THEN
Any control rod cannot be determined to be inserted to position O2 AND It has not been determined that the reactor will remain shutdown under all conditions without boron	Exit Section RL of this procedure and enter C5, Level/Power Control.

- By identifying (in capital letters) the requirement for a contingency action, and then effecting the transfer of control through explicit direction in the appropriate EOP sections and contingencies that address the affected parameter.

1 Before any area radiation reaches 10 R/hr, enter RPV Control and execute it concurrently with this procedure. 2 IF .... an area radiation level exceeds 10 R/hr in more than one area, THEN.... EMERGENCY RPV DEPRESSURIZATION IS REQUIRED.

* RPV Control, Section RP
* C3
* C5

*

Emergency RPV depressurization is required	Less than 7 SRVs are open	Exit section RP of this procedure and enter C2, Emergency RPV Depressurization.

This structure effects the transfer of control of a parameter when appropriate, and precludes concurrent, but conflicting instructions.

Operator Actions

When operator actions are specified to be conducted concurrently, no predetermined priority is implied. Each path entered at a branch point is to be executed in parallel.

Steps in a given path are followed sequentially in the order presented. Each step is considered as the operator comes to it. Once an operator completes the actions of a step and moves on to the next step, the previous step is no longer considered or implemented (except for override statements see below). If the conditions or actions specified in a step are not applicable or cannot be implemented, then the operator is to continue at the next step.

Upon reaching a hold point, the operator continues to execute or maintain the conditions specified by the previous operator actions until the conditions of the hold point are met. Once the conditions of the hold point are met, the operator continues on to the next flowchart element.

When an override statement is applicable to a series of steps(see Chapter B), the operator must consider the override continuously while executing those steps. The operator must execute the specified override actions any time the contingent conditions exist while executing the applicable steps.

At various points within these procedures, limits are specified beyond which certain actions are required. These limits are generally not as conservative as the limits specified in Technical Specifications. This is not to imply that operation beyond the Technical Specifications is recommended. Rather, such operation is required and is now permitted under the degraded conditions in order to safely mitigate the consequences of those degraded conditions. The limits specified in the EOPs establish the boundaries within which continued safe operation of the plant can be assured. Conformance with the EOPs does not ensure strict conformance with Technical Specifications or other licensing bases, but is necessary to mitigate the conditions present.

At other points within these procedures, 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 additional interlocks may also be required (e.g. due to instrument failure, etc.), but since these situations cannot be identified in advance, they are not specified by the procedures.

Exit and Endpoints

An EOP may be exited if the exit conditions of the procedure are met or any time that it is determined that an emergency no longer exists. Each flowpath is terminated with an endpoint. Endpoints indicate completion of the associated flowpath but do not indicate an exit of the flowpath or the entire procedure unless specifically stating so.

If an operator remains in an EOP even though an emergency does not or no longer exists, the EOP still provides appropriate instructions to maintain the reactor in a safe condition.

If an operator improperly exits an EOP prematurely, an entry condition for that procedure will occur or re-occur, and re-entry to the procedure will be required.

DEFINITIONS AND USAGE OF KEY WORDS

The meaning of the following terms is discussed in the context of their use within the EOPs. This information is provided in order to facilitate a consistent and technically accurate understanding of the entry conditions, operator actions, cautions, and execution of the EOPs.

Adequate core cooling

Sufficient heat removal from the reactor to prevent rupturing the fuel clad.

Three viable mechanisms of adequate core cooling exist; in order of preference they are:

- Core submergence
- Steam cooling with injection of makeup water to the RPV
- Steam cooling without injection of makeup water to the RPV

Core submergence is the preferred mechanism of core cooling, whereby each fuel element is completely covered with water. Indicated RPV water level at or anywhere above the elevation corresponding to the top of active fuel (TAF) constitutes the principal means of confirming the adequacy of core cooling achieved via this mechanism. Assurance of continued adequate core cooling through core submergence is achieved when RPV water level can be maintained at or anywhere above TAF.

Steam cooling is the mechanism of core cooling whereby steam updraft through the uncovered portion of the reactor core is sufficient to prevent the temperature of the hottest fuel rod from exceeding the appropriate limiting value, which

is specific to the mode of steam cooling being employed (Peak clad temperature of hottest fuel rod less than (1) 1500°F for steam cooling with injection or (2) 1800°F for steam cooling without injection). Two modes of steam cooling are employed in the EOPs: with and without injection of makeup water to the RPV. For each mode, the covered portion of the reactor core and lower plenum is the water source for the generation of the steam. A high fuel-to-steam differential temperature is required for the steam cooling method of heat transfer to be effective.

With injection into the RPV established, adequate core cooling exists when steam flow through the core is sufficient to preclude the peak clad temperature of the hottest fuel rod from exceeding 1500°F, the threshold temperature for fuel rod perforation. This mechanism of core cooling is employed during the RPV flooding evolution (Contingency #4) when the reactor may not be shutdown, and during the level/power control evolution (Contingency #5) when RPV water level is controlled below TAF to reduce reactor power. RPV pressure and the number of open SRVs, or RPV water level, provide the means of confirming the adequacy of core cooling achieved via steam cooling with injection. Assurance of continued adequate core cooling is achieved when RPV pressure can be maintained at or above the Minimum Alternate RPV Flooding Pressure or RPV water level can be maintained at or above the Minimum Steam Cooling RPV Water Level.

With no injection into the RPV established, adequate core cooling exists only so long as the covered portion of the reactor core generates sufficient steam to preclude the peak clad temperature of the hottest fuel rod from exceeding 1800°F, the threshold temperature for significant metal-water reaction. This mechanism of core cooling is employed in the steam cooling evolution (Contingency #3). Indicated RPV water level at or above the Minimum Zero Injection RPV Water Level is the only means available for confirming the adequacy of core cooling achieved via steam cooling without injection. The transient nature of this means of adequate core cooling prevents any assurance that it can be maintained.

Assure

Make certain that a specified state or condition is established and will be maintained. Encompasses an implied action to operate appropriate systems, as available, to accomplish the stated objective. Both direct and indirect indications may be used to determine that the specified state or condition has been achieved and will be maintained (refer to the discussion of "adequate core cooling").

Available

The state or condition of being ready and able to be used (placed into operation) to accomplish the stated (or implied) action or function. As applied to a system, this requires the operability of all necessary support systems (electrical power supplies, cooling water, lubrication, etc.) for the system/components to work as designed.

Before

Any time prior to. Utilized where an event-independent margin is not appropriate or cannot be defined.

Bypassing

Temporarily disabling the functioning of an automatic protection feature. As used in the EOPs, this term is generally limited to conditions where a bypass feature has been included in the system (e.g., bypassing a high drywell pressure interlock).

Can/Cannot be determined

The current value or status of an identified

parameter relative to that specified in the procedure can/cannot be ascertained using all available indications (direct and indirect, singly or in combination).

Can/Cannot be maintained above/below

The value of the identified parameter(s) is/is not able to be kept above/below specified limits. This determination includes making an evaluation that considers both current and future system performance in relation to the current value and trend of the parameter(s). "Cannot" does not imply that the actual value of the parameter must first exceed the specified limit.

Can/Cannot be restored above/below

The value of the identified parameter(s) is/is not able to be returned to above/below specified limits after having previously exceeded the specified limits. This determination includes making an evaluation that considers both current and future system performance in relation to the current value and trend of the parameter(s). This statement does not imply any specific time interval, but the intent does not permit prolonged operation beyond a limit without taking the specified action.

Confirm

Use all available indications (status lights, direct and indirect presentations of the values of associated plant and system parameters, etc.) and/or physical observation to established that, as applicable, the specified action has occurred, conditions are as stated, etc. This does not include any implied requirement to take any corrective action if the identified conditions do not exist.

Defeating

Permanently disabling the logic or function of a system so as to prevent it from operating. As used in the EOPs, this term generally indicates more than just the positioning of a "Bypass" switch (e.g., defeating RSCS interlocks).

Drywell temperature

Bulk average temperature of the atmosphere in the drywell airspace.

Enter

Unless otherwise specified, exit the present procedure and begin in the identified procedure. If concurrent action is specified, execute the steps of the entered procedure(s) in parallel with the steps of the procedure containing the enter instruction.

Exceeds

To go above or beyond, by any amount, the identified value or limit.

Execute

Leave the step containing the execute instruction and take the action specified in the identified step, continuing on through the subsequent steps of that section.

If

Logic term which indicates that taking the action prescribed in the step (and associated substeps) is contingent upon the current existence of the stated condition(s). If the identified condition(s) do not exist, the prescribed action (step and all associated substeps) is not to be taken. The operator should proceed in accordance with the following step.

Independent

Characterized by separateness of signal source

(i.e., sensors), signal processors, and indicators.

Initiate

Manipulate appropriate controls in the main control room (or other areas where instruments and controls for remote operation of equipment are located) as required to establish the specified system operating mode or plant condition(s). This term does not imply that prolonged attempts to accomplish actions (jumper interlocks, align alternate or backup power supplies, enter remote areas to manually operate valves, etc.), is intended.

Line up

Establish the initial conditions necessary for system operation including positioning of valves and breakers, installation of spool pieces, etc. This term does not include the actual starting of main system pumps.

Maintain below/above

Take the action necessary to prevent the value of the parameter from rising above (decreasing below) the identified limit or action level.

Maximum Normal Operating (parameter)

The highest value of the identified parameter expected to occur during normal plant operating conditions with all directly associated support and control systems functioning properly. Values of the parameter exceeding this action level are symptomatic of offnormal conditions which could degrade into an emergency.

Maximum Safe Operating (parameter)

The highest value of the identified operating parameter beyond which personnel access or continued operation of equipment important to safety cannot be assured. Values of the parameter exceeding this action level may directly threaten adequate core cooling, primary containment integrity, equipment important to safety, or personnel safety.

Monitor

Observe or evaluate at a frequency sufficient to remain appraised of the values, trend, and rate of change of the identified plant operating parameter. Plant conditions; the rate of change of the parameter and directly related plant parameters; its proximity to limits and operator action levels and the value; parameter trend; and the severity of consequences associated with the parameter; all contribute to the determination of the required frequency of observation or evaluation.

Multiple

As applied to plant instrumentation, more than one but as many as may be conveniently included. Independence (i.e. sensors, cabling, electronic signal processing, etc.) is not required.

Prevent

Take whatever action is necessary to preclude the stated action, occurrence, etc. Where not otherwise qualified or prohibited, this includes closing valves, tripping equipment, jumpering (or opening) contacts in the control logic of system components, deenergizing equipment, overriding automatic signals, etc.

Primary Containment

The drywell and suppression chamber.

Primary System

The pipes, valves, and other equipment which connect directly to the RPV such that a reduction in RPV pressure will decrease the steam or water being discharged through an unisolated

break in the system.

Purge

Force flow through an enclosed volume. Includes establishing both an influent (driving) and effluent (exhaust) flowpath similar to that of a "feed and bleed" process.

Restore

Take the appropriate action required to return the value of an identified parameter to within applicable limits.

Secondary Containment

The airtight spaces immediately adjacent to or surrounding the primary containment.

Shutdown

As applied to the reactor, the condition of being, or actions to become subcritical with reactor power below the heating range.

Suppression chamber

The structure enclosing the suppression pool water and the atmosphere (air or nitrogen) above it.

Suppression chamber pressure

The pressure of the atmosphere (air or nitrogen) in the suppression chamber.

Suppression pool

The volume of water in the suppression chamber intended to: (1) condense steam discharged from a primary system break inside the drywell, (2) condense steam discharged from the RPV via the SRVs, and (3) provide a water source for certain ECCS injection systems to cool the core.

Suppression pool temperature

Bulk average temperature of the suppression pool.

Terminate

Take the appropriate action required to stop the stated action, process, or evolution. Generally, the most direct action which will stop the stated action/process/evolution is preferred. However, a wide variety of actions may be employed. Refer to the table at the end of this section for suggested methods to terminate and prevent RPV injection.

Trend

The direction (increasing or decreasing) of the average rate of change of the value of a parameter. Momentary fluctuations in the value particularly over a small range are not considered a trend.

Vent

Open an effluent (exhaust) flowpath from an enclosed volume.

When

Direction provided to wait until the identified condition occurs, then take the action prescribed in the step. Execution of subsequent operator actions is not permitted until the identified condition exists.

Until

Indicates that the associated prescribed action is to proceed only as long as the identified condition does not exist.

TERMINATE AND PREVENT

Take appropriate actions to stop and preclude the stated action, process, or evolution. The most direct action is preferred. However, a wide variety of actions may be employed.

Suggested methods to terminate and prevent RPV injection

System	Preferred Method	Other Options
Feedwater	Close level control valves	• Close MOV21A and B • Trip pumps • Close other valves • Deenergize SWG
HPCS	Pump SW to PTL	• Close CSH*MOV107 (P601) (remote closing when L2 not cleared is prohibited by interlocks) • Locally close injection valve • Deenergize SWG
RCIC	Manual trip from P601	• Isolate system • Locally isolate system
LPCS / LPCI	Pump SW to PTL	• Close affected injection MOV (only with initiation signal seal in)
Firewater injection	Close the associated LPCI injection MOV	• Close manual valves locally • Trip fire pumps
Service Water injection	Close the associated LPCI injection MOV	• Close manual valves locally • Trip SWP pumps
Condensate Transfer	Close the associated ECCS injection MOV	• Close manual valves locally • Trip pumps
ECCS Keepfull	Close the associated ECCS injection MOV	• Turn off keep full pump • Locally close injection MOV

OPERATOR PRECAUTIONS

This section lists "Cautions" which are applicable at one or more specific points within the EOPs. Cautions identify potentially adverse consequences of certain plant conditions or actions. Cautions do not specify operator actions or limit the applicability of specified actions.

CAUTION: An RPV water level instrument may be used to determine RPV water level only when:

- The hottest drywell temperature is below the RPV Saturation Temperature (Figure RPV-1),

  AND
- RB temperature near instrument legs are below the RPV Saturation Temperature (Figure RPV-1, EOP-6, Att 28),

  AND
- The instrument reads above the Minimum Indicated Level

MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Narrow Range	150 in.
Wide Range	25 in.
Fuel Zone	-155 in.

Factors inherent in the design of Boiling Water Reactor RPV water level measurement systems make the validity of information supplied by these instruments contingent upon the value of primary and secondary containment temperatures and RPV pressure. Caution #1 identifies these specific conditions.

RPV water level instrument systems sense liquid level in the vessel downcomer region by measuring the differential pressure (ΔP) between a variable leg water column and a reference leg water column. The reference leg remains full of water from steam condensing in the chamber located at the top of the reference leg water column. Excess condensate drains back into the RPV.

When water level in the reactor vessel decreases, the variable leg height of water decreases, the sensed ΔP increases, and indicated RPV water level decreases. The converse occurs when water level in the reactor vessel increases; the variable leg height of water increases, the sensed ΔP decreases, and indicated RPV water level increases.

Change in the height or density of water in the instrument reference leg can cause change in indicated RPV water level. For example: if actual RPV water level is constant at some on-scale value and the instrument reference leg head of water (height and/or density) decreases, sensed ΔP decreases and indicated RPV water level increases.

Under extreme conditions, a high and increasing drywell temperature can decrease the density of water in the reference leg such that the instrument falsely indicates an on-scale and steadily increasing water level even though the actual RPV water level is decreasing and well below the elevation of the instrument variable leg tap.

Note that the information presented in Caution #1 is not just a simple accommodation for inaccuracies in RPV water level indication which occur when plant conditions are different from those for which the instruments are calibrated. Rather, the caution defines conditions under which the displayed value and the indicated trend of RPV water level cannot be relied upon.

Parts 1 and 2 of Caution #1 identifies the limiting conditions beyond which the water in the instrument legs may boil. Water in the RPV 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 RPV pressure.

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

The RPV Saturation Temperature is generic, based simply on the properties of water. The temperature curve is truncated at 350°F because that is as high as drywell temperature indicators read. The temperature axis of the Saturation Temperature curve is based on the hottest drywell temperature recorded. The Saturation Temperature curve for RPV pressure is plotted from atmospheric pressure to the pressure setpoint of the lowest lifting SRV.

Part 3 of Caution #1 addresses the effect that the hottest drywell temperature has on: (1) the validity of indicated RPV water level trend and (2) the ability to determine that RPV water level is within the instrument indicating range.

For each RPV water level instrument listed, the Minimum Indicated Level is given. These levels apply to all temperatures less than 350°F. This is the limiting hottest drywell temperature at which the instrument will indicate RPV water level at the bottom of the instrument scale when RPV water level is actually at the elevation of the instrument variable leg tap.

The Minimum Indicated Level is defined to be the highest RPV water level instrument indication which results from off-calibration instrument temperature conditions when RPV water level is actually at the elevation of the instrument variable leg tap. Separate levels are provided for each RPV water level instrument. These values are calculated based upon varying conditions of Reactor Building and Drywell temperature. The worst case minimum indicated level is then provided in the table.

CAUTIONS: • Operating RCIC below 1500 rpm may result in equipment damage
• Elevated suppression chamber pressure may trip the RCIC turbine

• RCIC with suction from the condensate storage tank.

Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)

Injection flowrate from RCIC can be controlled by adjusting turbine speed. Caution #3 identifies the minimum turbine speed which permits continuous unrestricted system operation. The minimum speed is based upon the following considerations:

- The RCIC turbine is lubricated by a shaft-driven oil pump and RCIC system auxiliaries are cooled by a shaft driven water pump. The minimum speed maintains fluid flow required for adequate lubrication and cooling.
- A minimum speed is required to generate sufficient control oil pressure to enable the turbine control valve to function properly.
- Operation of the turbine at very low speed positions the turbine governor (control) valve very close to its seat. This low steam flow condition may cause exhaust steam from the RCIC turbine to be at a low enough pressure to cause the exhaust line check valve to cycle open and close. Repeated occurrence can physically damage the exhaust check valves.
- RCIC pump internal cooling. At NMP 2 this is most limiting.

CAUTIONS: • Operating RCIC below 1500 rpm may result in equipment damage
• Elevated suppression chamber pressure may trip the RCIC turbine

• RCIC with suction from the condensate storage tank.

Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)

A RCIC turbine trip is initiated on high exhaust pressure to prevent over pressurization and damage to the shaft seals and exhaust piping. The caution is stated to remind the operator that

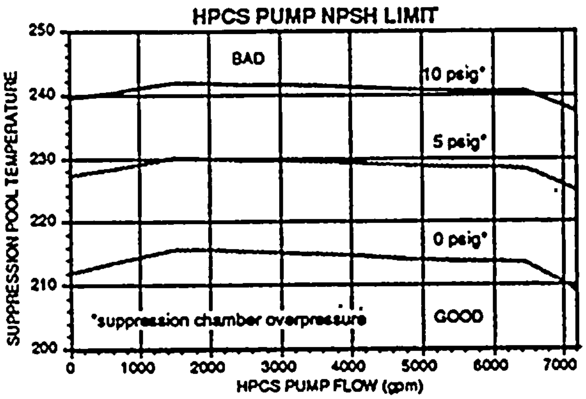
a high or sensed high suppression chamber pressure will cause a RCIC turbine trip. The resulting RCIC turbine trip would prevent further injection and depressurization with the RCIC system.

The trip setpoint may be reached at low suppression chamber pressures when the head of water above the RCIC exhaust line is higher than normal. The pressure drop that occurs between the turbine exhaust pressure sensor and the discharge device varies with exhaust flow. Either condition contributes to the possibility of a RCIC turbine trip when suppression chamber pressure is still below the exhaust pressure trip setpoint. Since the exact suppression chamber pressure at which the RCIC high exhaust pressure trip will actuate cannot be determined in advance, Caution #4 is stated in general terms.

CAUTION: HPCS pump damage may occur if NPSH limits are exceeded when taking suction from the suppression pool (Figure RPV-2)

- HPCS

Control and maintain pump flow less than the HPCS Vortex Limit (Figure RPV-5) (EOP-6, Att 3)



The High Pressure Core Spray (HPCS) Pump NPSH Limit is defined to be the highest suppression pool temperature which provides adequate net positive suction head (NPSH) for a HPCS pump taking suction on the pool. This temperature is a function of HPCS pump flow and suppression chamber overpressure (airspace pressure plus the hydrostatic head of water over the suction strainer in the pool). Exceeding the limit can cause cavitation, which can physically damage the pump impeller and result in unavailability of the system.

The shape of the HPCS Pump NPSH Limit curve is nearly flat, and thus operator action to reduce pump flow would have little effect on alleviating pump cavitation. Under certain plant conditions, reducing HPCS pump flow can actually result in pump cavitation. This caution can only warn operators that an undesirable condition may result.

IF	THEN
Suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit (Figure RPV-8)	Maintain RPV pressure below the curve (Figure RPV-8) irrespective of the resulting RPV cooldown rate

Actions directed in the EOPs to control RPV pressure may result in RPV cooldown rates greater than those allowed by Technical Specifications. This Caution makes it clear that, where indicated, performance of the specified action takes precedence over abiding by the RPV cooldown rate LCO. This caution has been integrated directly into the action step.

CAUTION : Raising injection flow rapidly may induce a large power excursion and result in substantial core damage

Caution #7 warns the operator of the potential plant response if injection of cold, unborated water into the core is too rapid under conditions where little or no shutdown margin may exist. This may result in a large increase in positive reactivity with a subsequent reactor power excursion large enough to substantially damage the core.

CAUTION:	**If fuel zone level instruments are not on scale and tracking or are otherwise unavailable, primary containment water level is to be presumed at the containment vent elevation (El. 298.25 ft.)**

This caution identifies that if fuel zone level instruments are not on scale and tracking or are otherwise unavailable, the containment water level should be considered to be at the elevation of the containment vent. This ensures that fill from sources external to the primary containment is terminated and thus preserving the containment vent path. This caution is utilized in C6, Primary Containment Flooding.

ABBREVIATIONS AND ACRONYMS

The following is a list of abbreviations and acronyms used in the EOPs.

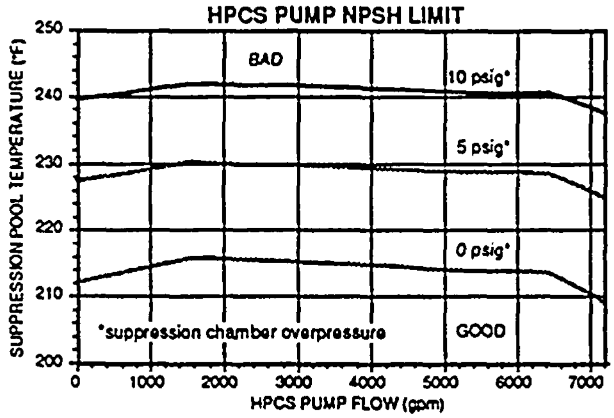
ARI	Alternate Rod Insertion
att	attachment
ADS	Automatic Depressurization System
APRM	Average Power Range Monitor
CST	Condensate Storage Tank
cont	containment
CRD	Control Rod Drive
cc	cubic centimeter
cfm	cubic feet per minute
Ci	curies
°F	degrees Fahrenheit
DWT	Drywell Temperature Control (procedure section)
El.	elevation
ECCS	Emergency Core Cooling System
EOP	emergency operating procedure
ft	feet
gal	gallon
gpm	gallons per minute
HCTL	Heat Capacity Temperature Limit
HVAC	heating, ventilation, and air conditioning
HVR	Heating and Ventilation Reactor Building
HPCS	High Pressure Core Spray
hr	hours
in.	inches
IAS	Instrument Air System
IRM	Intermediate Range Monitor
LPCI	Low Pressure Coolant Injection
LPCS	Low Pressure Core Spray
MSIV	Main Steam Isolation Valve
MSL	Main Steam Line Leakage Control (procedure designation)
max	maximum
μCi	microcuries
mr	milliroentgen
min	minutes
NPSH	net positive suction head
OP	Operating Procedure
lbs	pounds
lbm	pounds mass
psig	pounds per square inch
psid	pounds per square inch differential
PC	Primary Containment
PCH	Primary Containment Hydrogen Control(procedure section)
PCP	Primary Containment Pressure Control(procedure section)
rad	radiation
RR	Radioactivity Release Control(procedure designation)
RB	Reactor Building
RCIC	Reactor Core Isolation Cooling
RL	Reactor Level Control (procedure section)
RP	Reactor Pressure Control (procedure section)
RPV	Reactor Pressure Vessel
RQ	Reactor Power Control (procedure section)
RPS	Reactor Protection System
RWCU	Reactor Water Cleanup
RRCS	Redundant Reactivity Control System
RHR	Residual Heat Removal
R	roentgen
RSCS	Rod Sequence Control System
RWM	Rod Worth Minimizer
rpm	rotations per minute
SRV	safety relief valve
SCL	Secondary Containment Level Control(procedure section)
SCT	Secondary Containment Temperature Control(procedure section)
SCR	Secondary Containment Radiation Control(procedure section)
SRM	Source Range Monitor
SBGT	Standby Gas Treatment
SLC	Standby Liquid Control
SJAE	steam jet air ejector
supp	suppression
SPL	Suppression Pool Level Control (procedure section)
SPT	Suppression Pool Temperature Control (procedure section)
temp	temperature
TAF	top of active fuel

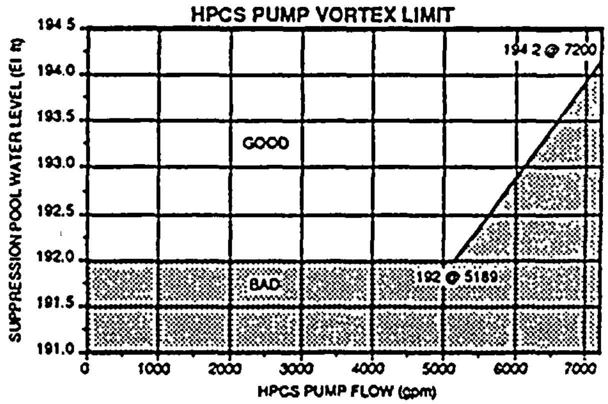
OPERATIONAL LIMITS AND SETPOINTS

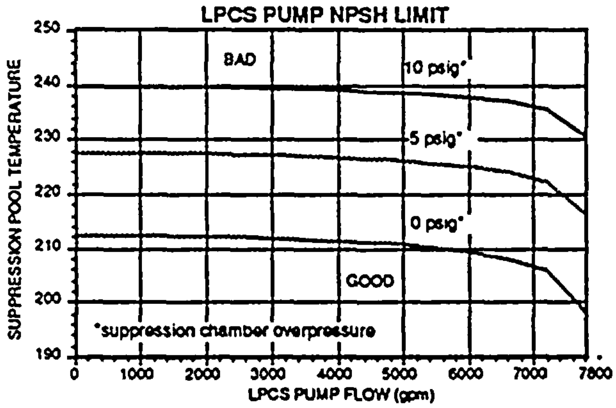
≤200°F	RPV water temperature for cold shut-down conditions
159.3 in.	low level scram setpoint
1037 psig	high RPV pressure scram setpoint
1.68 psig	high drywell pressure scram setpoint
4%	APRM downscale trip
02	Maximum Subcritical Banked Withdrawal Position
202.3 in.	high level trip setpoint
-14.4 in.	top of active fuel (rounded to -14 in. in the EOP)
1.68 psig	drywell pressure which initiates ECCS
7	number of SRVs dedicated to ADS
960 psig	pressure at which all turbine bypass valves are fully open
El.192 ft.	lowest instrumented suppression pool water level
769 pounds	cold shutdown boron weight
100°F/hr	RPV cooldown rate LCO
0 gallon	SLC tank water level trip
1500 rpm	minimum turbine speed limit per pump vendor manual
90°F	most limiting suppression pool temperature LCO
150°F	drywell temperature LCO
El.201 ft.	Maximum suppression pool water level LCO
El.199.5 ft.	minimum suppression pool water level LCO
1.8%	high hydrogen alarm setpoint
340°F	maximum temperature at which ADS is qualified and drywell design temperature
El.217 ft.	highest instrumented suppression pool water level
10.57 psig	suppression chamber spray initiation pressure (Rounded to 10 psig in the EOP)
1%	minimum detectable hydrogen concentration
4%	minimum hydrogen concentration for recombiner operation
5%	maximum hydrogen concentration for recombiner operation
2.5%	maximum oxygen concentration for recombiner operation (while hydrogen concentration is 5% or over)
5%	maximum oxygen concentration for recombiner operation (while hydrogen concentration is below 5%)
17.8 in.	ADS initiation setpoint
195 psig	highest RPV pressure at which the shutoff head of a low-water-quality alternate injection subsystem (excluding SLC) is reached
4	minimum number of SRVs required for emergency depressurization
-57.8 in.	Minimum Zero Injection RPV Water Level (Rounded to -55 psig in the EOP)
1	minimum number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure
61 psig	Minimum RPV Flooding Pressure
-45.2 in.	Minimum Steam Cooling RPV Water Level (Rounded to -45 psig in the EOP)
248.5 ft.	elevation of the bottom of the lowest recirculation piping
298.5 ft.	elevation of top of active fuel
10 R/hr.	Maximum Safe Operating Radiation Level for the secondary containment
135/212°F	Maximum Safe Operating Temperature for the secondary containment

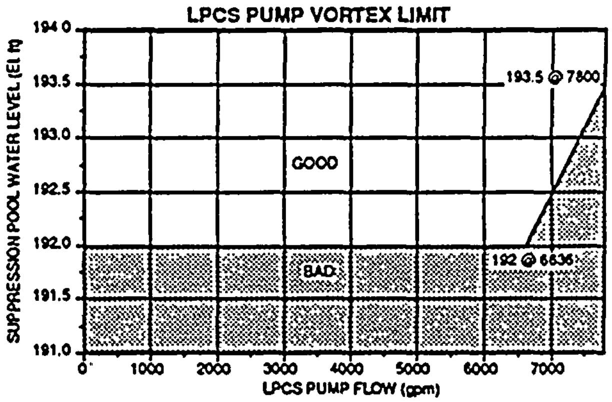
OPERATIONAL LIMITS - FIGURES

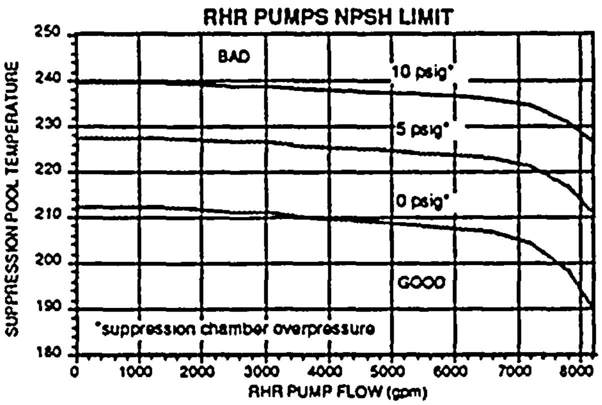
The following figures illustrate operational limits used in the EOPs. The limits and figures are discussed in detail when an EOP step references a specific figure.

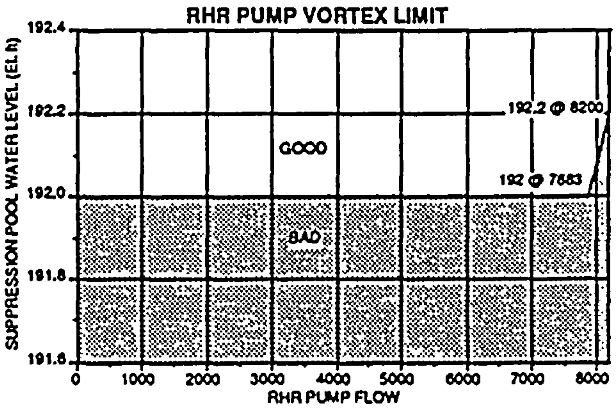




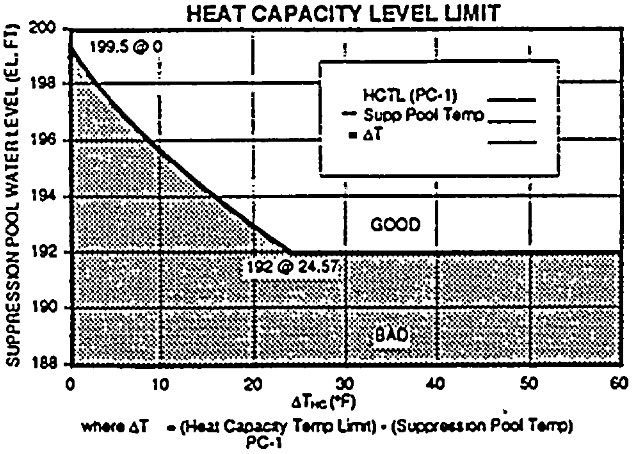




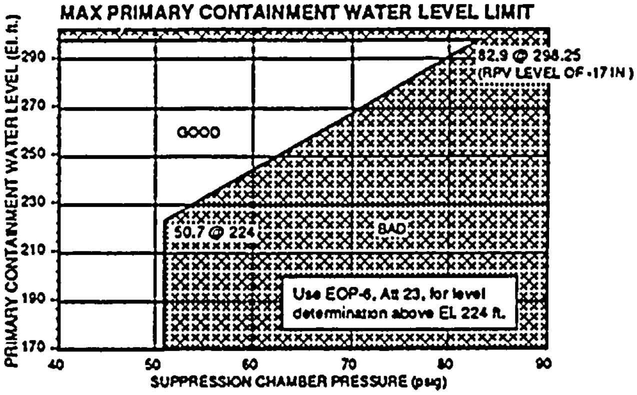




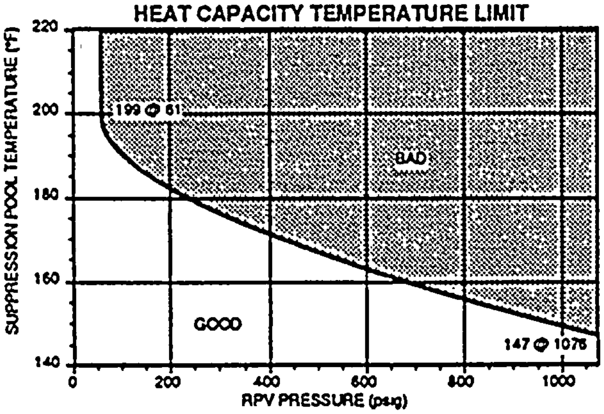
HEAT CAPACITY LEVEL LIMIT



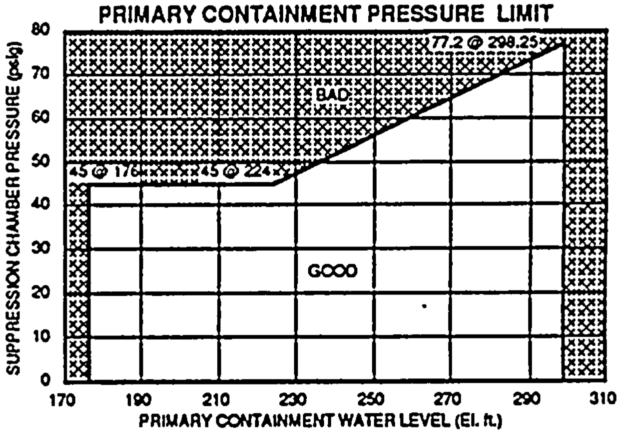
MAX PRIMARY CONTAINMENT WATER LEVEL LIMIT



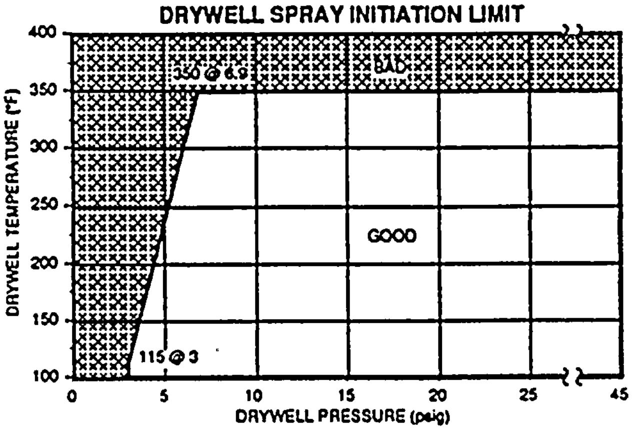
HEAT CAPACITY TEMPERATURE LIMIT



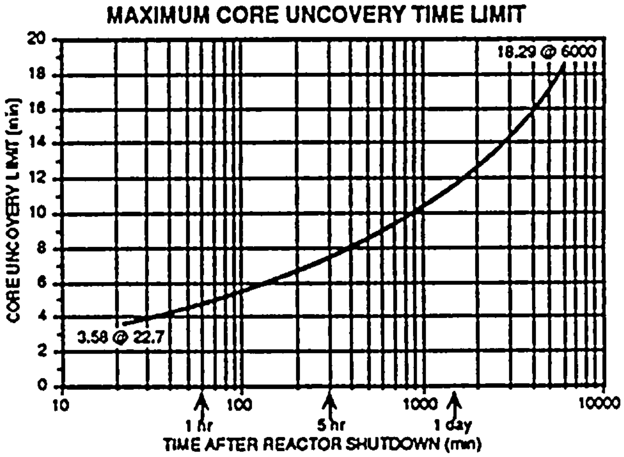
PRIMARY CONTAINMENT PRESSURE LIMIT

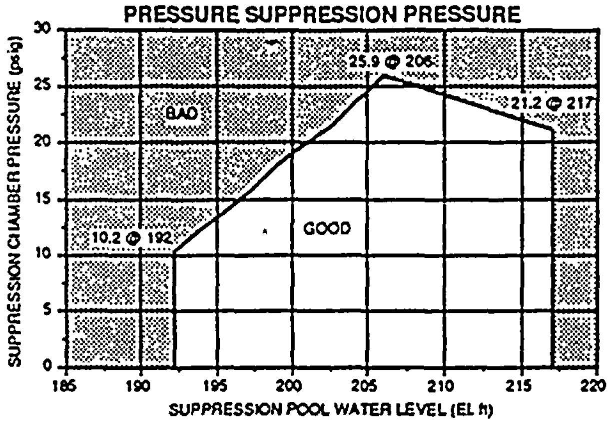


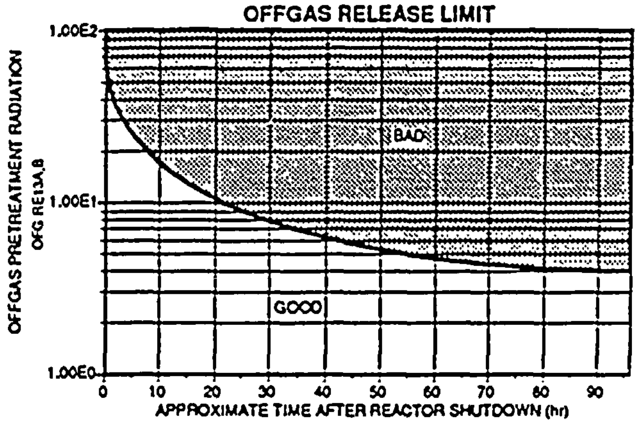
DRYWELL SPRAY INITIATION LIMIT

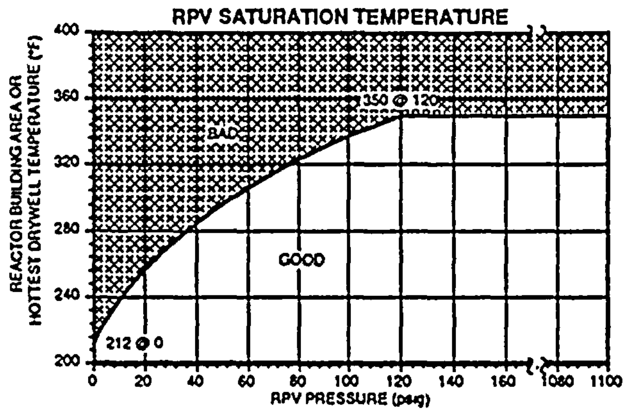


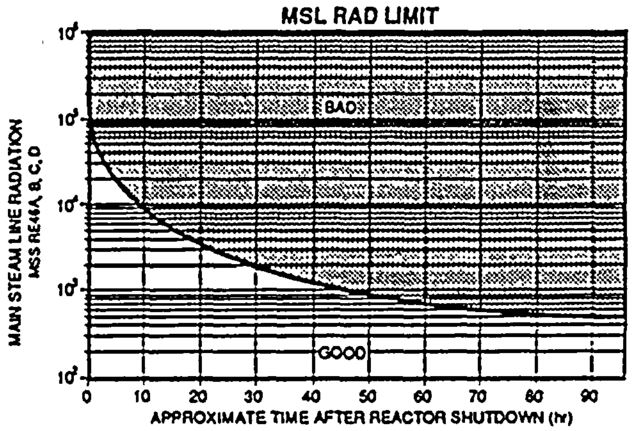
MAXIMUM CORE UNCOVERY TIME LIMIT

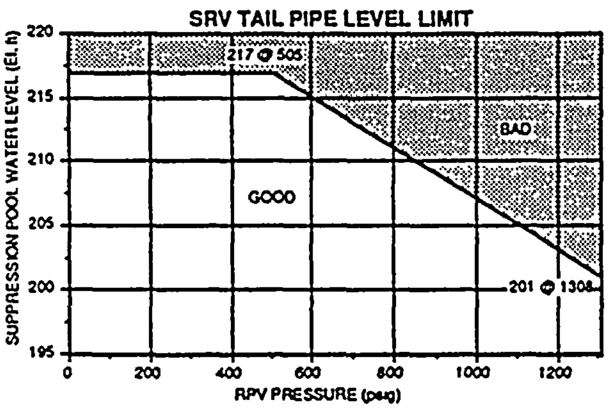


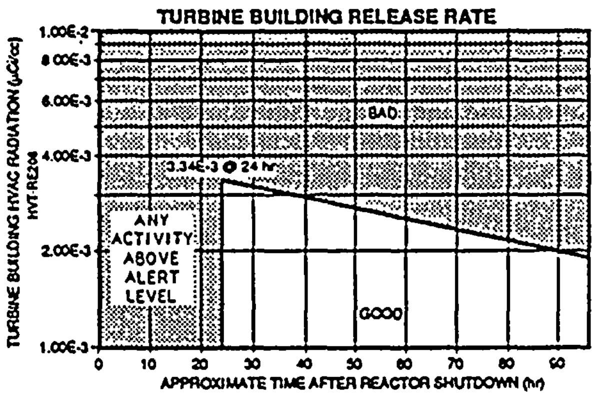

PRESSURE SUPPRESSION PRESSURE
SUPPRESSION CHAMBER PRESSURE (psig)
SUPPRESSION POOL WATER LEVEL (EL ft)
BAD
GOOD
25.9 @ 206
21.2 @ 217
10.2 @ 192


OFFGAS RELEASE LIMIT
OFFGAS PRETREATMENT RADIATION
OFG RE13A,B
APPROXIMATE TIME AFTER REACTOR SHUTDOWN (hr)
1.00E2
1.00E1
1.00E0
BAD
GOOD


RPV SATURATION TEMPERATURE
REACTOR BUILDING AREA OR
HOTTEST DRYWELL TEMPERATURE (°F)
RPV PRESSURE (psig)
BAD
GOOD
350 @ 120
212 @ 0


MSL RAD LIMIT
MAIN STEAM LINE RADIATION
MSS RE46A, B, C, D
APPROXIMATE TIME AFTER REACTOR SHUTDOWN (hr)
BAD
GOOD


SRV TAIL PIPE LEVEL LIMIT
SUPPRESSION POOL WATER LEVEL (El. ft)
RPV PRESSURE (psig)
217 @ 505
201 @ 1308
BAD
GOOD


TURBINE BUILDING RELEASE RATE
TURBINE BUILDING HVAC RADIATION (μCi/cc)
HVT-RE206
APPROXIMATE TIME AFTER REACTOR SHUTDOWN (hr)
3.34E-3 @ 24 hr
ANY
ACTIVITY
ABOVE
ALERT
LEVEL
BAD
GOOD

OPERATIONAL LIMITS - TABLES

The following tables illustrate operational limits used in the EOPs. The limits and tables are discussed in detail when an EOP step references a specific table.

MINIMUM ALTERNATE RPV FLOODING PRESSURE

NUMBER OF OPEN SRVs	MINIMUM ALTERNATE RPV FLOODING PRESSURE (psig)
7 or more	135
6	160
5	195
4	247
3	334
2	508
1	1031

MINIMUM CORE FLOODING INTERVAL

NUMBER OF OPEN SRVs	MINIMUM CORE FLOODING INTERVAL (min)
7 or more	23
6	32
5	49
4	82

DEFINITION OF OPERATIONAL LIMITS - SINGLE VALUES, FIGURES, AND TABLES

The BORON INJECTION INITIATION TEMPERATURE is defined to be the greater of either (1) the suppression pool temperature at which a reactor scram is required by plant Technical Specifications or (2) the highest suppression pool temperature at which initiation of boron injection will result in injection of the Hot Shutdown Boron Weight before suppression pool temperature exceeds the Heat Capacity Temperature Limit. The Boron Injection Initiation Temperature is a function of reactor power, and it is utilized in establishing the conditions before which boron injection must be initiated if RPV depressurization with the reactor at power is to be precluded. At NMP2, it was decided that for simplicity one (conservative) value of 110°F is used in lieu of using the Boron Injection Initiation Temperature curve developed in the EOP calculation.

The COLD SHUTDOWN BORON WEIGHT is defined to be the least weight of soluble boron which, if injected into the RPV and mixed uniformly, will maintain the reactor shutdown under all conditions. This weight is utilized to assure the reactor will remain shutdown irrespective of control rod position or RPV water temperature.

The DRYWELL SPRAY INITIATION LIMIT is defined to be the highest drywell temperature at which initiation of drywell spray will not result in an evaporative cooling pressure drop to below either (1) the drywell-below-wetwell differential pressure capability or (2) the high drywell pressure scram setpoint. This temperature is a function of drywell pressure, and the limit is utilized to preclude containment failure or de-inertion following initiation of drywell sprays.

The HEAT CAPACITY LEVEL LIMIT is defined to be the higher of either (1) the elevation of the downcomer openings or (2) the lowest suppression pool water level at which initiation of RPV depressurization will not result in exceeding the Heat Capacity Temperature Limit. This water level is a function of the margin to the Heat Capacity Temperature Limit, and the Level Limit is utilized in conjunction with the Temperature Limit to preclude failure of the containment or equipment necessary for the

safe shutdown of the plant and to preclude loss of the pressure suppression function of the containment.

The HEAT CAPACITY TEMPERATURE LIMIT is defined to be the highest suppression pool temperature at which initiation of RPV depressurization will not result in exceeding either (1) the suppression chamber design temperature or (2) the Primary Containment Pressure Limit before the rate of energy transfer from the RPV to the containment is within the capacity of the containment vent. This temperature is a function of RPV pressure, and the limit is utilized to preclude failure of the containment or equipment necessary for the safe shutdown of the plant.

The HOT SHUTDOWN BORON WEIGHT is defined to be the least weight of soluble boron which, if injected into the RPV and mixed uniformly, will maintain the reactor shutdown under hot standby conditions. This weight is utilized to assure the reactor will shutdown irrespective of control rod position when RPV water level is raised to uniformly mix the injected boron. Hot Shutdown Boron Weight is not used at NMP2 due to boron dilution concerns.

The MINIMUM ALTERNATE RPV FLOODING PRESSURE is defined to be the lowest RPV pressure at which steam flow through open SRVs is sufficient to preclude any clad temperature from exceeding 1500°F even if the reactor core is not completely covered. This pressure is a function of the number of open SRVs, and it is utilized to preclude fuel damage during the RPV flooding evolution when the reactor may not be shutdown.

The MINIMUM CORE FLOODING INTERVAL is defined to be the greatest amount of time required to flood the RPV to the top of active fuel with RPV pressure at the Minimum RPV Flooding Pressure and at least the Number of SRVs Required for Emergency Depressurization open. This interval is a function of the number of SRVs which are actually open, and it is utilized to assure the reactor core has been covered before recovery from the RPV flooding evolution is initiated.

The MAXIMUM CORE UNCOVERY TIME LIMIT is defined to be the greatest amount of time the reactor core can remain completely uncovered and uncooled without resulting in peak clad temperature exceeding 1500°F. This amount of time is a function of the time after reactor shutdown, and the limit is utilized to preclude fuel damage during recovery from the RPV flooding evolution.

The MINIMUM INDICATED LEVEL is defined to be the highest RPV water level instrument indication which results from off-calibration instrument run temperature conditions when RPV water level is actually at the elevation of the instrument variable leg tap. This level is utilized in establishing the conditions under which an RPV water level instrument may be used to determine RPV water level. Separate levels are provided for each RPV water level instrument.

The MINIMUM NUMBER OF SRVs REQUIRED FOR EMERGENCY DEPRESSURIZATION is defined to be the greater of either (1) The least number of SRVs which, if opened, will remove all decay heat from the core at a temperature sufficiently low that the ECCS with the lowest head will be capable of making up the SRV steam flow or (2) the least number of SRVs which correspond to a Mini-

mum Alternate RPV 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 RPV Flooding Pressure. The number is utilized to assure the RPV will depressurize and remain depressurized when emergency depressurization is required.

The MAXIMUM PRIMARY CONTAINMENT WATER LEVEL LIMIT is defined to be the lesser of either (1) the elevation of the highest containment vent capable of rejecting all decay heat or (2) the highest containment water level which will not result in exceeding the pressure capability of the containment. This water level is a function of suppression chamber pressure and temperature, and the limit is utilized to preclude containment failure.

The MINIMUM RPV FLOODING PRESSURE is defined to be the greater of either (1) the Minimum SRV Re-opening Pressure or (2) the lowest differential pressure between the RPV and the suppression chamber at which steam flow through the Minimum Number of SRVs Required for Emergency Depressurization is sufficient to remove all decay heat from the core. This pressure is utilized to assure sufficient liquid injection into the RPV to maintain SRVs open and to flood the RPV to the elevation of the main steam lines during the RPV flooding evolution when the RPV is shutdown.

The MAXIMUM RUN TEMPERATURE is defined to be the lowest RPV water level instrument run temperature at which the instrument will indicate RPV water level at the bottom of the instrument scale when RPV water level is actually at the elevation of the instrument variable leg tap. This temperature is utilized in establishing the conditions under which an RPV water level instrument may be used to determine RPV water level. Separate temperatures are provided for each RPV water level instrument. This variable is simplified and conservatively incorporated into Caution 1 at NMP2.

The MAXIMUM SUBCRITICAL BANKED WITHDRAWAL POSITION is defined to be the lowest control rod position at which all control rods may be withdrawn in bank and the reactor will nonetheless remain shutdown under all conditions. This position is utilized to assure the reactor will remain shutdown under all conditions irrespective of RPV water temperature.

The MINIMUM STEAM COOLING RPV WATER LEVEL is defined to be the lowest RPV 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 1800°F. This water level is utilized to preclude fuel damage when RPV water level is lowered to below the top of active fuel.

The MAXIMUM SAFE OPERATING RADIATION LEVEL is defined to be the highest radiation level at which neither (1) equipment necessary for the safe shutdown of the plant nor (2) personnel access for the safe shutdown of the plant will be precluded. This radiation level is utilized in establishing the conditions under which RPV depressurization is required.

The MAXIMUM SAFE OPERATING TEMPERATURE is defined to be the highest temperature at which neither (1) equipment necessary for the safe shutdown of the plant nor (2) personnel access for the safe shutdown of the plant will be precluded. This temperature is utilized in establishing the conditions under which RPV depressurization is required.

The MAXIMUM SAFE OPERATING WATER LEVEL is defined to be the highest water level at which neither (1) equipment necessary for the safe shutdown of the plant nor (2) personnel access for the safe shutdown of the plant will be precluded. This water level is utilized in establishing the conditions under which RPV depressurization is required.

The MINIMUM SRV RE-OPENING PRESSURE is defined to be the lowest RPV pressure at which an SRV will fully open and will remain fully opened when its control switch is placed in the OPEN position. This pressure is utilized to preclude SRV cycling during the RPV flooding evolution.

The MINIMUM ZERO INJECTION RPV WATER LEVEL is defined to be the lowest RPV 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 1800°F. This water level is utilized to preclude significant fuel damage and hydrogen generation for as long as possible.

The NET POSITIVE SUCTION HEAD (NPSH) LIMIT is defined to be the highest suppression pool temperature which provides adequate net positive suction head for an ECCS pump taking suction on the pool. This temperature is a function of ECCS pump flow and suppression chamber overpressure (airspace pressure plus hydrostatic head over the ECCS suction), and the limit is utilized to preclude ECCS damage due to cavitation. Separate limits are provided for each ECCS, as appropriate.

The PRIMARY CONTAINMENT PRESSURE LIMIT is defined to be the lesser of either (1) the pressure capability of the containment or (2) the maximum containment pressure at which vent valves can be opened and closed to reject all decay heat from the containment or (3) the maximum containment pressure at which SRVs can be opened and will remain opened or (4) the maximum containment pressure at which vent valves can be opened and closed to vent the RPV. This pressure is a function of primary containment water level and temperature, and the limit is utilized to preclude containment failure and core damage.

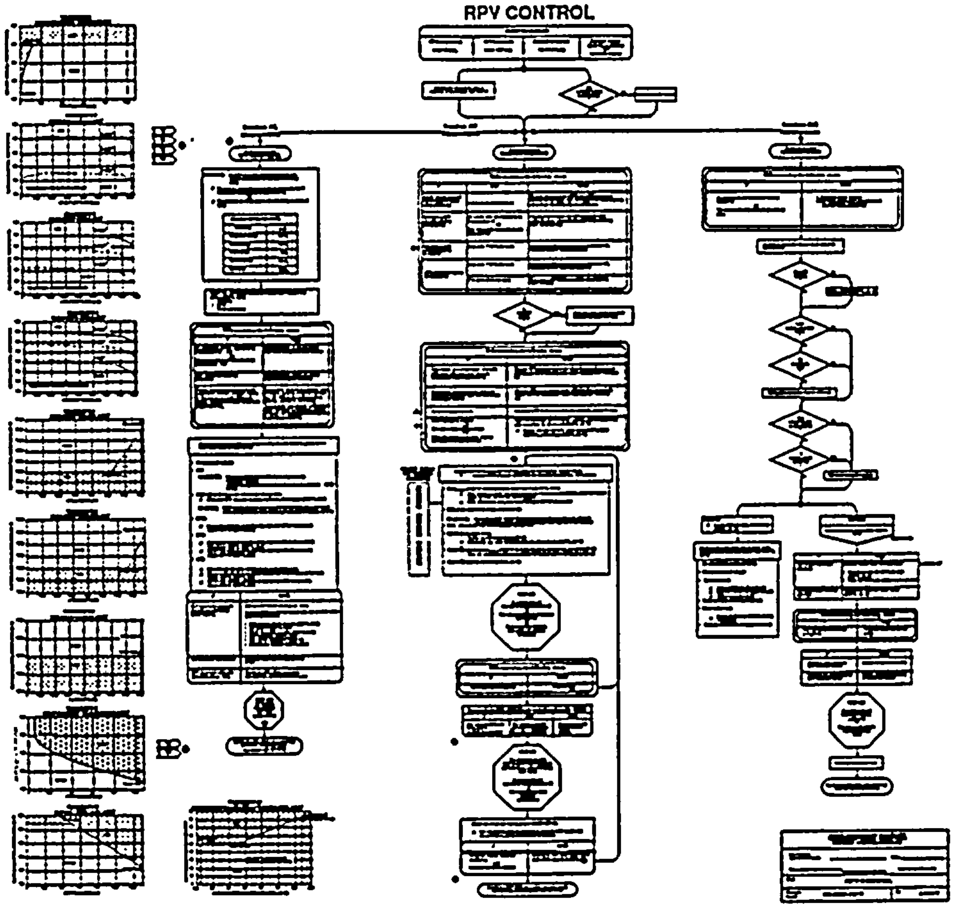
The PRESSURE SUPPRESSION PRESSURE is defined to be the lesser of either (1) the highest suppression chamber pressure which can occur without steam in the suppression chamber airspace or (2) the highest suppression chamber pressure at which initiation of RPV depressurization will not result in exceeding the Primary Containment Pressure Limit before the RPV pressure drops to the Minimum RPV Flooding pressure or (3) the highest suppression chamber pressure which can be maintained without exceeding the suppression pool boundary design load if SRVs are opened. This pressure is a function of primary containment water level, and it is utilized to assure the pressure suppression function of the containment is maintained while the RPV is at pressure.

The SUPPRESSION CHAMBER SPRAY INITIATION PRESSURE is defined to be the lowest suppression chamber pressure which can occur when 95% of the noncondensibles in the drywell have been transferred to the suppression chamber. This pressure is utilized to preclude chugging.

The SRV TAIL PIPE LEVEL LIMIT is defined to be the highest suppression pool water level at which opening an SRV will not result in exceeding the capability of the SRV tail pipe, tail pipe supports, quencher, or quencher supports. This water level is a function of RPV pressure, and the limit is utilized to preclude SRV system damage and containment failure.

The VORTEX LIMIT is defined to be the lowest suppression pool water level above which air entrainment is not expected to occur in an ECCS taking suction on the pool. This suppression pool water level is a function of an ECCS flow, and the limit is utilized to preclude ECCS damage due to air entrainment. Separate limits are provided for each ECCS suction or suction header, as appropriate.

RPV CONTROL

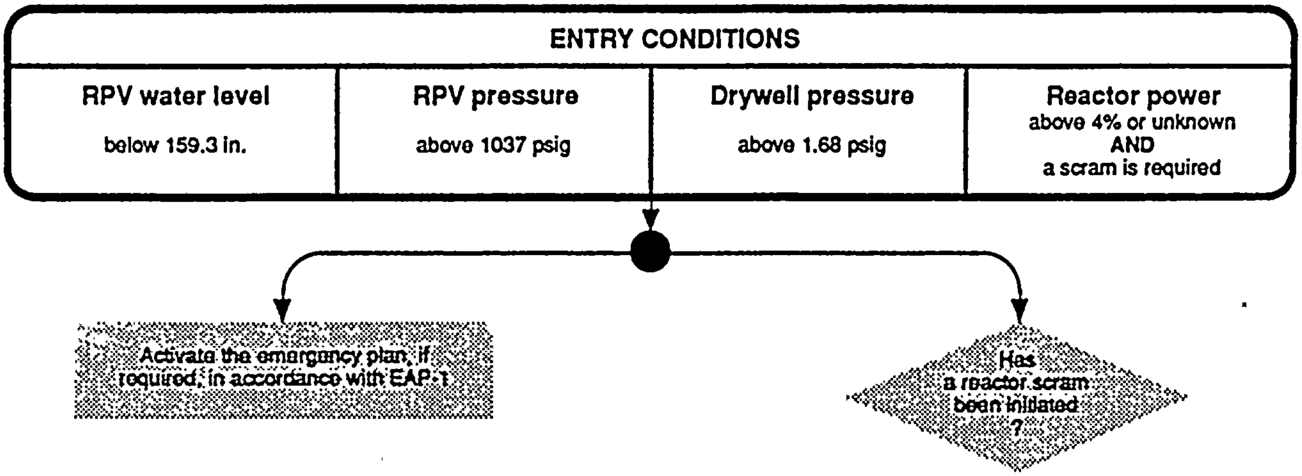


PURPOSE

The purpose of this procedure is to maintain adequate core cooling, shutdown the reactor, and cool down the Reactor Pressure Vessel (RPV) to cold shutdown conditions. Three parameters are controlled: RPV water level, RPV pressure and reactor power. The procedure is constructed of three paths, each addressing one of the aforementioned parameters. The paths are executed concurrently since action to control any one of the three parameters affects the control of the others.

RPV water level control establishes adequate core cooling by maintaining the core submerged. RPV pressure control stabilizes RPV pressure to assist in controlling RPV water level and, if necessary, depressurize and cool down the RPV to cold shutdown. Reactor power control actions confirm a scram and, if the scram is unsuccessful, reduce reactor power and shut down the reactor by control rod insertion and boron injection.

ENTRY:



DISCUSSION:

Specific entry conditions to this procedure are indicative of emergency conditions or conditions which could degrade to emergency levels. Each entry condition has been chosen so as to be simple, operationally significant, unambiguous, readily identifiable, and familiar to plant operators. The entry condition setpoints are specified so as to provide advance warning to operators of potential emergency conditions, allowing action to be taken sufficiently early to prevent more severe consequences.

RPV water level below 159.3 in.

This entry condition addresses loss of coolant accidents where makeup capacity to the RPV is insufficient to compensate for break flow, and loss of feedwater transients where makeup to the RPV has been lost or where the feedwater control system does not adequately respond to steam demand. Although RPV water level at the low level scram setpoint does not in itself constitute an emergency condition, correct and prompt operator action may be required to prevent threatening core uncovery. The low RPV water level scram setpoint is sufficiently above the low RPV water level Emergency Core Cooling Systems (ECCS) initiation setpoint such that prompt operator action may be successful in restoring and maintaining RPV water level without automatic initiation of ECCS.

DISCUSSION: (Continued)

RPV pressure above 1037 psig

This entry condition addresses safety relief valve failure and turbine trip with turbine bypass valve failure events. It indirectly addresses steam line breaks and fuel element failure events because these conditions initiate a closure of the Main Steam Isolation Valves (MSIVs), which, with the reactor at power, would yield a high pressure condition. The setpoint of 1037 psig was chosen because it is a reactor scram setpoint and easily identifiable.

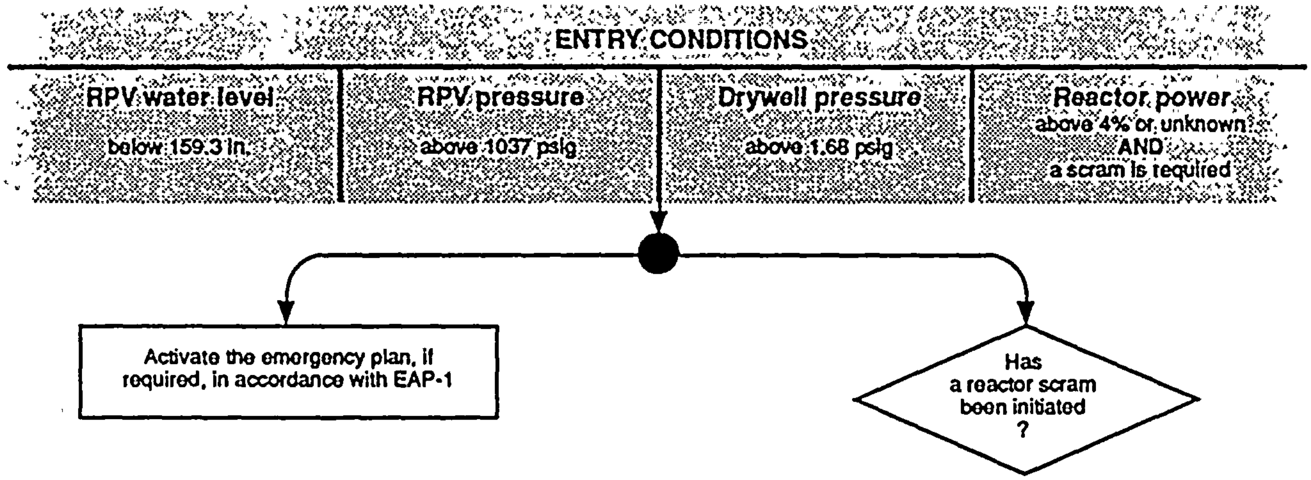
Drywell pressure above 1.68 psig

This entry condition addresses loss of coolant accidents due to breaks inside the drywell and loss of drywell cooling events. The setpoint of 1.68 psig was chosen because it is a reactor scram setpoint and easily identifiable.

Reactor power above 4% or unknown AND a scram is required

This condition indicates a failure to scram event, where the reactor remains at power, or where power cannot be determined. The value of 4% was chosen because it is quickly and easily identified by the Average Power Range Monitor (APRM) downscale lamps and/or system power level indications. Loss of power to the APRMs does not, by itself, constitute the inability to determine the magnitude of reactor power. For this procedure, the operator may use the values of reactor period, steam flow, pressure and pressure trend, main generator load, etc., to determine reactor power.

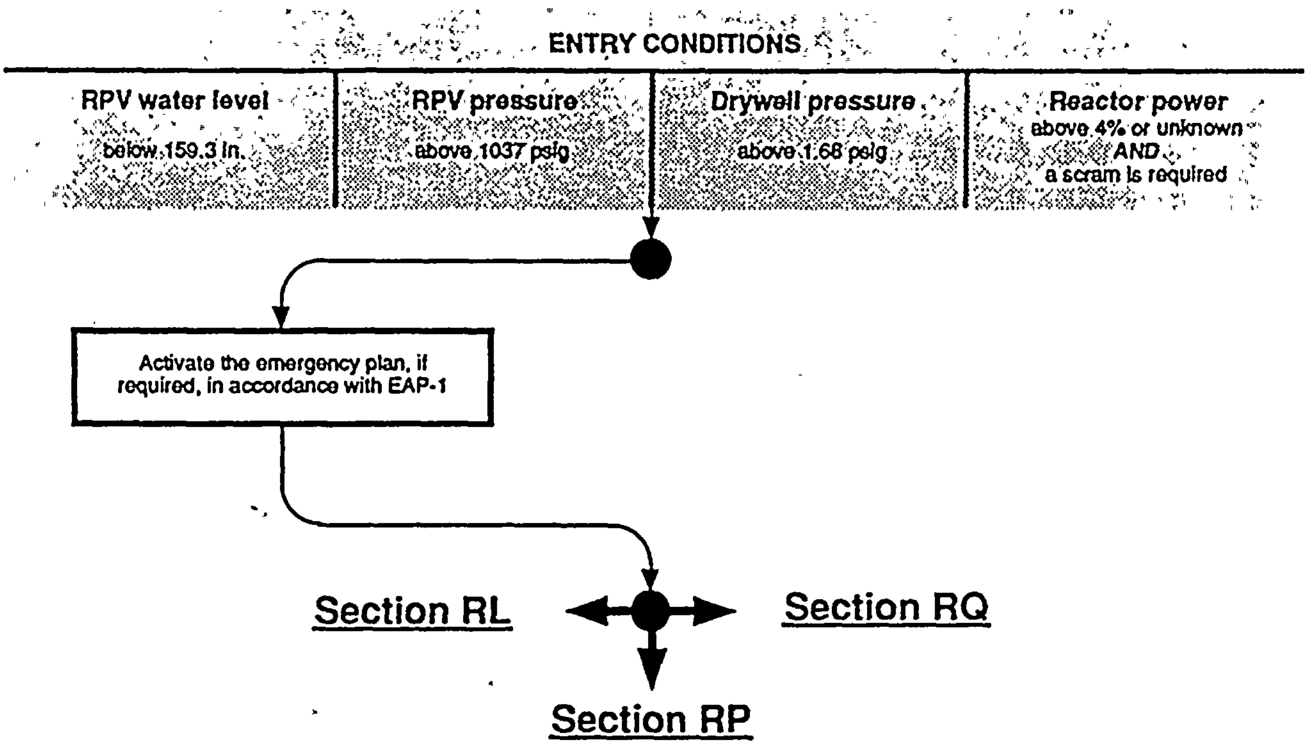
STEP:



DISCUSSION:

The following steps concerning initiation of a scram and activating the Emergency Plan are performed concurrently when at least one entry condition for RPV Control exists.

STEP:

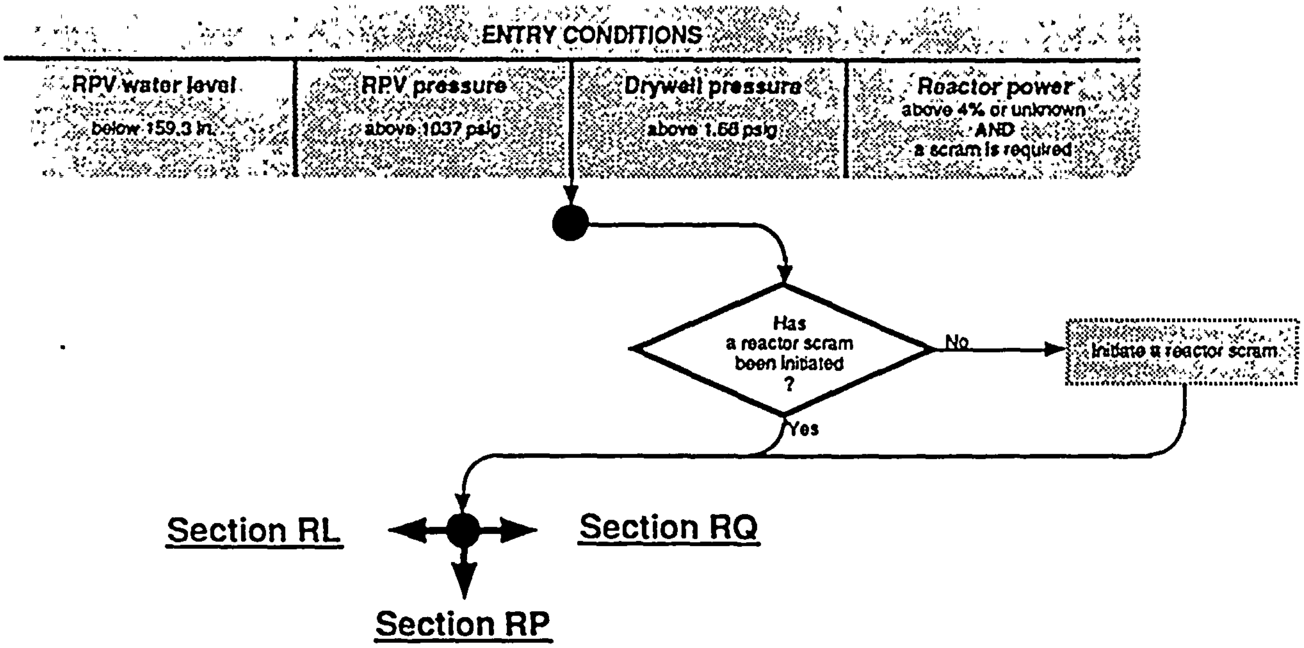


DISCUSSION:

Concurrently with the following steps discussed, the operator is directed to determine if any plant conditions are at an emergency plan action level and to take the appropriate actions in accordance with EAP-1. Following completion of this step, the operator is directed simultaneously to each leg of the RPV Control Procedure.

This step serves to flag the operator that emergency plan implementation may be required. It is not intended that all emergency plan actions be completed before proceeding in the procedure.

STEP:

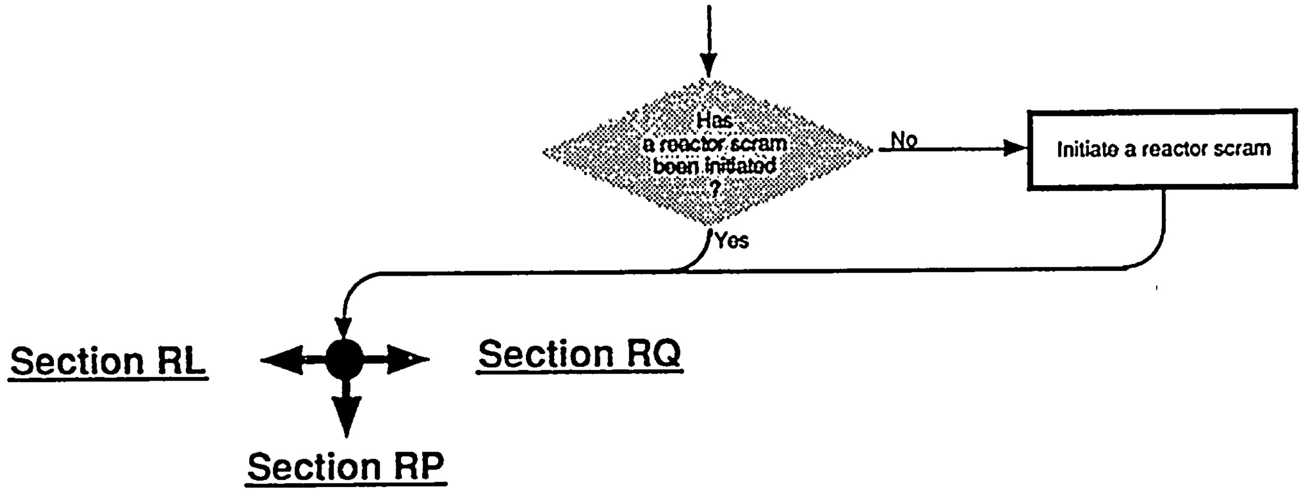


DISCUSSION:

This step addresses the possibility that failures in the automatic Reactor Protection System (RPS) logic have prevented a scram from occurring. A "YES" answer directs the operator to each leg in the RPV Control Procedure. A "NO" answer directs the operator to initiate a scram. The purpose of this step also provides for a scram initiation if entry into RPV Control is directed from a procedure where no condition exists which would have automatically initiated a scram.

Re-entry into the RPV Control Procedure is required whenever any entry condition occurs or re-occurs. However, a reactor scram need be initiated only once. Upon re-entry to the RPV Control Procedure, a "YES" response at this step is proper because a scram has been previously initiated. A second scram initiation would be precluded since a "NO" response directs the operator to insert a scram. Therefore, any conflict is prevented when actions must be taken to reset the scram and manually insert control rods in Section RQ.

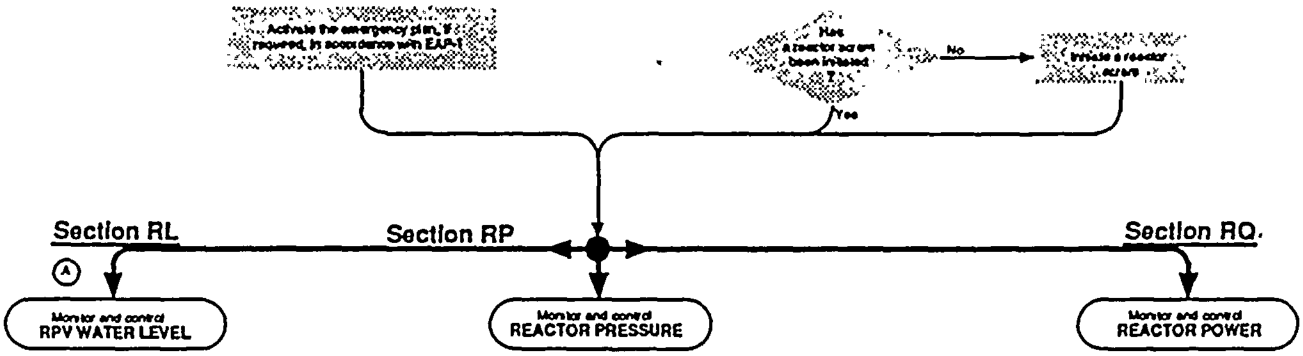
STEP:



DISCUSSION:

If the answer to the previous step was 'no', the operator is directed to take appropriate manual actions to initiate a scram. This action includes placing the reactor mode switch in shutdown. If that action is ineffective arming and depressing the manual scram pushbuttons should be used. After performance of this step, the operator is directed to each leg of the RPV Control Procedure.

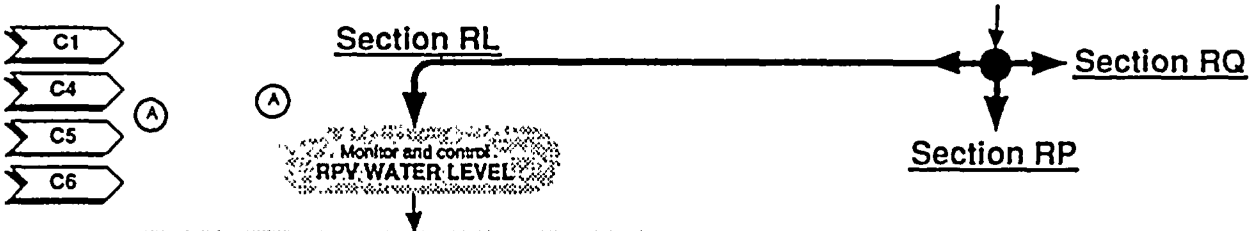
STEP:



DISCUSSION:

Due to the inherent interrelations in a BWR between RPV water level, RPV pressure and reactor power, the actions taken to control any one of the parameters has the possibility of affecting the other parameters. Additionally, the procedure cannot prioritize control of one parameter at the sacrifice of another. The operator must utilize his judgement and analysis of current plant conditions to direct recovery actions. Therefore, this procedure is formatted with three parallel paths, each of which is to be executed concurrently. The operator continues at Sections RQ, RL and RP simultaneously.

STEP:



CAUTION: An RPV water level instrument may be used to determine RPV water level only when:

- The hottest drywell temperature is below the RPV Saturation Temperature (Figure RPV-1),

  AND

- The instrument reads above the Minimum Indicated Level

MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Wide Range	25 in.
Narrow Range	160 in.
Fuel Zone	-155 in.

DISCUSSION:

Along with the entry conditions for RPV Control, Section RL may be entered from the following contingency procedures:

Contingency #1, Alternate Level Control

- Whenever RPV water level is determined to be rising.

Contingency #4, RPV Flooding

- Whenever RPV water level can be deter mined AND all control rods are inserted to or beyond position 02 OR the reactor will remain shutdown under all conditions without boron.
- After RPV water level indication has been restored within the Maximum Core Uncovery Time Limit.

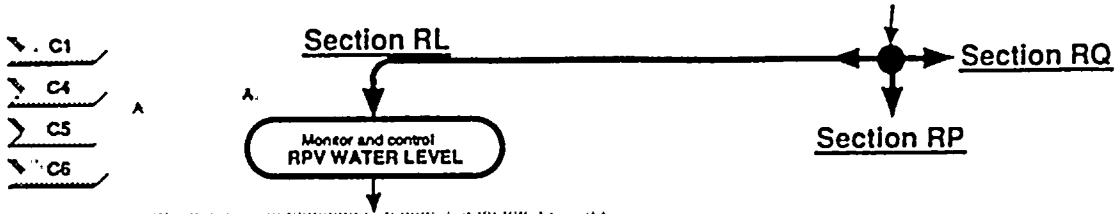
Contingency #5, Level/Power Control

- Whenever all control rods are inserted to or beyond position 02 OR the reactor will remain shutdown under all conditions without boron.

Contingency #6, Primary Containment Flooding

- Whenever RPV water level can be restored and maintained above -14 inches.

STEP:



CAUTION: An RPV water level instrument may be used to determine RPV water level only when:

- The hottest drywell temperature is below the RPV Saturation Temperature (Figure RPV-1),
  AND
- The instrument reads above the Minimum Indicated Level

MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Wide Range	25 in.
Narrow Range	150 in.
Fuel Zone	-155 in.

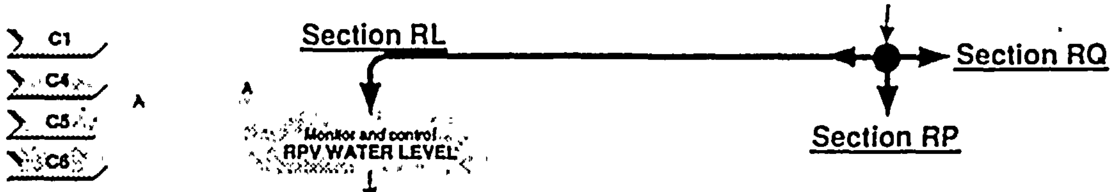
Initiate any of the following which should have initiated but did not (EOP-6, Att 1):

- Isolations
- ECCS
- Diesel generators

DISCUSSION:

Since RQ, RL, and RP are entered concurrently, irrespective of entry conditions, the possibility exists that there is no abnormal RPV water level condition. This step provides instructions to monitor RPV water level for any abnormal indications and to maintain adequate core cooling through core submergence as directed by the remaining steps.

STEP:



CAUTION: An RPV water level instrument may be used to determine RPV water level only when:

- The hottest drywell temperature is below the RPV Saturation Temperature (Figure RPV-1),

  AND
- RB temperature near instrument legs are below the RPV Saturation Temperature (Figure RPV-1, EOP-6, Att 28),

  AND
- The instrument reads above the Minimum Indicated Level

MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Narrow Range	150 in.
Wide Range	25 in.
Fuel Zone	-155 in.

Initiate any of the following which should have initiated but did not (EOP-6, Att 1):

- Isolations
- ECCS
- Diesel generators

DISCUSSION:

Ambient drywell or reactor building area temperature may affect RPV water level indications. This statement delineates specific conditional limitations for each of the RPV water level instrument ranges. For further detail concerning the basis for this step refer to the Section C, Caution #1 of the basis document.

STEP:

MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Wide Range	25 in.
Narrow Range	150 in.
Fuel Zone	-155 in.

Initiate any of the following which should have initiated but did not (EOP-6, Att 1):

- Isolations
- ECCS
- Diesel generators

While executing the following steps:

IF	THEN
All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit Section RL of this procedure and enter C5, Level/Power Control

DISCUSSION:

This step assures initiation of those automatic actions most important for controlling RPV water inventory. Manual operator action to initiate the appropriate action "which should have initiated but did not" is required.

Isolation actions terminate the loss of reactor coolant. The scope of isolations include those valved lines that connect directly to the RPV and penetrate the Primary Containment.

ECCS initiation aligns sources of makeup water for injection into the RPV. More detailed instructions for operating these systems to establish and maintain control of RPV water level are provided in subsequent steps.

During emergency conditions, the diesel generators may be required to supply electrical power to RPV injection systems. Diesel operation should be verified when systems which require emergency electrical power are placed in service.

STEP:

Initiate any of the following which should have initiated but did not (EOP-6, Att.1):
- Isolations
- ECCS
- Diesel generators

While executing the following steps:	
IF	THEN
All control rods are not inserted to at least position 02 AND The reactor will not remain shutdown without boron	Exit Section RL of this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit Section RL of this procedure and enter C4, RPV Flooding
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure RPV-10)	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 curve (Figure RPV-10)

Restore and maintain RPV level between 159.3 in. and 202.3 in. using one or more of the systems listed below:

DISCUSSION:

This step is an override and applies until Section RL is exited.

Positive confirmation that the reactor will remain shutdown under all conditions is best obtained by determining that no control rod is withdrawn past the Maximum Subcritical Banked Withdrawal Position. The Maximum Subcritical Banked Withdrawal Position is defined to be the lowest control rod position to which all control rods may be withdrawn in bank and still ensure the reactor will remain shutdown under all conditions.

Other criteria may be employed by Reactor Engineering to determine that the reactor is shutdown, such as: existence of the design basis shutdown margin (SDM) with the single control rod of the highest worth full-out and all other control rods full-in, compliance with the Technical Specification requirements governing control rod position and the allowable number of inoperable control rods, etc.

If any possibility exists that the reactor may not remain shutdown on control rod insertion alone, the actions required for control of RPV water level differ from those prescribed in RPV Control. The RPV water level control actions that are appropriate under these conditions are specified in Contingency #5, Level/Power Control.

STEP:

Initiate any of the following which should have initiated but did not (EOP-6, Att 1):

- Isolations
- ECCS
- Diesel generators

While executing the following steps:

IF	THEN
All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit Section RL of this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit Section RL of this procedure and enter C4, RPV Flooding
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure RPV-10).	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 curve (Figure RPV-10)

Restore and maintain RPV level between 159.3 in. and 202.3 in. using one or more of the systems listed below:

DISCUSSION:

This step is an override and applies until Section RL is exited.

If RPV water level cannot be determined, the actions specified in subsequent steps of this procedure cannot be performed since water level and water level trend information is required for determining which actions to perform. Transferring control of RPV water level from RPV Control to Reactor Flooding is necessary to assure adequate core cooling under the condition of not being able to determine RPV water level. Refer to Section C for the definition of 'cannot be determined'.

STEP:

Initiate any of the following which should have initiated but did not (EOP-6, Att 1):

- Isolations
- ECCS
- Diesel generators

While executing the following steps:

IF	THEN
All control rods are not inserted to at least position 02 AND The reactor will not remain shutdown without boron	Exit Section RL of this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit Section RL of this procedure and enter C4, RPV Flooding
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure RPV-10).	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 curve (Figure RPV-10)

Restore and maintain RPV level between 159.3 in. and 202.3 in. using one or more of the systems listed below:

DISCUSSION:

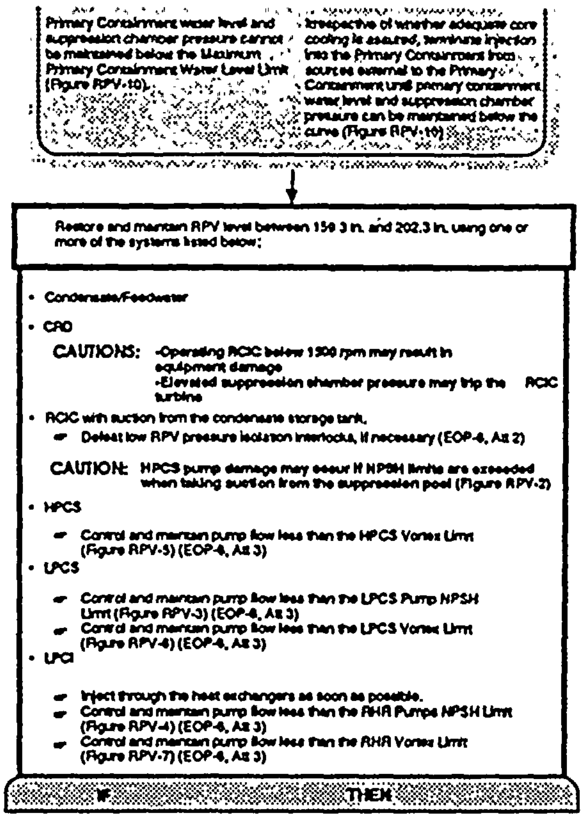
This step is an override and applies until Section RL is exited.

This condition addresses the concern for maintaining Primary Containment integrity. With a non-isolable primary system break, injection systems will increase RPV water level until it reaches the elevation of the break. Once this occurs, the makeup water will spill from the break into the Primary Containment. With systems operating which take suction external to the Primary Containment, the suppression pool and eventually the Primary Containment water level will increase. If this situation were to continue, Primary Containment water level would eventually reach the Maximum Primary Containment Water Level Limit (refer to Section C for Figure RPV-10), which corresponds to the level of the highest Primary Containment vent. The Maximum Primary Containment Water Level Limit is defined to be the lesser of either: (1) The elevation of the highest containment vent capable of rejecting all core decay heat, or (2) the highest containment water level which will not result in exceeding the pressure capability of the containment. The NMP2 limit is based upon (1) above. With water level above this limit, effective Primary Containment venting capability is lost which could lead to Primary Containment failure. Under these conditions injection from systems which cannot be aligned with suction from inside the Primary Containment is required to be terminated, irrespective of whether adequate core cooling is assured. When it is necessary to make a choice between assuring Primary Containment integrity or adequate core cooling, preference will be made

DISCUSSION: (Continued)

toward assuring Primary Containment integrity, regardless of core conditions, in order to ensure the ability to protect the general public.

STEP:



DISCUSSION:

This step provides a preferred range in which RPV water level should be maintained and the preferred systems to be used to supply water. The upper water level limit prevents a main turbine trip, feed pump trips, High Pressure Core Spray (HPCS) injection valve closure and Reactor Core Isolation Cooling (RCIC) shutdown. These events would complicate RPV water level control and/or decay heat dissipation. The lower water level limit assures adequate core cooling, allows the use of the normal shutdown cooling system, and allows for resetting a reactor scram (barring other scram signals). This broad range of water level was also selected to avoid unwarranted demands on operator attention. If unnecessarily constrained within narrower limits, an operator may be less effective in performing concurrent duties.

The operator is instructed to operate the RCIC System with suction from the Condensate Storage Tank (CST) to ensure that the highest quality water for injection into the RPV is utilized.

The operator is alerted that operating the RCIC turbine at speeds less than 1500 rpm could result in inadequate pump internal cooling.

The operator is reminded that the RCIC turbine may trip due to elevated pressure in the suppression chamber. This would result in the inability to inject water to the RPV with the low volume RCIC system.

DISCUSSION: (Continued)

Direction to defeat the RCIC low pressure isolation interlock is given to allow operation of the RCIC turbine at low pressure. Even if RPV pressure is below the isolation setpoint, but above the turbine stall pressure, RCIC can still provide some injection into the RPV.

The operator is cautioned that HPCS pump damage may occur if NPSH limits are exceeded when taking a suction from the suppression pool. Since the shape of the curve is nearly flat, operator action would have little effect on alleviating pump cavitation. Under certain conditions, reducing HPCS pump flow can actually result in pump cavitation. This caution can only alert the operator that an undesirable condition may result.

The operator is instructed to monitor and maintain Low Pressure Core Spray (LPCS) and Low Pressure Coolant Injection (LPCI) mode of Residual Heat Removal (RHR) flow less than the Net Positive Suction Head (NPSH) Limit (Figures RPV-3 and RPV-4). This is to prevent damage to the pumps due to cavitation. The throttling of LPCS and RHR pump flow may restore and maintain system operation within the NPSH limit.

The operator is instructed to monitor and maintain HPCS/LPCS/LPCI ECCS flow less than the Vortex Limit (Figures RPV-5, RPV-6, and RPV-7). This prevents air entrapment caused by vortex formation at the pump suction strainer in the suppression pool.

Refer to Section C for Figures RPV-2, 3, 4, 5, 6, and 7.

The operator is directed to observe the NPSH and Vortex Limits since degraded conditions allowing ECCS operation irrespective of NPSH and Vortex Limits do not exist. It is desirable to maintain long term ECCS availability.

The purpose of injecting through the RHR heat exchangers as soon as possible is to promote rapid removal of heat from the Primary Containment, thus minimizing suppression pool heatup and prolong the availability of the suppression pool as a heat sink. As used in this step, the phrase "as soon as possible" means the earliest practical time within the constraints imposed by system conditions, valve control logic, and concurrently required operator actions.

STEP:

- Inject through the heat exchangers as soon as possible.
- Control and maintain pump flow less than the RHR Pumps NPSH Limit (Figure RPV-4) (EOP-6, Att 3)
- Control and maintain pump flow less than the RHR Vortex Limit (Figure RPV-7) (EOP-6, Att 3)

IF	THEN
RPV water level cannot be restored and maintained above 159.3 in.	Maintain RPV water level above -14 in. Augment RPV water level control with one or more of the systems listed below: • SLC (test tank) (EOP-6, Att 9) • ECCS Keep-Full systems (EOP-6, Att 7) • Condensate Transfer (EOP-6, Att 8) • RHR Service Water crosstie (EOP-6, Att 5) • Fire system (EOP-6, Att 6) • SLC (boron tank) (OP-36A, Section H.1)
The ADS timer has initiated	Place the ADS logic inhibit switches in ON
RPV water level cannot be maintained above -14 in.	Exit Section RL of this procedure and enter C1, Alternate Level Control

WAIT until OP-101C is entered from EOP-RPV Section RP

DISCUSSION:

If RPV water level cannot be maintained above 159.3 inches, an alternate control band with a lower limit is defined. The widened RPV water level control band provides additional operational flexibility while still assuring adequate core cooling. By establishing the widened control band, additional time may be available to place injection systems not yet operating into service. The widened control band also accommodates controlling RPV water level without employing additional contingency actions for a condition where a break exists between the low RPV water level scram setpoint and the top of active fuel (TAF), and injection flow cannot overcome break flow.

This step also lists additional systems which may be used, if necessary, to inject water into the RPV. Included are those systems which supply water of relatively low quality and those systems which entail more complex and involved injection lineups. The intent of this step is for the operator to use a source of water that will minimize corrosion and cleanup time before resuming normal operations. The use of Standby Liquid Control (SLC), service water, or fire system will require significant cleanup and system inspection. These systems should be used only when no other sources of water are available.

STEP:

- Inject through the heat exchangers as soon as possible.
- Control and maintain pump flow less than the RHR Pumps NPSH Limit (Figure RPV-4) (EOP-6, Att 3)
- Control and maintain pump flow less than the RHR Vortex Limit (Figure RPV-7) (EOP-6, Att 3)

IF	THEN
RPV water level cannot be restored and maintained above 159.3 in.	Maintain RPV water level above -14 in. Augment RPV water level control with one or more of the systems listed below: • RHR Service Water crosstie (EOP-6, Att 5) • Fire system (EOP-6, Att 6) • ECCS Keep-Full systems (EOP-6, Att 7) • SLC (test tank) (EOP-6, Att 9) • SLC (boron tank) (EOP-6, Att 12) • Condensate Transfer (EOP-6, Att 8)
The ADS timer has initiated	Place the ADS logic inhibit switches in ON
RPV water level cannot be maintained above -14 in.	Exit Section RL of this procedure and enter C1, Alternate Level Control

WAIT until OP-101C is entered from EOP-RPV Section RP at (D)

DISCUSSION:

If RPV water level is below 17.8 inches, then it is assumed that the Automatic Depressurization System (ADS) timer has initiated.

An ADS actuation will:

1. Impose a severe pressure and tempera ture transient on the RPV
2. Complicate the effort to restore and maintain RPV water level
3. In severe cases with no low pressure injection systems available, may create a loss of adequate core cooling and subsequent core damage which otherwise could have been avoided.

The conditions assumed in the design of the ADS logic (no operator action for 10 minutes) do not exist when the operator is executing the steps of this procedure. Having access to more information than the ADS logic, the operator is in a better position to judge when and how to depressurize the RPV while minimizing transient loads and optimizing adequate core cooling. Placing the ADS logic inhibit switches in "ON" is the approved NMP2 method for preventing automatic initiation. If depressurization of the RPV is subsequently required, explicit direction is provided in the appropriate EOP. Thus, any requirement to maintain the automatic initiation capability of ADS is not required.

STEP:

- Inject through the heat exchangers as soon as possible.
- Control and maintain pump flow less than the RHR Pumps NPSH Limit (Figure RPV-4) (EOP-6, Att 3)
- Control and maintain pump flow less than the RHR Vortex Limit (Figure RPV-7) (EOP-6, Att 3)

IF	THEN
RPV water level cannot be restored and maintained above 159.3 in.	Maintain RPV water level above -14 in. Augment RPV water level control with one or more of the systems listed below: • RHR Service Water crosstie (EOP-6, Att 5) • Fire system (EOP-6, Att 6) • ECCS Keep-Full systems (EOP-6, Att 7) • SLC (test tank) (EOP-6, Att 9) • SLC (boron tank) (EOP-6, Att 12) • Condensate Transfer (EOP-6, Att 8)
The ADS timer has initiated	Place the ADS logic inhibit switches in ON
RPV water level cannot be maintained above -14 in.	Exit Section RL of this procedure and enter C1, Alternate Level Control

WAIT until OP-101C is entered from EOP-RPV Section RP at (O)

DISCUSSION:

This step tests the success of RPV water level control efforts taken in the preceding steps and alerts the operator that Alternate Level Control may be required. This step provides the point where a transition to more severe methods of RPV water level control will begin. The operator can respond to this contingency statement before RPV water level actually drops to -14 inches, if it is known (based on current RPV water level and expected system availability) that without further actions, RPV water level will drop to -14 inches.

When the operator has decided, based on current plant conditions, or observed that RPV water level cannot be maintained above -14 inches, the operator must exit Section RL and enter Contingency #1, Alternate Level Control.

STEP:

IF	THEN
RPV water level cannot be restored and maintained above 159.3 in.	Maintain RPV water level above -14 in. Augment RPV water level control with one or more of the systems listed below: • RHR Service Water crosstie (EOP-6, Att 5) • Fire system (EOP-6, Att 6) • ECCS Keep-Full systems (EOP-6, Att 7) • SLC (test tank) (EOP-6, Att 9) • SLC (boron tank) (EOP-6, Att 12) • Condensate Transfer (EOP-6, Att 8)
The ADS timer has initiated	Place the ADS logic inhibit switches in ON
RPV water level cannot be maintained above -14 in.	Exit Section RL of this procedure and enter C1, *Alternate Level Control*

WAIT until OP-101C is entered from EOP-RPV Section RP at (D)

Exit Section RL of this procedure and proceed to cold shutdown in accordance with OP-101C

IF	THEN
Shutdown cooling cannot be established AND further cooldown is required	Continue to cool down using one or more of the systems listed at (B)

(D)

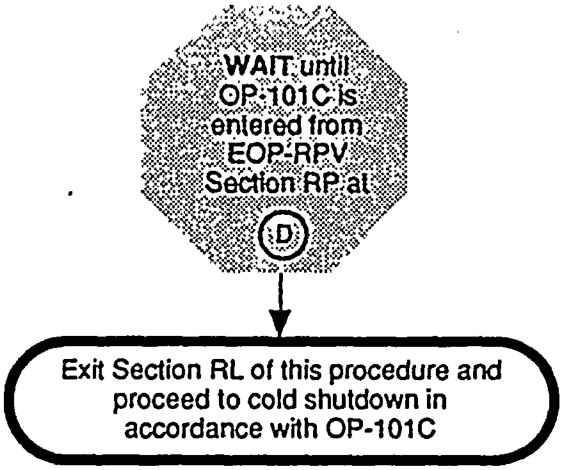
Exit Section RP of this procedure and proceed to cold shutdown in accordance with OP-101C

DISCUSSION:

It is appropriate to hold at this point in Section RL and maintain RPV water level in the directed band (either between 159.3 inches and 202.3 inches OR above -14 inches) until point D is reached in Section RP.

When point D is reached in Section RP, shutdown is achieved by control rod insertion.

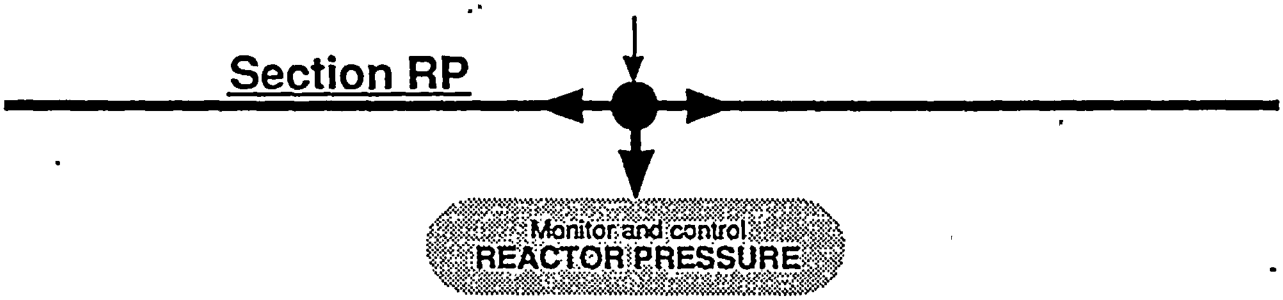
STEP:



DISCUSSION:

This step in conjunction with the last step of Section RP coordinates the exit from the RPV Control procedure. After RPV pressure has been reduced to below the shutdown cooling interlocks and shutdown cooling has been established, normal operating procedures provide the appropriate instructions for continued control of RPV water level.

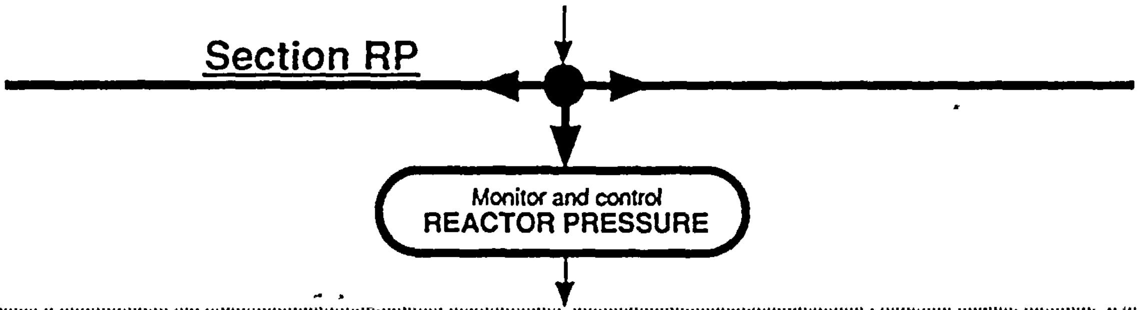
STEP:



DISCUSSION:

The pressure control section first stabilizes RPV pressure below the high RPV pressure scram setpoint and then directs the depressurization and cooldown of the RPV to cold shutdown conditions. The main turbine bypass valves and the main condenser comprise the preferred mechanism for discharging and condensing steam from the RPV. Alternate methods are identified should the preferred method be unavailable.

STEP:



While executing the following steps:

IF	AND	THEN
A high drywell pressure ECCS initiation signal exists (1.68 psig)		Prevent injection from LPCS and LPCI pumps not needed for adequate core cooling prior to depressurizing below their maximum injection pressures
Emergency RPV depressurization is anticipated	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Rapidly depressurize the RPV using the main turbine bypass valves irrespective of the resulting RPV cooldown rate

DISCUSSION:

Since RL, RP, and RQ are executed concurrently, irrespective of entry conditions, the possibility that no abnormal reactor pressure condition exists must be addressed. This step provides instructions to monitor RPV pressure for any abnormal indications and to maintain RPV pressure as directed by the remaining steps.

STEP:

Monitor and control
REACTOR PRESSURE

While executing the following steps:

IF	AND	THEN
A high drywell pressure ECCS initiation signal exists (1.68 psig)	----------------------------------	Prevent injection from LPCS and LPCI pumps not needed for adequate core cooling prior to depressurizing below their maximum injection pressures
Emergency RPV depressurization is anticipated	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Rapidly depressurize the RPV using the main turbine bypass valves irrespective of the resulting RPV cooldown rate
Emergency RPV depressurization is required	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization
RPV water level cannot be determined	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization S
	7 or more SRVs are open	Exit section RP of this procedure and enter C4, RPV Flooding

Is any SRV cycling ?

DISCUSSION:

If any of the conditions in this override statement occur, RPV pressure must be controlled in a manner other than that specified in the steps of Section RP.

This condition reminds the operator of the high drywell pressure (1.68 psig) automatic start signal for ECCS pumps. Since subsequent steps in this procedure can depressurize the RPV to below the low pressure interlock for the ECCS injection valves, it is important to prevent inadvertent injection from those ECCS systems not required to assure adequate core cooling to preclude an uncontrolled RPV floodup and a reactor power excursion due to the injection of relatively cold, unborated water.

The term 'prevent' permits securing pumps as well as closing injection valves. Placing the pump control switch in PULL-TO-LOCK (PTL) is preferred. The injection valve override will not work if a sealed in initiation signal does not exist. These systems may be required to be used later if conditions change such that system operation is required for adequate core cooling.

STEP:

Monitor and control REACTOR PRESSURE

While executing the following steps:

IF	AND	THEN
A high drywell pressure ECCS initiation signal exists (1.68 psig)		Prevent injection from LPCS and LPCI pumps not needed for adequate core cooling prior to depressurizing below their maximum injection pressures
Emergency RPV depressurization is anticipated	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Rapidly depressurize the RPV using the main turbine bypass valves irrespective of the resulting RPV cooldown rate
Emergency RPV depressurization is required	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization
RPV water level cannot be determined	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization &
	7 or more SRVs are open	Exit section RP of this procedure and enter C4, RPV Flooding

Is any SRV cycling ?

DISCUSSION:

If any of the conditions in this override statement occur, RPV pressure must be controlled in a manner other than that specified in the steps of Section RP.

This condition addresses the anticipated need to emergency depressurize the RPV when the reactor will remain shutdown under all conditions. If emergency RPV depressurization is imminent, it is desirable to discharge as much heat as possible to the main condenser to minimize the heat loading of the suppression pool. Bypassing or defeating isolation interlocks is NOT authorized by this override.

Determining that no control rod is withdrawn beyond the Maximum Subcritical Banked Withdrawal Position, is positive confirmation that the reactor will remain shutdown under all conditions. Reactor Engineering may employ other criteria to determine that the reactor is shutdown, such as, existence of the core design basis shutdown margin, etc.

Rapid depressurization of the RPV takes precedence over limiting the cooldown rate to the maximum cooldown rate that is permitted by Technical Specifications. This caution has been incorporated directly into the action step.

STEP:

Monitor and control
REACTOR PRESSURE

While executing the following steps:

IF	AND	THEN
A high drywell pressure ECCS initiation signal exists (1.68 psig)		Prevent injection from LPCS and LPCI pumps not needed for adequate core cooling prior to depressurizing below their maximum injection pressures
Emergency RPV depressurization is anticipated	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Rapidly depressurize the RPV using the main turbine bypass valves irrespective of the resulting RPV cooldown rate
Emergency RPV depressurization is required	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization
RPV water level cannot be determined	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization S
	7 or more SRVs are open	Exit section RP of this procedure and enter C4, RPV Flooding

Is any SRV cycling ?

DISCUSSION:

If any of the conditions in this override statement occur, RPV pressure must be controlled in a manner other than that specified in the steps of Section RP.

This condition addresses the situation when emergency RPV depressurization is required and the number of Safety/Relief Valves (SRVs) open is less than the number of SRVs dedicated to ADS. If seven SRVs are already open, the objective of Emergency RPV Depressurization, is already achieved so it is not necessary to exit this procedure. With less than seven SRVs open, entry into Contingency #2, Emergency RPV Depressurization, is required to provide additional guidance to accomplish RPV emergency depressurization. Additionally, the operator enters Contingency #2 to restore, prolong or establish means of providing adequate core cooling. The directions presented in the Emergency RPV Depressurization procedure are in conflict with the actions of this branch of the RPV Control procedure, but has a higher priority and takes precedence; therefore, Section RP is exited.

STEP:

Monitor and control
REACTOR PRESSURE

While executing the following steps:

IF	AND	THEN
A high drywell pressure ECCS initiation signal exists (1.68 psig)		Prevent injection from LPCS and LPCI pumps not needed for adequate core cooling prior to depressurizing below their maximum injection pressures
Emergency RPV depressurization is anticipated	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Rapidly depressurize the RPV using the main turbine bypass valves irrespective of the resulting RPV cooldown rate
Emergency RPV depressurization is required	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization
RPV water level cannot be determined	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization S
	7 or more SRVs are open	Exit section RP of this procedure and enter C4, RPV Flooding

Is any SRV cycling ?

DISCUSSION:

If any of the conditions in this override statement occur, RPV pressure must be controlled in a manner other than that specified in the steps of Section RP..

This condition addresses the need for Emergency RPV Depressurization and reactor flooding when less than seven SRVs are open and RPV water level cannot be determined. If RPV water level cannot be determined, then RPV flooding is required to ensure adequate core cooling through core submergence. RPV flooding requires control of RPV pressure in a manner that conflicts with the Reactor Pressure portion of this procedure. Additionally, RPV flooding requires depressurizing the RPV. With less than seven SRVs open, for reasons discussed in the previous condition, it is necessary to transfer pressure control to Contingency #2, Emergency RPV Depressurization.

STEP:

Monitor and control REACTOR PRESSURE

While executing the following steps:

IF	AND	THEN
A high drywell pressure ECCS initiation signal exists (1.68 psig)		Prevent injection from LPCS and LPCI pumps not needed for adequate core cooling prior to depressurizing below their maximum injection pressures
Emergency RPV depressurization is anticipated	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Rapidly depressurize the RPV using the main turbine bypass valves irrespective of the resulting RPV cooldown rate
Emergency RPV depressurization is required	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization
RPV water level cannot be determined	Less than 7 SRVs are open	Exit Section RP of this procedure and enter C2, Emergency RPV Depressurization S
	7 or more SRVs are open	Exit section RP of this procedure and enter C4, RPV Flooding

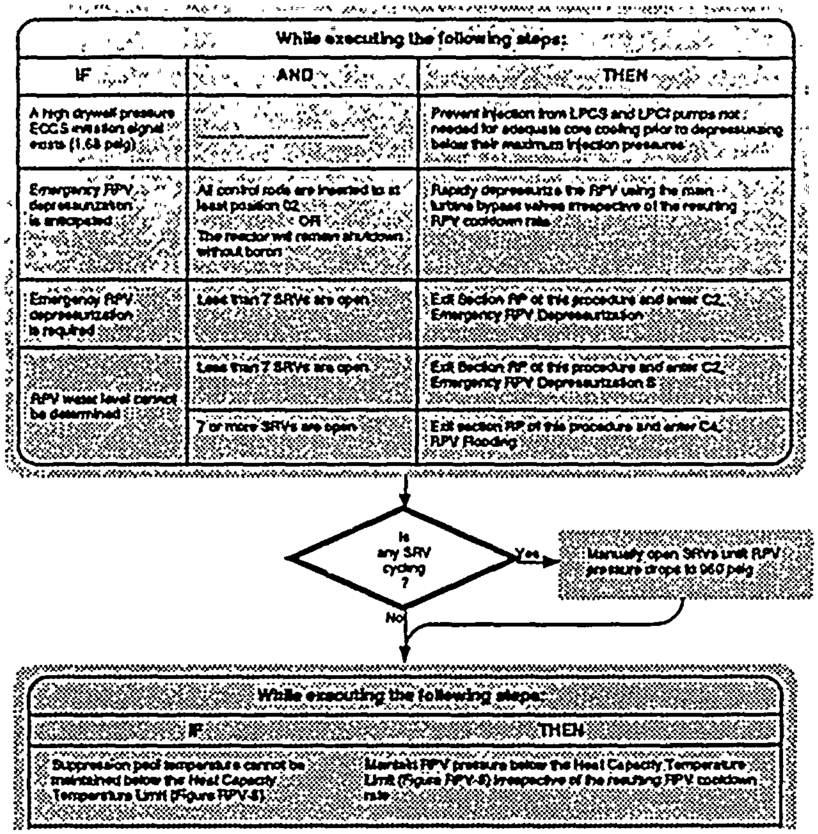
Is any SRV cycling ?

DISCUSSION:

If any of the conditions in this override statement occur, RPV pressure must be controlled in a manner other than that specified in the steps of Section RP.

This condition addresses the need for RPV flooding, when at least seven SRVs are already open. Since the objectives of Emergency RPV Depressurization are already met, it is not necessary to enter Contingency #2. The operator is referenced directly to Contingency #4, RPV Flooding.

STEP:

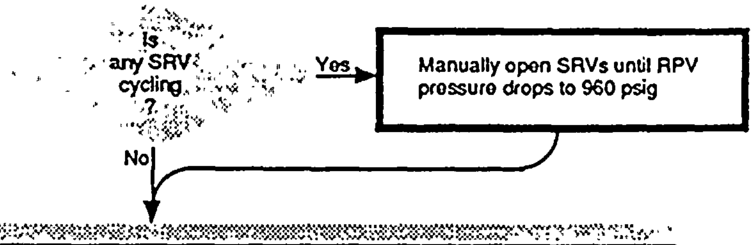


DISCUSSION:

"SRV cycling" is defined as <u>multiple, closely sequenced</u> relief/safety valve actuations with valve opening being initiated in response to RPV pressure increasing to or above the lifting setpoint, and the subsequent valve closure being governed by RPV pressure decreasing to or below the SRV reset setpoint. The severe consequences associated with SRV cycling require prompt manual action to reduce RPV pressure below the SRV lifting setpoint. Actions to prevent SRV cycling will minimize:

- Significant dynamic loads/stresses imposed on the RPV, SRV tail pipes and supporting structures, and on the Primary Containment structures.
- Fluctuating RPV water level (swell as RPV pressure rapidly decreases when the valves open and shrink as RPV pressure increases when the valves close).
- Repeated challenges to SRV operability (the potential failure of a valve to open on demand or to close once it has opened).

STEP:



While executing the following steps:	
IF	THEN
Suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit (Figure RPV-8)	Maintain RPV pressure below the Heat Capacity Temperature Limit (Figure RPV-8) irrespective of the resulting RPV cooldown rate
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure RPV-9)	Maintain RPV pressure below the SRV Tail Pipe Level Limit (Figure RPV-9) irrespective of the resulting RPV cooldown rate
▲ Steam cooling is required	Exit section RP of this procedure and enter C3, Steam Cooling
❖ 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 the MSIVs (or prevent MSIV closure), and reestablish the main condenser as a heat sink (EOP-6, Att 10) ➡ Bypass IAS and low RPV water level MSIV isolation interlocks, if necessary (EOP-6, Att 10)

DISCUSSION:

This step is entered as the result of a "YES" response to the previous step. If any SRV is cycling, it is appropriate to take manual control of SRVs and open SRVs to decrease RPV pressure to less than 960 psig. Manual operation of the SRVs for prompt reduction in RPV pressure has the following advantages:

- SRVs can be operated irrespective of MSIV status
- The magnitude of RPV depressurization can be directly controlled.

Reactor pressure is reduced to a value where turbine bypass valves can pass 100% of bypass valve capacity. If the MSIVs are open, reducing pressure below 960 psig will result in a partial closure of the bypass valves and a corresponding increase in the amount of steam sent to the suppression pool through the SRVs. If the MSIVs are closed, this pressure (960 psig) provides an adequate margin below the setpoint pressure of the lowest lifting SRV.

Following a specific SRV opening sequence is unwarranted at this time since a prompt reduction in pressure is desired.

STEP:

Is any SRV cycling?

Yes → Manually open SRVs until RPV pressure drops to 960 psig

No ↓

While executing the following steps:	
IF	**THEN**
Suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit (Figure RPV-8)	Maintain RPV pressure below the Heat Capacity Temperature Limit (Figure RPV-8) irrespective of the resulting RPV cooldown rate
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure RPV-9)	Maintain RPV pressure below the SRV Tail Pipe Level Limit (Figure RPV-9) irrespective of the resulting RPV cooldown rate
Steam cooling is required	Exit section RP of this procedure and enter C3, Steam Cooling
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 the MSIVs (or prevent MSIV closure), and reestablish the main condenser as a heat sink (EOP-6, Att 10) ☛ Bypass IAS and low RPV water level MSIV isolation interlocks, if necessary (EOP-6, Att 10)

(B)

Stabilize RPV pressure below 1037 psig using the main turbine bypass valves.
☛ Augment RPV pressure control with the systems listed below, if necessary.

DISCUSSION:

This step is an override and applies throughout the remainder of section RP. This step is entered as the result of a "NO" response to whether SRVs were cycling or after reducing RPV pressure to 960 psig.

This condition concerns the Heat Capacity Temperature Limit Curve (Figure RPV-8, refer to Section C). The Heat Capacity Temperature Limit (HCTL) is defined to be the highest suppression pool temperature at which initiation of RPV depressurization will not result in exceeding either (1) the suppression chamber design temperature or (2) the Primary Containment Pressure Limit before the rate of energy transfer from the RPV to the containment is within the capacity of the containment vent. This temperature is a function of RPV pressure, and the Limit is utilized to preclude failure of the containment or equipment necessary for the safe shutdown of the plant. If the actions currently being taken to limit suppression pool temperature increase are inadequate or not effective, RPV pressure must be reduced in order to remain below the Heat Capacity Temperature Limit.

The operator is reminded that excessive RPV cooldown rates may be required. This caution is incorporated directly into the step.

STEP:

Is any SRV cycling ?

Yes → Manually open SRVs until RPV pressure drops to 960 psig

No ↓

While executing the following steps:

IF	THEN
Suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit (Figure RPV-8)	Maintain RPV pressure below the Heat Capacity Temperature Limit (Figure RPV-8) irrespective of the resulting RPV cooldown rate
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure RPV-9)	Maintain RPV pressure below the SRV Tail Pipe Level Limit (Figure RPV-9) irrespective of the resulting RPV cooldown rate
▲ Steam cooling is required	Exit section RP of this procedure and enter C3, Steam Cooling
❖ 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 the MSIVs (or prevent MSIV closure), and reestablish the main condenser as a heat sink (EOP-6, Att.10) ➡ Bypass IAS and low RPV water level MSIV isolation interlocks, if necessary (EOP-6, Att.10)

(B)

Stabilize RPV pressure below 1037 psig using the main turbine bypass valves.

➡ Augment RPV pressure control with the systems listed below, if necessary.

DISCUSSION:

This step is an override and applies throughout the remainder of section RP. This step is entered as the result of a "NO" response to whether SRVs were cycling or after reducing RPV pressure to 960 psig.

This condition concerns the SRV Tail Pipe Level Limit (Figure RPV-9, refer to Section C). The SRV Tail Pipe Level Limit is defined to be the highest suppression pool water level at which opening an SRV will not result in exceeding the allowable stresses in the SRV tail pipe, tail pipe supports, quencher, or quencher supports. The SRV Tail Pipe Level Limit is a function of suppression pool water level and RPV pressure and is utilized to preclude SRV system damage and containment failure. If actions currently taken to limit suppression pool level are inadequate or ineffective, RPV pressure must be reduced in order to remain below the SRV Tail Pipe Level Limit.

The operator is reminded that excessive RPV cooldown rates may be required. This caution is incorporated directly into the step.

STEP:

Is any SRV cycling?

Yes → Manually open SRVs until RPV pressure drops to 960 psig

No

While executing the following steps:

IF	THEN
Suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit (Figure RPV-8)	Maintain RPV pressure below the Heat Capacity Temperature Limit (Figure RPV-8) irrespective of the resulting RPV cooldown rate
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure RPV-9)	Maintain RPV pressure below the SRV Tail Pipe Level Limit (Figure RPV-9) irrespective of the resulting RPV cooldown rate
Steam cooling is required	Exit section RP of this procedure and enter C3, Steam Cooling
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 the MSIVs (or prevent MSIV closure), and reestablish the main condenser as a heat sink (EOP-6, Att 10) → Bypass IAS and low RPV water level MSIV isolation interlocks, if necessary (EOP-6, Att 10)

(B)

Stabilize RPV pressure below 1037 psig using the main turbine bypass valves.
→ Augment RPV pressure control with the systems listed below, if necessary.

DISCUSSION:

This step is an override and applies throughout the remainder of section RP. This step is entered as the result of a "NO" response to whether SRVs were cycling or after reducing RPV pressure to 960 psig.

This condition addresses the possibility that Steam Cooling is required. The criteria for identifying Steam Cooling being required are discussed in the basis for Contingency #3. The Steam Cooling procedure involves depressurizing the RPV, which is contrary to actions in the Reactor Pressure portion of this procedure. Under these conditions, the operator must exit Section RP of RPV Control.

When exiting RPV Control Section RP to C3, the pressure control strategy is changing such that stabilizing pressure or cooling down will be suspended, and pressure control will be by SRVs in auto.

STEP:

Is any SRV cycling?

Yes → Manually open SRVs until RPV pressure drops to 960 psig

No ↓

While executing the following steps:

IF	THEN
Suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit (Figure RPV-8)	Maintain RPV pressure below the Heat Capacity Temperature Limit (Figure RPV-8) irrespective of the resulting RPV cooldown rate
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure RPV-9)	Maintain RPV pressure below the SRV Tail Pipe Level Limit (Figure RPV-9) irrespective of the resulting RPV cooldown rate
▲ Steam cooling is required	Exit section RP of this procedure and enter C3, Steam Cooling
❖ 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 the MSIVs (or prevent MSIV closure), and reestablish the main condenser as a heat sink (EOP-6, Att 10) ☛ Bypass IAS and defeat low RPV water level MSIV isolation interlocks, if necessary (EOP-6, Att 10)

(B)

Stabilize RPV pressure below 1037 psig using the main turbine bypass valves.

☛ Augment RPV pressure control with the systems listed below, if necessary.

DISCUSSION:

This step is an override and applies throughout the remainder of section RP. This step is entered as the result of a "NO" response to whether SRVs were cycling or after reducing RPV pressure to 960 psig.

The purpose of this step is to provide a means to minimize heat addition to the suppression pool via the SRVs when a failure-to-scram event has occurred. To stabilize reactor pressure, the reactor steam generation rate must be within the capacity of systems designed to remove steam from the RPV. If the reactor is not shutdown, the amount of steam that must be relieved to the suppression pool could be substantial. If this heat is discharged to the suppression pool, the Heat Capacity Temperature Limit (Figure RPV-8) could be reached in a very short period of time.

Under these circumstances, the utilization of the main condenser as a heat sink is of sufficient importance to warrant opening of the Main Steam Isolation Valves (MSIVs) even if automatic closure for low RPV water level has to be bypassed. This override permits bypassing of the low, low, low RPV water level portion of the MSIV isolation logic. Other MSIV isolation interlocks are not bypassed because they provide automatic protection for situations where reopening of the MSIVs is not appropriate such as the main steam line (MSL) high radiation isolation, indicating a fuel element failure, or the MSL high flow isolation, indicating a MSL break.

DISCUSSION: (Continued)

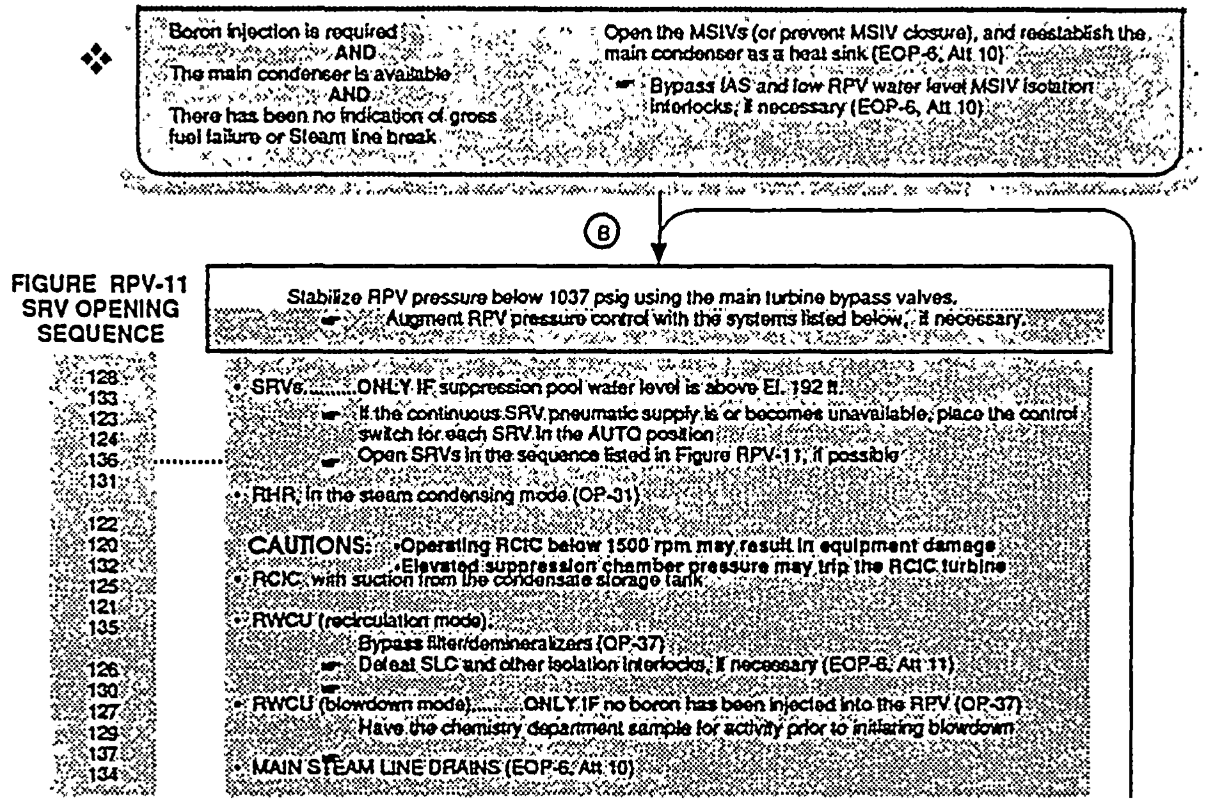
In addition, authorization is provided to override interlocks which prevent the restoration of the Instrument Air Supply (IAS) to the MSIV actuators.

Gross fuel failure is defined as either of the following conditions:

- A reading of equal to or greater than three times normal full power background on the MSL rad monitors or,

- Coolant activity increase of at least three times normal full power levels.

STEP:



DISCUSSION:

This step is entered after preventing SRVs from cycling, if required, and as directed from future references in Section RP to return to point B. The operator is given a desired pressure control value to remain below and the preferred systems for doing so. Following a successful scram, the Electrohydraulic Control (EHC) System should be able to control RPV pressure at the required pressure setpoint with no operator action. This step reminds the operator to take action to maintain RPV pressure below the scram setpoint of 1037 psig, if EHC does not automatically function to control RPV pressure. Controlling below 1037 psig allows resetting the scram (barring other scram signals) and provides sufficient margin to SRV lift setpoints. Main turbine bypass valves are the preferred flowpath allowing the main condenser to be utilized as the heat sink.

STEP:

FIGURE RPV-11
SRV OPENING SEQUENCE

128
133
123
124
136
131

122
120
132
125
121
135

126
130
127
129
137
134

Stabilize RPV pressure below 1037 psig using the main turbine bypass valves.
- Augment RPV pressure control with the systems listed below, if necessary.

- SRVs.........ONLY IF suppression pool water level is above El. 192 ft.
  - Bypass LOCA isolation interlocks and reopen IAS supply valves, if necessary (2IAS*SOV164, 165, 166, 184)
  - If the continuous SRV pneumatic supply is or becomes unavailable, place the control switch for each SRV in the AUTO position
  - Open SRVs in the sequence listed in Figure RPV-11, if possible
- RHR, in the steam condensing mode (OP-31)

CAUTIONS: •Operating RCIC below 1500 rpm may result in equipment damage
•Elevated suppression chamber pressure may trip the RCIC turbine

- RCIC with suction from the condensate storage tank, if available (EOP-6, Att 4)
- RWCU (recirculation mode).
  - Bypass filter/demineralizers (OP-37, Section H.5.0)
  - Defeat SLC and other isolation interlocks, if necessary (EOP-6, Att 11)
- RWCU (blowdown mode)..........ONLY IF no boron has been injected into the RPV (OP-37, Sections H.5.0 and H.3.0)
  - Have the chemistry department sample for activity prior to initiating blowdown
- MAIN STEAM LINE DRAINS (EOP-6, Att 10)

WAIT until:
All control rods are inserted to at least position 02
OR
The reactor will remain shutdown without boron

DISCUSSION:

If the main turbine bypass valves cannot be used or are not able to maintain RPV pressure below 1037 psig, additional systems must be used to augment RPV pressure control. No prioritization is implied regarding the order of this list.

The operator is cautioned to use SRVs only if suppression pool level is above 192 feet to ensure that the T-Quenchers are submerged and to prevent a rapid pressurization of the Primary Containment if steam is admitted via uncovered SRV T-quenchers. If the SRV continuous pneumatic supply cannot be unisolated or is otherwise lost, the SRVs can be manually opened a limited number of times. The pneumatic supply is, therefore, conserved for possible Emergency Depressurization with the SRVs left aligned to open in the "relief" mode. When manual SRV actuation is required, a preferred opening sequence is designated to distribute heat uniformly throughout the suppression pool and to evenly distributes the number of cycles among all the SRVs.

Bypassing LOCA isolation logic and reopening IAS supply valves if required promotes more stable pressure control if SRVs are used for stabilizing pressure and prolongs the availability of SRVs should they be required for RPV cooldown or emergency depressurization.

Operating RHR in the steam condensing mode removes decay heat through the condensing of reactor steam and RCIC turbine operation.

DISCUSSION: (Continued)

Operating RCIC with suction from the condensate storage tank can provide makeup to the RPV as well as remove decay heat through RCIC turbine operation.

The operator is alerted that operating the RCIC turbine at speeds less than 1500 rpm could result in system damage.

The operator is reminded that the RCIC turbine may trip due to elevated pressure in the suppression chamber. This would result in the inability to inject water to the RPV with the low volume RCIC system.

When operating Reactor Water Cleanup (RWCU) in the recirculation mode, the filter/demineralizers are bypassed to minimize boron depletion/removal if boron injection is required, and to prevent chemical breakdown of the demineralizer resins by overheating. Since operation of RWCU in the recirculation mode does not remove coolant inventory from the RPV, overriding interlocks and system operation during boron injection is authorized.

RWCU blowdown mode is not used if boron has been injected to prevent dilution of boron, since this method requires an external source of RPV makeup. Additionally, prior to RWCU blowdown, the reactor coolant must be sampled and analyzed for activity.

STEP:

127 129 137 134

- RWCU (blowdown mode)..........ONLY IF no boron has been injected into the RPV (OP-37)
  - ☛ Have the chemistry department sample for activity prior to initiating blowdown
- MAIN STEAM LINE DRAINS (EOP-6, Att 10)

↓

WAIT until

All control rods are inserted to at least position 02
OR
The reactor will remain shutdown without boron
OR
If boron is being injected, SLC tank level drops to 900 gallons
(769 pounds injected)
OR
The reactor is shutdown and no boron has been injected

↓

While executing the following steps:

IF	THEN
The reactor is not shutdown	Return to (B)

DISCUSSION:

This step ensures that RPV depressurization and cooldown will not proceed until the reactor is shutdown by the existence of one of four conditions.

The first condition (All control rods are inserted to at least position 02) requires that all control rods be inserted to or beyond position 02, the Maximum Subcritical Banked Withdrawal Position. If this criteria is met, control rod insertion alone assures the reactor will remain shutdown.

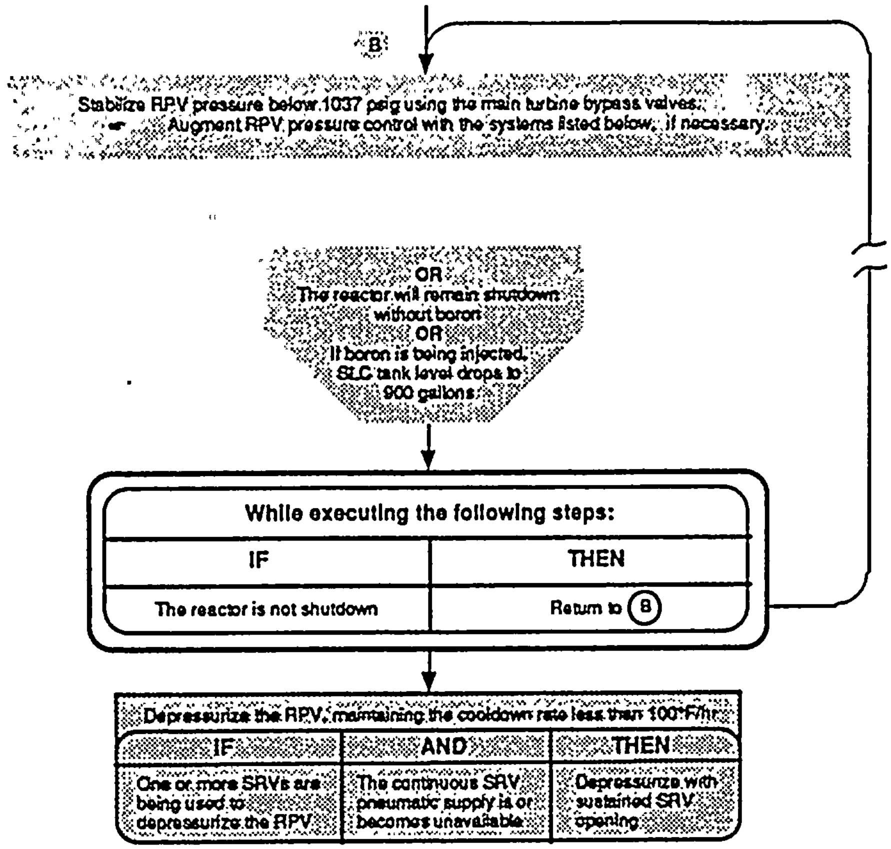
The second condition (The reactor will remain shutdown without boron) addresses the condition where, even though all control rods may not be inserted to or beyond position 02, it has been determined that the reactor will remain shutdown for all possible conditions without reliance on boron injection. Criteria for the determination that the reactor is shutdown may include the existence of the required shutdown margin with the most reactive control rod full out and all other control rods full in.

The third condition (If boron is being injected, SLC tank level drops to 900 gallons) requires that SLC tank level be reduced to 900 gallons by injection to the RPV. This corresponds to the injection of the Cold Shutdown Boron Weight into the RPV. The Cold Shutdown Boron Weight is defined to be the minimum weight of soluble boron, which if injected into the RPV and mixed uniformly, will maintain the reactor shutdown under all conditions. This weight is utilized to ensure the reactor will remain shutdown irrespective of control rod position or RPV temperature. 769 pounds is also included should alternate boron injection methods not utilize the SLC tank (RWCU).

DISCUSSION: (Continued)

If no boron has been injected into the RPV, depressurization and cooldown may proceed as long as control rod insertion is sufficient to shut down the reactor. Such action is permitted even though the existing margin to criticality is small. A return to criticality under these conditions is acceptable because termination of the cooldown will stop the reactor power increase. For purposes of this step, shutdown is defined as the reactor is subcritical below the heating range.

STEP:



DISCUSSION:

This override is in effect while depressurizing and cooling the RPV to cold shutdown conditions.

The positive reactivity added during cooldown may return the reactor to criticality. Returning to point B, terminates the cooldown and stabilizes RPV pressure until the reactor can again be shutdown.

STEP:

While executing the following steps:	
IF	**THEN**
The reactor is not shutdown	Return to (B)

Depressurize the RPV, maintaining the cooldown rate less than 100°F/hr

IF	AND	THEN
One or more SRVs are being used to depressurize the RPV	The continuous SRV pneumatic supply is or becomes unavailable	Depressurize with sustained SRV opening

(C)

DISCUSSION:

The operator is directed at this time to depressurize the RPV ensuring that the Technical Specification cooldown rate is observed to maintain RPV metal ductility limits. The cooldown rate is also controlled to avoid an inadvertent, rapid return to criticality.

STEP:

Depressurize the RPV, maintaining the cooldown rate less than 100°F/hr.

IF	AND	THEN
One or more SRVs are being used to depressurize the RPV	The continuous SRV pneumatic supply is or becomes unavailable	Depressurize with sustained SRV opening

C

WAIT until:

The Shutdown Cooling RPV pressure interlocks clear (RPV pressure below 128 psig) AND either:

All control rods are inserted to at least position 02
OR
The reactor will remain shutdown without boron

DISCUSSION:

Sustained SRV opening conserves pneumatic accumulator pressure, when the source of pressure to the SRV pneumatic supply system is isolated or otherwise out of service and cannot be restored. This action preserves SRV long term availability should plant conditions degrade and SRVs are later required for rapid RPV depressurization. The term 'continuous' includes any backup or alternate means of pressurizing the pneumatic SRV supply system in addition to the permanent source. 'Sustained' means prolonged opening in this case within the constraints of the T.S. CDR limit.

STEP:

Depressurize the RPV, maintaining the cooldown rate less than 100°F/hr.

IF	AND	THEN
One or more SRVs are being used to depressurize the RPV	The continuous SRV pneumatic supply is or becomes unavailable	Depressurize with sustained SRV opening

Ⓒ

WAIT until:

The Shutdown Cooling RPV pressure interlocks clear (RPV pressure below 128 psig) AND either:

All control rods are inserted to at least position 02
OR
The reactor will remain shutdown without boron.

DISCUSSION:

Section RP is entered at this point from the following Contingencies:

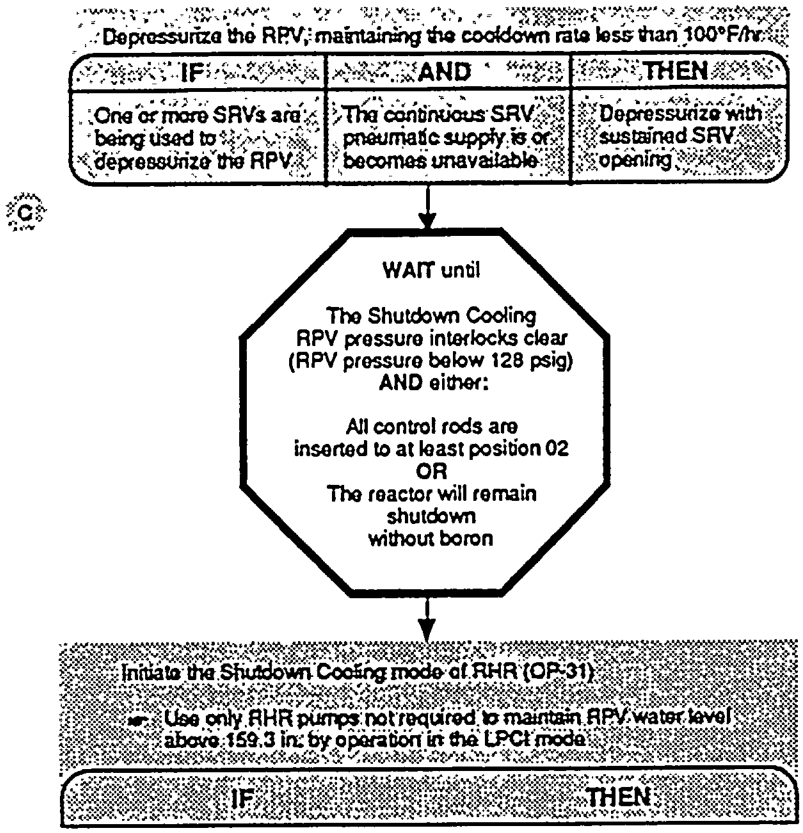
C2, Emergency RPV Depressurization

- After the Emergency RPV Depressurization has been conducted, the operator is directed to exit C2 and proceed to this point.

C4, RPV Flooding

- If RPV water level can be determined and any control rod cannot be determined to be inserted to or beyond position 02 and it has not been determined that the reactor will remain shutdown under all conditions without boron.
- If RPV water level can be determined and all control rods can be determined to be inserted to or beyond position 02 or it has been determined that the reactor will remain shutdown under all conditions without boron.
- If no SRV is open OR RPV pressure can not be raised above the Minimum Alternate RPV Flooding Pressure (Figure C4-2).
- If less than 4 SRVs are open OR RPV pressure cannot be maintained at least 61psig above suppression chamber pressure.
- When RPV level is lowered, following RPV flooding and RPV level indication is restored within the Maximum Core Uncovery Time Limit.

STEP:

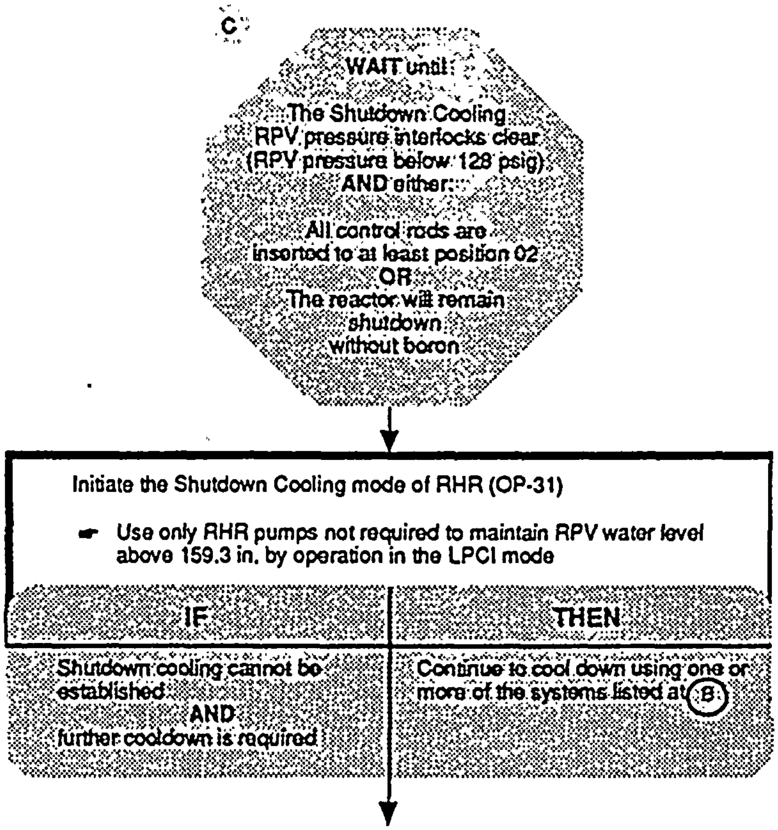


DISCUSSION:

Operation of the shutdown cooling mode of RHR is the normal method of conducting a controlled cooldown of the RPV to cold shutdown conditions. It is appropriate now to wait until the high pressure shutdown cooling interlock clears. Section RP relies on Section RL to restore and maintain water level above the low water level shutdown cooling interlock.

Shutdown cooling is not initiated until the reactor is and will remain shutdown under all conditions without boron. This minimizes the potential for flushing boron from the core.

STEP:



DISCUSSION:

Maintaining RPV water level in the preferred water level band directed by Section RL takes priority over forced cooldown of the RPV. If operation of an RHR pump in the LPCI mode is not required to maintain RPV water level, it is permissible to use those RHR pumps in the shutdown cooling mode. Initiate shutdown cooling after the shutdown cooling high pressure interlock clears, and the reactor is and will remain shutdown under all conditions without boron.

STEP:

WAIT until

The Shutdown Cooling RPV pressure interlocks clear (RPV pressure below 128 psig)
AND either:

All control rods are inserted to at least position 02
OR
The reactor will remain shutdown without boron

↓

Initiate the Shutdown Cooling mode of RHR (OP-31)

- Use only RHR pumps not required to maintain RPV water level above 159.3 in. by operation in the LPCI mode

IF	THEN
Shutdown cooling cannot be established AND further cooldown is required	Continue to cool down using one or more of the systems listed at (B) above.

(D)

↓

Exit Section RP of this procedure and proceed to cold shutdown in accordance with OP-101C.

DISCUSSION:

If shutdown cooling cannot be established, continued RPV depressurization and cooldown may be accomplished using a combination of the systems listed in the previously identified step to augment RPV pressure control. As RPV pressure and temperature decrease, it may be necessary to re-evaluate the most appropriate method for continuing further pressure and temperature reduction.

STEP:

Initiate the Shutdown Cooling mode of RHR (OP-31)

- Use only RHR pumps not required to maintain RPV water level above 159.3 in. by operation in the LPCI mode

IF	THEN
Shutdown cooling cannot be established AND further cooldown is required	Continue to cool down using one or more of the systems listed at (B)

(D)

Exit Section RP of this procedure and proceed to cold shutdown in accordance with OP-101C

DISCUSSION:

Upon satisfying the requirements of the reactor shutdown on control rods, the operator is directed to OP-101C, where direction will be provided to bring the plant to cold shutdown.

STEP:

Section RQ

Monitor and control
REACTOR POWER

While executing the following steps:	
IF	**THEN**
All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	1. Terminate boron injection 2. Exit Section RQ of this procedure and enter OP-101C, Section H.1

DISCUSSION:

Since Sections RQ, RL, and RP are entered concurrently, irrespective of entry conditions, the possibility that no abnormal condition exists with respect to reactor power must be addressed. This step directs the operator to monitor and control reactor power via normal means. Following a successful scram, this includes trending the decrease in reactor power.

STEP:

Section RQ

Monitor and control
REACTOR POWER

While executing the following steps:

IF	THEN
All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	1. Terminate boron injection 2. Exit Section RQ of this procedure and enter OP-101C, Section H.1

Confirm or place the reactor mode switch in SHUTDOWN

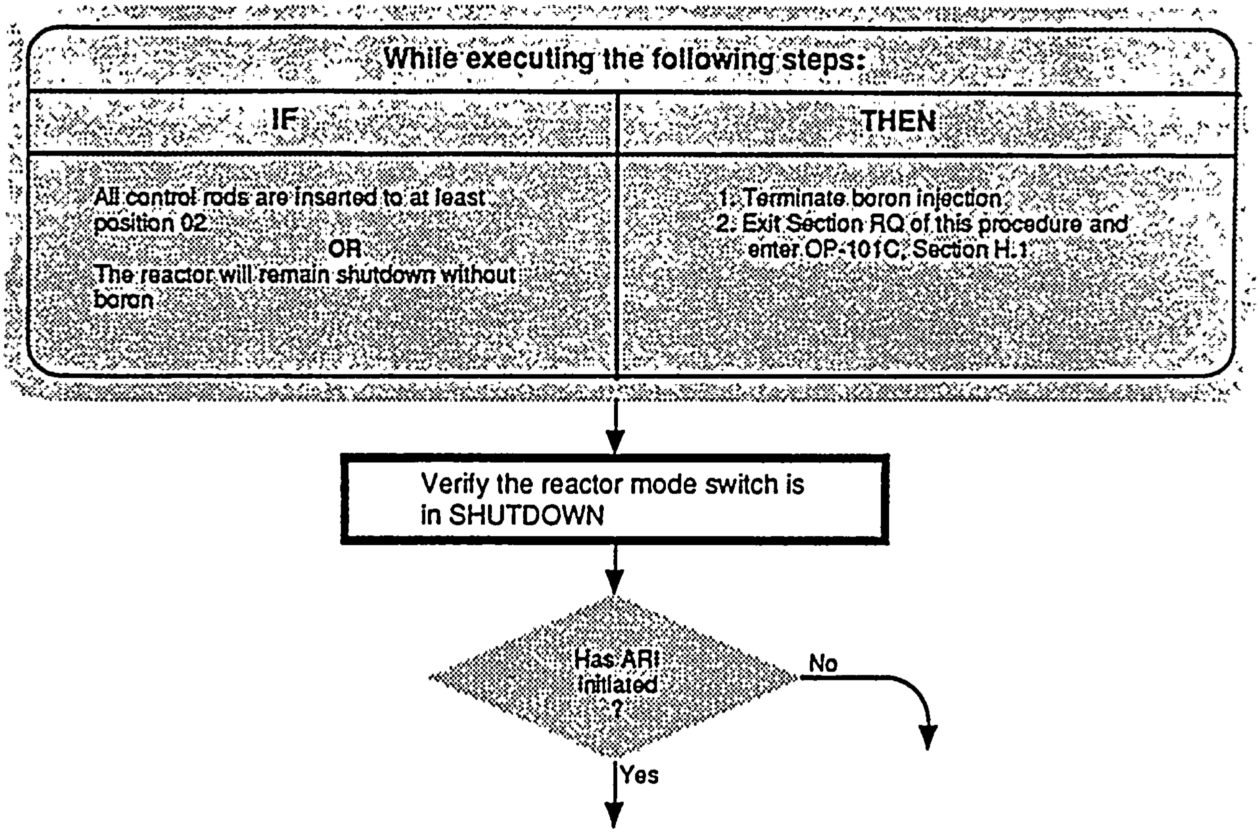
DISCUSSION:

This override step is applicable throughout the remainder of Section RQ.

The first condition addressed in this override is when all rods are inserted to or beyond position 02. If all control rods are inserted to or beyond the Maximum Subcritical Banked Withdrawal Position, it has been proven by analysis that the reactor is, and will remain, subcritical under all conditions. If this condition exists during the performance of RQ, it is appropriate to exit RQ and perform the normal shutdown actions specified in OP-101C.

The second condition addressed in this override is where all control rods may not be inserted to or beyond position 02 and Reactor Engineering has determined that the reactor will remain shutdown for all possible conditions of coolant temperature and boron concentration. If boron was injected into the RPV, actions to increase RPV water level could dilute or wash the boron from the core. Without sufficient negative reactivity from control rod insertion, a return to criticality could produce a power excursion and core damage. Criteria for the determination that the reactor is shutdown may include the existence of the required shutdown margin with the most reactive control rod full out and all other control rods full in. It is appropriate to end boron injection and perform the normal shutdown actions specified in OP-101C.

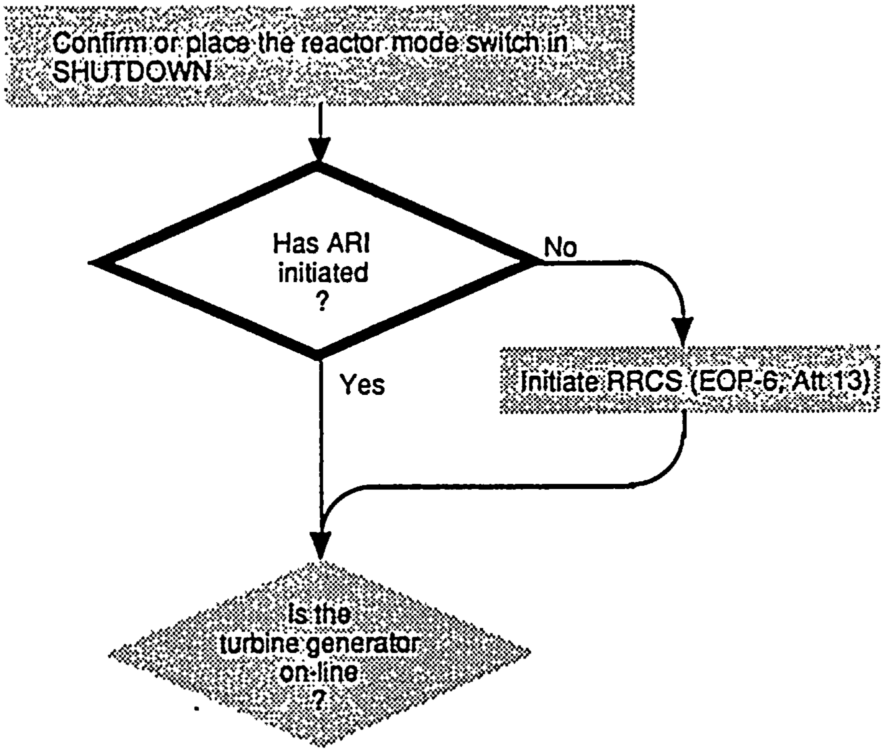
STEP:



DISCUSSION:

The operator is instructed to place the reactor mode switch to the SHUTDOWN position, which will insert a "back-up" scram signal in the RPS logic. If a failure-to-scram ėvent has occurred, this action can quickly terminate the event. Taking the mode switch out of the RUN position may also preclude a MSIV isolation due to low steam line pressure. This will simplify RPV pressure control and minimize heat added to the suppression pool, by maintaining the main condenser as the heat sink.

STEP:



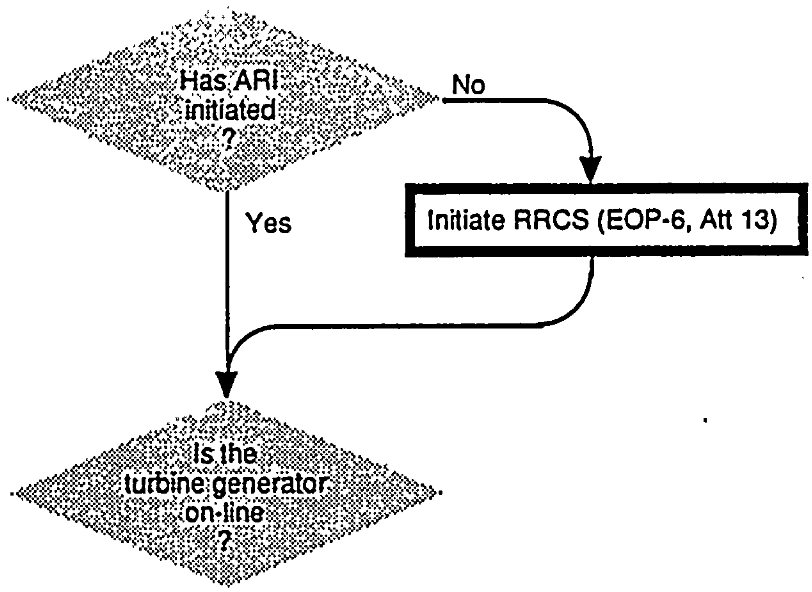
DISCUSSION:

This step has the operator evaluate the present status of the Alternate Rod Insertion (ARI) System, to ensure that an independent and redundant scram signal has been generated.

If ARI has initiated, as indicated by a "YES" response to this step, an independent and redundant scram signal has been generated. The operator is, therefore, directed to continue in this procedural leg where additional actions to lower reactor power level, if required, are addressed.

If ARI has not initiated, as indicated by a "NO" response to this step, an independent and redundant scram signal has not been generated. The operator is, therefore, directed to continue in this procedural leg where actions to initiate ARI, by initiating RRCS, are addressed.

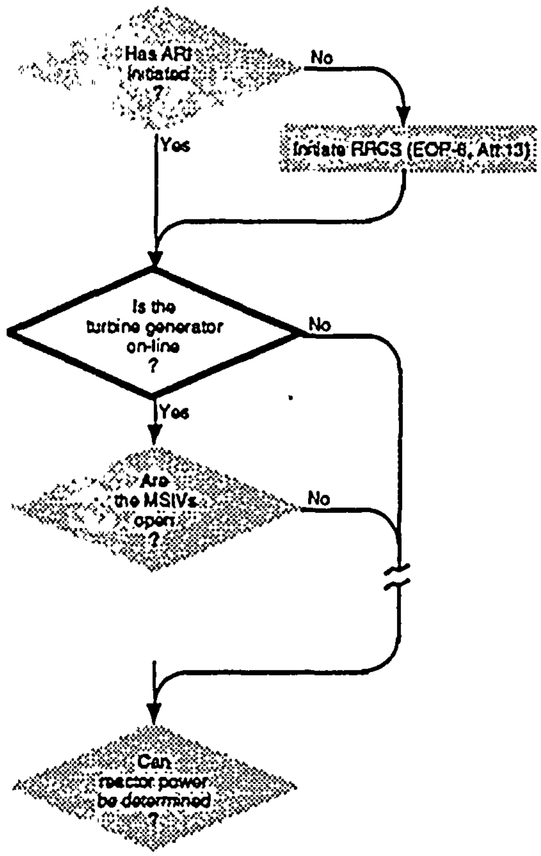
STEP:



DISCUSSION:

Initiation of Redundant Reactivity Control System (RRCS) actuates the ARI System, which then independently depressurizes the scram air header and re-aligns the scram discharge volume vent and drain valves to effect a reactor scram, if these actions have not already occurred. If after 98 seconds reactor power is above 4%, automatic SLC injection will commence. At this point, Bpron Injection Is Required. If automatic SLC injection fails to start and reactor power is above 4%, manual SLC injection is required.

STEP:



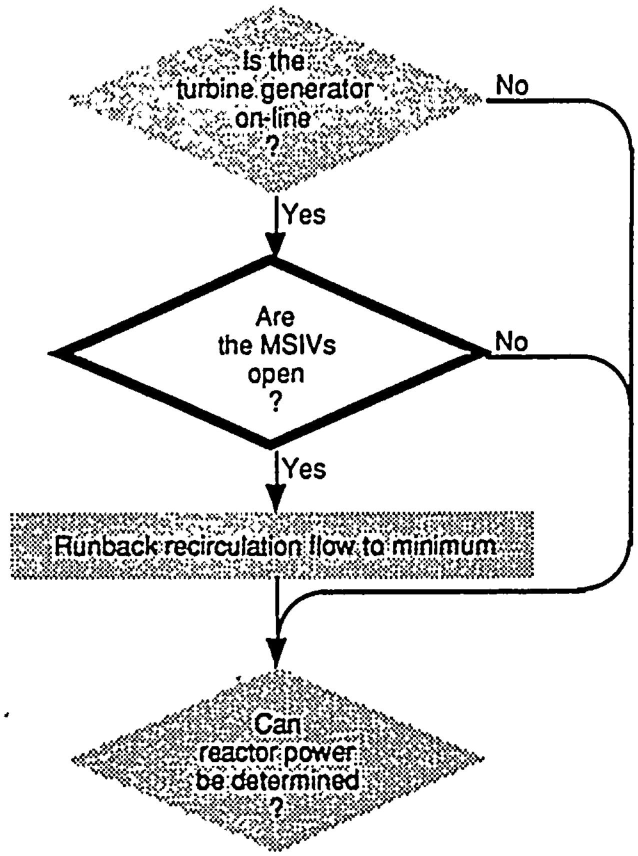
DISCUSSION:

This step has the operator evaluate the present status of the main turbine-generator. This evaluation is made prior to directing actions to trip the recirculation pumps in order to prevent a turbine trip (and its associated complications) at high reactor power levels. Recirculation pumps will not be tripped if this action would result in a turbine trip.

If the turbine-generator is on-line, as indicated by a "YES" response to this step, a turbine trip could occur if recirculation pumps are tripped. To avoid the complications associated with a turbine trip at high reactor power levels, the operator is directed to continue in this procedural leg where the status of the Main Steam Isolation Valves (MSIVs) will be evaluated.

If the turbine-generator is not on-line, as indicated by a "NO" response to this step, a turbine trip is of no concern. The operator is directed to continue in this procedural leg where the status of reactor power level will be evaluated, to determine if recirculation pump trip is warranted.

STEP:



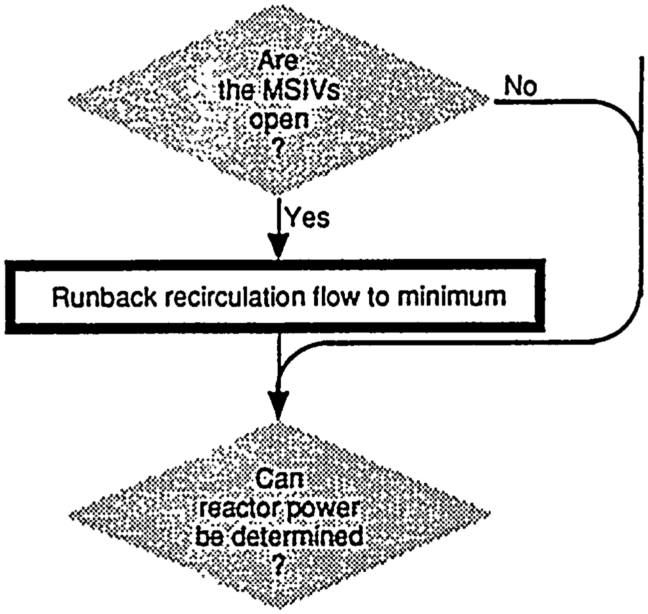
DISCUSSION:

This step has the operator evaluate the present status of the MSIVs. This evaluation is made prior to directing actions to trip the recirculation pumps in order to prevent a turbine trip (and its associated complications) at high reactor power levels. Recirculation pumps will not be tripped if this action would result in a turbine trip.

If the MSIVs are open, as indicated by a "YES" response to this step, a turbine trip may occur if recirculation pumps are tripped. To avoid the complications associated with a turbine trip at high reactor power levels, the operator is directed to continue in this procedural leg where actions to runback recirculation pump speed, prior to initiating a recirculation pump trip, are addressed.

If the MSIVs are not open, as indicated by a "NO" response to this step, a turbine trip is of no concern. The operator is directed to continue in this procedural leg where the status of reactor power level will be evaluated, to determine if a recirculation pump trip is warranted.

STEP:



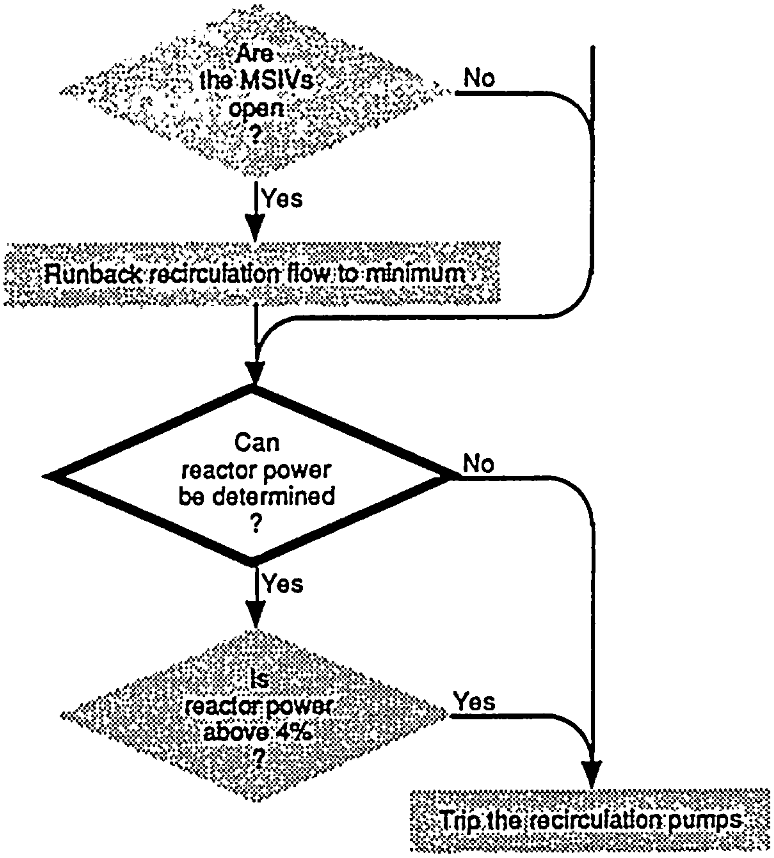
DISCUSSION:

An immediate and rapid reduction in reactor power will result from reducing reactor coolant recirculation flowrate. The more rapid the flowrate reduction, the more rapid the reactor power reduction. The quickest reactor power reduction is achieved by tripping the recirculation pumps. However, if the recirculation pump trip is initiated from a high reactor power level, the resulting plant transient may cause a turbine trip, due to the rapid changes in steam flow, RPV pressure, and RPV water level. If reactor power is above the turbine bypass valve capacity and the turbine trips, RPV pressure will increase until one or more SRVs open. Heatup of the suppression pool begins and if not adequately controlled, boron injection may ultimately be required.

To avoid a turbine trip and its associated complications, a recirculation flow runback is performed prior to tripping the recirculation pumps in order to effect a more controlled reduction in reactor power. Flow should not be reduced to the point at which core flow enters the T.S. restricted zone.

If an automatic recirculation flow runback has already occurred, the operator need only confirm the action.

STEP:



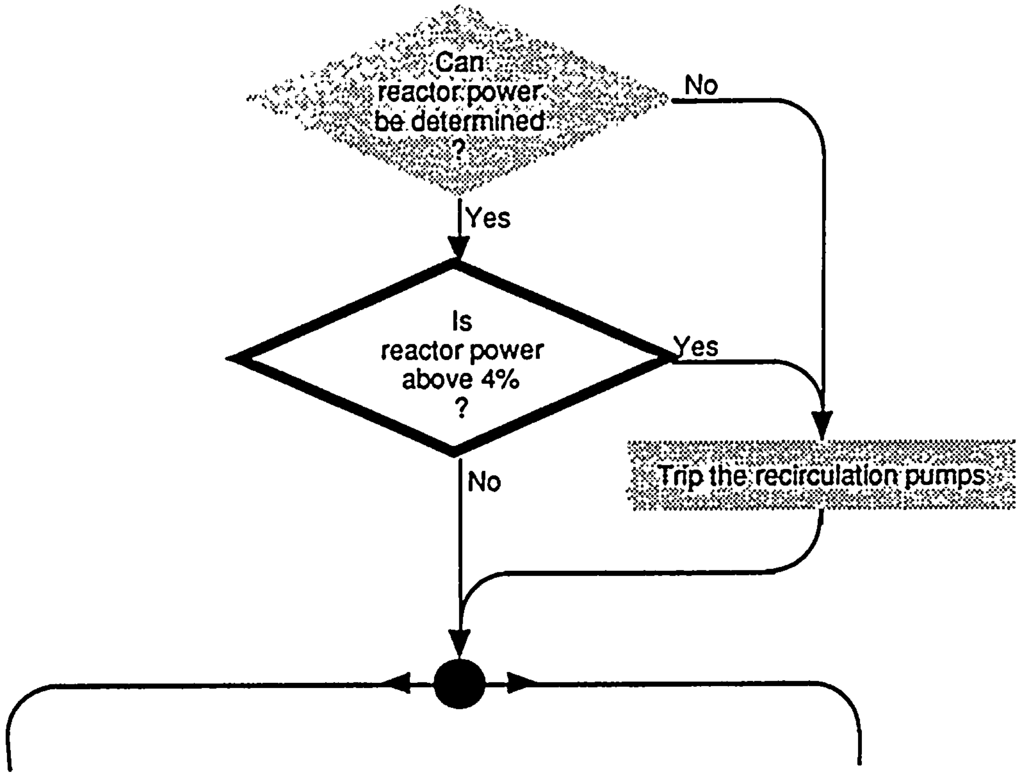
DISCUSSION:

This step asks the operator if reactor power indications are available to determine if a recirculation pump trip is warranted.

If reactor power can be determined, as indicated by a "YES" response to this step, a recirculation pump trip may be directed. The operator is, therefore, directed to continue in this procedural leg where additional actions will be directed based on the present value of reactor power.

If reactor power cannot be determined by any means, as indicated by a "NO" response to this step, a recirculation pump trip is warranted. The operator is, therefore, directed to continue in this procedural leg where actions to trip the recirculation pumps are addressed.

STEP:



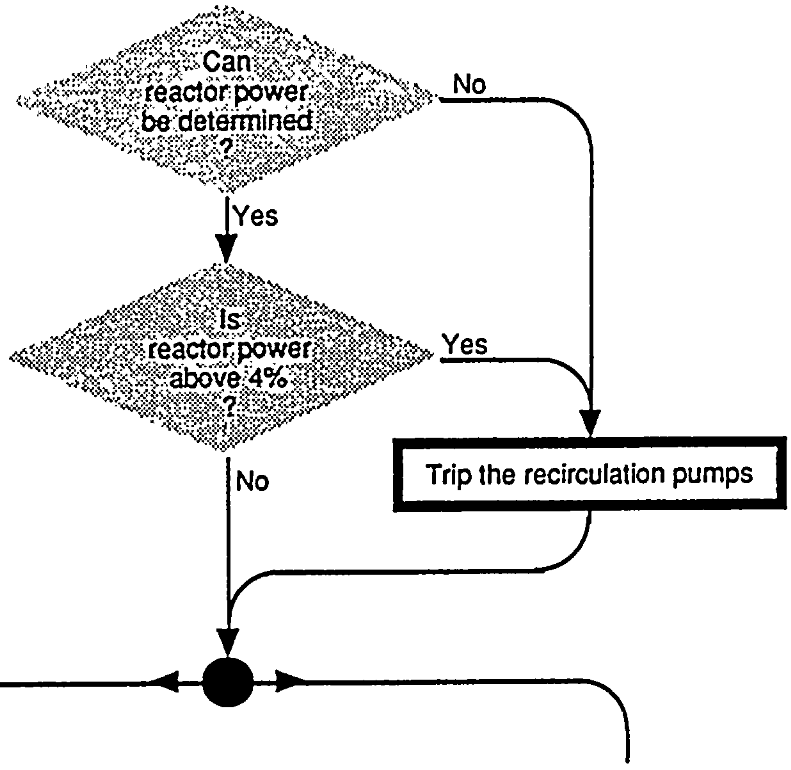
DISCUSSION:

This step asks the operator what the present value of reactor power indication is, to determine if a recirculation pump trip is warranted.

If reactor power can be determined to be above 4% (the APRM downscale trip setpoint), as indicated by a "YES" response to this step, a recirculation pump trip is required. The operator is, therefore, directed to continue in this procedural leg where actions to trip the recirculation pumps are addressed.

If reactor power is not above the APRM downscale trip setpoint (4%), as indicated by a "NO" response to this step, a recirculation pump trip is not warranted. Below 4% reactor power, a trip would result in little, if any reduction in reactor power. The operator is, therefore, directed to continue in this procedural leg where additional actions to reduce reactor power if required, are addressed.

STEP:

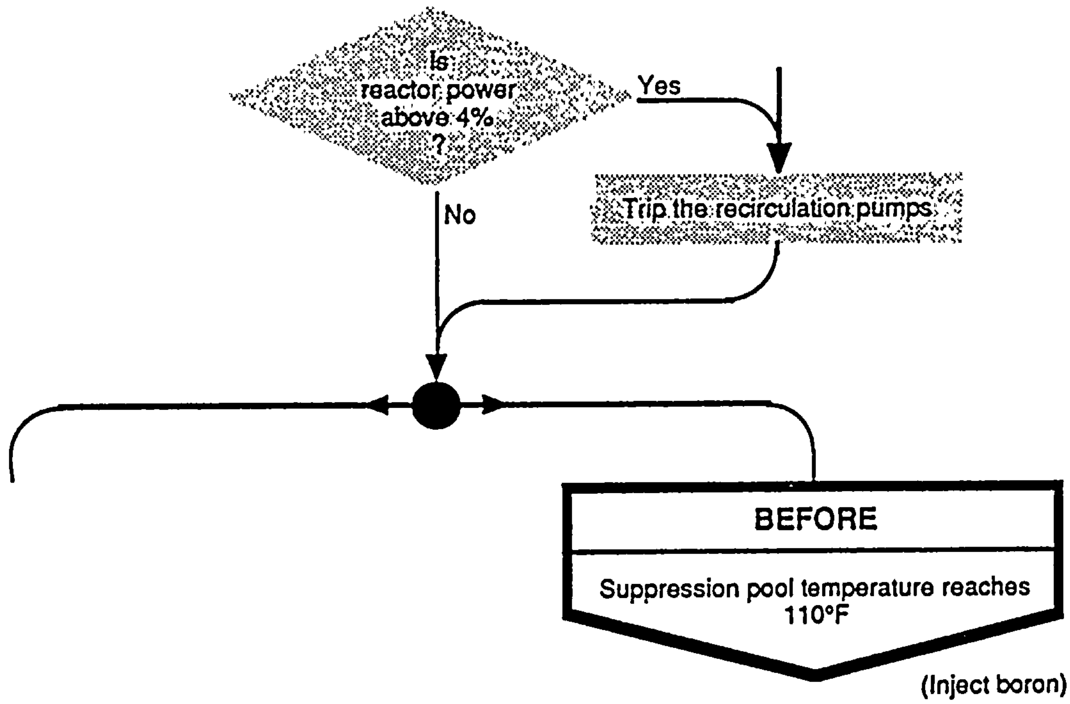


DISCUSSION:

The step directs the operator to trip the reactor recirculation pumps. Tripping the recirculation pumps with reactor power above 4% (the APRM downscale trip setpoint) effects a prompt reduction in reactor power.

If boron injection is later required, tests have shown that natural circulation flow in the core will ensure adequate boron mixing.

STEP:



DISCUSSION:

The following steps concern continued actions to reduce reactor power. One leg addresses additional actions to attempt to insert control rods to shutdown the reactor, the other leg provides actions for using boron injection systems to shutdown the reactor.

The operator must utilize his judgement and analysis of current plant conditions to concurrently execute both flowpaths as conditions permit.

STEP:

Insert control rods using one or more of the following methods (EOP-6, Att 14):

- Reset ARI
  - ☛ Defeat logic trips, if necessary
- De-energize the scram solenoids
  - ☛ Power source select switch
  - ☛ Individual scram test switches
- Vent the scram air header
- Manually initiate additional scrams
  - ☛ Reset the scram, defeat RPS logic, if necessary
  - ☛ Drain the scram discharge volume
  - ☛ Initiate a manual scram
- Drive control rods
  - ☛ Defeat RSCS and RWM interlocks if necessary
- Vent control rod drive overpiston volumes

DISCUSSION:

This step directs the operator to insert control rods using one or more of the identified methods. The order of alternate methods for inserting the control rods in the list does not imply any priority. Plant design considerations and information available to the operator during the event dictate the sequence in which the alternate control rod insertion methods are to be performed.

A discussion of each of the listed alternate control rod insertion methods follows:

Reset ARI; defeat logic trips if necessary

Since the initiation of ARI (directed above) restricts other methods of inserting control rods, it is appropriate to defeat initiation signals which would otherwise prevent resetting ARI.

De-energize the scram solenoids

If all scram valves are already open, this method is not useful.

This method is best employed if the scram relays fail to open. To be effective, this method must be accomplished before the scram discharge volume is pressurized (from bypass leakage on those control rods which did scram) to prevent further control rod movement.

Removing fuses or opening circuit breakers in the scram solenoid valve power supply

DISCUSSION: (Continued)

circuit is the preferred method to de-energize the scram solenoids. At NMP2 this is performed by cycling the Alternate Power Selector switch. The alternate method is by use of individual scram test switches.

This method acts on a single control rod at a time, but can be performed quickly to many control rods. If the scram can be reset, this method may be more effective than a full core scram because the total available differential pressure of the CRD hydraulic system is applied to the single selected control rod. Since the scram discharge volume vent and drain valves remain open, the maximum differential pressure is applied over the full travel of the control rod. Also, the rate of water lost from the RPV through a single control rod drive mechanism is small.

Other methods, such as de-energizing the entire RPS bus, could result in loss of APRM indication and MSIV closure. Removal of fuses supplying the scram relay control circuit is not desirable because this only de-energizes the scram relay without interrupting the power supply to the solenoids. Sticking relays or welded contacts could continue to supply power to the scram solenoids even though the scram relays are de-energized.

Vent the scram air header

This method is effective only when one or more scram valves did not open and the HCU area is accessible. This method will allow those valves to open which are still being held closed by air pressure. This method will not open valves that are mechanically prevented from opening. To be effective, the scram air header must be depressurized before the scram discharge volume is pressurized (from bypass leakage on control rods which did scram) to prevent further control rod movement.

Manually initiate additional scrams; reset the scram; defeat RPS logic trips if necessary, drain the scram discharge volume and initiate a manual scram

This method may be effective when control rods are: (1) stuck, (2) reactor pressure and accumulator pressure are not sufficient to effect a full control rod scram, or (3) the scram system functioned but did not result in full control rod insertion.

Scram signals may exist due to other plant conditions. These RPS logic signals must be defeated to allow the scram to be reset.

A reactor scram is manually repeated as long as control rod insertion occurs. Each time prior to initiating the manual scram, the scram discharge volume must be drained and the accumulators charged.

Drive control rods; defeat RSCS and RWM interlocks if necessary

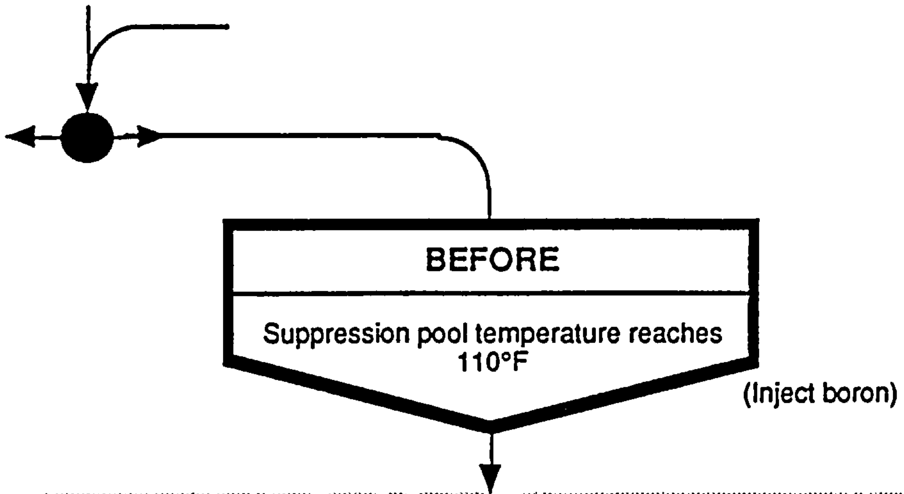
This method is best applied when only: (1) a few control rods cannot be inserted, (2) alternate methods are being performed which cannot be performed continuously, (3) the scram cannot be reset, or (4) individual control rod scrams are not effective. To assist in driving individual control rods, it is possible to maximize drive pressure by starting an additional CRD pump or by shutting the HCU accumulator charging water header stop valve if the scram cannot be reset. Increasing the flow controller to maximum may also result in increased control rod insertion speeds.

DISCUSSION: (Continued)

Vent control rod drive overpiston volumes

This method maximizes the differential pressure across the control rod drive piston and is normal practice when control rod drive maintenance is required. During an operational event which necessitates the use of this method, the operator is reminded that the discharged coolant could be hot (RPV temperature) and radioactive. Access to the HCU area is required.

STEP:



IF	THEN
The reactor cannot be shutdown	BORON INJECTION IS REQUIRED • Inject boron into the RPV with SLC (EOP-6, Att 15) • Place the ADS logic inhibit switches in ON
Boron cannot be injected with SLC	Inject boron using the hydro pump (EOP-6, Att 15)

❖Section RP

DISCUSSION:

This step directs the operator to initiate the actions in this procedural leg before suppression pool temperature reaches the Boron Injection Initiation Temperature (110°F).

As long as the core remains submerged (the preferred method of core cooling), fuel integrity and RPV integrity are not directly challenged, even under failure-to-scram conditions. A failure-to-scram coupled with an MSIV isolation can result in a rapid heatup of the suppression pool. Steam discharged from the RPV to control pressure is directed through the SRVs into the suppression pool, resulting in heating up the suppression pool. To prevent the potential failure of the primary containment, which may result from overheating of the suppression pool water, boron injection is required to shutdown the reactor.

If suppression pool temperature and RPV pressure cannot be maintained below the Heat Capacity Temperature Limit (Figure RPV-8, refer to Section C), rapid depressurization of the RPV will be required. To avoid depressurizing the RPV with the reactor at power, it is desirable to shutdown the reactor prior to reaching the Heat Capacity Temperature Limit. Subsequent actions in this procedural leg direct boron injection to shutdown the reactor thus minimizing the quantity of heat rejected to the suppression pool.

DISCUSSION: (Continued)

The Boron Injection Initiation Temperature (Figure RPV-11, refer to Section C) is defined to be the greater of either: (1) the suppression pool temperature at which initiation of a reactor scram is required by Technical Specifications, OR, (2) the highest suppression pool temperature at which initiation of boron injection using SLC will result in injection of the Hot Shutdown Boron Weight of boron before suppression pool temperature exceeds the Heat Capacity Temperature Limit.

The second criterion is a function of reactor power; a higher reactor power level results in more heat energy rejected to the suppression pool. Thus boron injection is required at a lower suppression pool temperature to prevent exceeding the Heat Capacity Temperature Limit before reactor shutdown is achieved.

If a valid RRCS signal results in an automatic SLC initiation, then Boron Injection is required and all appropriate actions as directed by the EOPs must be taken.

STEP:

BEFORE

Suppression pool temperature reaches 110°F

(Inject boron)

IF	THEN
The reactor cannot be shutdown	BORON INJECTION IS REQUIRED • Inject boron into the RPV with SLC (OP-36A, Section H.1) • Place the ADS logic inhibit switches in ON
Boron cannot be injected with SLC	Inject boron using the hydro pump (EOP-6, Att 15)

❖Section RP

While executing the following steps:

IF	THEN
SLC tank water level drops to 0 gallons	Verify automatic trip of SLC pumps

DISCUSSION:

This step directs the operator to inject boron into the reactor with the Standby Liquid System (SLC) to shutdown the reactor. The SLC system injects boron into the RPV. The boron in solution absorbs neutrons, providing negative reactivity to shutdown the reactor.

Note that the "BEFORE" step which precedes this step specifically permits SLC initiation before suppression pool temperature actually reaches the Boron Injection Initiation Temperature (110°F).

ADS initiation may result in the injection of large amounts of relatively cold, unborated water from low pressure injection systems. With the reactor still critical or shutdown on boron, the positive reactivity addition due to boron dilution and temperature reduction from the injection of cold water may result in a reactor power excursion large enough to cause substantial core damage. Defeating ADS is, therefore, appropriate whenever boron injection is required.

Placing the ADS logic switches in "ON" is the approved NMP2 method for preventing automatic initiation. If depressurization of the RPV is subsequently required, explicit direction is provided in the appropriate EOP. Thus, any requirement to maintain the automatic initiation capability of ADS is not required.

STEP:

BEFORE
Suppression pool temperature reaches 110°F

(Inject boron)

IF	THEN
The reactor cannot be shutdown	BORON INJECTION IS REQUIRED • Inject boron into the RPV with SLC (EOP-6, Att 15) • Place the ADS logic inhibit switches in ON
Boron injection is required AND Boron cannot be injected with SLC	Inject boron with one or more of the following: • Hydro pump (EOP-6, Att 15) • RWCU (EOP-6, Att 19)

❖Section RP

While executing the following steps:

IF	THEN
SLC tank water level drops to 0 gallons	Verify automatic trip of SLC pumps

DISCUSSION:

Alternate methods of boron injection include the hydro pump and RWCU.

STEP:

IF	THEN
The reactor cannot be shutdown	BORON INJECTION IS REQUIRED • Inject boron into the RPV with SLC (EOP-6, Att 15) • Place the ADS logic inhibit switches in ON
Boron cannot be injected with SLC	Inject boron using the hydro pump (EOP-6, Att 15)

❖Section RP

While executing the following steps:

IF	THEN
SLC tank water level drops to 0 gallons	Verify automatic trip of SLC pumps

IF	THEN
RWCU is being used for RPV pressure control	Bypass filter/demineralizers

DISCUSSION:

This is an override step and applies throughout the performance of the remainder of the "SLC injection" portion of the reactor power control (RQ) leg.

Failure to secure the SLC pumps before the SLC pump suction inlet becomes uncovered may result in mechanical damage to the pumps. Tripping the SLC pumps at 0 gallons in the SLC tank preserves the availability of the SLC System, should operation of the system be needed again.

STEP:

While executing the following steps:

IF	THEN
SLC tank water level drops to 0 gallons	Verify automatic trip of SLC pumps

IF	THEN
RWCU is being used for RPV pressure control or boron injection	Bypass filter/demineralizers (OP-37, Section F.2.0)
RWCU is <u>not</u> being used for RPV pressure control or boron injection	Bypass filter/demineralizers or isolate the system

WAIT until:

All control rods are inserted to at least position 02
OR

DISCUSSION:

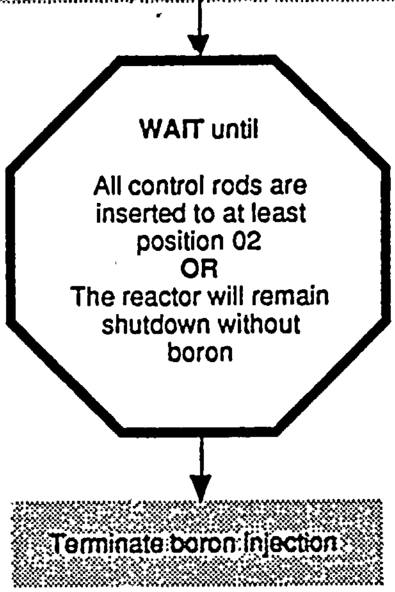
This step directs the operator to bypass the Reactor Water Cleanup (RWCU) filter/demineralizers if the RWCU System is not isolated while injecting boron into the RPV. RWCU would not be isolated while injecting boron if either it is used for boron injection or to support RPV pressure control.

Isolation of the RWCU system is desirable when boron is injected into the RPV for the following reasons: (1) the filter and demineralizer volume is not included in the calculation of the boron weight for reactor shutdown, (2) demineralizer action removes boron from the reactor coolant through ion exchange, and (3) boron may precipitate out in the relatively cool sections of RWCU System piping.

However, if the RWCU System must be used for RPV pressure control (Section RP of this procedure), the operator is directed to bypass the RWCU filter/demineralizers to prevent the removal of boron from the reactor coolant.

STEP:

IF	THEN
RWCU is being used for RPV pressure control	Bypass filter/demineralizers
RWCU is <u>not</u> being used for RPV pressure control	Bypass filter/demineralizers or isolate the system

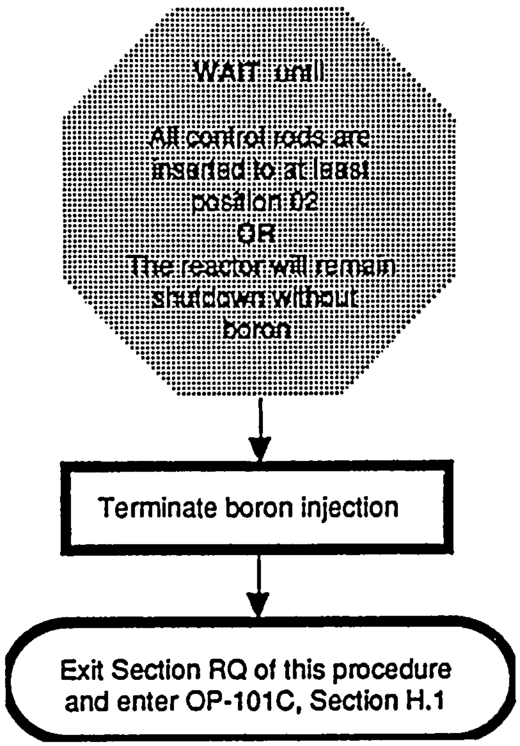


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent steps in this procedural leg until one of the stated conditions, has been met.

This ensures that the procedure is not exited and boron injection terminated until the reactor is shutdown and will remain shutdown on control rods.

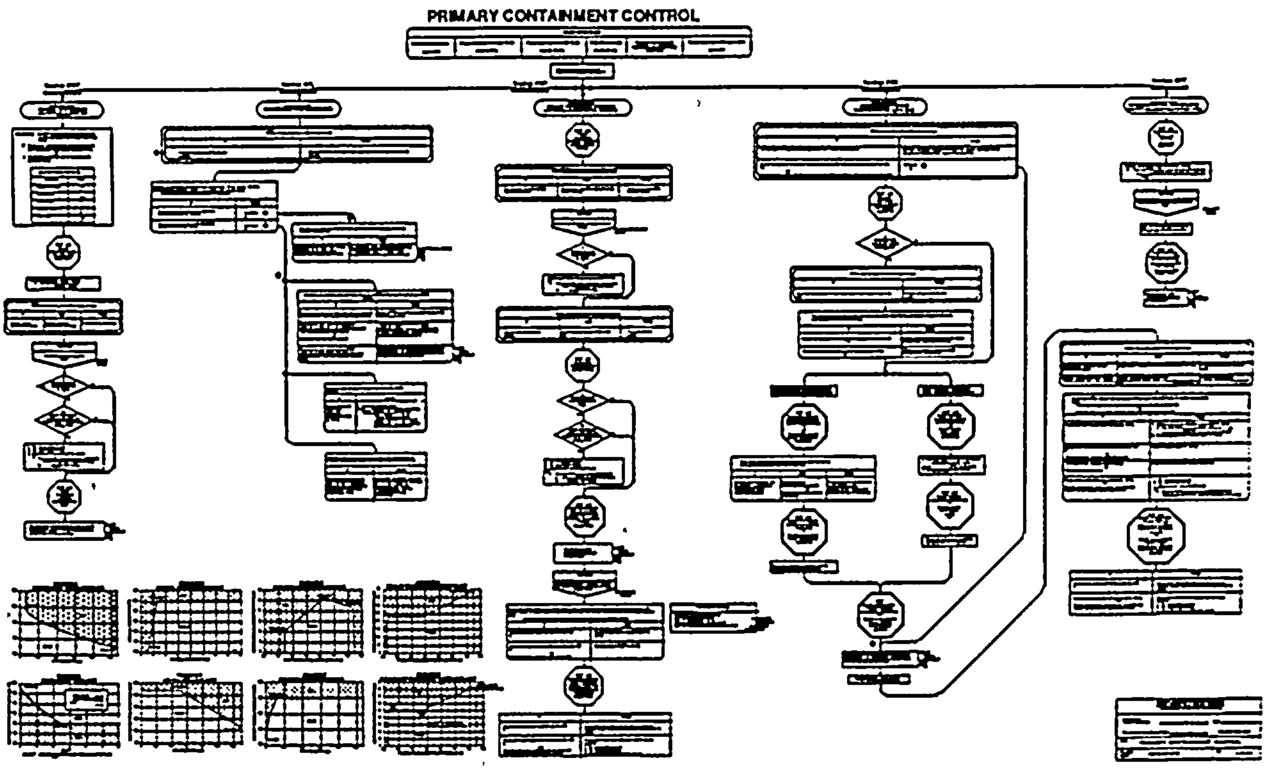
STEP:



DISCUSSION:

Termination of boron injection is appropriate when the reactor is and will remain shutdown on control rods alone. At this point it is also appropriate to exit to the normal scram procedure. These actions are consistent with the override at the top of Section RQ.

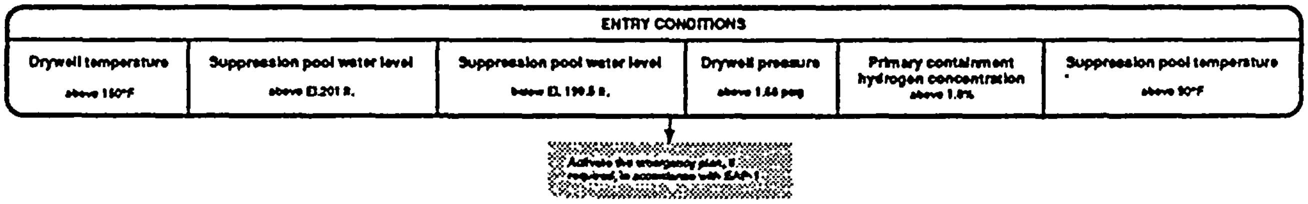
PRIMARY CONTAINMENT CONTROL



PURPOSE:

The purpose of N2-EOP-PC, Primary Containment Control, is to protect safety related equipment in the primary containment and to maintain primary containment integrity. This is accomplished through concurrent control of five (5) key primary containment parameters.

ENTRY:



DISCUSSION:

When any of these parameters exceed the values listed below, this procedure must be entered:

- **Drywell temperature above 150°F**

This entry condition addresses the controlling of drywell temperature which prevents exceeding the drywell design temperature limit and the environmental qualification temperature of safety related electrical equipment in the drywell, both of which have a value of 340°F. Maintaining drywell temperature will also minimize errors in RPV water level indications and trend, caused by instrument reference leg density changes. The setpoint of 150°F was chosen because it is easily identifiable and is the Technical Specification Limiting Condition for Operation (LCO) value for drywell temperature.

- **Suppression pool water level above El. 201 ft.**

This entry condition addresses the controlling of a high suppression pool water level to prevent both the failure of the primary containment due to static and/or dynamic loadings and the coverage of primary containment vent paths. The setpoint of El. 201 ft. was chosen because it is easily identifiable and is the Technical Specification limit for maximum suppression pool water level.

DISCUSSION: (Continued)

- **Suppression pool water level below El. 199.5ft.**

This entry condition addresses the controlling of a low suppression pool water level to prevent the failure of the primary containment due to direct pressurization when the pressure suppression function of the suppression chamber is degraded or lost. This limit also ensures adequate NPSH for pumps which take a suction on the suppression pool. The setpoint of El. 199.5 ft. was chosen because it is easily identifiable and is the Technical Specification limit for minimum suppression pool water level.

- **Drywell pressure above 1.68 psig**

This entry condition addresses the controlling of drywell pressure which prevents the loss of primary containment integrity due to over pressure. The setpoint of 1.68 psig was chosen because it is easily identifiable, it is the Technical Specification Limiting Safety System Setting for drywell pressure, and it is an ECCS actuation setpoint.

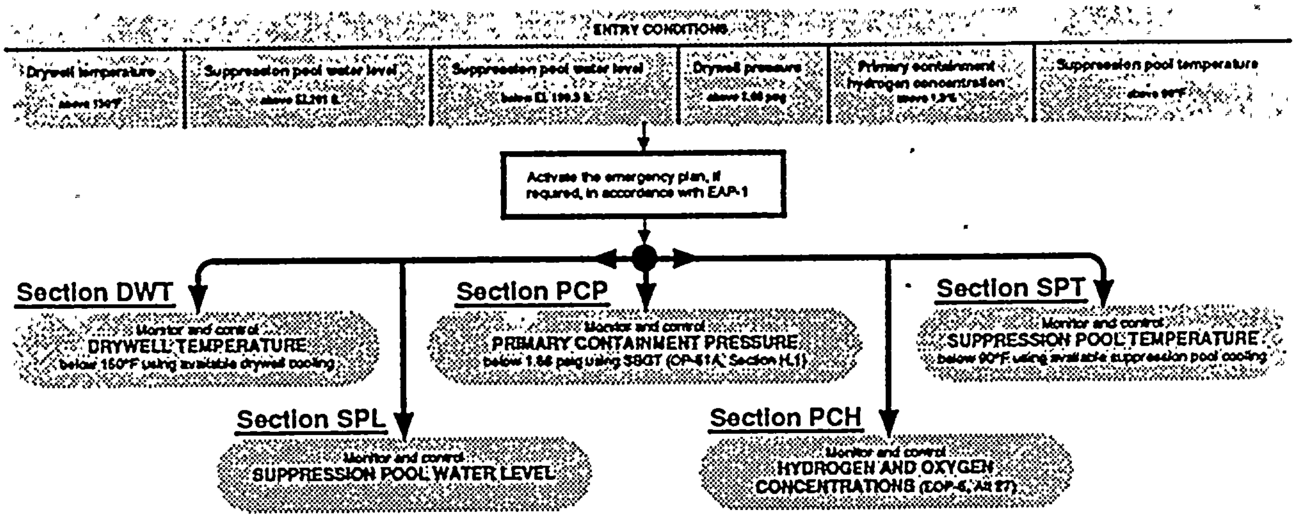
- **Primary containment H2 concentration above 1.8%**

This entry condition addresses the controlling of primary containment hydrogen (H2) concentration to prevent the failure of the primary containment due to the pressure/temperature increases associated with the ignition of combustible gases. The setpoint of 1.8% was chosen because it is easily identifiable and is the hydrogen/oxygen (H2/O2) analyzer alarm setpoint.

- **Suppression pool temperature above 90°F**

This entry condition addresses the controlling of suppression pool temperature, which: (1) provides maintenance of the pressure suppression function of the primary containment, (2) maintains adequate NPSH requirements for pumps which take suction on the suppression pool, and (3) prevents exceeding the suppression pool/chamber design limits. The setpoint of 90°F was chosen because it is easily identifiable and is the most limiting suppression pool temperature value addressed by Technical Specifications.

STEP:

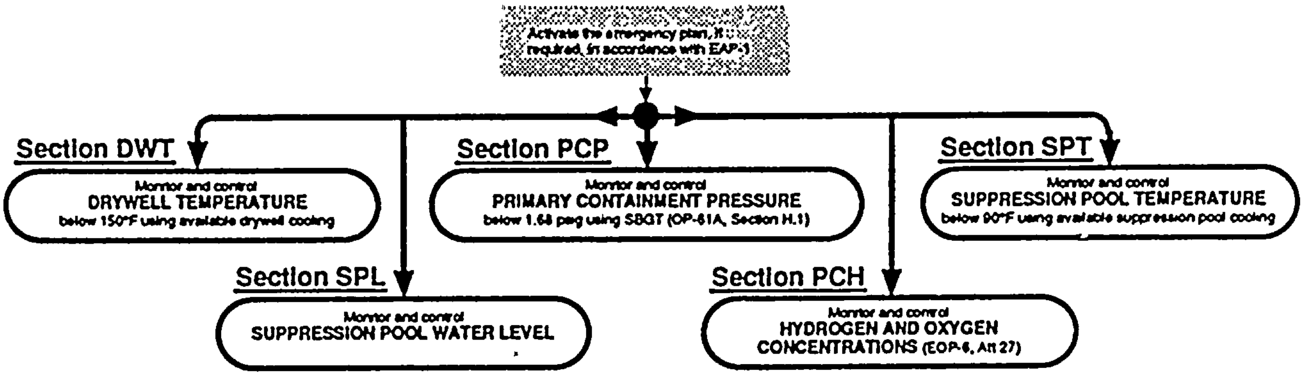


DISCUSSION:

The operator is directed to determine if any plant conditions are at an emergency plan action level and to take the appropriate actions in accordance with EAP-1. Following the completion of this step, the operator is directed simultaneously to each leg of N2-EOP-PC, Primary Containment Control.

This step serves to flag the operator that emergency plan implementation may be required. It is not intended that emergency plan actions be completed before proceeding in the procedure.

STEP:

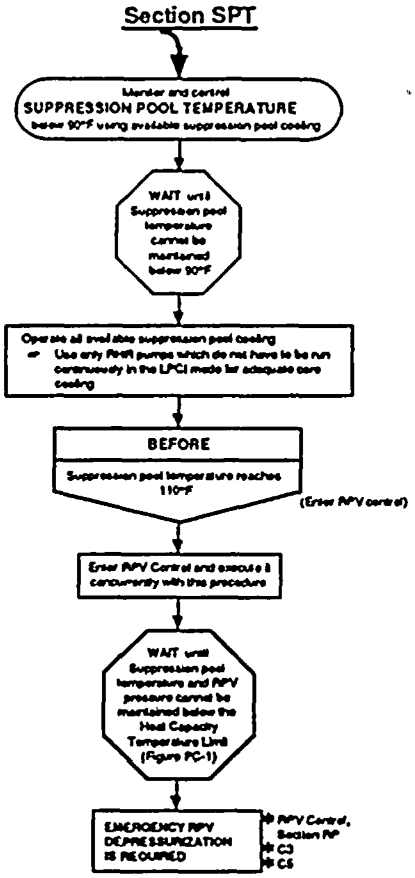


DISCUSSION:

The Primary Containment Control procedure is structured along five parallel action flowpaths. Actions taken to control parameters in one flowpath can affect parameters in another flowpath. Therefore, all paths are entered and executed concurrently.

The current values, parameter trends, and plant system status during a transient or emergency dictate the order and priority of specific actions taken. There is no priority assigned to the execution of any sectional division of individual actions.

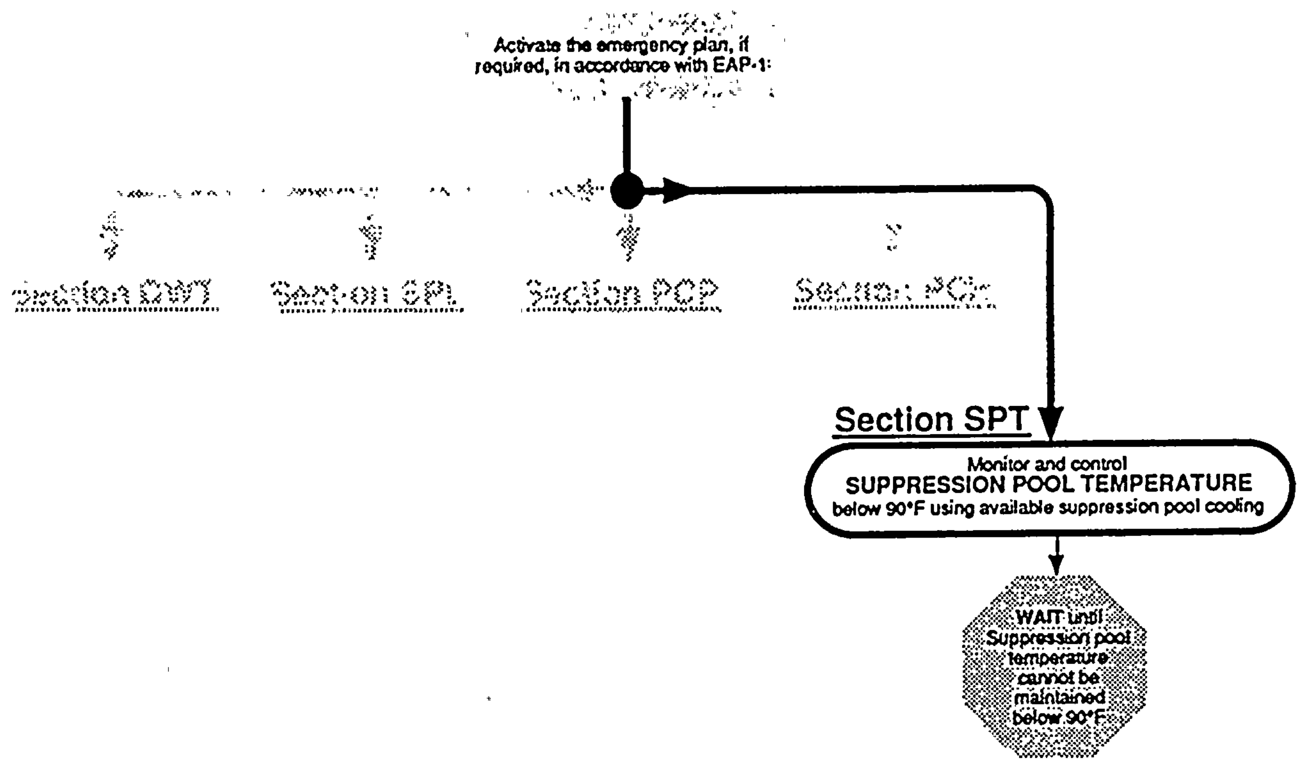
STEP:



DISCUSSION:

This section of N2-EOP-PC, Primary Containment Control, specifies operator actions to control and maintain suppression pool temperature. Failure to maintain suppression pool temperature within prescribed limits could result in: (1) the loss of the pressure suppression function of the primary containment, (2) exceeding suppression chamber design temperature limits and/or (3) exceeding NPSH limits for pumps which take suction on the suppression pool.

STEP:

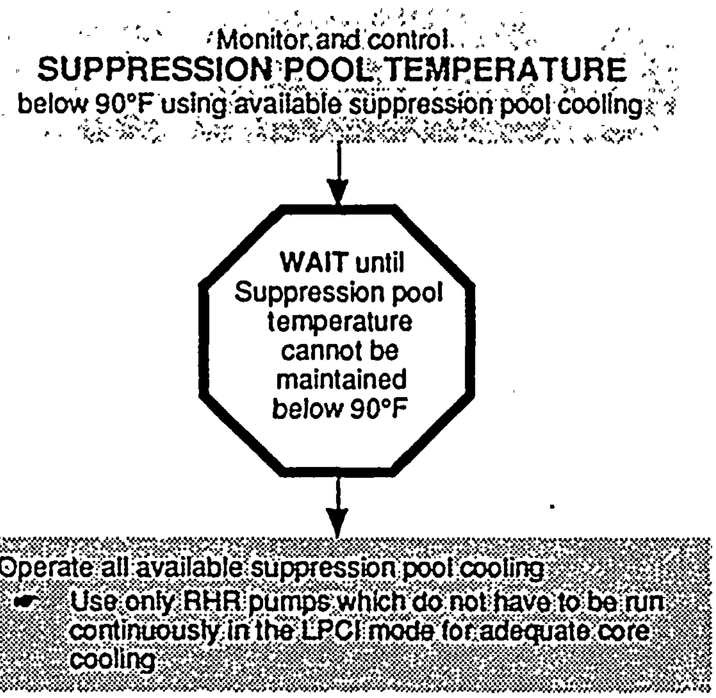


DISCUSSION:

The initial actions taken to control suppression pool temperature employ the same methods typically used during normal plant operations: (1) monitoring its status and (2) placing available suppression pool cooling in operation as required to maintain temperature within Technical Specification limits. This step thus provides a smooth transition from general plant procedures to emergency operating procedures, and assures that the normal method of suppression pool temperature control is attempted in advance of initiating more complex actions to terminate an increasing suppression pool temperature condition.

As long as suppression pool temperature remains below the value of the most limiting suppression pool temperature Limiting Condition for Operation (LCO) (90°F), no further operator action is required in this procedural leg other than continuing to monitor and control suppression pool temperature using available suppression pool cooling systems.

STEP:

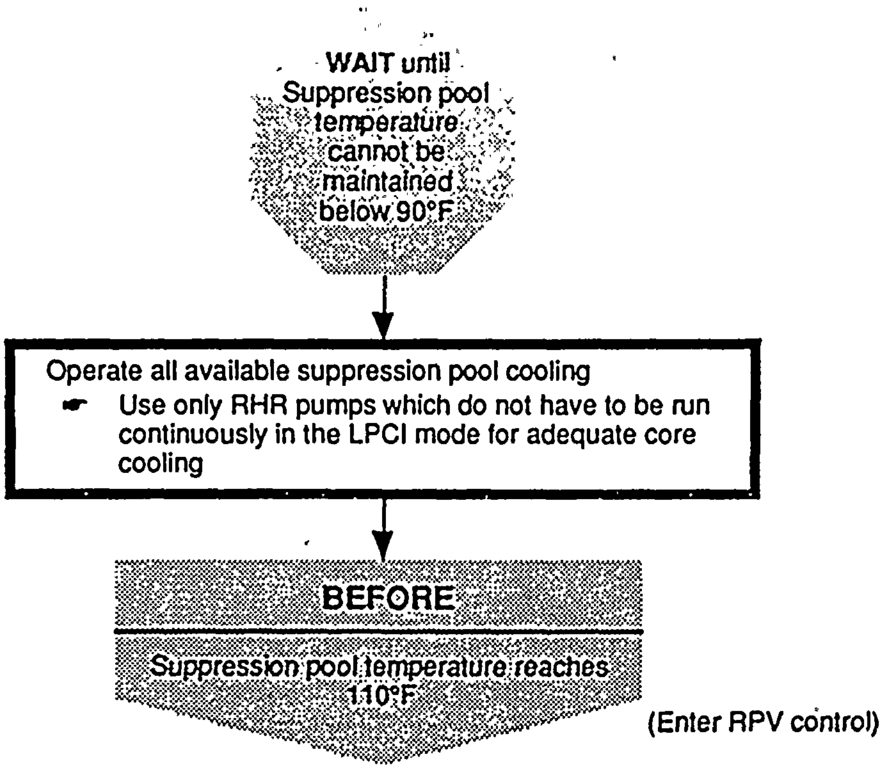


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, suppression pool temperature cannot be maintained below 90°F, has been met.

Delaying the performance of the subsequent actions in this step, confirms that the available suppression pool cooling systems are unable to maintain temperature below the most limiting suppression pool temperature LCO value (90°F), and that further control actions need to be directed.

STEP:

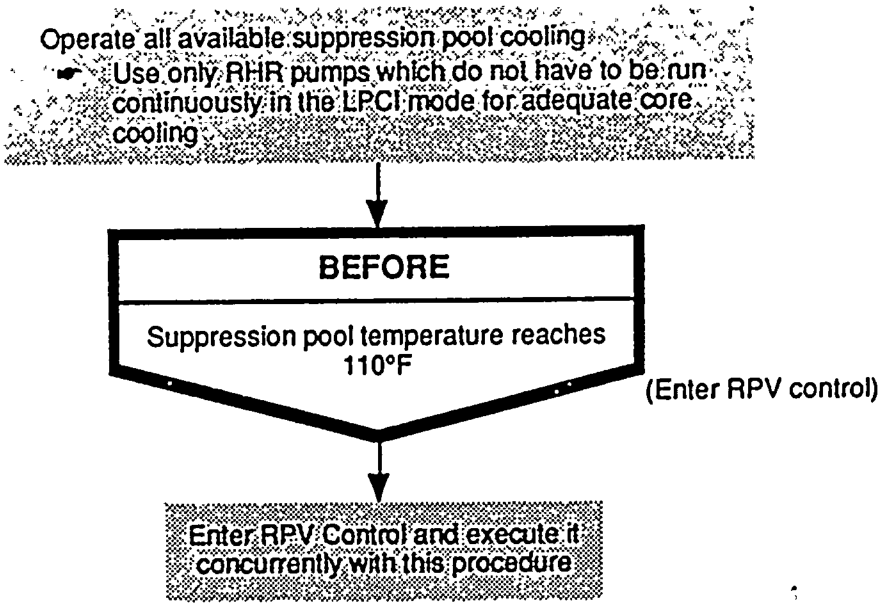


DISCUSSION:

When suppression pool temperature cannot be maintained below the most limiting suppression pool temperature LCO value (90°F), explicit instruction to place into operation all available methods of suppression pool cooling is given.

Maintaining adequate core cooling takes precedence over maintaining suppression pool temperature below the LCO value since catastrophic failure of the primary containment is not expected to occur at this temperature (90°F). In addition, further action is still available for reversing the increasing suppression pool temperature trend. Therefore, only if the continuous operation of a RHR pump in the LPCI mode is not required to assure adequate core cooling, is it permissible to use that pump for suppression pool cooling. This step, however, does permit alternating the use of RHR pumps between the LPCI injection and suppression pool cooling modes, as the need for each occurs and as long as adequate core cooling is able to be maintained.

STEP:

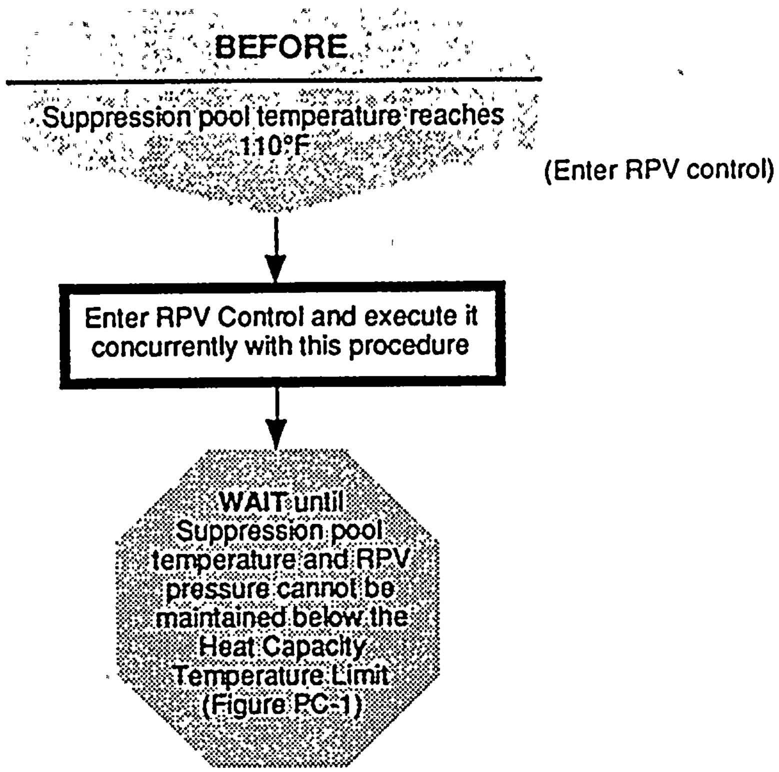


DISCUSSION:

If suppression pool temperature continues to increase with all available suppression pool cooling in operation, further actions to reverse the increasing temperature trend must be directed. These actions must be taken BEFORE suppression pool temperature REACHES the Boron Injection Initiation Temperature (110°F) to ensure that, if emergency RPV depressurization is required later, the heat rejected to the primary containment will be minimized.

The Boron Injection Initiation Temperature Limit is defined to be the greater of either: (1) the suppression pool temperature at which Technical Specifications require initiation of a manual scram, or (2) the maximum suppression pool temperature at which initiation of SLC will achieve reactor shutdown before suppression pool temperature exceeds the Heat Capacity Temperature Limit.

STEP:

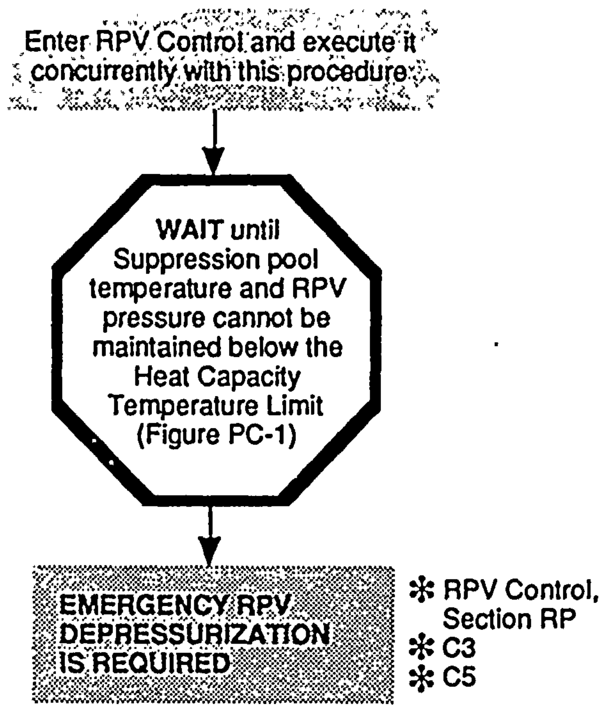


DISCUSSION:

Entering N2-EOP-RPV, RPV Control, assures that, if possible, the reactor is scrammed and shutdown by control rod insertion before the requirement for boron injection is reached. Entry into N2-EOP-RPV, RPV Control, must be directed because conditions requiring entry into N2-EOP-PC, Primary Containment Control, do not necessarily require entry into N2-EOP-RPV, RPV Control. Therefore, a scram may not have yet been initiated.

Directing that N2-EOP-RPV, RPV Control, be entered rather than stating "initiate a reactor scram" coordinates actions currently being executed if N2-EOP-RPV, RPV Control, has already been entered (N2-EOP-RPV, RPV Control, requires the initiation of a reactor scram only if one has not previously been initiated). In addition entry into N2-EOP-RPV, RPV Control must be made because it is through the Reactor Pressure (RP) leg of RPV Control that a transfer is made to N2-EOP-C2, Emergency RPV Depressurization.

STEP:



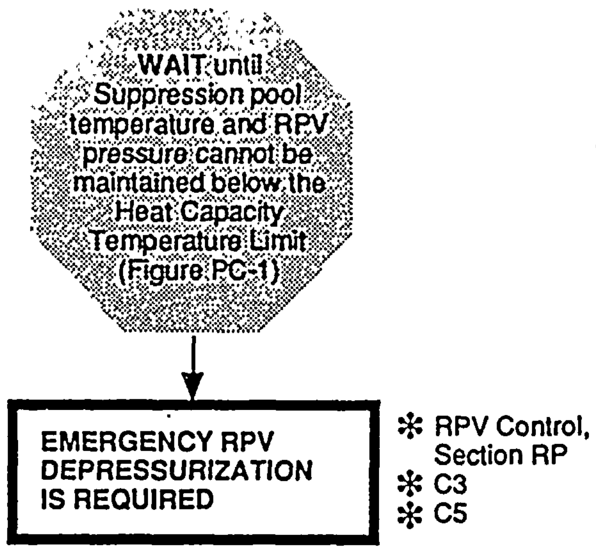
DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, suppression pool temperature and RPV pressure cannot be maintained below the Heat Capacity Temperature Limit (Figure PC-1), has been met.

Delaying the performance of the subsequent actions in this procedural leg confirms that all previous actions taken to terminate the suppression pool temperature increase have been ineffective, and that additional actions need to be addressed.

The Heat Capacity Temperature Limit (Figure PC-1, refer to Section C) is defined to be the highest suppression pool temperature at which initiation of RPV depressurization will not result in exceeding either: (1) the suppression chamber design temperature, or (2) the Primary Containment Pressure Limit, before the rate of energy transfer from the RPV to the primary containment is within the capacity of the primary containment vent. Thus, depressurizing the RPV when suppression pool temperature and RPV pressure cannot be maintained below the Heat Capacity Temperature Limit precludes failure of the primary containment or equipment necessary for the safe shutdown of the plant.

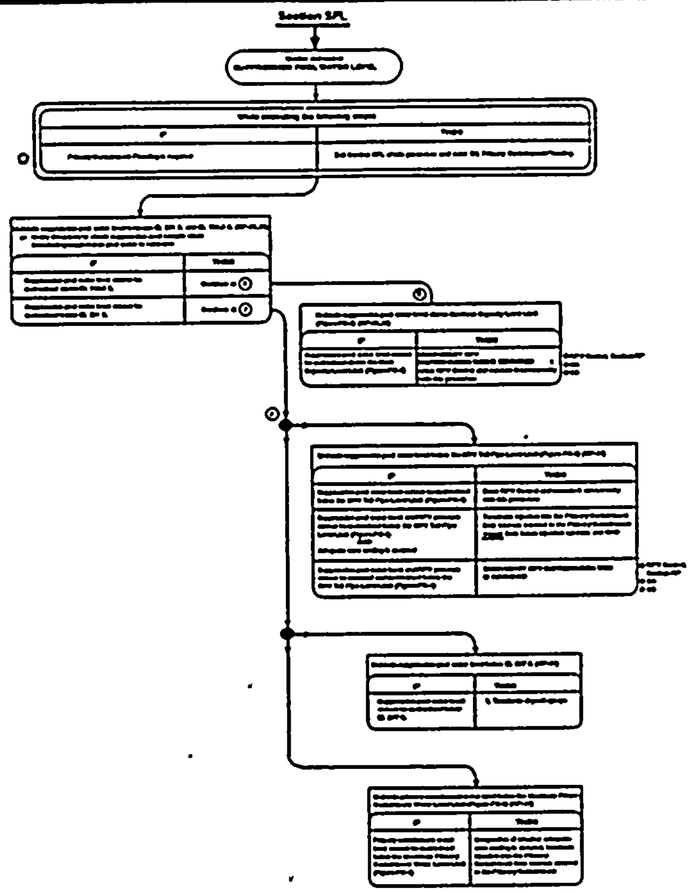
STEP:



DISCUSSION:

When RPV pressure and suppression pool temperature cannot be maintained below the Heat Capacity Temperature Limit (Figure PC-1), emergency RPV depressurization must be commenced. Failure to emergency depressurize could lead to a loss of primary containment integrity or loss of equipment necessary for the safe shutdown of the plant.

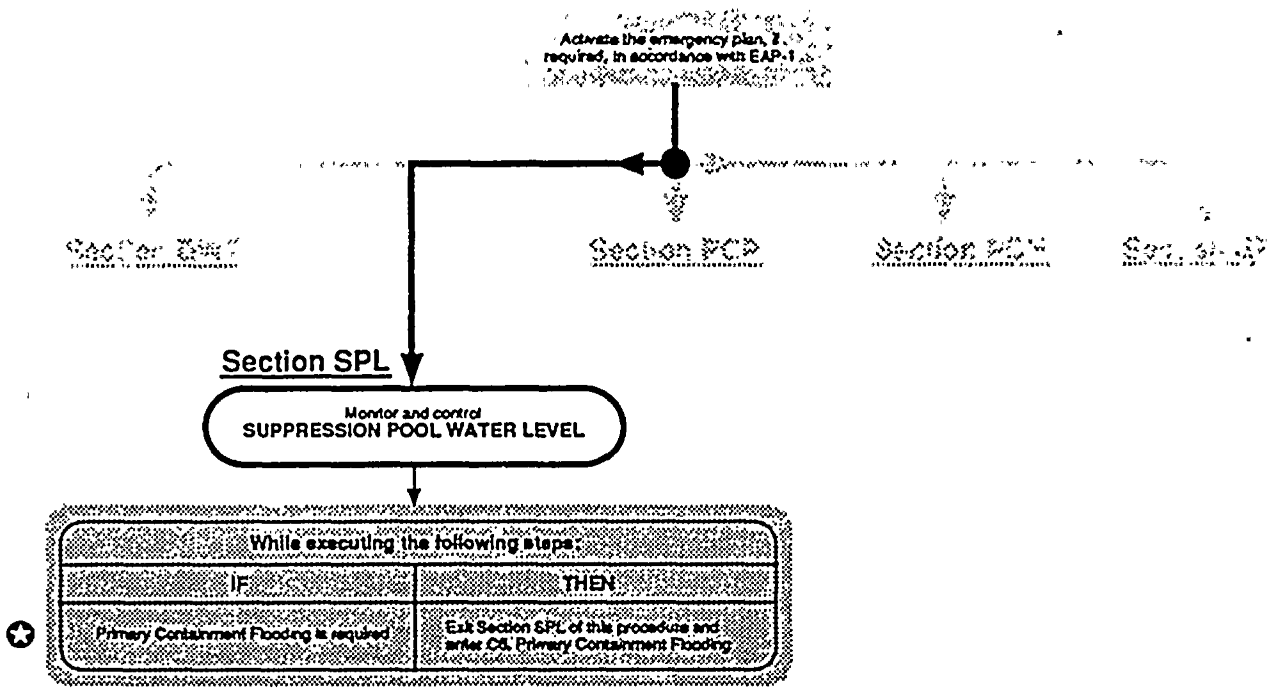
STEP:



DISCUSSION:

This section of N2-EOP-PC, Primary Containment Control, specifies operator actions to be taken to control and maintain suppression pool water level. Failure to maintain suppression pool water level above the prescribed low water level limit could result in: (1) a loss of the pressure suppression function of the suppression chamber, (2) direct pressurization of the suppression chamber air space, and/or (3) insufficient NPSH for pumps taking a suction on the suppression pool. Failure to maintain suppression pool water level below the prescribed high water level limit could result in: (1) the failure of the primary containment due to static and/or dynamic loadings and (2) coverage of the primary containment vent paths.

STEP:



DISCUSSION:

The operator is directed to control suppression pool water level using the same methods typically used during normal plant operations: (1) monitoring its status and (2) filling or draining as required to maintain water level within the Technical Specification limits (El. 201 ft. to El. 199.5 ft.). This step thus provides a smooth transition from general plant procedures to emergency operating procedures, and assures that the normal methods of suppression pool water level control are attempted in advance of initiating more complex actions to terminate an increasing/decreasing suppression pool water level condition.

As long as suppression pool water level remains within the Technical Specification limits (El. 201 ft. to El. 199.5 ft.), no further operator action is required in this procedural leg other than continuing to monitor and control suppression pool water level using normal methods.

STEP:

Monitor and control
SUPPRESSION POOL WATER LEVEL

While executing the following steps:

IF	THEN
Primary Containment Flooding is required	Exit Section SPL of this procedure and enter C6, Primary Containment Flooding

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)
- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

DISCUSSION:

This override applies throughout the performance of the remainder of this procedural leg.

When flooding of the primary containment is required, the operator is to exit this leg (SPL) of N2-EOP-PC, Primary Containment Control, and enter N2-EOP-C6, Primary Containment Flooding. Exiting this procedure precludes the potential for conflicting instructions for controlling suppression pool water level.

STEP:

While executing the following steps:

IF	THEN
Primary Containment Flooding is required	Exit Section SPL of this procedure and enter C6, Primary Containment Flooding

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)

- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

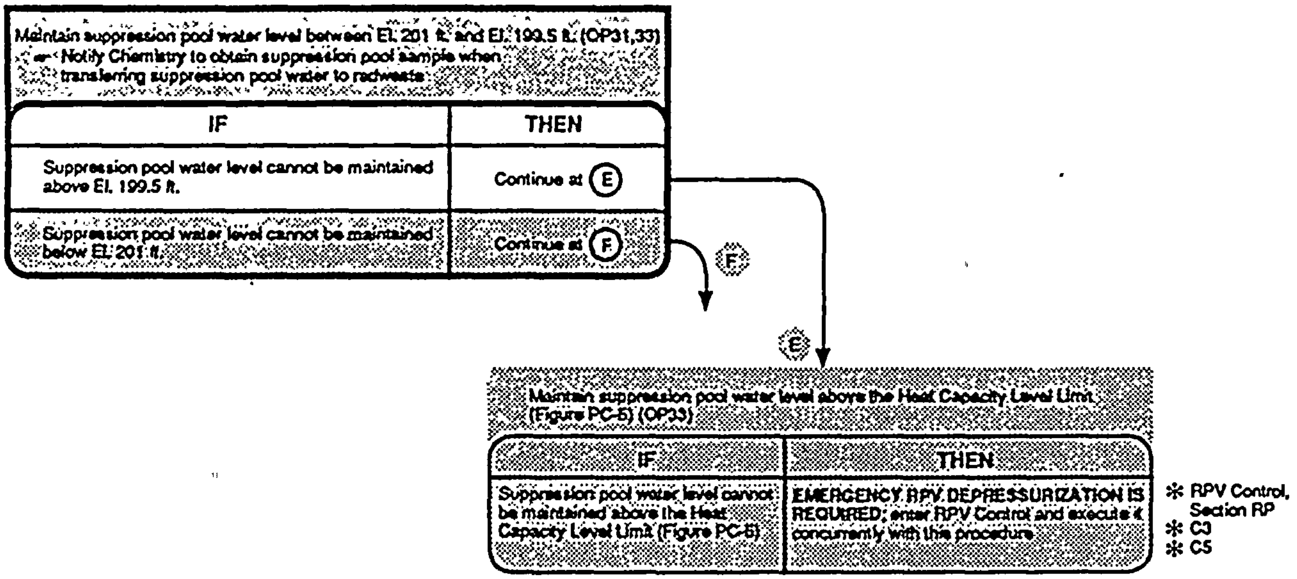
IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

DISCUSSION:

The initial action taken to control suppression pool water level employs the same methods typically used during normal plant operations: to fill or drain the suppression pool to maintain water level.

Nine Mile Point Unit 2 Chemistry Department sampling requirements and procedures must be followed when discharging water from the suppression pool to determine and control the amount of radioactivity transferred outside of the primary containment. It is not required to wait for sample results prior to commencing the transfer.

STEP:



DISCUSSION:

Separate legs in the suppression pool water level control (SPL) section of N2-EOP-PC, Primary Containment Control, are provided to respond to a high or low suppression pool water level condition, as appropriate.

If suppression pool water level drops below El.199.5 ft. directions are provided to address the situation at point E.

STEP:

Maintain suppression pool water level between EL 201 ft. and EL 199.5 ft. (OP-31) Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above EL 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below EL 201 ft.	Continue at (F)

E

(F)

Maintain primary containment water level below the Maximum Primary Containment Water Level Limit (Figure PC-8) (OP-31)

IF	THEN
Primary containment water level cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure PC-8)	Irrespective of whether adequate core cooling is assured, terminate injection into the Primary Containment from sources external to the Primary Containment

Maintain suppression pool water level below EL 217 ft. (OP-31)

IF	THEN
Suppression pool water level cannot be maintained below EL 217 ft.	1. Terminate drywell sprays 2. IF ...... adequate core cooling is assured, THEN ... terminate injection into the Primary Containment from sources external to the Primary Containment <u>except</u> from boron injection systems and CRD

Maintain suppression pool water level below the SRV Tail Pipe Level Limit (Figure PC-6) (OP-31)

IF	THEN
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	Enter RPV Control and execute it concurrently with this procedure

DISCUSSION:

Separate legs in the suppression pool water level control (SPL) section of N2-EOP-PC, Primary Containment Control, are provided to respond to a high or low suppression pool water level condition, as appropriate.

If suppression pool water level rises above El. 201 ft. directions are provided to address the situation at point F.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)

Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(E)

Maintain suppression pool water level above the Heat Capacity Level Limit (Figure PC-5) (OP-31,33)

IF	THEN
Suppression pool water level cannot be maintained above the Heat Capacity Level Limit (Figure PC-5)	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

✻ RPV Control, Section RP
✻ C3
✻ C5

DISCUSSION:

This step directs the operator to maintain suppression pool water level above the Heat Capacity Level Limit (Figure PC-5, refer to Section C).

The Heat Capacity Level Limit is defined to be the higher of either: (1) the elevation of the downcomer openings, or (2) the lowest suppression pool water level at which initiation of RPV depressurization will not result in exceeding the Heat Capacity Temperature Limit (Figure PC-1, refer to Section C). The Heat Capacity Level Limit is used in conjunction with the Heat Capacity Temperature Limit to preclude failure of the primary containment or equipment necessary for the safe shutdown of the plant, and also to preclude the loss of the pressure suppression function of the primary containment.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)

- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(E)

Maintain suppression pool water level above the Heat Capacity Level Limit (Figure PC-5) (OP33)

IF	THEN
Suppression pool water level cannot be maintained above the Heat Capacity Level Limit (Figure PC-5)	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

* RPV Control, Section RP
* C3
* C5

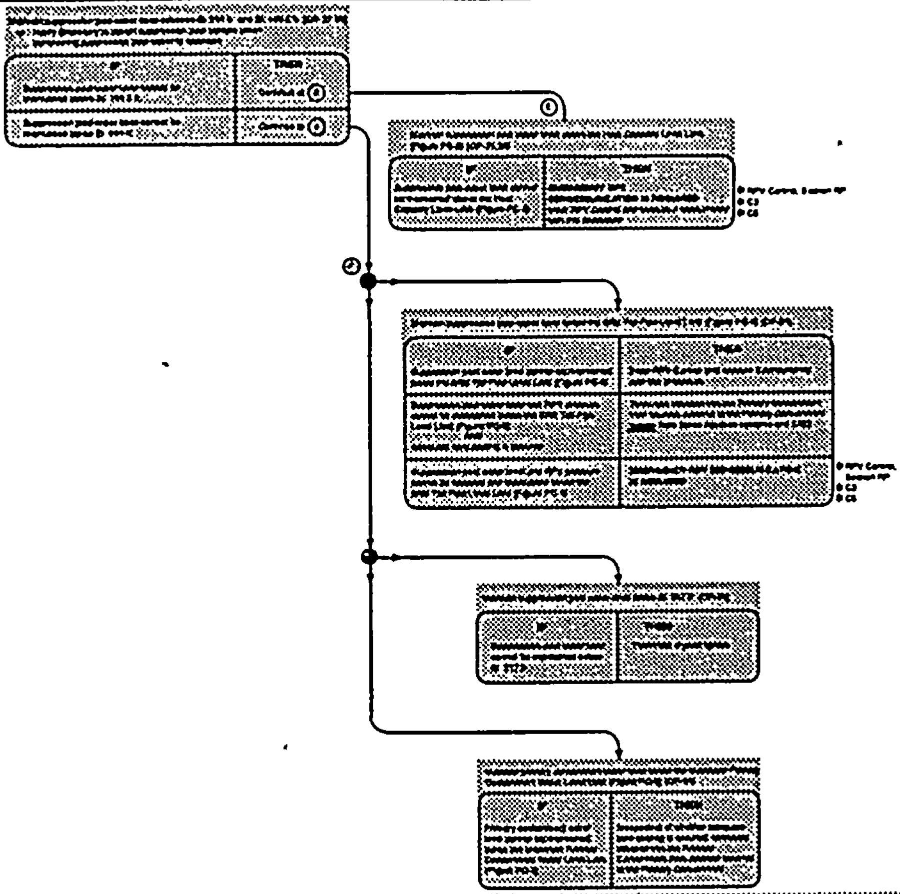
DISCUSSION:

The RPV is not permitted to remain at pressure if suppression of steam discharged from the RPV to the suppression pool cannot be assured.

Entering N2-EOP-RPV, RPV Control, assures that, if possible, the reactor is scrammed and shutdown by control rod insertion before RPV depressurization is initiated. Entry into N2-EOP-RPV, RPV Control, must be stated because conditions requiring entry into N2-EOP-PC, Primary Containment Control, do not necessarily require entry into N2-EOP-RPV, RPV Control. Therefore, a scram may not yet have been initiated.

Directing that N2-EOP-RPV, RPV Control, be entered, rather than stating "initiate a reactor scram" coordinates actions currently being executed if N2-EOP-RPV, RPV Control, has already been entered (N2-EOP-RPV, RPV Control, requires initiating a reactor scram only if one has not previously been initiated). In addition, entry into N2-EOP-RPV, RPV Control, must be made because it is through the Reactor Pressure (RP) leg of RPV Control that the transfer is made to N2-EOP-C2, Emergency RPV Depressurization.

STEP:



DISCUSSION:

The actions for high suppression pool water level are structured along three parallel action flowpaths. Actions taken to control parameters in one flowpath can affect parameters in another flowpath. Therefore all flowpaths are entered and executed concurrently. The current values, parameter trends and plant status during a transient or emergency dictate the order and priority of specific actions taken. There is no priority assigned to the execution of any flowpath.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)
☛ Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste.

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(F)

Maintain primary containment water level below the Maximum Primary Containment Water Level Limit (Figure PC-8) (OP-31)

IF	THEN
Primary containment water level cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure PC-8)	Irrespective of whether adequate core cooling is assured, terminate injection into the Primary Containment from sources external to the Primary Containment

DISCUSSION:

This step directs the operator to maintain primary containment water level below the Maximum Primary Containment Water Level Limit, (MPCWLL, Figure PC-8, refer to Section C) to assure that the integrity of the primary containment is maintained.

The MPCWLL is defined to be the lesser of either: (1) the elevation of the highest primary containment vent capable of rejecting all core decay heat, or (2) the highest primary containment water level which will not result in exceeding the pressure capability of the primary containment. Beyond this limit, primary containment integrity can no longer be assured. At Nine Mile Point Station Unit 2 the value is based on (1) the elevation of the primary containment vent.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)

- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(F)

Maintain primary containment water level below the Maximum Primary Containment Water Level Limit (Figure PC-8) (OP-31)

IF	THEN
Primary containment water level cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure PC-8)	Irrespective of whether adequate *core cooling is assured, terminate* injection into the Primary Containment from sources external to the Primary Containment

DISCUSSION:

This step provides the operator with directions if efforts to control and maintain primary containment water level below the MPCWLL (Figure PC-8, refer to Section C) are unsuccessful. Direction is given to terminate injection from sources external to the primary containment irrespective of adequate core cooling consequences, to prevent a further increase in primary containment water level.

When it is necessary to make a choice between assuring primary containment integrity or adequate core cooling, the Nine Mile Point Station Unit 2 EOPs direct that preference will be made toward assuring primary containment integrity, regardless of core conditions, in order to protect the general public. This action is specified because not doing so may eventually result in a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the containment may fail, the loss of the suppression pool must be assumed leading to the subsequent complete and unrecoverable loss of core cooling, whereby the degraded core condition and loss of containment integrity releases substantial amounts of radioactivity to the environment.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)
- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(F)

Maintain suppression pool water level below the SRV Tail Pipe Level Limit (Figure PC-6) (OP-31)

IF	THEN
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	Enter RPV Control and execute it concurrently with this procedure
Suppression pool water level and RPV pressure cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6) AND Adequate core cooling is assured	Terminate injection into the Primary Containment from sources external to the Primary Containment <u>except</u> from boron injection systems and CRD
Suppression pool water level and RPV pressure cannot be restored and maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

* RPV Control, Section RP
* C3
* C5

DISCUSSION:

This step directs the operator to maintain suppression pool water level below the SRV Tail Pipe Level Limit (Figure PC-6, refer to Section C).

The SRV Tail Pipe Level Limit is a relationship between RPV pressure and suppression pool water level.

The SRV Tail Pipe Level Limit is defined to be the highest suppression pool water level at which opening of an SRV will not result in exceeding the capability of the SRV tail pipe, tail pipe supports, T-quencher, or quencher supports. The SRV Tail Pipe Level Limit is utilized to preclude SRV system damage and primary containment failure.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)

☞ Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(F)

Maintain suppression pool water level below the SRV Tail Pipe Level Limit (Figure PC-6) (OP-31)

IF	THEN
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	Enter RPV Control and execute it concurrently with this procedure
Suppression pool water level and RPV pressure cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6) AND 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
Suppression pool water level and RPV pressure cannot be restored and maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

✻ RPV Control, Section RP
✻ C3
✻ C5

DISCUSSION:

The SRV Tail Pipe Level Limit (Figure PC-6, refer to Section C) is a relationship between RPV pressure and suppression pool water level. If the operator is unable to maintain suppression pool water level below the SRV Tail Pipe Level Limit, then an effort is made to control RPV pressure to ensure that the SRV Tail Pipe Level Limit is not exceeded.

Entry into N2-EOP-RPV, RPV Control, is directed to control RPV pressure relative to the SRV Tail Pipe Level Limit if action to control the principal parameter, suppression pool water level, is ineffective.

Entry into N2-EOP-RPV, RPV Control, requires the initiation of a reactor scram, if one has not yet been initiated. This action reduces core heat and the steam generation rate in the RPV to decay heat levels (assuming the scram is successful). The scram will assist in maintaining RPV pressure below the SRV Tail Pipe Level Limit.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)
- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(F)

Maintain suppression pool water level below the SRV Tail Pipe Level Limit (Figure PC-6) (OP-31)

IF	THEN
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	Enter RPV Control and execute it concurrently with this procedure
Suppression pool water level and RPV pressure cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6) AND Adequate core cooling is assured	Terminate injection into the Primary Containment from sources external to the Primary Containment <u>except</u> from boron injection systems and CRD
Suppression pool water level and RPV pressure cannot be restored and maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

✻ RPV Control, Section RP
✻ C3
✻ C5

DISCUSSION:

The SRV Tail Pipe Level Limit (Figure PC-6, refer to Section C) is a relationship between RPV pressure and suppression pool water level. If the operator is unable to maintain suppression pool water level and RPV pressure below the SRV Tail Pipe Level Limit, and adequate core cooling is assured, then an effort is made to control primary containment water level by terminating injection from outside of containment.

A break in the RPV may be contributing to the high suppression pool water level condition. Water injected into the RPV may be spilling out a break and accumulating in the suppression pool. If adequate core cooling is assured, injection from sources outside the primary containment is terminated to prevent any further increase in suppression pool water level.

Assuring adequate core cooling, using sources with external water sources, takes precedence over securing those systems because additional action is still available to prevent SRV system damage and/or containment failure.

Injection from boron injection systems is not terminated because it may be required to establish and maintain reactor shutdown. CRD injection is not terminated because operation may be required to achieve and maintain control rod insertion. Boron injection and CRD systems are also low volume systems.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)

- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(F)

Maintain suppression pool water level below the SRV Tail Pipe Level Limit (Figure PC-6) (OP-31)

IF	THEN
Suppression pool water level cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	Enter RPV Control and execute it concurrently with this procedure
Suppression pool water level and RPV pressure cannot be maintained below the SRV Tail Pipe Level Limit (Figure PC-6) AND Adequate core cooling is assured	Terminate injection into the Primary Containment from sources external to the Primary Containment <u>except</u> from boron injection systems and CRD
Suppression pool water level and RPV pressure cannot be restored and maintained below the SRV Tail Pipe Level Limit (Figure PC-6)	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

* RPV Control, Section RP
* C3
* C5

DISCUSSION:

The RPV is not permitted to remain at pressure if operation of SRVs may cause the SRV discharge line or associated components to fail.

The consequences of operating SRVs when the status of suppression pool water level and RPV pressure exceeds the SRV Tail Pipe Level Limit may include direct pressurization of the primary containment from a break in the SRV discharge line. A break in the SRV discharge line could allow steam to be directed into the suppression chamber air space instead of into the suppression pool water. The resulting primary containment pressurization could cause a primary containment failure. To prevent this condition from occurring, the RPV is depressurized before conditions significantly worsen.

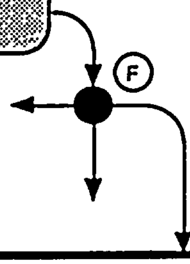
Since N2-EOP-RPV, RPV Control, is executed concurrently with this procedure at this time, the direction to enter N2-EOP-C2, Emergency RPV Depressurization, is given in the override in the Reactor Pressure (RP) leg denoted with a *.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31,33)

- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)



Maintain suppression pool water level below El. 217 ft. (OP-31)

IF	THEN
Suppression pool water level cannot be maintained below El. 217 ft.	1. Terminate drywell sprays 2. IF....... adequate core cooling is assured, THEN... terminate injection into the Primary Containment from sources external to the Primary Containment <u>except</u> from boron injection systems and CRD

DISCUSSION:

This step directs the operator to maintain suppression pool water level below El. 217 ft. Suppression pool water level is maintained below El. 217 ft., the elevation of the bottom of the suppression chamber-to-drywell vacuum breakers, to preserve the operability of these valves and permit operation of drywell sprays.

Although the actual elevation of the suppression chamber-to-drywell vacuum breakers is above El. 217 ft. indicated, El. 217 ft. is the maximum level at which installed instruments can accurately detect and display suppression pool water level. If indicated suppression pool water level is at or above El. 217 ft., it must be assumed that suppression chamber-to-drywell vacuum breakers are submerged.

The vacuum breakers will not function as designed if any portion of the valve is covered with water. Drywell spray operation with the vacuum breakers partially or completely submerged (i.e., no drywell vacuum relief capability) could result in exceeding the design negative differential pressure capability (-4.7 PSID) of the primary containment because of the inability to equalize pressure through the vacuum breakers. Therefore, drywell spray operation is not permitted if suppression pool water level is above El. 217 ft.

STEP:

Maintain suppression pool water level between El. 201 ft. and El. 199.5 ft. (OP31;33)
- Notify Chemistry to obtain suppression pool sample when transferring suppression pool water to radwaste

IF	THEN
Suppression pool water level cannot be maintained above El. 199.5 ft.	Continue at (E)
Suppression pool water level cannot be maintained below El. 201 ft.	Continue at (F)

(F)

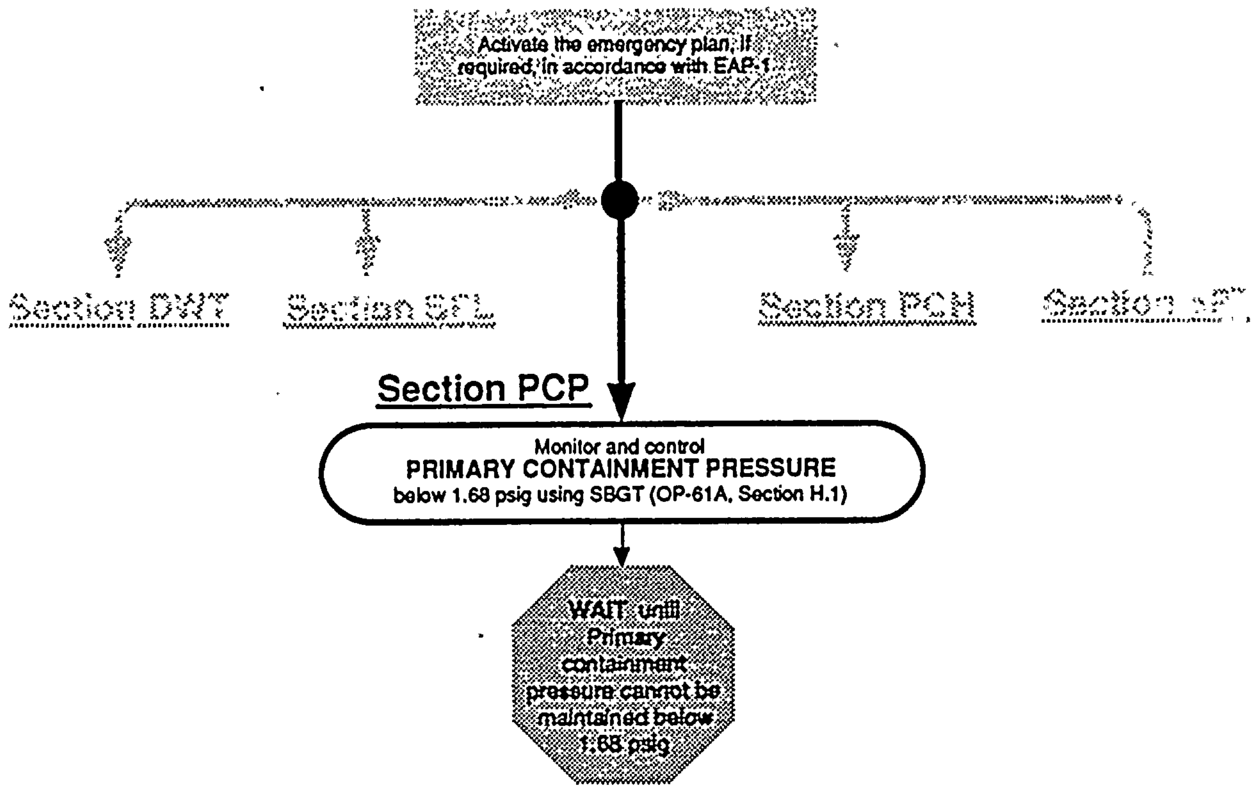
Maintain suppression pool water level below El. 217 ft. (OP-31)

IF	THEN
Suppression pool water level cannot be maintained below El. 217 ft.	Terminate drywell sprays

DISCUSSION:

If suppression pool water level cannot be maintained below El. 217 ft., operation of drywell sprays must be terminated because post spray drywell vacuum relief cannot be assured. If adequate core cooling can be assured without systems with external water sources, the systems with external water sources are to be secured.

STEP:

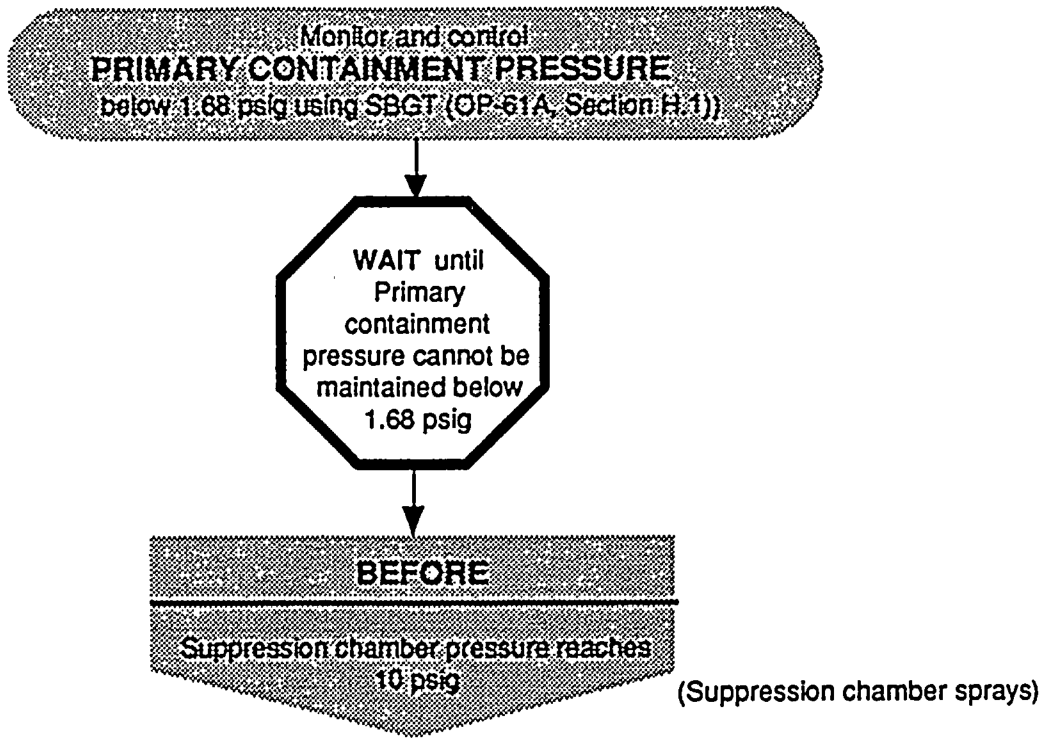


DISCUSSION:

This section of N2-EOP-PC, Primary Containment Control, specifies operator actions to control and maintain primary containment pressure. Excessive pressure may cause primary containment failure. There are two causes for a primary containment pressure increase: (1) loss of coolant accidents (LOCAs) due to breaks inside the drywell, and (2) loss of drywell cooling.

The initial actions taken to control primary containment pressure employ the same methods typically used during normal plant operations: (1) monitoring pressure status and trends and (2) using the Standby Gas Treatment (SBGT) System as required to maintain primary containment pressure below 1.68 psig (the high drywell scram setpoint). This step provides a smooth transition from general plant procedures to emergency operating procedures, assuring that normal methods of primary containment pressure control are attempted in advance of initiating more complex actions to terminate an increasing primary containment pressure condition.

STEP:

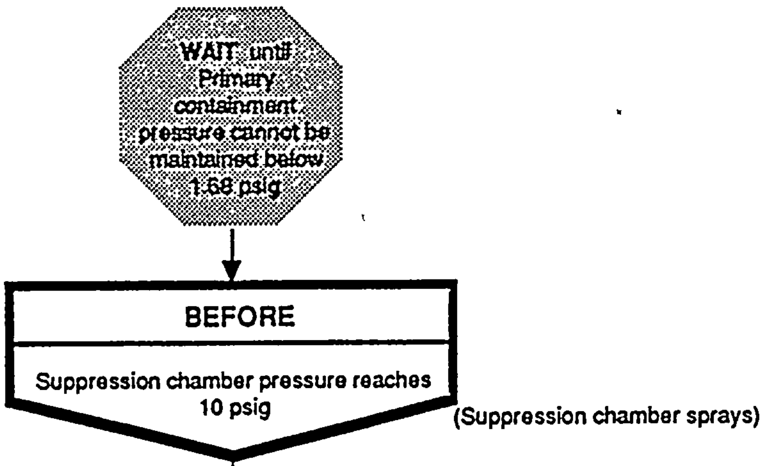


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, primary containment pressure cannot be maintained below 1.68 psig, has been met.

Delaying the performance of the subsequent actions in this procedural leg confirms that the SBGT System is unable to maintain primary containment pressure below the high drywell pressure scram setpoint (1.68 psig), and that further control actions need to be addressed.

STEP:



While executing the following steps:

IF	AND	THEN
Suppression chamber sprays have been initiated	Suppression chamber pressure drops below 1.68 psig	Terminate suppression chamber sprays

DISCUSSION:

If primary containment pressure continues to increase with the SBGT System in operation, further actions (initiating suppression chamber sprays) must be directed to reverse the increasing pressure trend. These actions must be taken BEFORE suppression chamber pressure REACHES the Suppression Chamber Spray Initiation Pressure to preclude chugging effects.

Chugging is the cyclic condensation of steam at the downcomer openings of the drywell vents. Chugging occurs when steam bubbles collapse at the exit of the downcomers. The rush of water which fills the void (some of which is drawn up into the downcomer pipe) induces a severe stress at the junction of the downcomer and the vent header. Repeated application of this stress can cause these joints to experience fatigue failure, thereby creating a pathway which bypasses the pressure suppression function of the primary containment. Subsequent steam discharges through the downcomers would then directly pressurize the suppression chamber air space rather than being discharged to and condensed in the suppression pool.

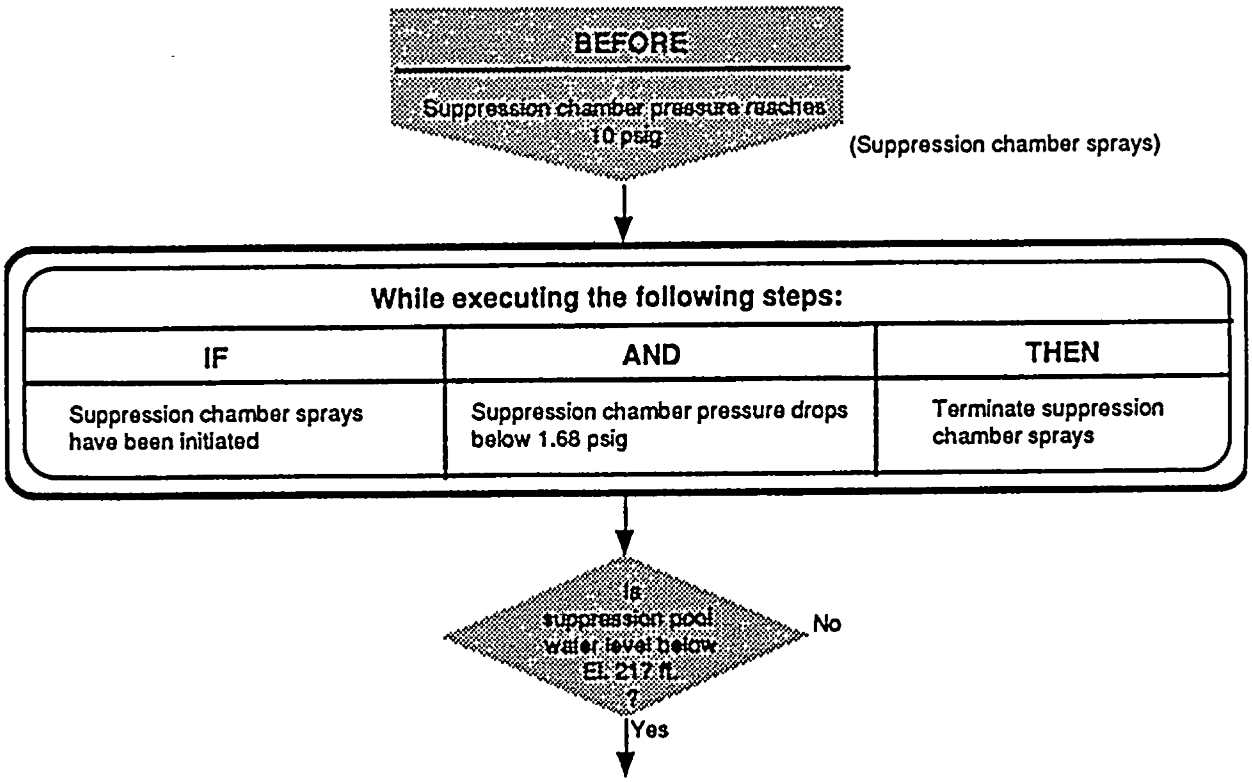
Although operation of suppression chamber sprays by itself will not preclude chugging, suppression chamber sprays are initiated before reaching the Suppression Chamber Spray Initiation Pressure (10 psig). This action assures that this method of primary containment

DISCUSSION: (Continued)

pressure reduction is attempted before the operation of drywell sprays is directed in subsequent steps of the sectional division.

The Suppression Chamber Spray Initiation Pressure is conservatively defined to be the lowest suppression chamber pressure which can occur when 95% of the non-condensibles in the drywell have been transferred to the air space of the suppression chamber. Scale model tests have demonstrated that chugging will not occur so long as the drywell atmosphere contains at least 1% non-condensibles. To prevent the occurrence of conditions under which chugging may happen, the Suppression Chamber Spray Initiation Pressure is conservatively defined by specifying 5% non-condensibles.

STEP:



DISCUSSION:

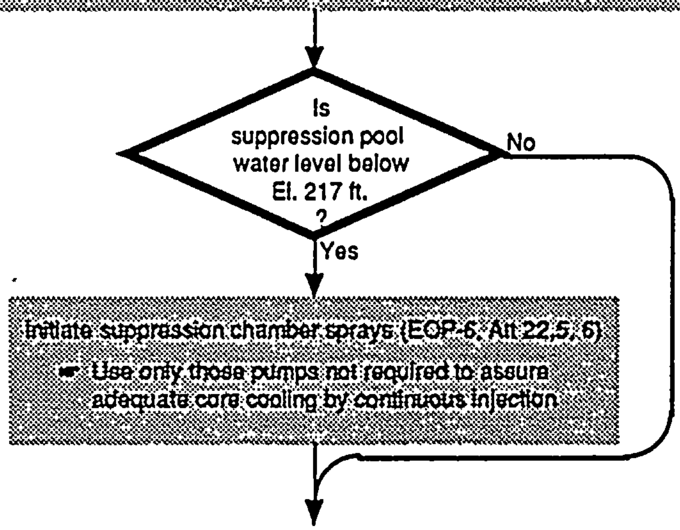
This is an override step and applies throughout the performance of the remainder of this procedural leg.

The action directed in this step terminates the operation of suppression chamber sprays when suppression chamber pressure drops to 1.68 psig (the high drywell pressure scram setpoint) to assure that primary containment pressure is not reduced below atmospheric pressure. Maintaining a positive primary containment pressure provides a safe (positive) margin to the negative design pressure (-4.7 PSID) of the primary containment.

STEP:

While executing the following steps:

IF	AND	THEN
Suppression chamber sprays have been initiated	Suppression chamber pressure drops below 1.68 psig	Terminate suppression chamber sprays



DISCUSSION:

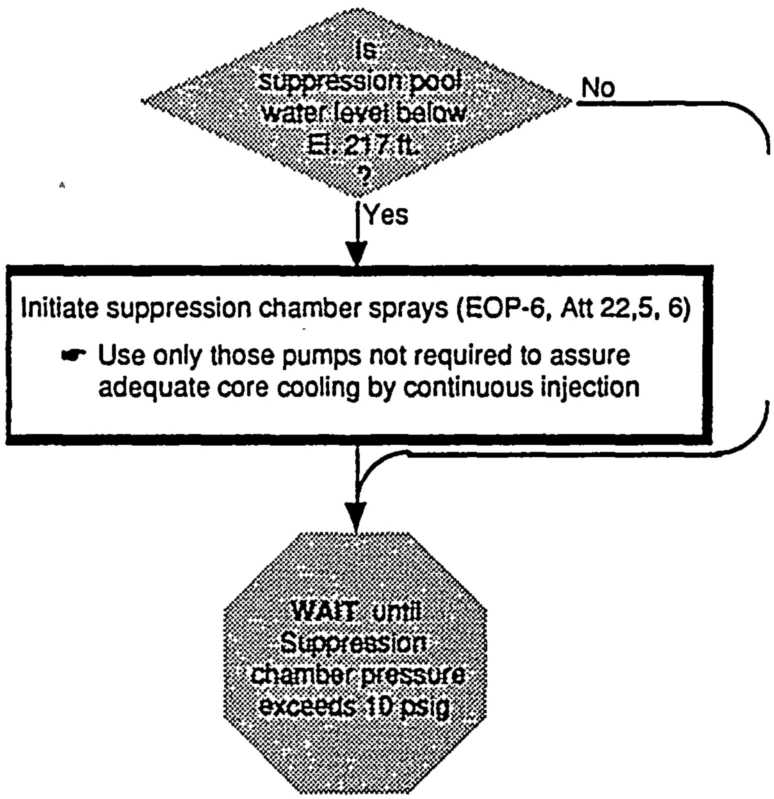
This step has the operator evaluate the present status of suppression pool water level to determine if suppression chamber spray operation is permissible.

If suppression pool water level is below El. 217 ft., as indicated by a "YES" response to this step, the suppression chamber spray nozzles are not submerged and suppression chamber spray operation can be used to reduce the primary containment pressure. The operator is, therefore, directed to continue in this procedure where initiation of suppression chamber sprays is addressed.

If suppression pool water level is at or above El. 217 ft., as indicated by a "NO" response to this step, the suppression chamber spray nozzles are submerged. If the spray nozzles are submerged, no spray action would occur and no benefit would be derived from initiating the system. The operator is, therefore, directed to continue in this procedure where additional actions to reverse the increasing primary containment pressure trend are directed.

Although the actual elevation of the suppression chamber spray nozzles is above El. 217 ft. indicated, El. 217 ft. is the maximum level at which installed instruments can accurately detect and display suppression pool water level. If indicated suppression pool water level is at or above El. 217 ft., it must be assumed that suppression chamber spray nozzles are submerged.

STEP:



DISCUSSION:

This step directs the operator to initiate suppression chamber sprays to effect the necessary reduction in primary containment pressure.

Suppression chamber spray operation reduces suppression chamber pressure and temperature through the combined effects of evaporative cooling and convective cooling. In evaporative cooling the water spray undergoes a change of state, liquid to vapor, whereas convective cooling involves no change of state.

Evaporative cooling occurs when water is sprayed into a superheated atmosphere. The water at the surface of each droplet is heated and flashed to steam until the surrounding atmosphere saturates, absorbing heat energy from the atmosphere.

In the suppression chamber with typical suppression chamber spray flowrate, this cooling process results in an immediate, rapid, large reduction in pressure.

Convective cooling occurs when water is sprayed into a saturated atmosphere. The sprayed water droplets absorb heat from the surrounding atmosphere through convective heat transfer (sensible heat from the suppression chamber atmosphere is transferred to the water droplets), reducing suppression chamber ambient temperature and pressure until equilibrium conditions are established.

DISCUSSION: (Continued)

This process proceeds at a rate much slower than the evaporative cooling process. An operator can effectively control the magnitude of the suppression chamber temperature/pressure reduction from convective cooling by terminating operation of the sprays.

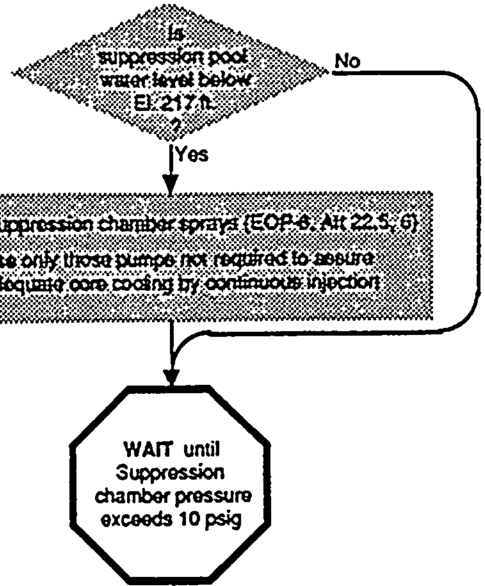
The supplemental action reminds the operator to ensure adequate core cooling is available. Maintaining adequate core cooling takes precedence over initiating suppression chamber sprays because catastrophic failure of the primary containment is not expected to occur at the Suppression Chamber Spray Initiation Pressure (10 psig). In addition, further action is still available for reversing the increasing primary containment pressure trend. Therefore, only if the continuous operation of a RHR pump in the LPCI mode is not required to assure adequate core cooling is it permissible to use that pump for suppression chamber sprays.

This step, however, does permit alternating the use of RHR pumps between the LPCI injection and suppression chamber spray modes, as the need for each occurs and as long as adequate core cooling is able to be maintained.

This step addresses initiation of suppression chamber sprays. Instructions for terminating suppression chamber spray operation, once initiated, were provided by a previous override step.

Additionally, this step provides for the capability to utilize SWP for containment sprays similar to RHR. If continuous SWP injection is required to assure adequate core cooling, it should not be diverted to the spray mode.

STEP:



While executing the following steps:

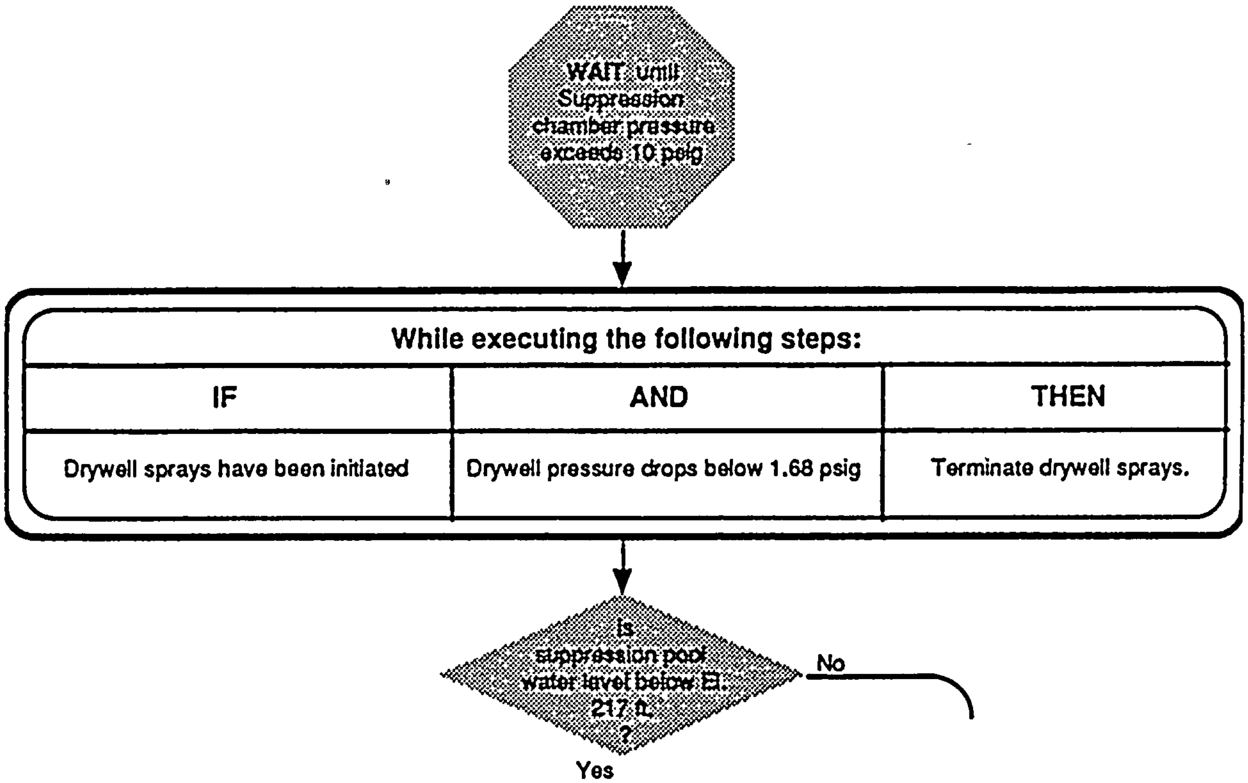
IF	AND	THEN
Drywell sprays have been initiated	Drywell pressure drops below 1.68 psig	Terminate drywell sprays.

DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, suppression chamber pressure above 10 psig, has been met.

Delaying the performance of the subsequent actions in this procedural leg confirms that suppression chamber sprays were unable to reduce primary containment pressure (or that they could not be initiated due to high suppression pool water level), and that further control actions need to be directed.

STEP:



DISCUSSION:

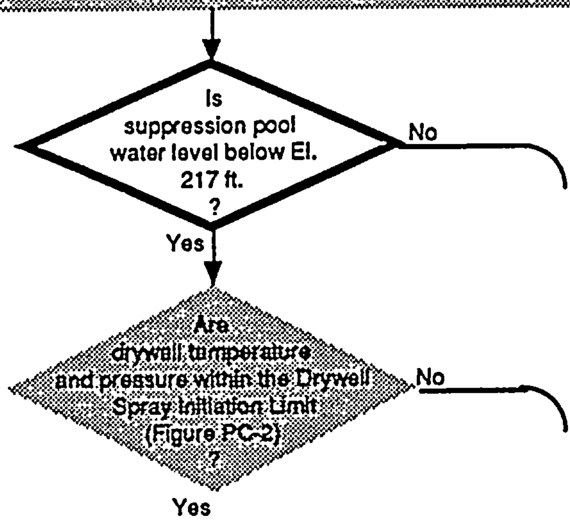
This is an override step and applies throughout the performance of the remainder of this procedural leg.

The action directed in this step terminates the operation of drywell sprays, the convective cooling process of the drywell air space and the cooling/condensing of potential steam in the air space to ensure that primary containment pressure is not reduced below atmospheric. Terminating drywell sprays when drywell pressure decreases below 1.68 psig avoids creating a negative primary containment pressure. Maintaining a positive primary containment pressure assures that a safe (positive) margin to the negative design pressure (-4.7 PSID) of the primary containment exists.

STEP:

While executing the following steps:

IF	AND	THEN
Drywell sprays have been initiated	Drywell pressure drops below 1.68 psig	Terminate drywell sprays.



DISCUSSION:

This step has the operator evaluate the present status of suppression pool water level to determine if drywell spray operation is permissible.

If suppression pool water level is below El. 217 ft., as indicated by a "YES" response to this step, the suppression chamber-to-drywell vacuum breakers are not submerged and will function as designed. Drywell spray operation can be used to reduce primary containment pressure and may continue as long as drywell temperature and pressures are within the limits of the Drywell Spray Initiation Limit (Figure PC-2, refer to Section C).

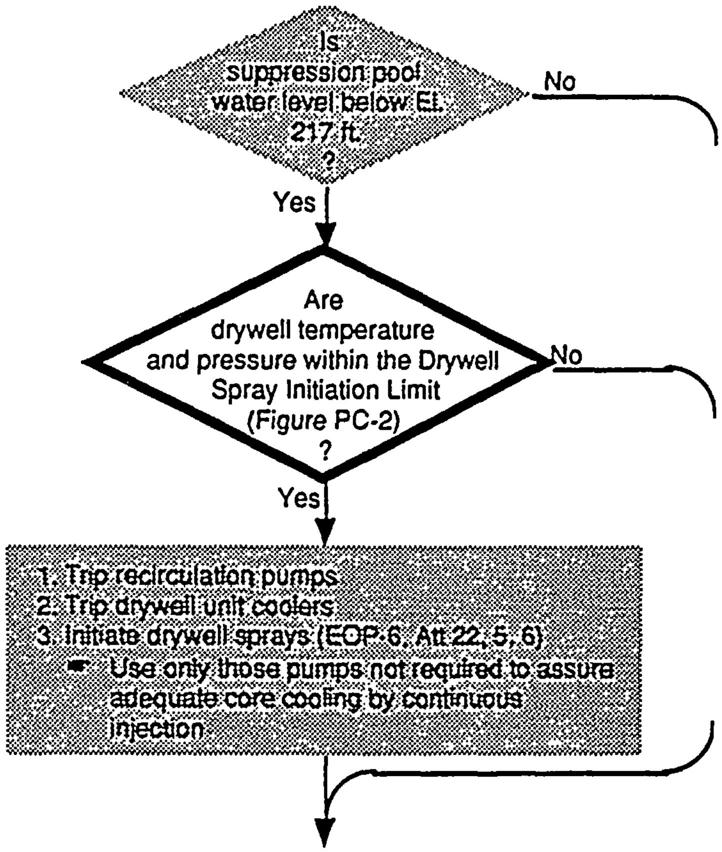
If suppression pool water level is at or above El. 217 ft., as indicated by a "NO" response to this step, the suppression chamber-to-drywell vacuum breakers are submerged. Drywell spray operation with the vacuum breakers partially or completely submerged (i.e., no drywell vacuum relief capability) could result in exceeding the design negative differential pressure capability (-4.7 PSID) of the primary containment because of the inability to equalize pressure through the vacuum breakers. Therefore, drywell spray operation is not permitted if suppression pool water level is above El. 217 ft.

Although the actual elevation of the suppression chamber-to-drywell vacuum breakers is above El. 217 ft. indicated, El. 217 ft. is the maximum level at which installed instruments

DISCUSSION: (Continued)

can accurately detect and display suppression pool water level. If indicated suppression pool water level is at or above El. 217 ft., it must be assumed that suppression chamber-to-drywell vacuum breakers will not function as designed, because a portion of the valve is covered with water.

STEP:



DISCUSSION:

This step has the operator evaluate the present status of drywell temperature and pressure relative to the Drywell Spray Initiation Limit (Figure PC-2, refer to Section C) to determine if drywell spray operation is permissible.

The Drywell Spray Initiation Limit is defined to be the highest drywell temperature at which initiation of drywell sprays will not result in an evaporative cooling pressure drop to below either: (1) the drywell-below-suppression chamber differential pressure capability (-10 PSID), or (2) the high drywell pressure scram setpoint (1.68 psig).

Drywell spray operation effects a primary containment pressure and temperature reduction through the combined effects of evaporative and convective cooling. In evaporative cooling the water spray undergoes a change of state, liquid to vapor, whereas convective cooling involves no change of state.

Evaporative cooling occurs when water is sprayed into a superheated atmosphere. The water at the surface of each droplet is heated and flashes to steam, absorbing heat energy from the atmosphere, until the atmosphere reaches saturated conditions.

In the drywell, with typical drywell spray flowrate, this cooling process results in an immediate, rapid, large reduction in pressure which occurs at a rate much faster than can be

DISCUSSION: (Continued)

compensated for by the primary containment vacuum relief system. Unrestricted operation of drywell sprays could cause an excessive negative differential pressure to occur between the drywell and the suppression chamber, large enough to cause a loss of primary containment integrity.

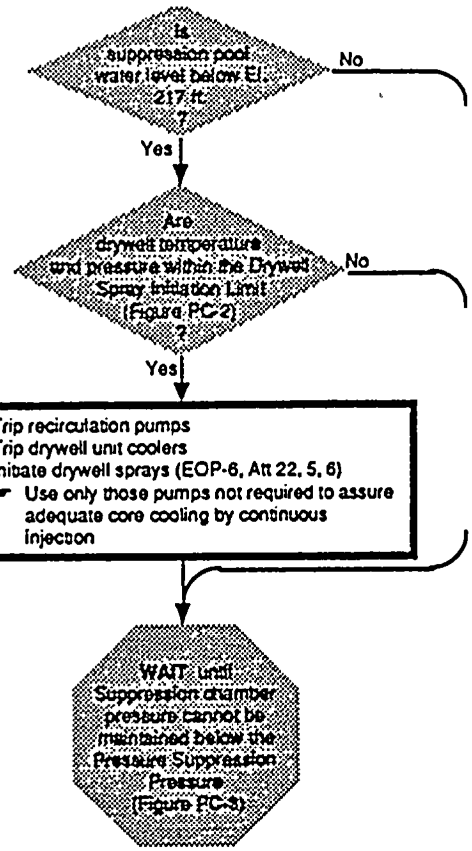
Convective cooling occurs when water is sprayed into a saturated atmosphere. The sprayed water droplets will absorb heat from the surrounding atmosphere through convective heat transfer (sensible heat from the atmosphere is transferred to the water droplets). This effect results in a reduction in ambient temperature and pressure until equilibrium conditions are established.

This cooling process occurs at a rate much slower than the evaporative cooling process. An operator can effectively control the magnitude of a drywell temperature/pressure reduction from convective cooling by terminating operation of drywell sprays.

If drywell temperature and pressure are within the limits of the Drywell Spray Initiation Limit, as indicated by a "YES" response to this step, drywell sprays can be used to reduce primary containment pressure. The operator is, directed to continue in this procedural leg where actions to initiate drywell sprays are addressed.

If drywell temperature and pressure are not within the Drywell Spray Initiation Limit, as indicated by a "NO" response to this step, drywell spray operation is not permitted because the negative design differential pressure limit (-10 PSID) between the drywell and suppression chamber may be exceeded, with subsequent failure of the primary containment. The operator is directed to continue in this procedural leg where additional actions to reduce primary containment pressure are addressed.

STEP:



DISCUSSION:

This step directs the operator to trip recirculation pumps and drywell unit coolers. Guidance is provided because these components are not designed to operate in a spray environment.

The operator is directed to initiate drywell sprays to reduce primary containment pressure. Drywell spray operation reduces drywell pressure and temperature through the combined effects of evaporative and convective cooling.

Maintaining adequate core cooling takes precedence over initiating drywell sprays, because catastrophic failure of the primary containment is not expected to occur at pressures slightly greater than the Suppression Chamber Spray Initiation Pressure (10 psig).

In addition, further action is still available for reversing the increasing primary containment pressure trend. Therefore, only if the continuous operation of a RHR pump in the LPCI mode is not required to assure adequate core cooling is it permissible to use that pump for drywell sprays.

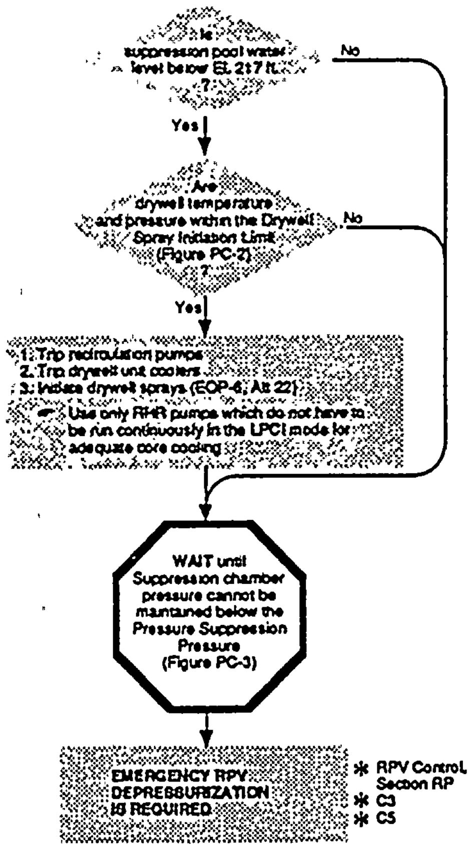
This step, however, does permit alternating the use of RHR pumps between the LPCI injection and drywell spray modes, as the need for each occurs and as long as adequate core cooling is able to be maintained.

This step addresses initiation of drywell sprays. Instructions for terminating drywell spray operation, once initiated, are provided by a previous override step.

DISCUSSION:-(Continued)

Additionally, this step provides for the capability to utilize SWP or FPW for containment sprays similar to RHR. If continuous SWP or FPW injection is required to assure adequate core cooling, it should not be diverted to the spray mode.

STEP:



DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, suppression chamber pressure cannot be maintained below the Pressure Suppression Pressure (Figure PC-3), has been met.

Delaying the performance of the subsequent actions in this procedural leg confirms that all prior actions taken to terminate the increasing primary containment pressure trend have been unsuccessful, and that further control actions need to be directed.

The Pressure Suppression Pressure is defined to be the lesser of either: (1) the highest suppression chamber pressure which can occur without steam in the suppression chamber air space, or (2) the highest suppression chamber pressure at which initiation of RPV depressurization will not result in exceeding the Primary Containment Pressure Limit before RPV pressure drops to the Minimum RPV Flooding Pressure, or (3) the highest suppression chamber pressure which can be maintained without exceeding the suppression pool design load if SRVs are opened.

The Nine Mile Point Station Unit 2 limit, up to a suppression pool water level of El. 206 ft., is based on (1) the highest suppression chamber pressure which can occur without steam in the suppression chamber air space. The Nine Mile Point Station Unit 2 limit above a suppression

DISCUSSION: (Continued)

pool water level of El. 206 ft. is based on (3) the highest suppression chamber pressure which can be maintained without exceeding the suppression pool boundary design load if SRVs are opened.

The Pressure Suppression Pressure assures that the pressure suppression function of the primary containment is maintained while the RPV is at pressure. If primary containment pressure cannot be maintained below the Pressure Suppression Pressure, rapid depressurization of the RPV is required to terminate, or reduce as much as possible, any continued primary containment pressure increase.

STEP:

WAIT until Suppression chamber pressure cannot be maintained below the Pressure Suppression Pressure (Figure PC-3)

↓

EMERGENCY RPV DEPRESSURIZATION IS REQUIRED

✻ RPV Control, Section RP
✻ C3
✻ C5

↓

BEFORE

Suppression chamber pressure reaches the Primary Containment Pressure Limit (Figure PC-4)

(Containment venting)

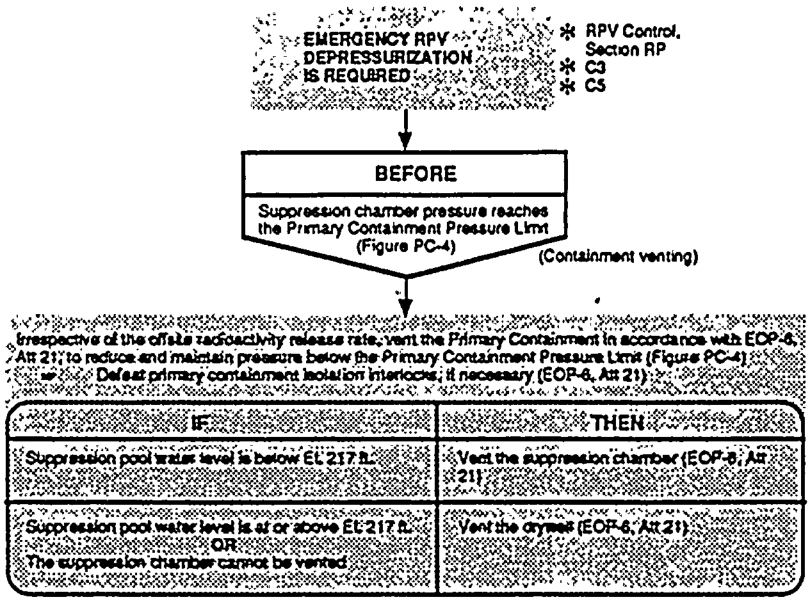
DISCUSSION:

When primary containment pressure cannot be maintained below the Pressure Suppression Pressure (Figure PC-3), emergency RPV depressurization must be performed to minimize the further release of energy from the RPV to the primary containment.

To have progressed this far in the sectional division flowpath, primary containment pressure has reached 1.68 psig, an entry condition for N2-EOP-RPV, RPV Control.

Since N2-EOP-RPV, RPV Control, is being executed concurrently with this procedure, the explicit direction to enter N2-EOP-C2, Emergency RPV Depressurization, is given in the override in the Reactor Pressure (RP) leg of N2-EOP-RPV denoted with a ✻ .

STEP:



EOP-6, Att 21 Sections
Isolate N_2 makeup (Section 21.1)
SOV 102 (2 in.) (Section 21.2)
Blind flange installation (Section 21.3)
AOV 101 vent (bypass SBGT) (Section 21.4)

DISCUSSION:

If suppression chamber pressure continues to increase, further actions to reverse the increasing pressure trend must be directed. These actions must be taken BEFORE suppression chamber pressure REACHES the Primary Containment Pressure Limit (Figure PC-4, refer to Section C) to ensure that the integrity of the primary containment is maintained.

The Primary Containment Pressure Limit (Figure PC-4, refer to Section C) is defined to be the lesser of either: (1) the pressure capability of the primary containment, or (2) the maximum primary containment pressure at which vent valves sized to reject all decay heat from the primary containment can be opened and closed, or (3) the maximum primary containment pressure at which SRVs can be opened and will remain open, or (4) the maximum primary containment pressure at which RPV vent valves can be opened and closed. The Nine Mile Point Station Unit 2 limit is based on (2) the maximum primary containment pressure at which vent valves sized to reject all decay heat from the primary containment can be opened and closed.

STEP:

BEFORE

Suppression chamber pressure reaches the Primary Containment Pressure Limit (Figure PC-4)

(Containment venting)

Irrespective of the offsite radioactivity release rate, vent the Primary Containment in accordance with EOP-6, Att 21, to reduce and maintain pressure below the Primary Containment Pressure Limit (Figure PC-4)

- Defeat primary containment isolation interlocks, if necessary (EOP-6, Att 21)

IF	THEN
Suppression pool water level is below EL 217 ft.	Vent the suppression chamber (EOP-6, Att 21)
Suppression pool water level is at or above EL 217 ft. OR The suppression chamber cannot be vented	Vent the drywell (EOP-6, Att 21)

EOP-6, Att 21 Sections

- Isolate N_2 makeup (Section 21.1) ______
- SOV 102 (2 in.) (Section 21.2) ______
- Blind flange installation (Section 21.3) ______
- AOV 101 vent (bypass SBGT) (Section 21.4) ______

DISCUSSION:

This step directs the operator to vent the primary containment before suppression chamber pressure exceeds the Primary Containment Pressure Limit (Figure PC-4, refer to Section C). Primary containment venting is accomplished to reduce primary containment pressure (in accordance with EOP-6, Attachment 21).

Venting of the primary containment is performed irrespective of the offsite radioactivity release rate that will occur, defeating isolation interlocks if necessary. This action is taken: (1) to assure that the integrity of the primary containment is maintained, and (2) to prevent core damage that might be caused by the inability to vent the RPV as necessary to permit injection of water to cool the core.

The consequences of not venting may result in a catastrophic loss of primary containment integrity with a subsequent uncontrolled release of radioactivity much greater than that which might otherwise occur. Direction is given to vent only until suppression chamber pressure can be reduced and maintained below the Primary Containment Pressure Limit (Figure PC-4, refer to Section C). This minimizes the offsite radioactivity release rate while still assuring primary containment integrity.

STEP:

BEFORE

Suppression chamber pressure reaches the Primary Containment Pressure Limit (Figure PC-4)

(Containment venting)

Irrespective of the offsite radioactivity release rate, vent the Primary Containment in accordance with EOP-6, Att 21, to reduce and maintain pressure below the Primary Containment Pressure Limit (Figure PC-4)

Defeat primary containment isolation interlocks, if necessary (EOP-6, Att 21)

IF	THEN
Suppression pool water level is below El. 217 ft.	Vent the suppression chamber (EOP-6, Att 21)
Suppression pool water level is at or above El. 217 ft. OR The suppression chamber cannot be vented	Vent the drywell (EOP-6, Att 21)

EOP-6, Att 21 Sections	
Isolate N_2 makeup (Section 21.1)	________
SOV 102 (2 in.) (Section 21.2)	________
Blind flange installation (Section 21.3)	________
AOV 101 vent (bypass SBGT) (Section 21.4)	________

DISCUSSION:

If suppression pool water level is below El. 217 ft., the suppression chamber vent is not submerged. Therefore, venting of the suppression chamber can reduce primary containment pressure.

Venting via the suppression chamber is the preferred method of primary containment venting because it takes advantage of the scrubbing effect (i.e. vented gas from the primary containment which exits from the downcomers passes through the suppression pool water volume). The scrubbing effect minimizes the amount of radioactivity released.

Venting is continued only until suppression chamber pressure has been reduced and, can be maintained below, the Primary Containment Pressure Limit (Figure PC-4, refer to Section C).

STEP:

Irrespective of the offsite radioactivity release rate, vent the Primary Containment in accordance with EOP-6, Att 21, to reduce and maintain pressure below the Primary Containment Pressure Limit (Figure PC-4).

Defeat primary containment isolation interlocks, if necessary (EOP-6, Att 21)

IF	THEN
Suppression pool water level is below El. 217 ft.	Vent the suppression chamber (EOP-6, Att 21)
Suppression pool water level is at or above El. 217 ft. OR The suppression chamber cannot be vented	Vent the drywell (EOP-6, Att 21)

WAIT until Suppression chamber pressure cannot be maintained below the Primary Containment Pressure Limit (Figure PC-4)

EOP-6, Att 21 Sections	
Isolate N_2 makeup (Section 21.1)	______
SOV 102 (2 in.) (Section 21.2)	______
Blind flange installation (Section 21.3)	______
AOV 101 vent (bypass SBGT) (Section 21.4)	______

DISCUSSION:

If suppression pool water level is at or above El. 217 ft., the suppression chamber vent is submerged. If the vent is submerged, the suppression chamber cannot be vented. Therefore, the operator is directed to vent the drywell (in accordance with EOP-6, Attachment 21) to reduce primary containment pressure.

Although the actual elevation of the suppression chamber vent is above El. 217 ft. indicated, El. 217 ft. is the maximum level at which installed instruments can accurately detect and display suppression pool water level. If indicated suppression pool water level is at or above El. 217 ft., it must be assumed that suppression chamber vent is submerged.

Venting is continued only until suppression chamber pressure has been reduced below, and can be maintained below, the Primary Containment Pressure Limit (Figure PC-4,

STEP:

Suppression pool water level is at or above El. 217 ft. OR The suppression chamber cannot be vented	Vent the drywell (EOP-6, Att 21)

WAIT until Suppression chamber pressure cannot be maintained below the Primary Containment Pressure Limit (Figure PC-4)

IF	THEN
Suppression pool water level is below El. 217 ft.	Irrespective of whether adequate core cooling is assured, initiate suppression chamber sprays (EOP-6, Att 22)
Suppression pool water level is at or below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2)	Irrespective of whether adequate core cooling is assured: 1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22)

DISCUSSION:

refer to Section C).

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, suppression chamber pressure cannot be maintained below the Primary Containment Pressure Limit (Figure PC-4, refer to Section C), has been met.

Delaying the performance of the subsequent actions in this procedural leg confirms that all prior actions to terminate the increasing primary containment pressure trend have been unsuccessful, and that further control actions

STEP:

WAIT until Suppression chamber pressure cannot be maintained below the Primary Containment Pressure Limit (Figure PC-4)

IF	THEN
Suppression pool water level is below El. 217 ft.	Irrespective of whether adequate core cooling is assured, initiate suppression chamber sprays (EOP-6, Att 22, 5, 6)
Suppression pool water level is at or below El. 217 ft. **AND** Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2)	Irrespective of whether adequate core cooling is assured: 1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22, 5, 6)

DISCUSSION:

need to be directed.

The use of suppression chamber sprays may previously have been precluded because of adequate core cooling concerns. When suppression chamber pressure cannot be maintained below the Primary Containment Pressure Limit (Figure PC-4, refer to Section C), the use of suppression chamber sprays is directed, irrespective of adequate core cooling concerns, to reduce primary containment pressure.

This action is specified at this point because not doing so may eventually result in a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the primary containment may fail, the loss of the suppression pool must be assumed, accompanied by complete and unrecoverable loss of core cooling. The degraded core condition and loss of primary containment integrity may release substantial amounts of radioactivity to the environment. When it is necessary to make a choice between assuring primary containment integrity or adequate core cooling, the Nine Mile Point Station Unit 2 EOPs direct that preference will be made toward assuring primary containment integrity, regardless of core conditions, in order to protect the general public.

The override step at the beginning of this procedural leg directs the operator to terminate suppression chamber sprays when suppression chamber pressure decreases to 1.68

DISCUSSION: (Continued)

psig (the high drywell pressure scram setpoint), to assure that primary containment pressure is not reduced below atmospheric. Maintaining a positive primary containment pressure assures that a safe (positive) margin to the negative design pressure (-4.7 PSID) of the primary containment exists.

The suppression pool water level requirement of less than El. 217 ft. is to ensure that the suppression chamber spray nozzles are not submerged. If the spray nozzles were submerged, no spray action would occur and no benefit would be derived from initiating the suppression chamber spray system.

STEP:

WAIT until Suppression chamber pressure cannot be maintained below the Primary Containment Pressure Limit (Figure PC-4)

IF	THEN
Suppression pool water level is below El. 217 ft.	Irrespective of whether adequate core cooling is assured, initiate suppression chamber sprays (EOP-6, Att 22, 5, 6)
Suppression pool water level is at or below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2)	Irrespective of whether adequate core cooling is assured: 1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22, 5, 6)

DISCUSSION:

The step directs the operator to trip recirculation pumps and drywell unit coolers. This guidance is provided because these components are not designed to operate in a spray environment.

The step directs the operator to initiate drywell sprays to reduce primary containment pressure. Drywell spray operation reduces drywell pressure and temperature through the combined effects of evaporative and convective cooling.

The use of drywell sprays may previously have been precluded because of adequate core cooling concerns. When suppression chamber pressure cannot be maintained below the Primary Containment Pressure Limit (Figure PC-4, refer to Section C), the use of drywell sprays is directed, irrespective of adequate core cooling.

This action is specified because not doing so may eventually result in a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the primary containment may fail, the loss of the suppression pool must be assumed, accompanied by complete and unrecoverable loss of core cooling. The degraded core condition and loss of primary containment integrity may release substantial amounts of radioactivity to the environment. When it is necessary to make a choice between assuring primary containment integrity or adequate core cooling, the Nine Mile Point Station Unit 2 EOPs direct

DISCUSSION: (Continued)

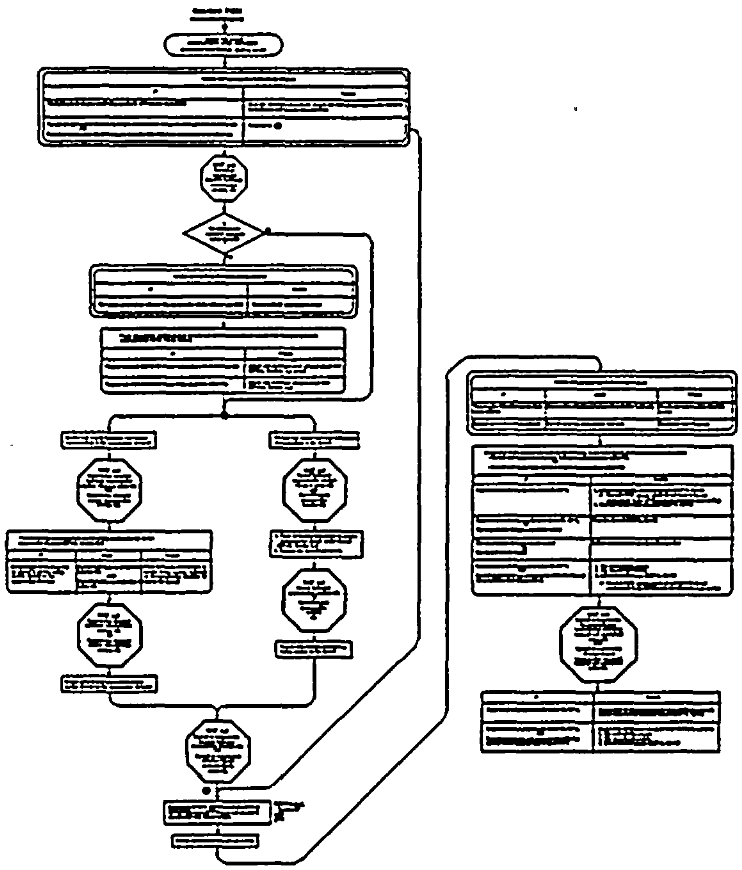
that preference will be made toward assuring primary containment integrity, regardless of core conditions, in order to protect the general public.

The restriction on suppression pool water level (less than El. 217 ft.) ensures that the design primary containment differential pressure (-4.7 PSID) is not challenged during drywell spray operations.

The Drywell Spray Initiation Limit (Figure PC-2, refer to Section C), controls initiation of drywell sprays. With drywell temperature and/or pressure above the Drywell Spray Initiation Limit, initiation of drywell sprays could result in a complete loss of primary containment integrity. Therefore, the operator is directed not to initiate drywell sprays if the combination of drywell temperature and pressure cannot be maintained below the Drywell Spray Initiation Limit.

The override step at the beginning of this procedural leg directs the operator to terminate drywell sprays when drywell pressure decreases to 1.68 psig (the high drywell pressure scram setpoint) to assure that primary containment pressure is not reduced below atmospheric. Maintaining a positive primary containment pressure, assures a safe (positive) margin to the negative design pressure (-4.7 PSID) of the primary containment.

STEP:



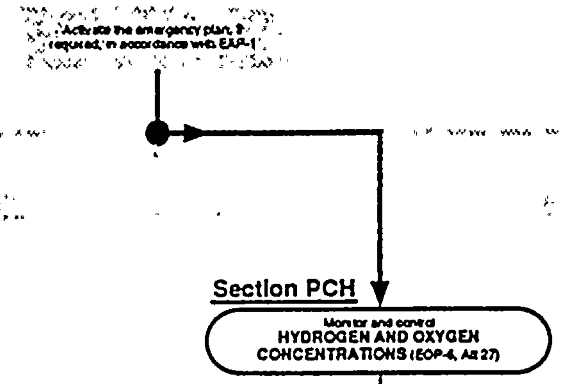
DISCUSSION:

This section of N2-EOP-PC, Primary Containment Control, specifies operator actions to be taken to control combustible gas (hydrogen and oxygen) concentrations in the primary containment.

Hydrogen and oxygen must both be present, in sufficient concentration, for combustion to occur. Excessive hydrogen concentration mixed with high oxygen concentration and ignited in the confined space of the primary containment can generate peak pressures which may exceed the structural capability of the drywell, suppression chamber or drywell-to-suppression chamber boundary. Such a failure may result in the uncontrolled release of radioactivity to the environment. In addition, the temperature and pressure shock waves created during the rapid burning of these gases may damage equipment important to the safe shutdown of the plant. Concentrations of both gases must be monitored and controlled to prevent the development of a flammable condition.

Measurable levels of hydrogen could appear in the primary containment from the following sources: (1) the high temperature reaction of metal (typically zirconium) with water to produce hydrogen gas and metal oxide, (2) radiolysis of water to produce hydrogen and oxygen, and (3) feedwater injection of hydrogen to control reactor chemistry. Nine Mile Point Station Unit 2 does not inject hydrogen into the RPV for reactor coolant chemistry control.

STEP:



While executing the following steps:	
IF	THEN
The hydrogen or oxygen monitoring system is or becomes unavailable	Have the chemistry department sample the drywell and suppression chamber for hydrogen and oxygen concentrations
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%	Continue at (M)

DISCUSSION:

This step directs the operator to monitor and control primary containment hydrogen and oxygen concentrations.

Entry into this procedure requires activation of available hydrogen monitoring systems, if not already in operation.

Measurable levels of oxygen are not expected during normal power operations except during brief periods at startup and shutdown of the plant when the primary containment atmosphere is being inerted or de-inerted. However, oxygen may occur from the radiolysis of water or, entry to the primary containment from leaks in the instrument air system. Oxygen concentration is routinely monitored and controlled during reactor operation in accordance with Technical Specification requirements.

STEP:

Monitor and control
HYDROGEN AND OXYGEN CONCENTRATIONS [EOP-6, Att 27]

While executing the following steps:

IF	THEN
The hydrogen or oxygen monitoring system is or becomes unavailable	Have the chemistry department sample the drywell and suppression chamber for hydrogen and oxygen concentrations
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%	Continue at (M)

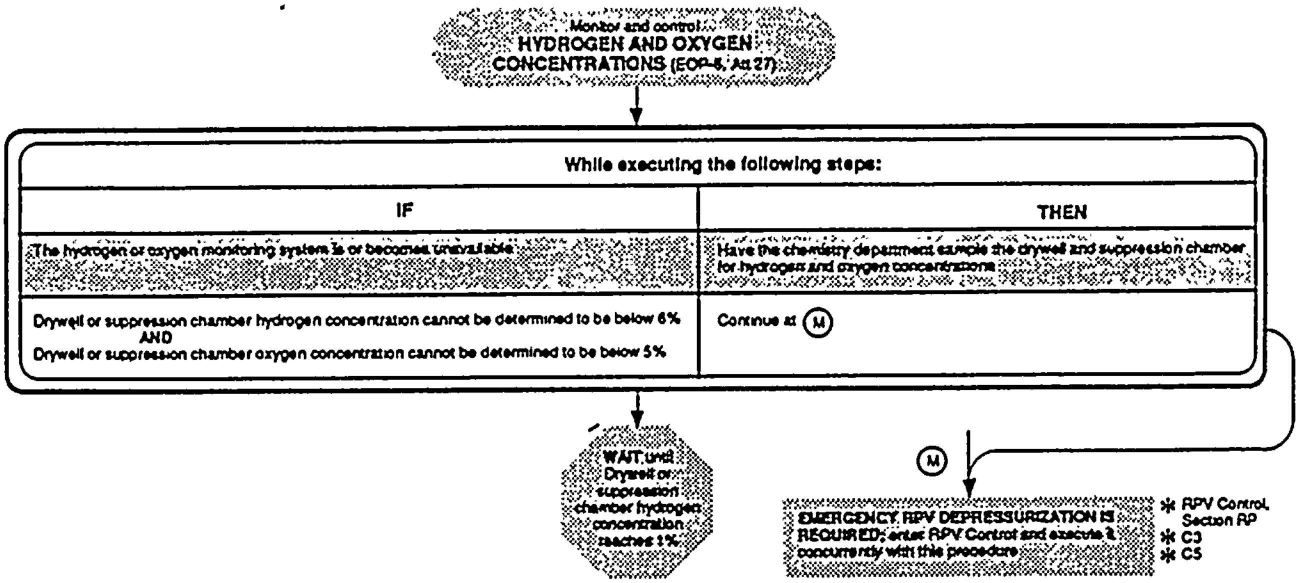
WAIT until Drywell or suppression chamber hydrogen concentration reaches 1%

DISCUSSION:

This is an override step and applies throughout the performance of the remainder of this procedural leg.

When the monitoring systems for hydrogen or oxygen become unavailable, the concentration of these gases must be determined by manually sampling and analysis.

STEP:



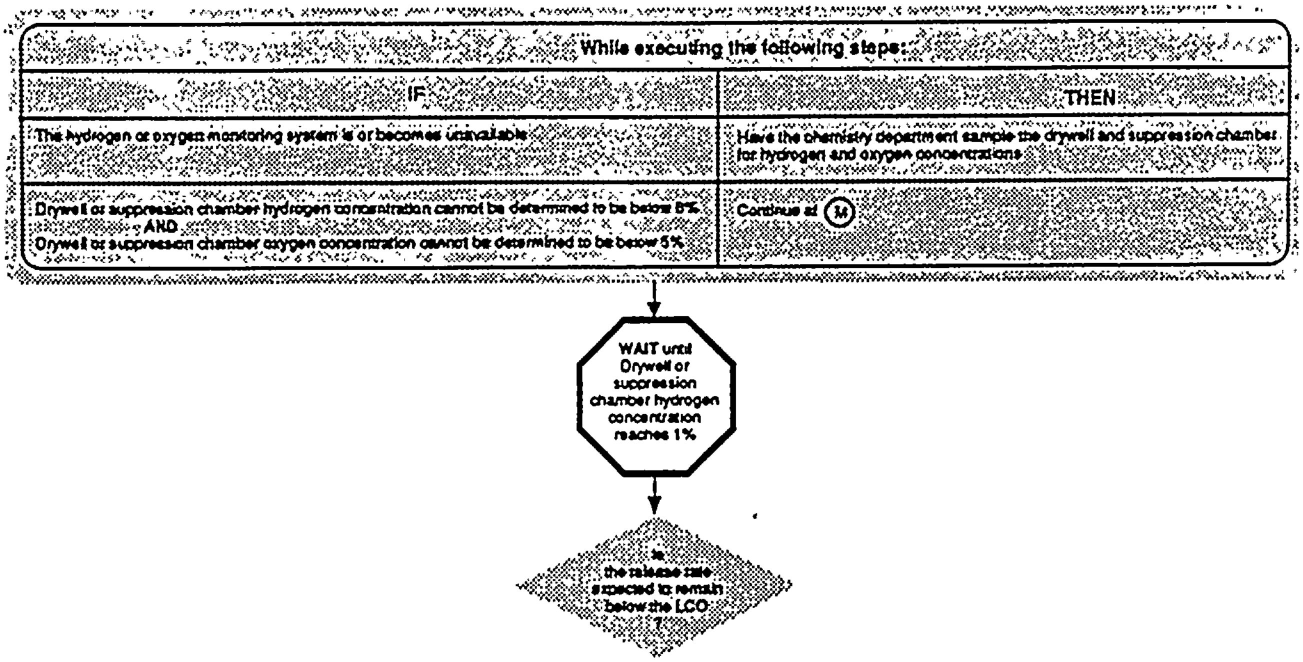
DISCUSSION:

If hydrogen and oxygen concentrations in the drywell or suppression chamber cannot be determined by any means, it must be assumed that levels are in excess of those required to support combustion.

The specified value of 6% hydrogen concentration is the minimum required to support a deflagration (to burn rapidly with intense heat). The associated stoichiometric concentration (quantitative relationship) of oxygen for this condition is 5%. Combustion of hydrogen in the deflagration concentration range creates a travelling flame front, heating the primary containment atmosphere and causing a rapid increase in primary containment pressure.

A deflagration may result in peak primary containment pressure high enough to rupture the drywell, suppression chamber, or drywell-to-suppression chamber boundary, thus defeating the pressure suppression function of the primary containment. If conditions in either the drywell or suppression chamber are such that a deflagration could occur, the operator is directed to continue in the procedure at point M, where appropriate actions are provided.

STEP:

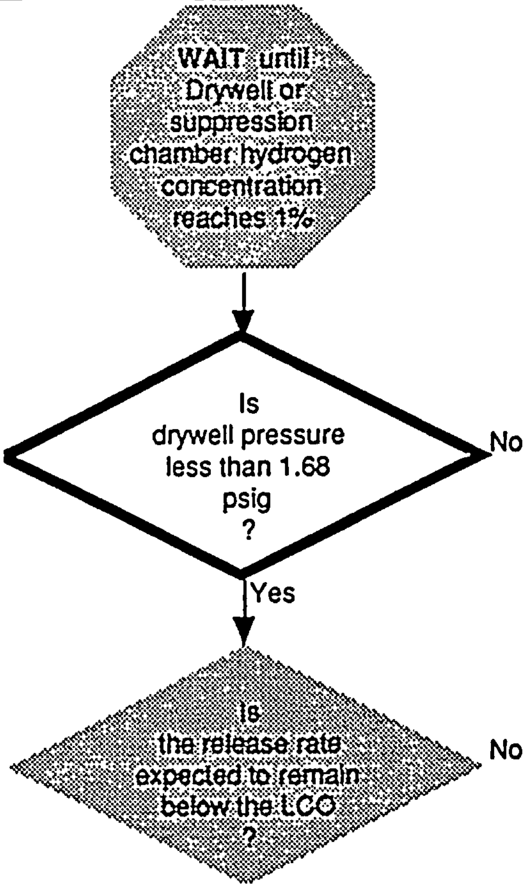


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, drywell or suppression chamber hydrogen concentration at 1%, has been met.

Delaying the performance of the subsequent actions in this procedural leg confirms that hydrogen gas concentration in either the drywell or suppression chamber is increasing, and that further control actions need to be directed. 1% is the H2/O2 analyzer minimum detectable H2 concentration.

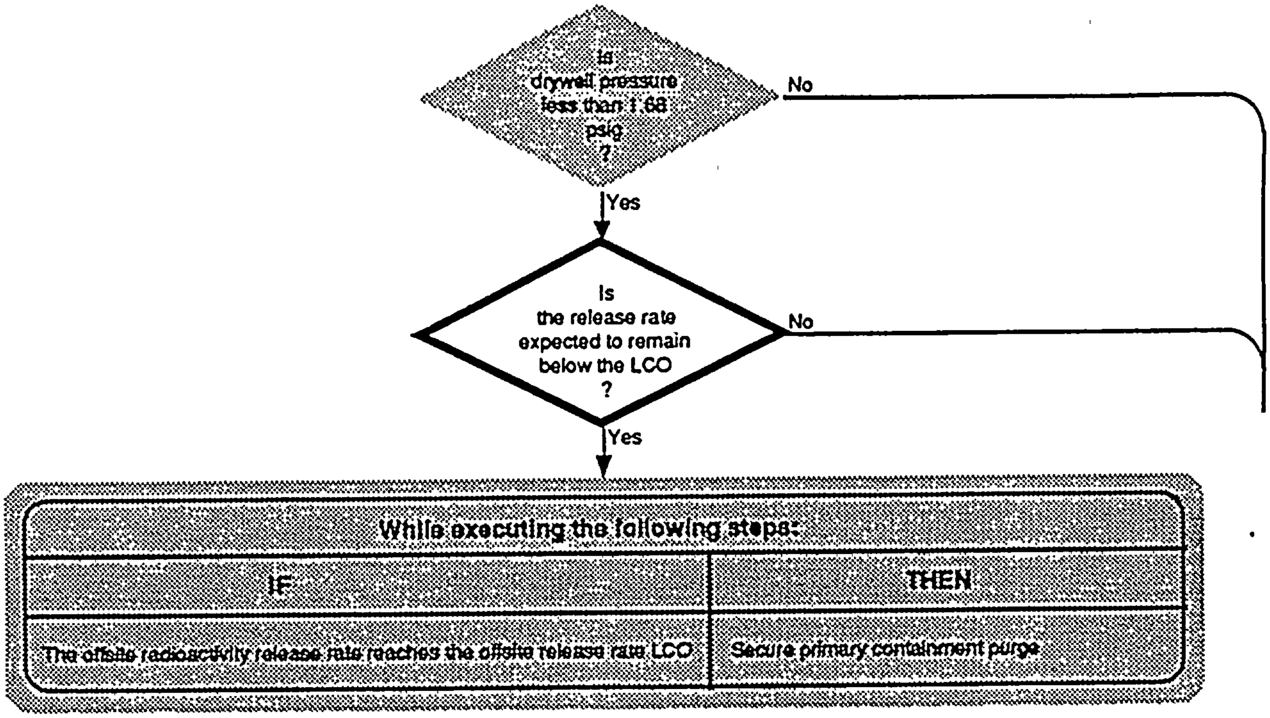
STEP:



DISCUSSION:

This step asks the question: "is drywell pressure less than 1.68 psig?". Since the subsequent action do not allow defeating LOCA isolation interlocks, this provides an easy method to bypass the steps where purging is performed using normal operating procedures.

STEP:



DISCUSSION:

The existence of a detectable amount of hydrogen (1%) in either the drywell or suppression chamber warrants corrective action, irrespective of the condition which required entry into N2-EOP-PC, Primary Containment Control.

Purging of the primary containment is the method normally used to control primary containment atmosphere conditions, and is , therefore, the first method employed to reduce hydrogen concentration at this point. Although continued increases in hydrogen concentration will directly threaten primary containment integrity, hydrogen concentrations near the minimum detectable level (1%) are not by themselves primary containment threatening. Therefore, purging at this point is permitted only if it can be performed within the limits prescribed for normal (non-emergency) plant operation (i.e., release rates will remain below the Technical Specification LCO limits).

Consistent with Nine Mile Point Station Unit 2 procedures, it is appropriate to wait for the results of an analysis of a sample of the primary containment before purging the primary containment. This is directed by N2-OP-61A.

If existing plant conditions and the most recently obtained air sample results suggest that the release to areas outside of the primary containment will remain within Technical Specification requirements, as indicated by a

DISCUSSION: (Continued)

"YES" response to this step, the primary containment purge may commence. The operator is, therefore, directed to continue in this procedural leg with actions to purge the primary containment.

If existing plant conditions and the most recently obtained air sample results suggest that the release to areas outside of the primary containment will not remain within Technical Specification requirements, as indicated by a "NO" response to this step, the primary containment should not be purged. The operator is, therefore, directed to continue in this procedural leg with actions to place the hydrogen recombiners in service.

DISCUSSION: (Continued)

"YES" response to this step, the primary containment purge may commence. The operator is, therefore, directed to continue in this procedural leg with actions to purge the primary containment.

If existing plant conditions and the most recently obtained air sample results suggest that the release to areas outside of the primary containment will not remain within Technical Specification requirements, as indicated by a "NO" response to this step, the primary containment should not be purged. The operator is, therefore, directed to continue in this procedural leg with actions to place the hydrogen recombiners in service.

STEP:

Is the release rate expected to remain below the LCO ?

Yes

While executing the following steps:	
IF	**THEN**
The offsite radioactivity release rate reaches the offsite release rate LCO	Secure primary containment purge

Purge the primary containment to restore and maintain drywell and suppression chamber hydrogen concentrations below 1% as follows:

IF	THEN
Oxygen concentration in the space being purged is at or above 5%	Initiate and maximize air or nitrogen purge flow (OP61A, Sections 5.0 or 3.0)
Oxygen concentration in the space being purged is below 5%	Initiate and maximize nitrogen purge flow (OP-61A, Section 3.0)

DISCUSSION:

This is an override step and applies throughout the performance of the remainder of this procedural leg to purge the primary containment with hydrogen and oxygen concentrations below deflagration limits.

The primary containment purge must be isolated if the offsite radioactivity release rate reaches the Technical Specification release rate LCO. Unrestricted purging to reduce combustible gas concentration is only appropriate when deflagration concentrations of hydrogen and oxygen are reached.

Nine Mile Point Station Unit 2 procedures provide directions for obtaining a primary containment air sample and performing the analyses which verify that the actual radioactivity release rate is within the limits permitted by Technical Specifications. (N2-OP-61A).

STEP:

While executing the following steps:	
IF	THEN
The offsite radioactivity release rate reaches the offsite release rate LCO	Secure primary containment purge

Purge the primary containment to restore and maintain drywell and suppression chamber hydrogen concentrations below 1% as follows:

IF	THEN
Oxygen concentration in the space being purged is at or above 5%	Initiate and maximize air or nitrogen purge flow (OP61A, Sections 5.0 or 3.0)
Oxygen concentration in the space being purged is below 5%	Initiate and maximize nitrogen purge flow (OP-61A, Section 3.0)

DISCUSSION:

This step directs the operator to purge the primary containment to restore and mainain drywell and suppression chamber hydrogen concentrations below 1%. Purge flow is established to provide the driving force for "pushing" hydogen out of the primary containment. The purge medium (air or nitrogen) will be determined by the following steps and is dependent on primary containment oxygen concentration.

STEP:

While executing the following steps:	
IF	THEN
The offsite radioactivity release rate reaches the offsite release rate LCO	Secure primary containment purge

Purge the primary containment to restore and maintain drywell and suppression chamber hydrogen concentrations below 1% as follows:

IF	THEN
Oxygen concentration in the space being purged is at or above 5%	Initiate and maximize air or nitrogen purge flow (OP61A, Sections 5.0 or 3.0)
Oxygen concentration in the space being purged is below 5%	Initiate and maximize nitrogen purge flow (OP-61A, Section 3.0)

DISCUSSION:

With oxygen concentration at or above 5% in the space to be purged, directions are provided to purge using either air or nitrogen as the purge medium. Since the space has already been de-inerted, no distinction between purging mediums is required.

STEP:

While executing the following steps:

IF	THEN
The offsite radioactivity release rate reaches the offsite release rate LCO	Secure primary containment purge

Purge the primary containment to restore and maintain drywell and suppression chamber hydrogen concentrations below 1% as follows:

IF	THEN
Oxygen concentration in the space being purged is at or above 5%	Initiate and maximize air or nitrogen purge flow (OP61A, Sections 5.0 or 3.0)
Oxygen concentration in the space being purged is below 5%	Initiate and maximize nitrogen purge flow (OP-61A, Section 3.0)

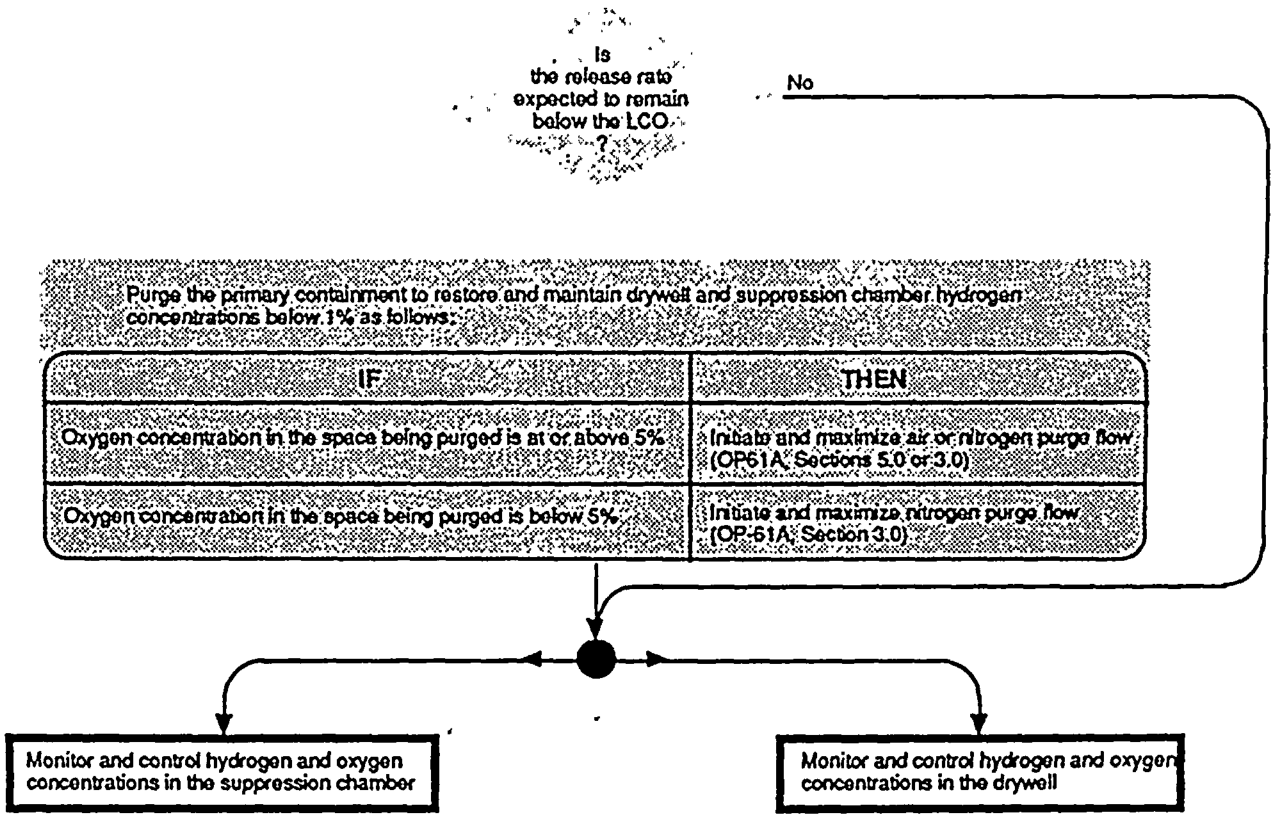
Monitor and control hydrogen and oxygen concentrations in the suppression chamber

Monitor and control hydrogen and oxygen concentrations in the drywell

DISCUSSION:

With oxygen concentration less than 5% in the space to be purged, directions are provided to purge using nitrogen. A nitrogen purge medium will maintain the inerted status of the space.

STEP:



IF	THEN
Oxygen concentration in the space being purged is at or above 5%	Initiate and maximize air or nitrogen purge flow (OP61A, Sections 5.0 or 3.0)
Oxygen concentration in the space being purged is below 5%	Initiate and maximize nitrogen purge flow (OP-61A, Section 3.0)

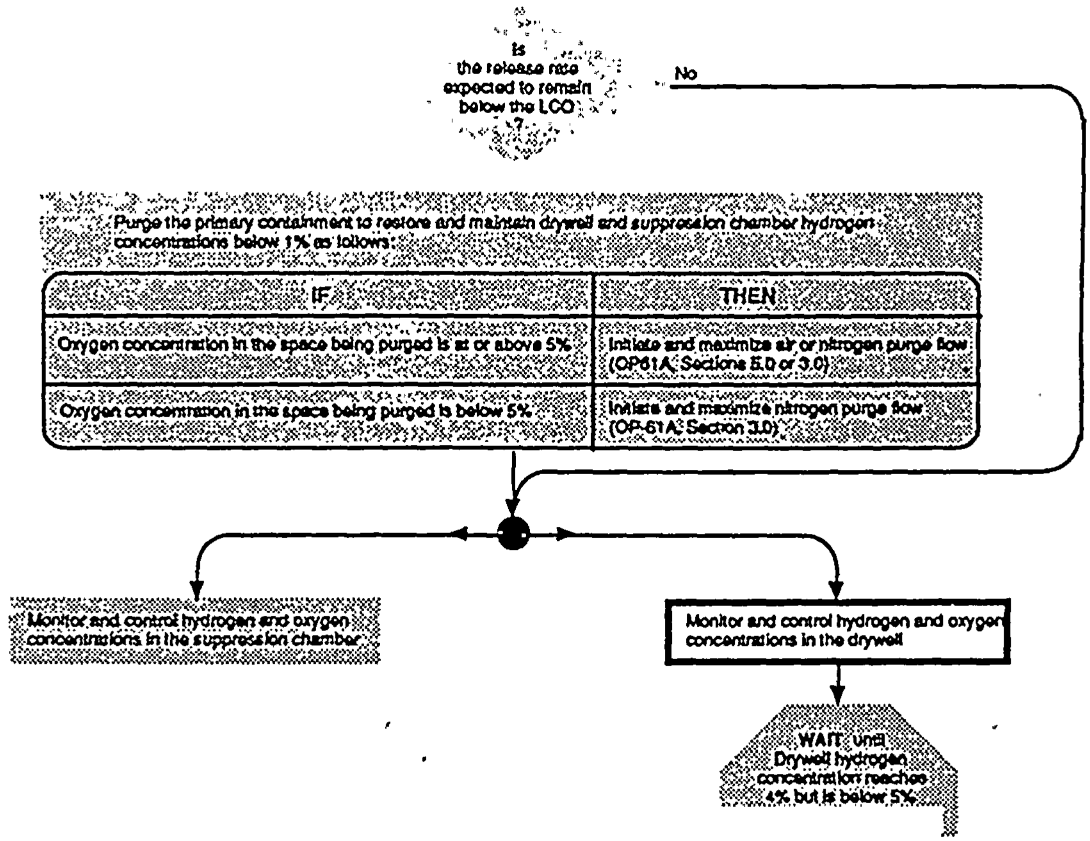
DISCUSSION:

The Primary Containment Hydrogen and Oxygen Concentration sectional division is divided into two concurrently executed flowpaths. Each flowpath directs the operators to monitor and control hydrogen and oxygen concentrations in the Primary Containment. One flowpath addresses the drywell, the other flowpath address the suppression chamber. Actions taken to control parameters in one flowpath affect parameters in the other flowpath.

Combustible gas concentrations may vary between the two areas. For example, a hydrogen generation event in conjunction with a small break in the drywell may raise drywell hydrogen concentration above detectable levels without an increase in suppression chamber hydrogen concentration. SRV discharge in conjunction with a hydrogen generation event may raise suppression chamber hydrogen concentration above detectable levels without an increase in drywell hydrogen concentration. Because the paths address different portions of the Primary Containment, both paths must be entered and executed concurrently.

The current values, parameters trends and plant system status during the transient/emergency, dictate the order and priority of specific actions taken. There is no priority assigned to the execution of either flowpath.

STEP:

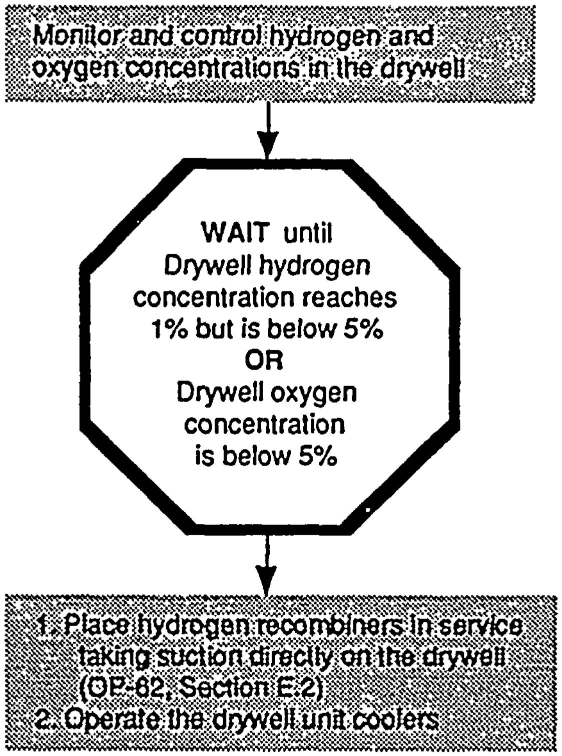


DISCUSSION:

This step directs the operator to monitor and control hydrogen and oxygen concentrations in the drywell.

Hydrogen and oxygen must both be present, in sufficient concentration, for combustion to occur. Excessive hydrogen concentration mixed with sufficient oxygen concentration and ignited in the confined space of the drywell can generate peak pressures which may exceed the structural capability of the drywell. Such a failure could lead to the uncontrolled release of radioactivity to the environment. In addition, the temperature and pressure shock waves created during the rapid burning of these gases may damage equipment important to the safe shutdown of the plant. Concentrations of both gases are therefore monitored and controlled to prevent the development of a flammable condition.

STEP:



DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until either of the stated conditions, drywell hydrogen concentration at 1% but is below 5% OR drywell oxygen concentration below 5%, have been met.

Delaying the performance of the subsequent actions in this procedural leg, confirms that hydrogen and/or oxygen gas concentrations in the drywell are within the vendor limitations for recombiner operation, and are below combustible gas concentrations.

The subsequent steps, directed in this procedural leg, place hydrogen recombiners in service taking suction on the drywell. These actions are taken, however, only when drywell hydrogen and oxygen concentrations are within the vendor limitations for recombiner operation.

The lower limit for hydrogen (1%) is the minimum detectable hydrogen concentration. Starting recombiners below this limit would serve no useful purpose because of an insufficient supply of hydrogen to support recombination.

The upper limits (below 5% hydrogen and below 5% oxygen) are defined to be (1) the lower of the hydrogen deflagration concentration or the maximum hydrogen concentration allowed by the recombiner vendor, and (2) the

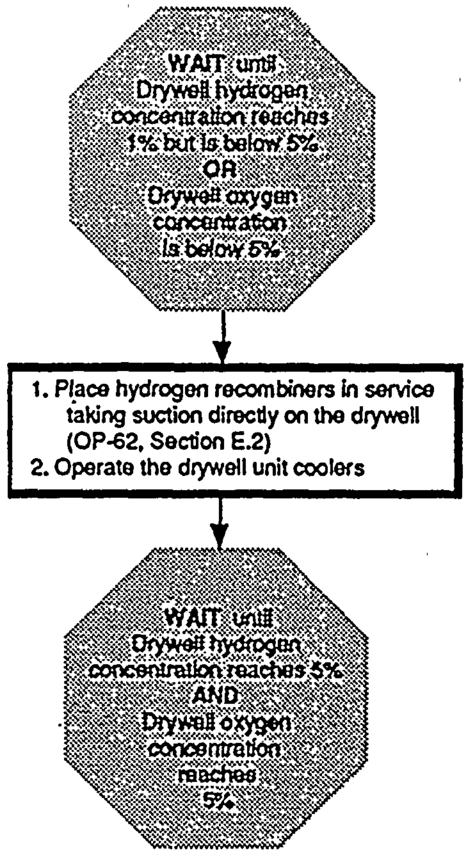
DISCUSSION: (Continued)

lower of oxygen deflagration concentration of 5% or the maximum oxygen concentration permitted by the recombiner vendor.

The Nine Mile Point Station Unit 2 limit for the upper limit of hydrogen concentration is based on the maximum hydrogen concentration allowed by the recombiner vendor. The Nine Mile Point Station Unit 2 limit for the upper limit for oxygen concentration (with hydrogen concentration below 5%) is based on the oxygen concentration deflagration limits.

Starting recombiners above the limits identified above could either create the ignition source which causes deflagration to occur, or cause damage to the recombiners and auxiliary system components due to operation at reaction temperatures above equipment design values (recombiners generate intense heat even under normal operating conditions).

STEP:

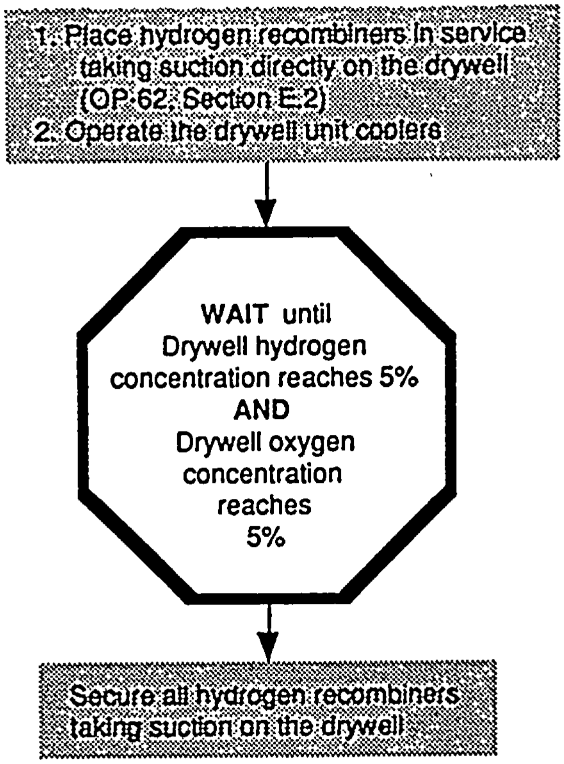


DISCUSSION:

This step directs the operator to place hydrogen recombiners in service taking suction directly on the drywell to reduce the drywell hydrogen concentration.

Operation of the drywell unit coolers serves to re-distribute the hydrogen throughout the drywell, thereby diluting localized regions of high hydrogen concentrations to minimize the potential for a deflagration event.

STEP:



DISCUSSION:

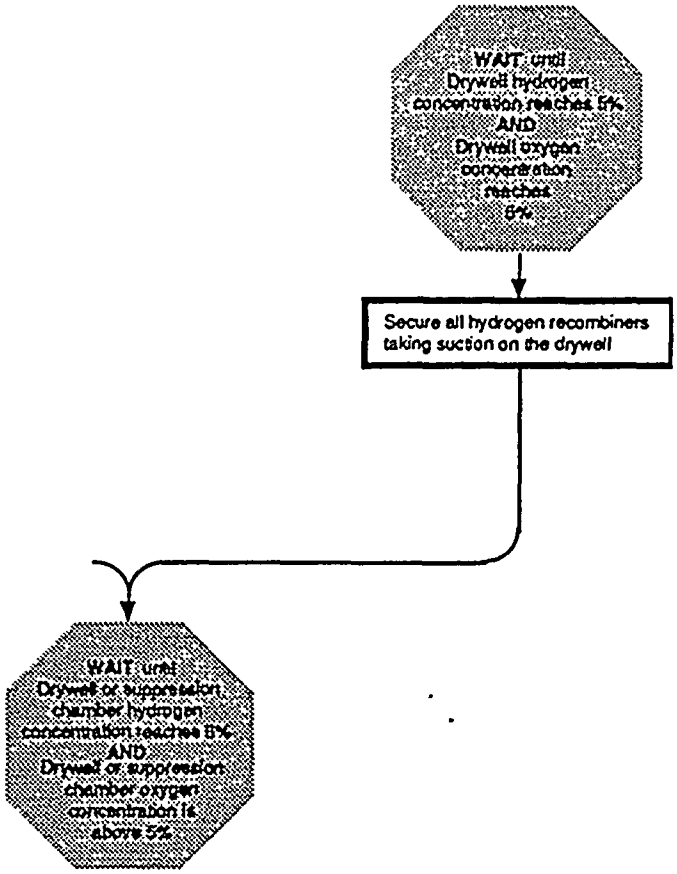
This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until both of the stated conditions, drywell hydrogen concentration at 5% AND drywell oxygen concentration at 5%, has been met.

Delaying the performance of the subsequent actions in this procedural leg, confirms that drywell hydrogen and oxygen concentrations have reached the maximum concentration for which recombiner operation is permitted. When this condition exists, additional actions must be directed to protect equipment and the primary containment from damage.

The combustible gas concentrations specified in this step define the upper end of the permissible recombiner operating range. This differs from the limits for starting recombiners in the previous step. Recombiner operation continues until both hydrogen and oxygen concentrations reach their respective limits.

The maximum oxygen concentration for recombiner operation (with hydrogen concentration below 5%) is 5%. This limit is based on the recombiner vendor limitations and is used to prevent combustion.

STEP:

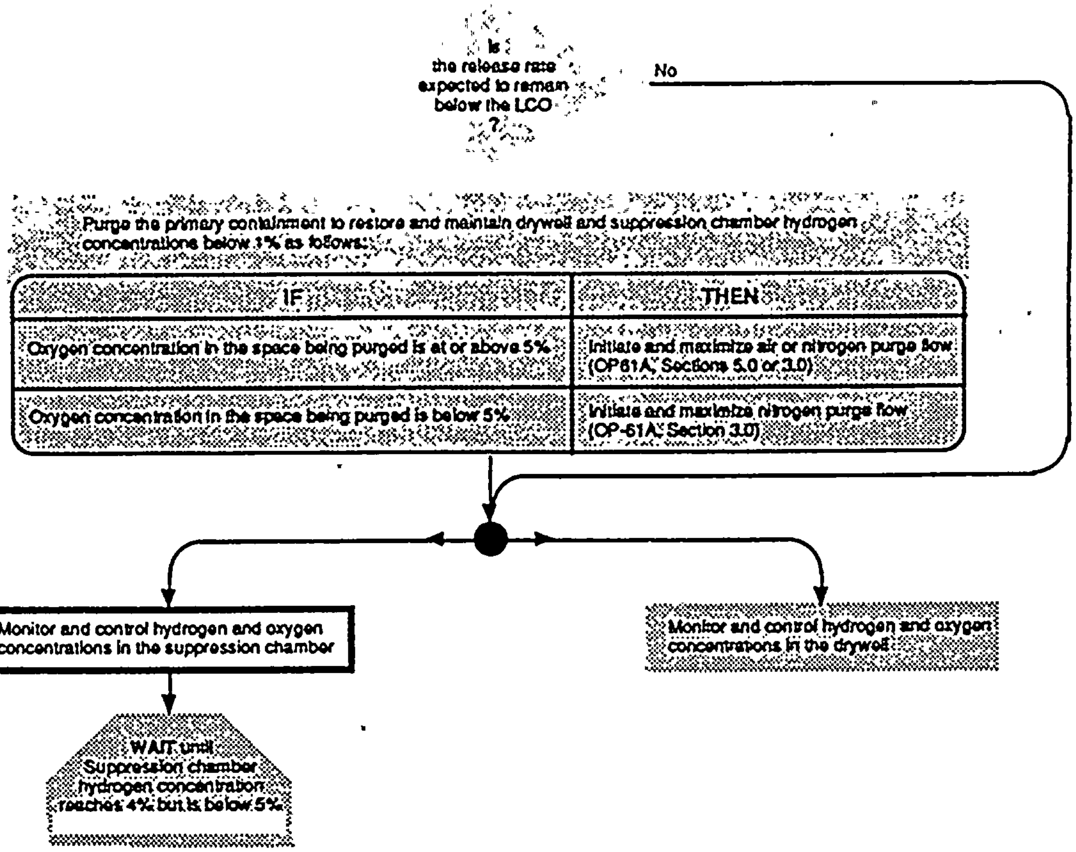


DISCUSSION:

If hydrogen and oxygen concentrations have increased to the levels specified in the previous step, recombiner operation has been ineffective in controlling combustible gas concentration in the drywell. Securing recombiners is warranted to prevent equipment or primary containment damage.

The drywell unit coolers do not need to be secured, since they may be operated up to the 6% hydrogen concentration limit. The recombiners are secured because they have lower limits for operation.

STEP:

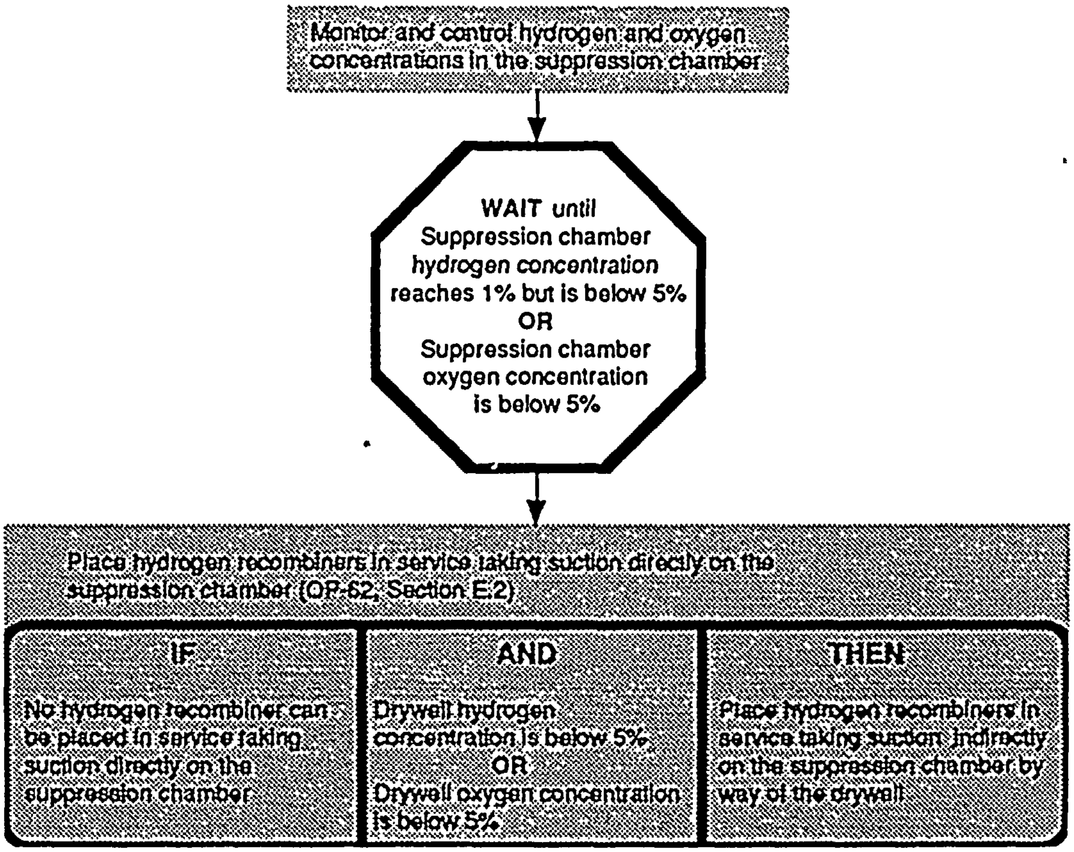


DISCUSSION:

This step directs the operator to monitor and control hydrogen and oxygen concentrations in the suppression chamber.

Hydrogen and oxygen must both be present, in sufficient concentration, for combustion to occur. Excessive hydrogen concentration mixed with sufficient oxygen concentration and ignited in the confined space of the suppression chamber can generate peak pressures which may exceed the structural capability of the suppression chamber. Such a failure could lead to the uncontrolled release of radioactivity to the environment. In addition, the temperature and pressure shock waves created during the rapid burning of these gases may damage equipment important to the safe shutdown of the plant. Concentrations of both gases are therefore monitored and controlled to prevent the development of a flammable condition.

STEP:



DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until either of the stated conditions, suppression chamber hydrogen concentration at 4% but is below 5% AND suppression chamber oxygen concentration below 5%, have been met.

Delaying the performance of the subsequent actions in this procedural leg, confirms that hydrogen and/or oxygen gas concentrations in the suppression chamber are within the vendor limitations for recombiner operation, and are also below combustible gas concentrations.

The subsequent steps, directed in this procedural leg, place hydrogen recombiners in service taking suction on the suppression chamber (either directly, or indirectly via the drywell). These actions are taken, however, only when suppression chamber hydrogen or oxygen concentrations are within the vendor limitations for recombiner operation.

The lower limit for hydrogen(4%) is the minimum concentration required for recombiner operation. Starting recombiners below this limit would serve no useful purpose because of an insufficient supply of hydrogen to support recombination.

The upper limits (below 5% hydrogen and below 5% oxygen) are defined to be (1) the lower of the hydrogen deflagration concentration or the maximum hydrogen concentration allowed by the recombiner vendor, and (2) the

DISCUSSION: (Continued)

lower of the oxygen deflagration concentration of 5% or the maximum oxygen concentration permitted by the recombiner vendor.

The Nine Mile Point Station Unit 2 limit for the upper limit of hydrogen concentration is based on the maximum hydrogen concentration allowed by the recombiner vendor. The Nine Mile Point Station Unit 2 limit for the upper limit for oxygen concentration (with hydrogen concentration below 5%) is based on the oxygen concentration deflagration limits.

Starting recombiners above the limits identified above could either create the ignition source which causes deflagration to occur, or cause damage to the recombiners and auxiliary system components due to operation at reaction temperatures above equipment design values (recombiners generate intense heat even under normal operating conditions).

STEP:

WAIT until
Suppression chamber
hydrogen concentration
reaches 1% but is below 5%
OR
Suppression chamber
oxygen concentration
is below 5%

↓

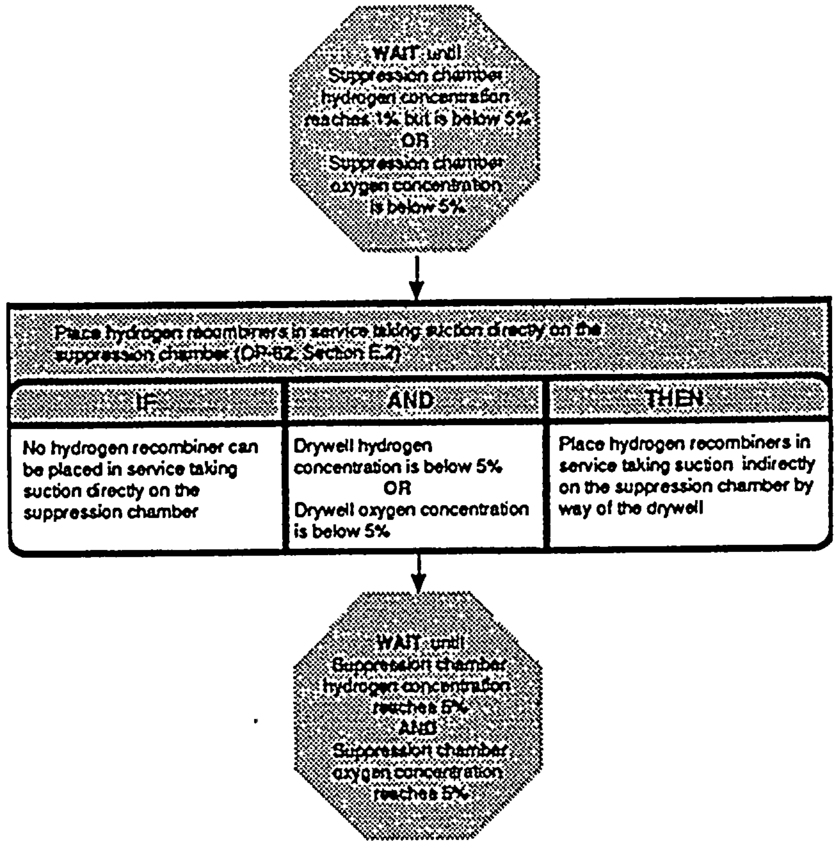
Place hydrogen recombiners in service taking suction directly on the suppression chamber (OP-62, Section E.2)

IF	AND	THEN
No hydrogen recombiner can be placed in service taking suction directly on the suppression chamber	Drywell hydrogen concentration is below 5% OR Drywell oxygen concentration is below 5%	Place hydrogen recombiners in service taking suction indirectly on the suppression chamber by way of the drywell

DISCUSSION:

This step directs the operator to place hydrogen recombiners in service taking suction directly on the suppression chamber to reduce the suppression chamber hydrogen concentration.

STEP:

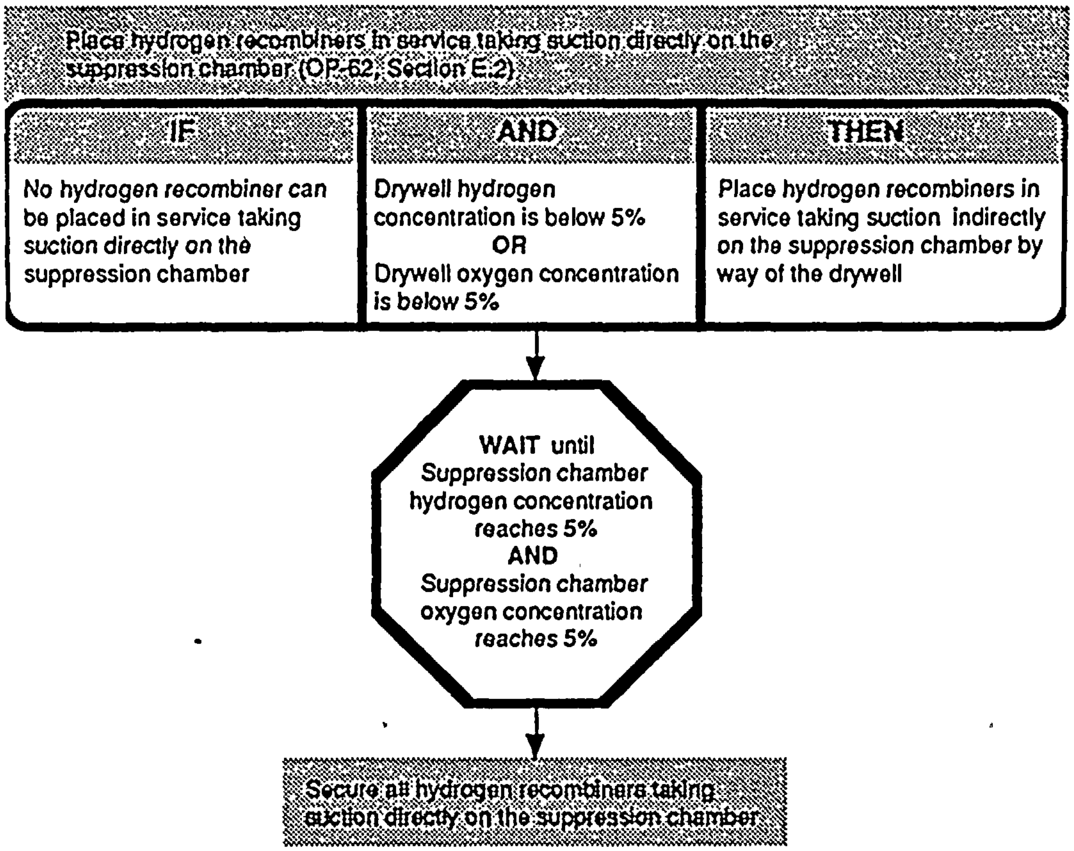


DISCUSSION:

Recombiners operating with suction from the drywell may reduce the suppression chamber hydrogen and oxygen concentrations. When the recombiner is operating, the gases combine to form water, and a pressure drop occurs in the atmosphere from which the gases were drawn. As drywell pressure decreases below suppression chamber pressure, suppression chamber-to-drywell vacuum breakers open to transfer gases from the suppression chamber to the drywell.

Control of suppression chamber combustible gas concentrations in this manner also requires that both drywell hydrogen and oxygen concentrations be within the vendor limitations for starting recombiners (i.e., hydrogen concentration above 1% but less than 5% OR oxygen concentration less than 5%).

STEP:



DISCUSSION:

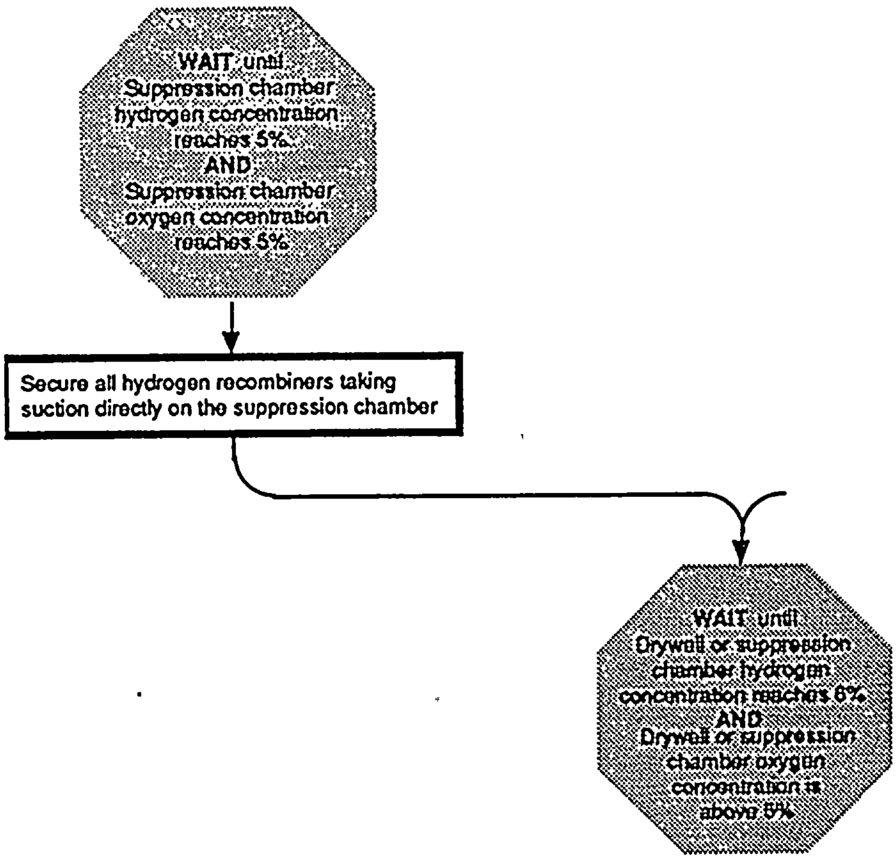
This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until both of the stated conditions, suppression chamber hydrogen concentration at 5% OR suppression chamber oxygen concentration at 5%, has been met.

Delaying the performance of the subsequent actions in this procedural leg confirms that suppression chamber hydrogen and oxygen concentrations have reached the maximum concentration for which recombiner operation is permitted. When this condition exists, additional actions must be directed to protect equipment and the primary containment from damage.

The combustible gas concentrations specified in this step define the upper end of the permissible recombiner operating range. This differs from the limits for starting recombiners in the previous step, in that recombiner operation continues until both hydrogen and oxygen concentrations reach their respective limits. Such action maximizes the time recombiners may operate to control hydrogen concentration.

The maximum oxygen concentration for recombiner operation (with hydrogen concentration below 5%) is 5%. This limit is based on the oxygen concentration deflagration limits.

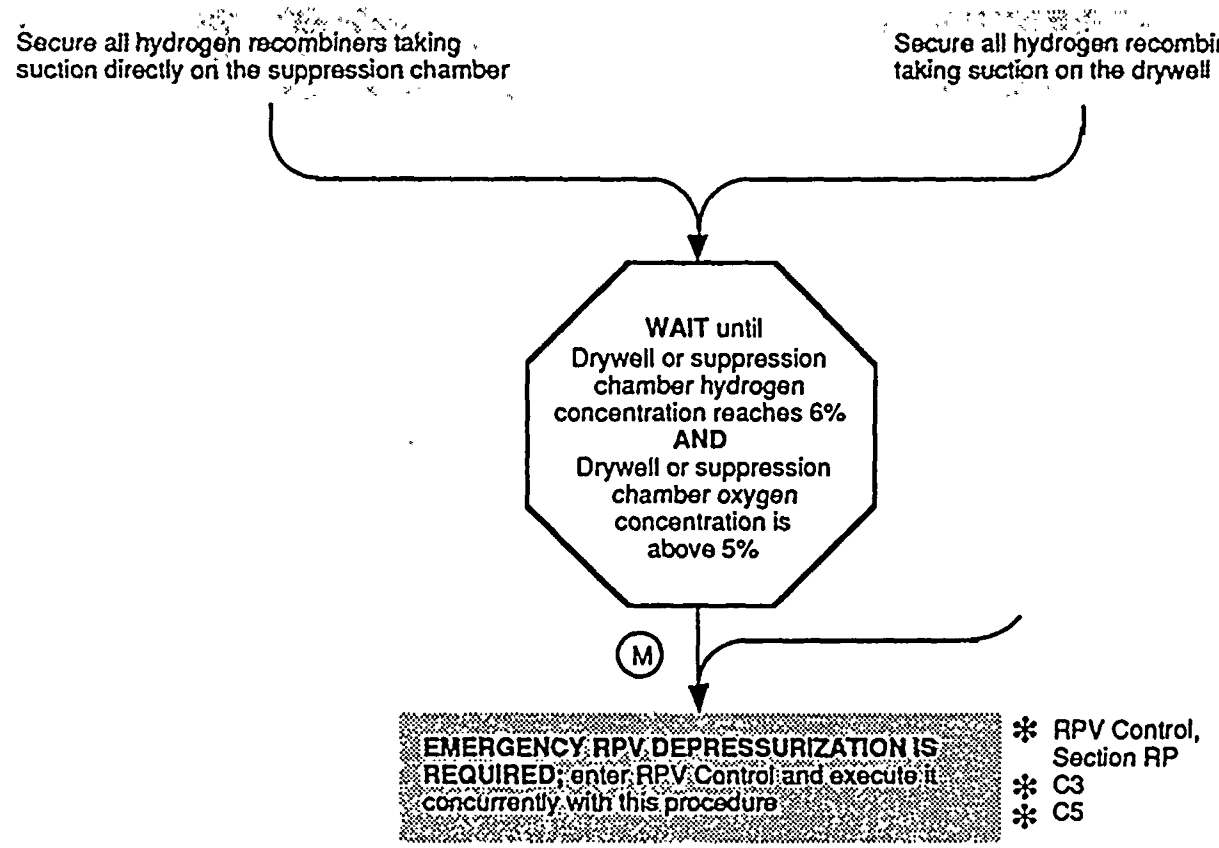
STEP:



DISCUSSION:

If hydrogen and oxygen concentrations have increased to the levels specified in the previous step, recombiner operation has been ineffective in controlling combustible gas concentration in the suppression chamber. Securing recombiners is warranted to prevent equipment or primary containment damage.

STEP:



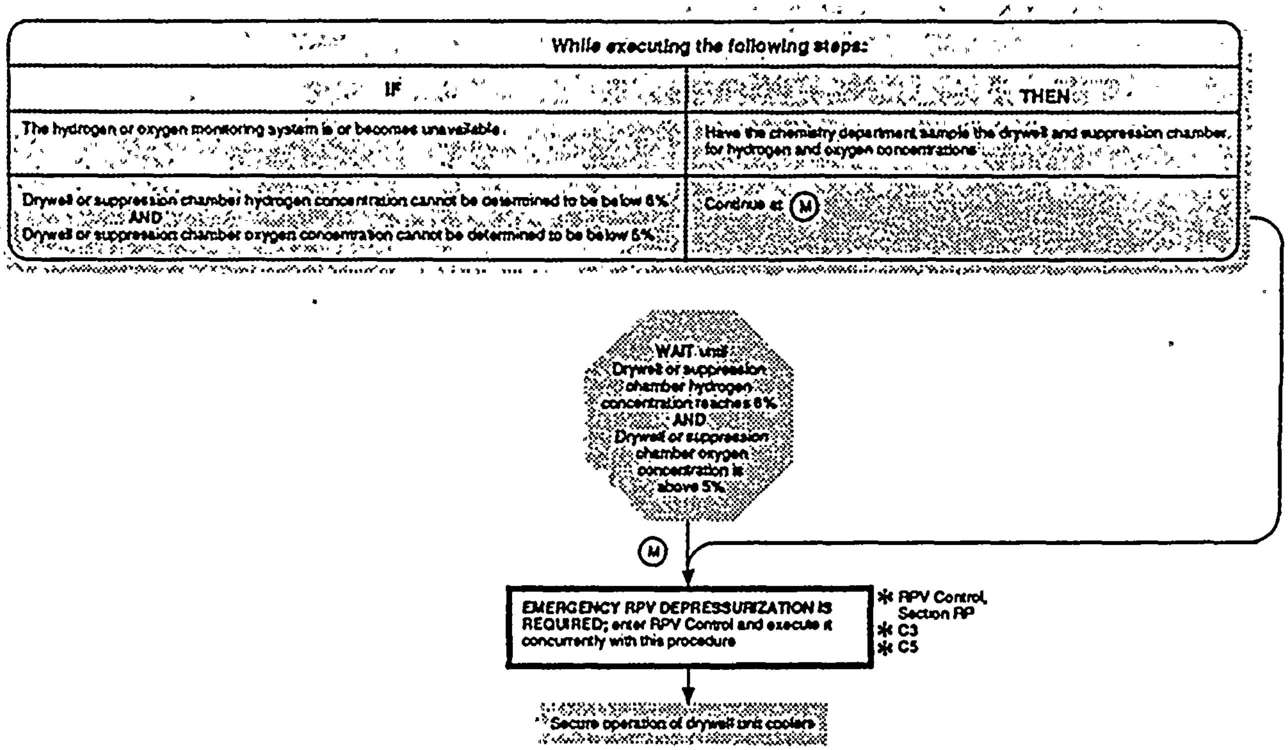
DISCUSSION:

The two concurrently executed flowpaths recombine at this point.

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until both of the stated conditions, drywell or suppression chamber hydrogen concentration reaches 6% AND drywell or suppression chamber oxygen concentration above 5%, have been met.

Delaying the performance of the subsequent actions in this procedural leg, confirms that the previous attempts to lower hydrogen and/or oxygen gas concentrations in the suppression chamber and drywell have been unsuccessful, and that further control actions need to be directed.

STEP:



DISCUSSION:

If hydrogen and oxygen concentrations in the drywell or suppression chamber reach deflagration limits, (6% hydrogen and 5% oxygen) the RPV must be rapidly depressurized to place the primary system in the safest condition (state of lowest energy).

The specified value of 6% hydrogen concentration is the minimum required to support a deflagration (to burn rapidly with intense heat). The associated stoichiometric concentration (quantitative relationship) of oxygen for this condition is 5%.

Combustion of hydrogen in the deflagration concentration range creates a travelling flame front, heating the primary containment atmosphere and causing a rapid increase in primary containment pressure. A deflagration may result in peak primary containment pressure high enough to rupture the drywell, suppression chamber, or drywell-to-suppression chamber boundary, thus defeating the pressure suppression function of the primary containment. If conditions in either the drywell or suppression chamber are such that a deflagration could occur, the RPV must be rapidly depressurized to place the primary system in the safest condition (state of lowest energy).

Entry into N2-EOP-RPV, RPV Control, ensures that a reactor scram is initiated before the RPV is depressurized. A reactor scram need only be initiated once during any given event

DISCUSSION: (Continued)

sequence that requires entry into the Emergency Operating Procedures. This allows concurrent execution of the Reactor Power (RQ) leg of N2-EOP-RPV, RPV Control, and avoids unnecessary cycling of the control rod drive hydraulic system. In addition, entry into N2-EOP-RPV, RPV Control, must be made because it is through that procedure's Reactor Pressure (RP) leg that direction to emergency depressurize the RPV is given.

STEP:

EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

*RPV Control, Section RP
*C3
*C5

Secure operation of drywell unit coolers and hydrogen recombiners

While executing the following steps:

IF	AND	THEN
Suppression Chamber sprays have been initiated	Suppression chamber pressure drops below 1.68 psig	Terminate suppression chamber sprays
Drywell sprays have been initiated	Drywell pressure drops below 1.68 psig	Terminate drywell sprays

DISCUSSION:

Drywell unit coolers are secured to eliminate potential ignition sources. Although these components are specifically designed to recirculate the primary containment atmosphere to reduce the localized buildup of combustible gases, their operation under the conditions addressed in this step would pose a potential ignition hazard. Hydrogen recombiners are secured at this point since the oxygen and hydrogen concentrations have exceeded those concentrations recommended by the vendor for recombiner operation. Although they may already have been secured in the previous step, this action is added here should this part of the procedure be entered from the override at the beginning of Section PCH.

STEP:

Secure operation of drywell unit coolers

While executing the following steps:

IF	AND	THEN
Suppression Chamber sprays have been initiated	Suppression chamber pressure drops below 1.68 psig	Terminate suppression chamber sprays
Drywell sprays have been initiated	Drywell pressure drops below 1.68 psig	Terminate drywell sprays

DISCUSSION:

This is an override step and applies throughout the performance of the remainder of this procedural leg.

The action directed in this step terminates the operation of suppression chamber sprays. This stops the convective cooling process and the cooling/condensing of potential steam in the suppression chamber air space ensuring that primary containment pressure is not reduced below atmospheric.

Terminating suppression chamber sprays when suppression chamber pressure decreases below 1.68 psig avoids creating a negative primary containment pressure. Maintaining a positive primary containment pressure assures that a safe (positive) margin to the negative design pressure (-4.7 PSID) of the primary containment exists.

STEP:

Secure operation of drywell unit coolers and hydrogen recombiners

While executing the following steps:		
IF	**AND**	**THEN**
Suppression Chamber sprays have been initiated	Suppression chamber pressure drops below 1.68 psig	Terminate suppression chamber sprays
Drywell sprays have been initiated	Drywell pressure drops below 1.68 psig	Terminate drywell sprays

Irrespective of the release rate perform the following, in the order listed, to restore and maintain either:

- Drywell and suppression chamber hydrogen concentrations below 6%

OR

- Drywell and suppression chamber oxygen concentrations below 5%

IF	THEN

DISCUSSION:

This is an override step and applies throughout the performance of the remainder of this procedural leg.

The action directed in this step terminates the operation of drywell sprays. This stops the convective cooling process and the cooling/ condensing of potential steam in the drywell air space ensuring that primary containment pressure is not reduced below atmospheric.

Terminating drywell sprays when drywell pressure decreases below 1.68 psig avoids creating a negative primary containment pressure. Maintaining a positive primary containment pressure assures that a safe (positive) margin to the negative design pressure (-4.7 PSID) of the primary containment exists.

STEP:

While executing the following steps:		
IF	AND	THEN
Suppression Chamber sprays have been initiated	Suppression chamber pressure drops below 1.68 psig	Terminate suppression chamber sprays
Drywell sprays have been initiated	Drywell pressure drops below 1.68 psig	Terminate drywell sprays

Irrespective of the release rate perform the following, in the order listed, to restore and maintain either:

- *Drywell and suppression chamber hydrogen concentrations below 6%*

OR

- *Drywell and suppression chamber oxygen concentrations below 5%*

IF	THEN
Suppression pool water level is below EL 217 ft.	Initiate suppression chamber sprays (EOP-6, Att 22.8, 6) ✓ Use only those pumps not required to assure adequate core cooling by continuous injection
Suppression pool water level is below EL 201 ft. AND Drywell pressure is below 1.68 psig	Purge the drywell through the suppression pool (EOP-6, Att 25, Section 25.2)
The suppression pool water level is at or above EL 201 ft. OR Drywell pressure is at or above 1.68 psig	Purge the Primary Containment (EOP-6, Att 25, Section 25.1)
Suppression pool water level is below EL 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2) AND The Primary Containment vent path is established	1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22.5, 8) ✓ Use only those pumps not required to assure adequate core cooling by continuous injection

DISCUSSION:

This step directs the operator to perform the following steps, in the order specified, to reduce drywell and suppression chamber hydrogen AND/OR oxygen concentrations below deflagration limits.

For those steps which direct venting and purging of the primary containment, the evolution should be performed irrespective of the resultant offsite radioactivity release rate. Direction for defeating isolation interlocks is provided in EOP-6, Attachment 25.

If a deflagration were to occur, primary containment failure may result. Venting the primary containment is the only mechanism which remains to prevent an uncontrolled and unpredictable breach of the primary containment. The controlled release of radioactivity to the environment is preferable to primary containment failure, which may result in the loss of adequate core cooling and an uncontrolled radioactivity release.

When hydrogen and oxygen concentrations can be determined and restored/maintained below deflagration limits, the operator should discontinue these actions and re-enter this procedural leg (PCH) taking actions as required by the known concentration of these gases. The intent is not to perform uncontrolled venting, rather, as required to stay below the specified limits.

STEP:

Irrespective of the release rate perform the following, in the order listed, to restore and maintain either:
- Drywell and suppression chamber hydrogen concentrations below 6%

OR
- Drywell and suppression chamber oxygen concentrations below 5%

IF	THEN
Suppression pool water level is below El. 217 ft.	Initiate suppression chamber sprays (EOP-6, Att 22.5, 6) ☛ Use only those pumps not required to assure adequate core cooling by continuous injection
Suppression pool water level is below El. 201 ft. AND Drywell pressure is below 1.68 psig	Purge the drywell through the suppression pool (EOP-6, Att 25, Section 25.2)
The suppression pool water level is at or above El. 201 ft. OR Drywell pressure is at or above 1.68 psig	Purge the Primary Containment (EOP-6, Att 25, Section 25.1)
Suppression pool water level is below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2) AND The Primary Containment vent path is established	1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22.5, 6) ☛ Use only those pumps not required to assure adequate core cooling by continuous injection

DISCUSSION:

If suppression pool water level is below El. 217 ft., the suppression chamber spray nozzles and the suppression chamber vent are not submerged. Therefore, the combined actions of spraying the suppression chamber and venting the suppression chamber can be used to reduce the drywell and suppression chamber hydrogen and oxygen concentrations. Venting via the suppression chamber is the preferred method of primary containment venting because it takes advantage of the scrubbing effect, which minimizes the amount of radioactivity released.

Suppression chamber sprays and suppression chamber venting are continued only until drywell and suppression chamber hydrogen and oxygen concentrations can be restored and maintained below deflagration limits, (6% hydrogen and 5% oxygen).

The supplemental action reminds the operator to ensure adequate core cooling is available. Maintaining adequate core cooling takes precedence over initiating suppression chamber sprays at this time because additional action is still available for reversing the increasing primary containment hydrogen and/or oxygen concentration trend. Therefore, only if the continuous operation of a RHR pump in the LPCI mode is not required to assure adequate core cooling is it permissible to use that pump for suppression chamber sprays.

DISCUSSION: (Continued)

This step, however, does permit alternating the use of RHR pumps between the LPCI injection and suppression chamber spray modes, as the need for each occurs and as long as adequate core cooling is able to be maintained.

Additionally, this step provides for the capability to utilize SWP for containment sprays similar to RHR. If continuous SWP injection is required to assure adequate core cooling, it should not be diverted to the spray mode.

This step addresses initiation of suppression chamber sprays. Instructions for terminating suppression chamber spray operation, once initiated, are provided by a previous override step.

STEP:

Irrespective of the release rate perform the following, in the order listed, to restore and maintain either:
- Drywell and suppression chamber hydrogen concentrations below 6%

OR

- Drywell and suppression chamber oxygen concentrations below 5%

IF	THEN
Suppression pool water level is below El. 217 ft.	Initiate suppression chamber sprays (EOP-6, Att 22.5, 6) ☛ Use only those pumps not required to assure adequate core cooling by continuous injection
Suppression pool water level is below El. 201 ft. AND Drywell pressure is below 1.68 psig	Purge the drywell through the suppression pool (EOP-6, Att 25, Section 25.2)
The suppression pool water level is at or above El. 201 ft. OR Drywell pressure is at or above 1.68 psig	Purge the Primary Containment (EOP-6, Att 25, Section 25.1)
Suppression pool water level is below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2) AND The Primary Containment vent path is established	1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22.5, 6) ☛ Use only those pumps not required to assure adequate core cooling by continuous injection

DISCUSSION:

If suppression pool water level is below El. 201 ft. and drywell pressure is below 1.68 psig, purging the drywell through the suppresion pool with nitrogen is performed. this will require pressurizing the drywell to approximately 5 pounds in order to establish theis flowpath (due to the water head from the bottom of the downcommers to the surface of the pool). The suppression pool high water level LCO and drywell pressure scram setpoint are chosen to ensure that pressurizing the drywell will not create or contribute to an already existing containment pressure problem. Above these values, the purge flowpath is performed.

Purging is continued only until drywell and suppression chamber hydrogen and/or oxygen concentrations can be restored and maintained below deflagration limits (6% hydrogen and 5% oxygen).

STEP:

Irrespective of the release rate perform the following, in the order listed, to restore and maintain either:
- Drywell and suppression chamber hydrogen concentrations below 6%

OR
- Drywell and suppression chamber oxygen concentrations below 5%

IF	THEN
Suppression pool water level is below El. 217 ft.	Initiate suppression chamber sprays (EOP-6, Att 22.5, 6) ☛ Use only those pumps not required to assure adequate core cooling by continuous injection
Suppression pool water level is below El. 201 ft. AND Drywell pressure is below 1.68 psig	Purge the drywell through the suppression pool (EOP-6, Att 25, Section 25.2)
The suppression pool water level is at or above El. 201 ft. OR Drywell pressure is at or above 1.68 psig	Purge the Primary Containment (EOP-6, Att 25, Section 25.1)
Suppression pool water level is below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2) AND The Primary Containment vent path is established	1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22.5, 6) ☛ Use only those pumps not required to assure adequate core cooling by continuous injection

DISCUSSION:

If drywell pressure is at or above the scram setpoint or suppression pool water level is at or above the high water level LCO, purging is accomplished by venting and purging the respective space with nitrogen. The flowpath into the drywell and out of the suppression chamber is not aligned (see previous page for reasons). The disadvantage of this vent path is that the containment atmosphere is not being scrubbed (bubbling through the pool's water) before being released offsite.

STEP:

Irrespective of the release rate perform the following, in the order listed, to restore and maintain either:

- Drywell and suppression chamber hydrogen concentrations below 6%

OR

- Drywell and suppression chamber oxygen concentrations below 5%

IF	THEN
Suppression pool water level is below El. 217 ft.	Initiate suppression chamber sprays (EOP-6, Att 22.5, 6) ☛ Use only those pumps not required to assure adequate core cooling by continuous injection
Suppression pool water level is below El. 201 ft. AND Drywell pressure is below 1.68 psig	Purge the drywell through the suppression pool (EOP-6, Att 25, Section 25.2)
The suppression pool water level is at or above El. 201 ft. OR Drywell pressure is at or above 1.68 psig	Purge the Primary Containment (EOP-6, Att 25, Section 25.1)
Suppression pool water level is below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2) AND The Primary Containment vent path is established	1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22.5, 6) ☛ Use only those pumps not required to assure adequate core cooling by continuous injection

WAIT until

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%

DISCUSSION:

This step directs the operator to trip the recirculation pumps and drywell cooling fans. Guidance is provided because these components are not designed to operate in a spray environment.

If suppression pool water level is below El. 217 ft., the suppression chamber-to-drywell vacuum breakers are not submerged and will function as designed to ensure that the design primary containment differential pressure (-4.7 PSID) is not challenged during drywell spray operations.

Initiation of drywell sprays with drywell temperature and/or pressure above the Drywell Spray Initiation Limit (Figure PC-2, refer to Section C) could result in a complete loss of primary containment integrity. Therefore, the operator is directed to initiate drywell sprays only if the combination of drywell temperature and pressure can be maintained below the Drywell Spray Initiation Limit.

Drywell sprays are initiated to mitigate the consequences of a deflagration, should one occur. Spraying water inside the primary containment will aid in (1) minimizing the temperature and pressure increase caused by a deflagration, (2) scrubbing radioactivity from the primary containment atmospherre prior to venting, and (3) thoroughly mixing the primary containment atmosphere to reduce localized buildup of combustible gases.

DISCUSSION: (Continued)

This step addresses initiation of drywell sprays. Instructions for terminating drywell spray operation, once initiated, are provided by a previous override step.

STEP:

Suppression pool water level is below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2)	1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22) Use only RHR pumps which do not have to be run continuously in the LPCI mode for adequate core cooling

WAIT until
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%

IF	THEN
Suppression pool water level is below El. 217 ft.	Irrespective of whether adequate core cooling is assured, initiate suppression chamber sprays (EOP-6, Att 22)
Suppression pool water level is below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2)	Irrespective of whether adequate core cooling is assured: 1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22)

DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until both of the stated conditions, drywell or suppression chamber hydrogen concentration cannot be maintained below 6% AND drywell or suppression chamber oxygen concentration cannot be maintained below 5%, have been met.

Delaying the performance of the subsequent actions in this procedural leg, confirms that the previous attempts to lower hydrogen and/or oxygen gas concentrations in the suppression chamber and drywell have been unsuccessful, and that further control actions need to be directed.

STEP:

WAIT until
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%

IF	THEN
Suppression pool water level is below El. 217 ft.	Irrespective of whether adequate core cooling is assured, initiate suppression chamber sprays (EOP-6, Att 22,5, 6)
Suppression pool water level is below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2)	Irrespective of whether adequate core cooling is assured: 1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22,5, 6)

DISCUSSION:

The use of suppression chamber sprays may have been previously precluded because of adequate core cooling concerns. When drywell and/or suppression chamber hydrogen and/or oxygen concentrations cannot be maintained below deflagration limits (6% hydrogen and 5% oxygen), the use of suppression chamber sprays is directed, irrespective of adequate core cooling concerns, to mitigate the consequences of a deflagration should one occur.

This action is specified at this point because not doing so may eventually result in a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the primary containment may fail, the loss of the suppression pool must be assumed accompanied by complete and unrecoverable loss of core cooling. The degraded core condition and loss of primary containment integrity could release substantial amounts of radioactivity to the environment. When it is necessary to make a choice between assuring primary containment integrity or adequate core cooling, the Nine Mile Point Station Unit 2 EOPs direct that preference will be made toward assuring primary containment integrity, regardless of core conditions, in order to protect the general public.

A previous override step directs the operator to terminate suppression chamber sprays when suppression chamber pressure decreases to 1.68 psig (the high drywell pressure scram

DISCUSSION: (Continued)

setpoint) to assure that primary containment pressure is not reduced below atmospheric. Maintaining a positive primary containment pressure assures that a safe (positive) margin to the negative design pressure (-4.7 PSID) of the primary containment exists.

A suppression pool water level below El. 217 ft. ensures that the suppression chamber spray nozzles are not submerged. If the spray nozzles were submerged, no spray action would occur and no benefit would be derived from initiating the system.

Suppression chamber spray operations are continued only until drywell and/or suppression chamber hydrogen and/or oxygen concentrations can be restored and maintained below deflagration limits (6% hydrogen and 5% oxygen).

STEP:

WAIT until
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%

IF	THEN
Suppression pool water level is below El. 217 ft.	Irrespective of whether adequate core cooling is assured, initiate suppression chamber sprays (EOP-6, Att 22,5, 6)
Suppression pool water level is below El. 217 ft. AND Drywell temperature and pressure are within the Drywell Spray Initiation Limit (Figure PC-2)	Irrespective of whether adequate core cooling is assured: 1. Trip recirculation pumps 2. Trip drywell unit coolers 3. Initiate drywell sprays (EOP-6, Att 22,5, 6)

DISCUSSION:

This step directs the operator to trip the recirculation pumps and drywell cooling fans. Guidance is provided because these components are not designed to operate in a spray environment.

The use of drywell sprays may have been previously precluded because of adequate core cooling concerns. When drywell and/or suppression chamber hydrogen and/or oxygen concentrations cannot be maintained below deflagration limits (6% hydrogen and 5% oxygen), the use of drywell sprays is directed, irrespective of adequate core cooling concerns, to reduce the primary containment hydrogen and/or oxygen concentrations. This action is specified because not doing so may eventually result in a complete and uncontrolled loss of primary containment integrity.

With no assurance as to where the primary containment may fail, the loss of the suppression pool must be assumed accompanied by a complete and unrecoverable loss of core cooling. The degraded core condition and loss of primary containment integrity has the potential to release substantial amounts of radioactivity to the environment. When it is necessary to make a choice between assuring primary containment integrity or adequate core cooling, the Nine Mile Point Station Unit 2 EOPs direct that preference will be made toward assuring primary containment integrity, regardless of core conditions, in order to protect the general public.

DISCUSSION: (Continued)

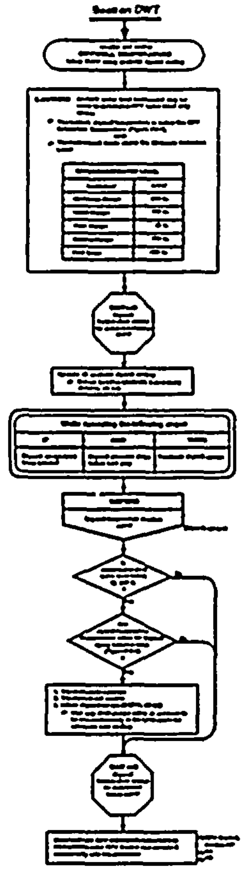
The restriction on suppression pool water level (less than El. 217 ft.) ensures that the design primary containment differential pressure (-4.7 PSID) is not challenged during drywell spray operations.

The Drywell Spray Initiation Limit (Figure PC-2, refer to Section C) controls initiation of drywell sprays. With drywell temperature and/or pressure above the Drywell Spray Initiation Limit, initiation of drywell sprays could result in a complete loss of primary containment integrity. Therefore, the operator is directed to initiate drywell sprays only if the combination of drywell temperature and pressure can be maintained below the Drywell Spray Initiation Limit.

This step addresses initiation of drywell sprays. Instructions for terminating drywell spray operation, once initiated, are provided by a previous override step.

Drywell spray operations are continued only until drywell and/or suppression chamber hydrogen and/or oxygen concentrations can be restored and maintained below deflagration limits (6% hydrogen and 5% oxygen).

STEP:

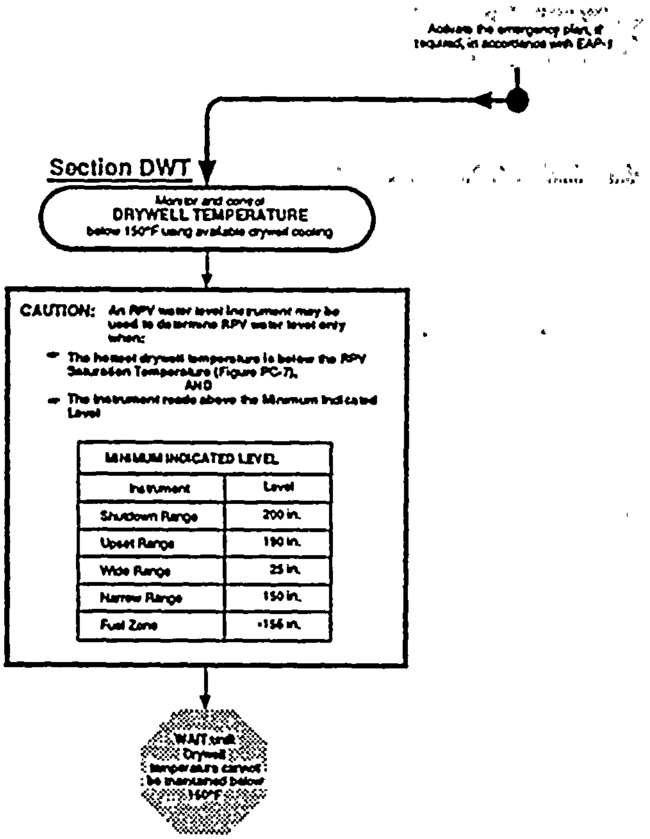


DISCUSSION:

This section of the N2-EOP-PC, Primary Containment Control, specifies operator actions to be taken to control and maintain drywell temperature. The three concerns associated with a high drywell temperature are: (1) exceeding the drywell design temperature limit, (2) exceeding the environmental qualification temperature limit of safety related equipment in the drywell, and (3) the accuracy of RPV water level indication.

This sectional leg assumes that drywell temperature can increase as a result of either: (1) a failure of the drywell heat removal system, or (2) the large addition of steam into the drywell. This sectional leg provides a series of steps to address either method of drywell temperature increase.

STEP:



MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Wide Range	25 in.
Narrow Range	150 in.
Fuel Zone	-156 in.

DISCUSSION:

The initial action taken to control drywell temperature employs the same method typically used during normal plant operations: (1) monitoring temperature status and (2) placing available drywell cooling in operation as required to maintain temperature within specified normal operating limits (drywell temperature LCO value). This step provides a smooth transition from general plant procedures to emergency operating procedures, and assures that the normal method of drywell temperature control is attempted in advance of initiating more complex actions to terminate an increasing drywell temperature condition.

As long as drywell temperature remains below its Technical Specification LCO value, no further operator action is required in this procedural leg other than continuing to monitor and control drywell temperature using available drywell cooling.

The operator is reminded that ambient drywell temperature may affect RPV water level indications and trend. The caution statement delineates specific conditional limitations for each of the RPV water level instrument ranges. Refer to Section C of the basis document for further discussion of this caution statement.

STEP:

MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Wide Range	25 in.
Narrow Range	150 in.
Fuel Zone	-155 in.

WAIT until Drywell temperature cannot be maintained below 150°F

Operate all available drywell cooling
- Defeat isolation interlocks if necessary (EOP-6, Att 24)

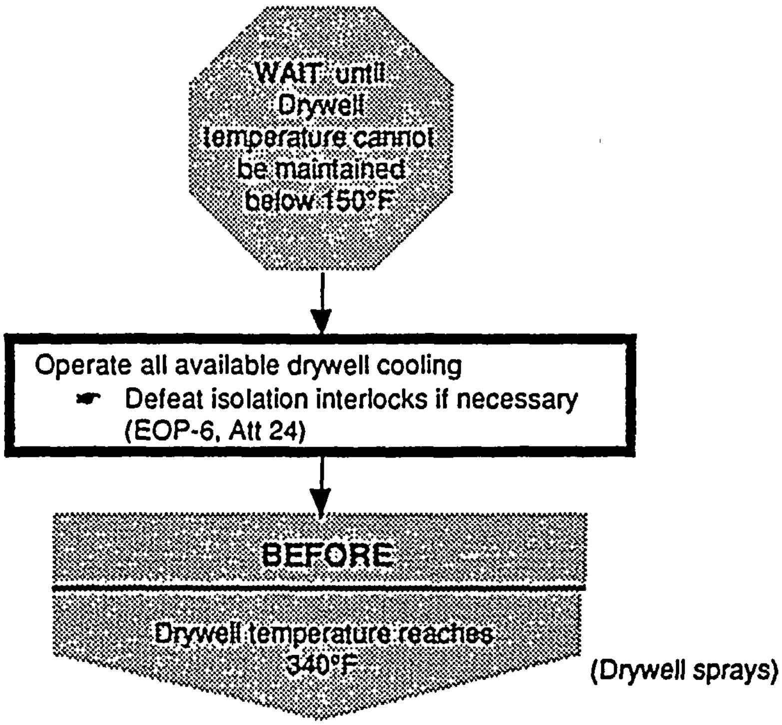
DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, drywell temperature cannot be maintained below 150°F, has been met.

Delaying the performance of the subsequent actions in this procedural leg, confirms that the available drywell cooling systems are unable to maintain drywell temperature below the maximum normal operating temperature, and that further control actions need to be addressed.

[illegible]

STEP:



DISCUSSION:

When drywell temperature cannot be maintained below its maximum normal operating temperature, instruction is given to place into operation all available methods of drywell cooling with authorization to defeat isolation interlocks.

The step recognizes that drywell cooler operation may be otherwise precluded by concurrent actions required in other Nine Mile Point Station Unit 2 EOPs being simultaneously executed (e.g., lowering RPV water level in N2-EOP-C5, Level/Power Control).

STEP:

Operate all available drywell cooling
☛ Defeat isolation interlocks if necessary (EOP-6, Att 24)

↓

BEFORE

Drywell temperature reaches 340°F (Drywell sprays)

↓

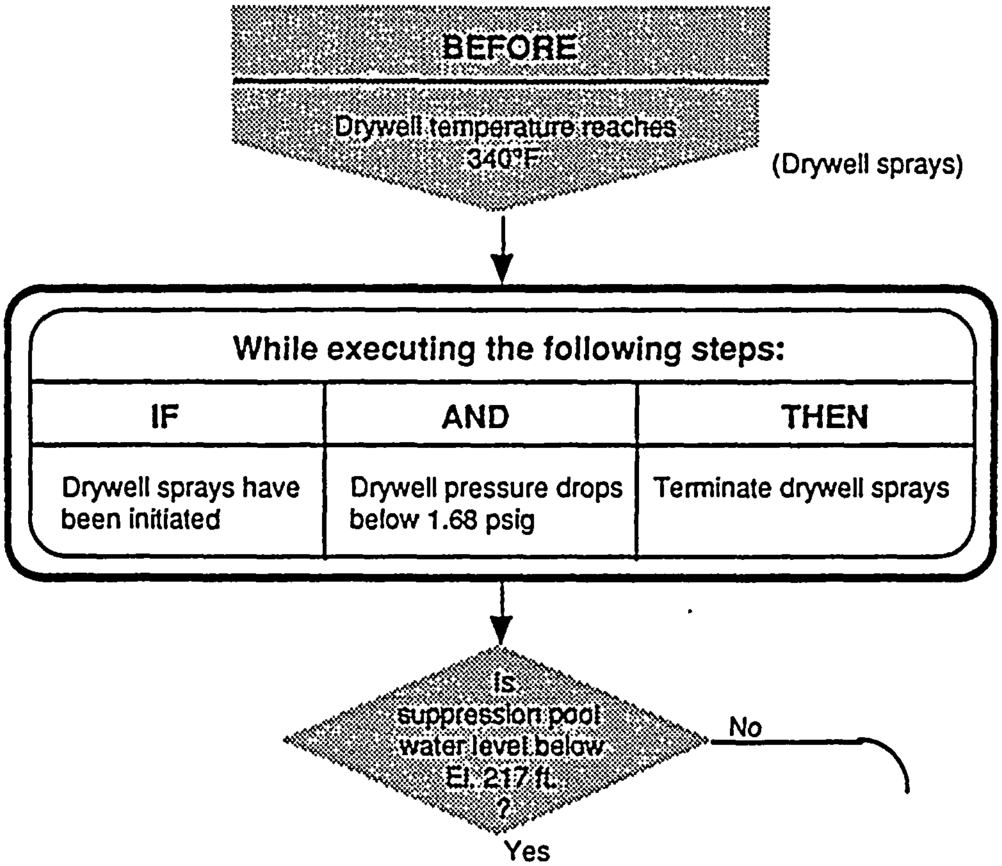
While executing the following steps:

IF	AND	THEN
Drywell sprays have been initiated	Drywell pressure drops below 1.68 psig	Terminate drywell sprays

DISCUSSION:

If drywell temperature continues to increase with all available drywell cooling in operation, further actions (initiating drywell sprays) must be directed to reverse the increasing temperature trend. These actions must be taken BEFORE drywell temperature reaches the drywell design temperature (340°F) to maintain primary containment integrity.

STEP:



DISCUSSION:

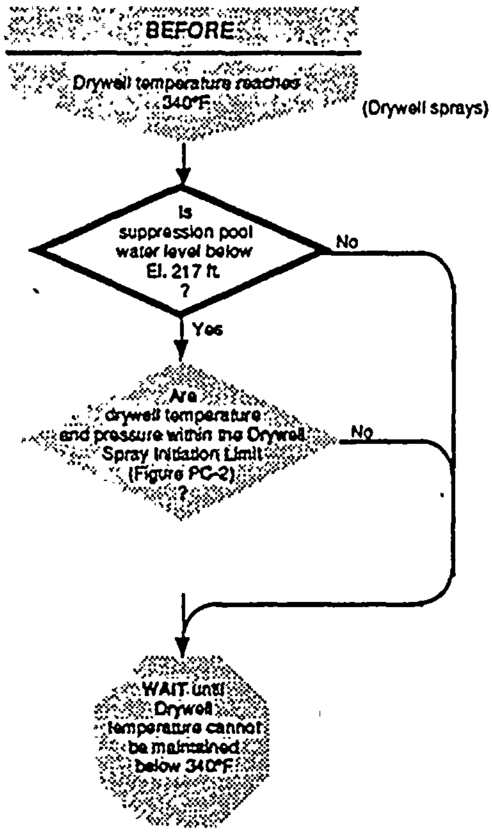
This is an override step and applies throughout the performance of the remainder of this procedural leg.

The action directed in this step terminates the operation of drywell sprays. This stops the convective cooling process and the cooling/ condensing of potential steam in the drywell air space to ensure that primary containment pressure is not reduced below atmospheric.

Drywell pressure below 1.68 psig also permits resetting scram logic and primary containment isolation logic. Resetting the scram and isolation logic allows the operator to perform actions directed by EOPs without having to defeat interlocks.

Terminating drywell sprays when drywell pressure decreases below 1.68 psig avoids creating negative primary containment pressure. Maintaining a positive primary containment pressure assures a safe (positive) margin to the negative design pressure (-4.7 PSID) of the primary containment.

STEP:



DISCUSSION:

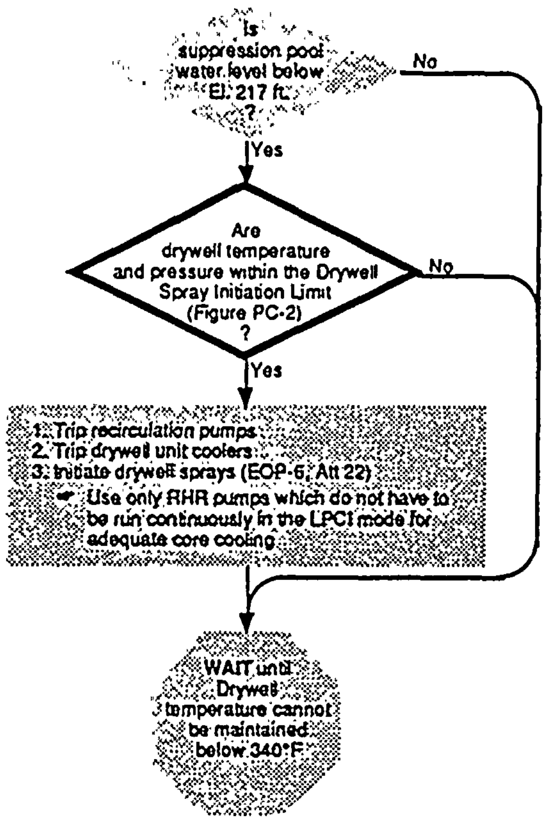
This step has the operator evaluate the present status of suppression pool water level to determine if drywell spray operation is permissible.

If suppression pool water level is below El. 217 ft., as indicated by a "YES" response to this step, the suppression chamber-to-drywell vacuum breakers are not submerged and will function as designed. Drywell spray operation can be used to reduce drywell temperature and may continues as long as drywell temperature and pressures are within the limits of the Drywell Spray Initiation Limit (Figure PC-2, refer to Section C).

If suppression pool water level is at or above El. 217 ft., as indicated by a "NO" response to this step, the suppression chamber-to-drywell vacuum breakers are submerged. Drywell spray operation with the vacuum breakers partially or completely submerged (i.e., no drywell vacuum relief capability) could result in exceeding the design negative differential pressure capability (-4.7 PSID) of the primary containment because of the inability to equalize pressure through the vacuum breakers. Therefore, drywell spray operation is not permitted if suppression pool water level is at or above El. 217 ft.

Although the actual elevation of the suppression chamber-to-drywell vacuum breakers is above El. 217 ft. indicated, El. 217 ft. is the maximum level at which installed instruments can accurately detect and display suppression pool water level. If indicated suppression pool water level is at or above El. 217 ft., it must be assumed that suppression chamber-to-drywell vacuum breakers will not function as designed, because a portion of the valve is covered with water.

STEP:



DISCUSSION:

This step has the operator evaluate the present status of drywell temperature and pressure relative to the Drywell Spray Initiation Limit (Figure PC-2, refer to Section C) to determine if drywell spray operation is permissible.

The Drywell Spray Initiation Limit (Figure PC-2, refer to Section C) is defined to be the highest drywell temperature at which initiation of drywell sprays will not result in an evaporative cooling pressure drop to below either: (1) the drywell-below-suppression chamber differential pressure capability (-10 PSID), or (2) the high drywell pressure scram setpoint (1.68 psig)

Drywell spray operation reduces primary containment pressure and temperature through the combined effects of evaporative and convective cooling. In evaporative cooling the water spray undergoes a change of state, liquid to vapor, whereas convective cooling involves no change of state.

Evaporative cooling occurs when water is sprayed into a superheated atmosphere. The water at the surface of each droplet is heated and flashes to steam, absorbing heat energy from the atmosphere, until the atmosphere reaches saturated conditions.

In the drywell, with typical drywell spray flowrate, this cooling process results in an immediate, rapid, large reduction in pressure. This occurs at a rate much faster than can be compensated for by the primary containment

DISCUSSION: (Continued)

vacuum relief system. Unrestricted operation of drywell sprays could cause an excessive negative differential pressure to occur between the drywell and the suppression chamber, large enough to cause a loss of primary containment integrity.

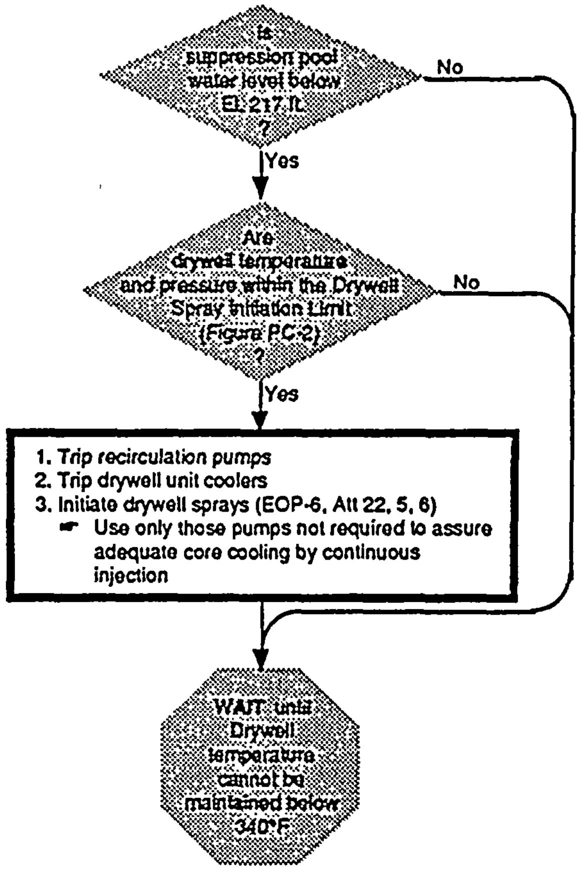
Convective cooling occurs when water is sprayed into a saturated atmosphere. The sprayed water droplets absorb heat from the surrounding atmosphere through convective heat transfer (sensible heat from the atmosphere is transferred to the water droplets). This effect results in a reduction in ambient temperature and pressure until equilibrium conditions are established.

This cooling process occurs at a rate much slower than the evaporative cooling process. An operator can effectively control the magnitude of a drywell temperature/pressure reduction from convective cooling by terminating operation of drywell sprays.

If drywell temperature and pressure are within the limits of the Drywell Spray Initiation Limit, as indicated by a "YES" response to this step, drywell sprays can be used to reduce drywell temperature. The operator is directed to continue in this procedural leg where actions to initiate drywell sprays are addressed.

If drywell temperature and pressure are not within the limits of the Drywell Spray Initiation Limit, as indicated by a "NO" response to this step, drywell spray operation is not permitted because the negative design differential pressure limit between the drywell and suppression chamber may be exceeded, with subsequent failure of the primary containment. The operator is directed to continue in this procedural leg where additional actions to reduce drywell temperature will be directed when temperature cannot be maintained below the drywell design temperature (340°F).

STEP:



DISCUSSION:

The step directs the operator to trip recirculation pumps and drywell unit coolers. Guidance is provided because these components are not designed to operate in a spray environment.

The step directs the operator to initiate drywell sprays to reduce primary containment pressure. Drywell spray operation reduces drywell pressure and temperature through the combined effects of evaporative cooling and convective cooling.

Maintaining adequate core cooling takes precedence over initiating drywell sprays, since catastrophic failure of the primary containment is not expected to occur at the stated value of drywell temperature (340°F). In addition, further action is still available for reversing the increasing drywell temperature trend.

Operation of RHR pumps to provide drywell spray is permitted only if continuous operation of the RHR pumps in the Low Pressure Coolant Injection (LPCI) mode is not required to assure adequate core cooling. This step, however, does permit alternating the use of RHR pumps between the LPCI injection and drywell spray modes, as the need for each occurs and as long as adequate core cooling is able to be maintained.

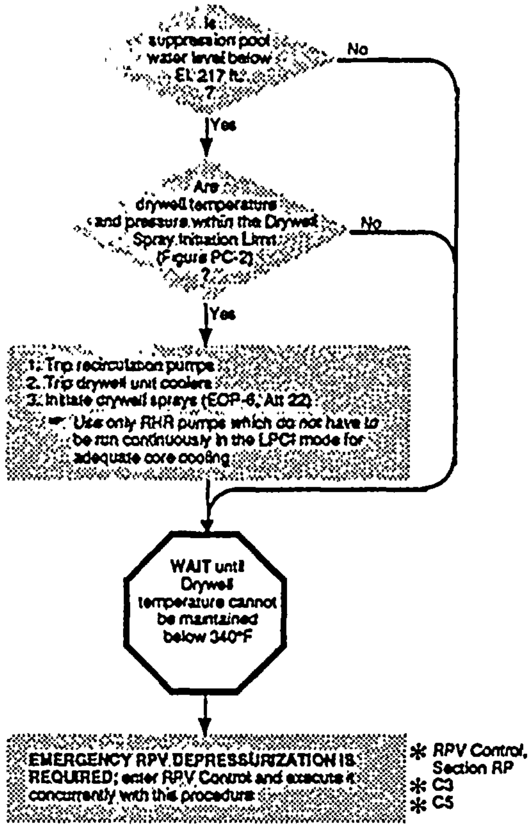
This step addresses initiation of drywell sprays. Instructions for terminating drywell spray operation, once initiated, are provided by a previous override step.

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, drywell

DISCUSSION: (Continued)

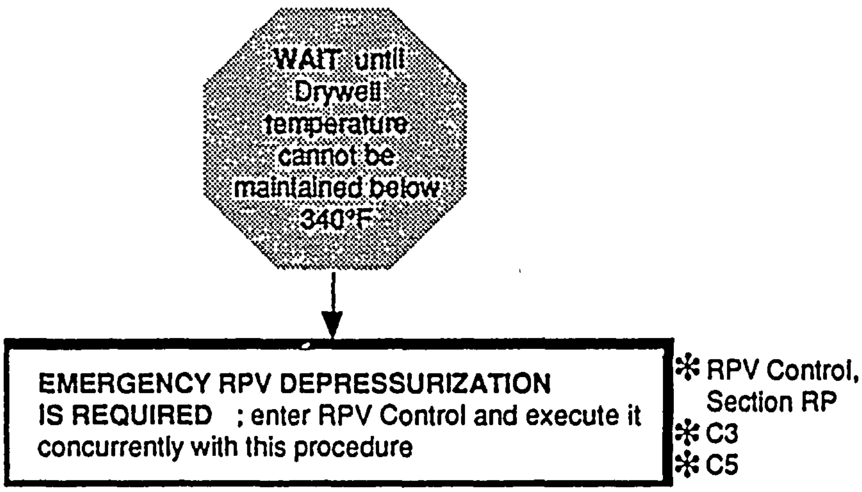
Additionally, this step provides for the capability to utilize SWP or FPW for containment sprays similar to RHR. If continuous SWP or FPW injection is required to assure adequate core cooling, it should not be diverted to the spray mode.

STEP:



DISCUSSION:

STEP:



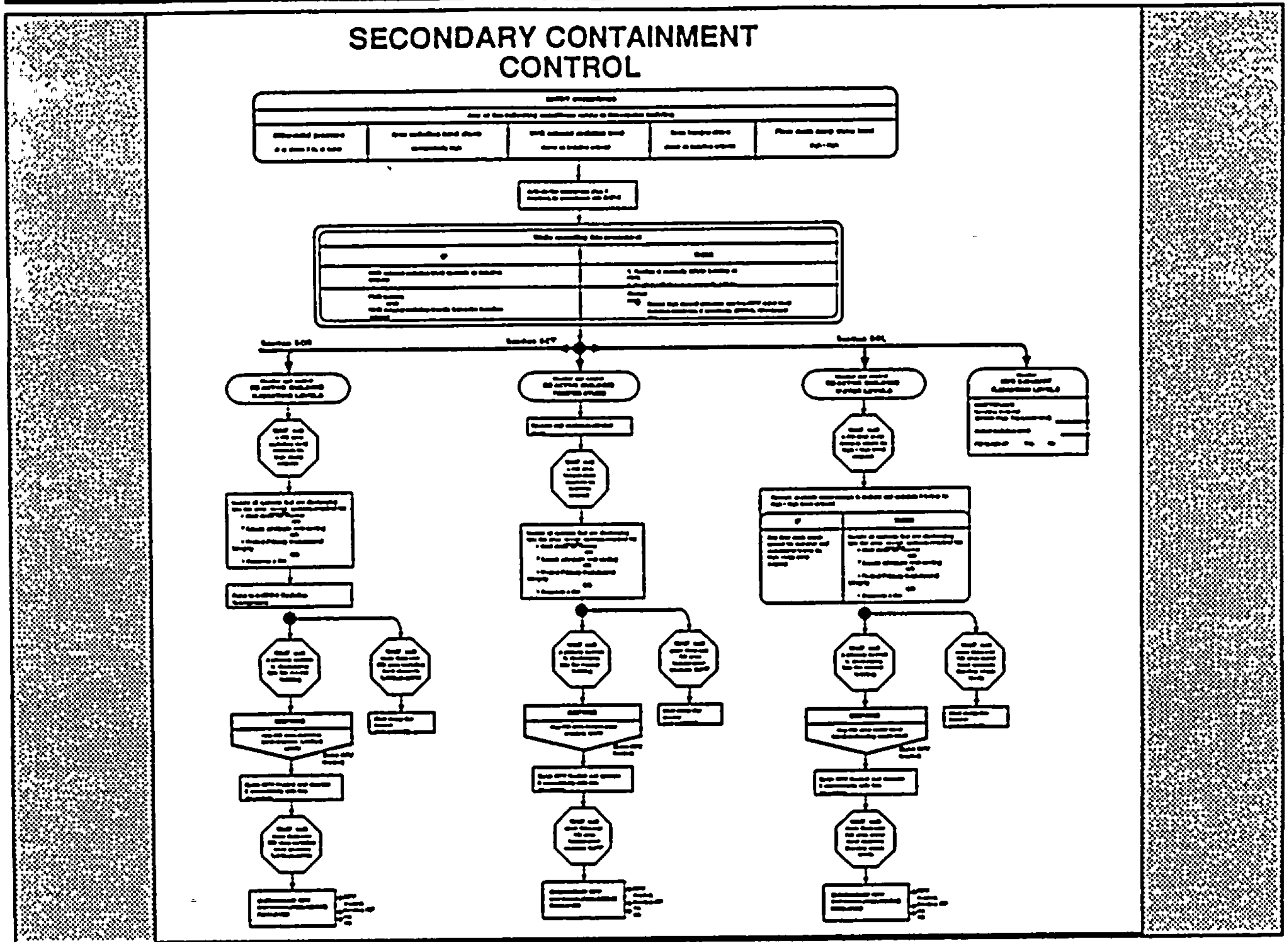
DISCUSSION:

When drywell temperature cannot be maintained below applicable component qualification or structural design limits, further release of energy from the RPV to the drywell can be minimized by rapidly depressurizing the RPV. This action serves to terminate, or reduce as much as possible, any continued drywell temperature increase.

Entering N2-EOP-RPV, RPV Control, assures that, if possible, the reactor is scrammed and shutdown by control rod insertion before RPV depressurization is initiated. Entry into N2-EOP-RPV, RPV Control, from this procedure must be directed because conditions requiring entry into N2-EOP-PC, Primary Containment Control, do not necessarily require entry into N2-EOP-RPV, RPV Control. Therefore, a scram may not have yet been initiated.

Directing that N2-EOP-RPV, RPV Control, be entered, rather than stating "initiate a reactor scram", coordinates actions currently being executed if N2-EOP-RPV, RPV Control, has already been entered (N2-EOP-RPV, RPV Control, requires initiating a reactor scram only if one has not previously been initiated). In addition, entry into N2-EOP-RPV, RPV Control, must be made because it is through the override statement in the Reactor Pressure (RP) leg of RPV Control that a transfer is made to N2-EOP-C2, Emergency RPV Depressurization.

SECONDARY CONTAINMENT CONTROL



PURPOSE:

The purpose of this procedure is to protect equipment in the secondary containment, limit the radioactivity release to the secondary containment, and either maintain secondary containment integrity or limit radioactivity release from the secondary containment.

The purpose of this procedure relates directly to the basic functions performed by the secondary containment structures:

- Contain fission products which may leak from the primary containment.
- Minimize ground level releases of airborne radioactive material by discharge through an elevated release point.
- Shield personnel from radiation which penetrates the primary containment.
- Provide a protected environment for key equipment important to safety.

The procedure's purpose is accomplished through concurrent control of secondary containment radiation level, temperature, and water level.

STEP:

ENTRY CONDITIONS				
Any of the following conditions exists in the reactor building				
Differential pressure at or above 0 in. of water	Area radiation level alarm unexpectedly high	Floor drain sump water level high-high	Area temperature above an isolation setpoint	HVR exhaust radiation level above an isolation setpoint

Activate the emergency plan, if required, in accordance with EAP-1

DISCUSSION:

The entry conditions for this procedure are symptomatic of conditions which, if not corrected, could degrade into an emergency. Adverse effects on equipment operability and conditions directly challenging secondary containment integrity were specifically considered in the selection of these entry conditions.

Differential pressure at or above 0 in. of water

A high secondary containment differential pressure indicates a potential loss of secondary containment structural integrity and could result in uncontrolled release of radioactivity to the environment.

Floor drain sump water level high-high

A floor drain sump water level high-high is an indication that steam or water may be discharging into the secondary containment.

Area radiation level alarm unexpectedly high

An unexpected high area radiation alarm is an indication that water from a primary system or from a primary to secondary system leak may be discharging into the secondary containment.

DISCUSSION: (Continued)

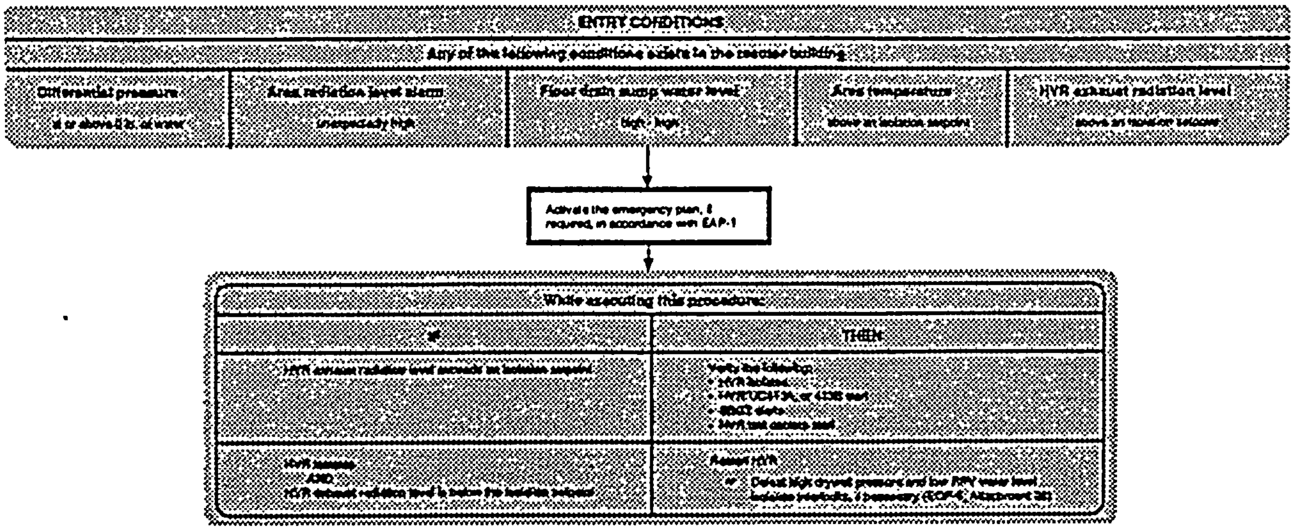
HVR exhaust radiation level above an isolation setpoint

High HVR exhaust radiation levels may indicate radioactivity is being released to the environment when the system should have automatically isolated.

Area temperature above an isolation setpoint

An area temperature above an isolation setpoint is an indication that steam from a primary system may be discharging into the secondary containment. As temperatures continue to increase, the continued operability of equipment needed to carry out EOP actions may be compromised. High area temperatures also present a danger to personnel since access to the secondary containment may be required by actions specified by the EOPs.

STEP:



DISCUSSION:

It is appropriate to activate the emergency plan if plant conditions are at action levels specified in EAP-1.

This step serves to flag the operator that emergency plan implementation may be required. It is not intended that emergency plan actions be completed before proceeding in the procedure.

STEP:

Activate the emergency plan, if required, in accordance with EAP-1

While executing this procedure:	
IF	**THEN**
HVR exhaust radiation level exceeds an isolation setpoint	Verify the following: • HVR isolates • HVR*UC413A, or 413B start • SBGT starts • HVR unit coolers start
HVR isolates AND HVR exhaust radiation level is below the isolation setpoint	Restart HVR — Defeat high drywell pressure and low RPV water level isolation interlocks, if necessary (EOP-6, Attachment 26)

Section SCR

Section SCT

Section SCL

DISCUSSION:

This override must be continuously evaluated during the execution of the Secondary Containment Control EOP.

Confirming isolation of HVR after receipt of a high radiation signal, terminates any further release of radioactivity to the environment from this system.

SBGT is normally used under post-transient conditions to maintain reactor building pressure negative with respect to the atmosphere. The exhaust from SBGT is processed before being discharged to the environment through an elevated release point.

STEP:

Activate the emergency plan, if required, in accordance with EAP-1

While executing this procedure:

IF	THEN
HVR exhaust radiation level exceeds an isolation setpoint	Verify the following: • HVR isolates • HVR*UC413A, or 413B start • SBGT starts • HVR unit coolers start
HVR isolates AND HVR exhaust radiation level is below the isolation setpoint	Restart HVR ☛ Defeat high drywell pressure and low RPV water level isolation interlocks, if necessary (EOP-6, Attachment 26)

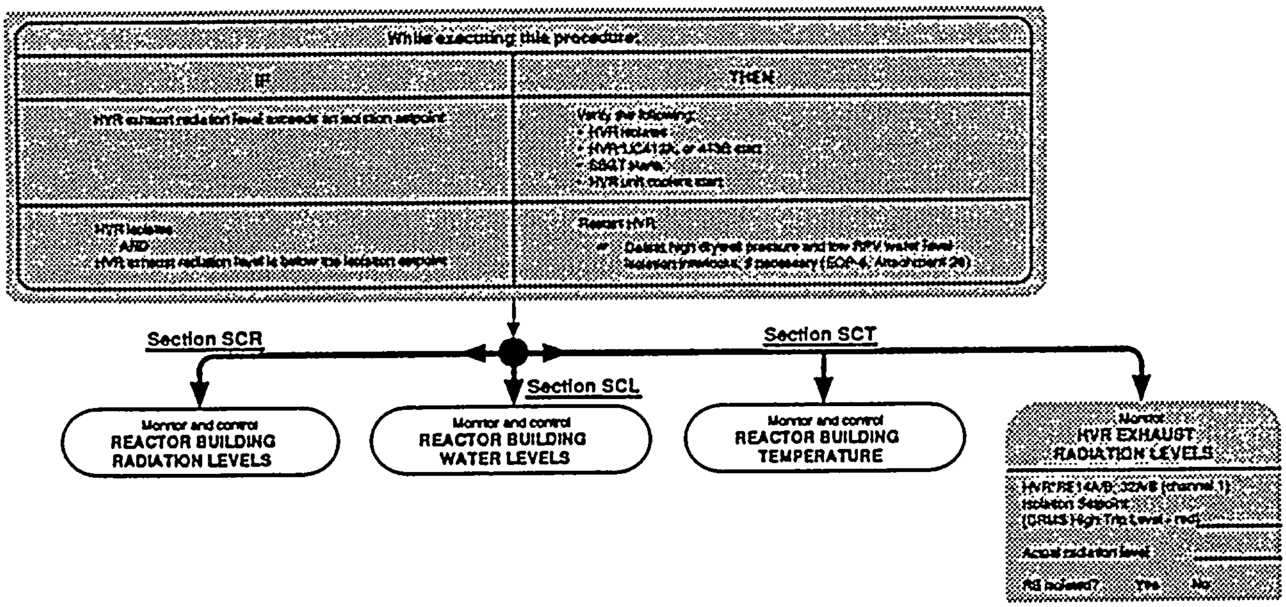
Section SCR
Section SCT
Section SCL

DISCUSSION:

HVR is normally used to maintain secondary containment temperature and differential pressure within operational limits. If isolated, once it has been confirmed that restart will not result in an excessive release of radioactivity to the environment, it is appropriate to restart this system and use it to restore and maintain temperature and pressure.

It is appropriate to defeat the high drywell pressure and low RPV water level isolation interlocks, if needed, since application of these isolations to HVR is for the sole purpose of limiting radioactivity release to the environment. These isolation interlocks become dispensable once it is assured that excessive release of radioactivity will not occur.

STEP:

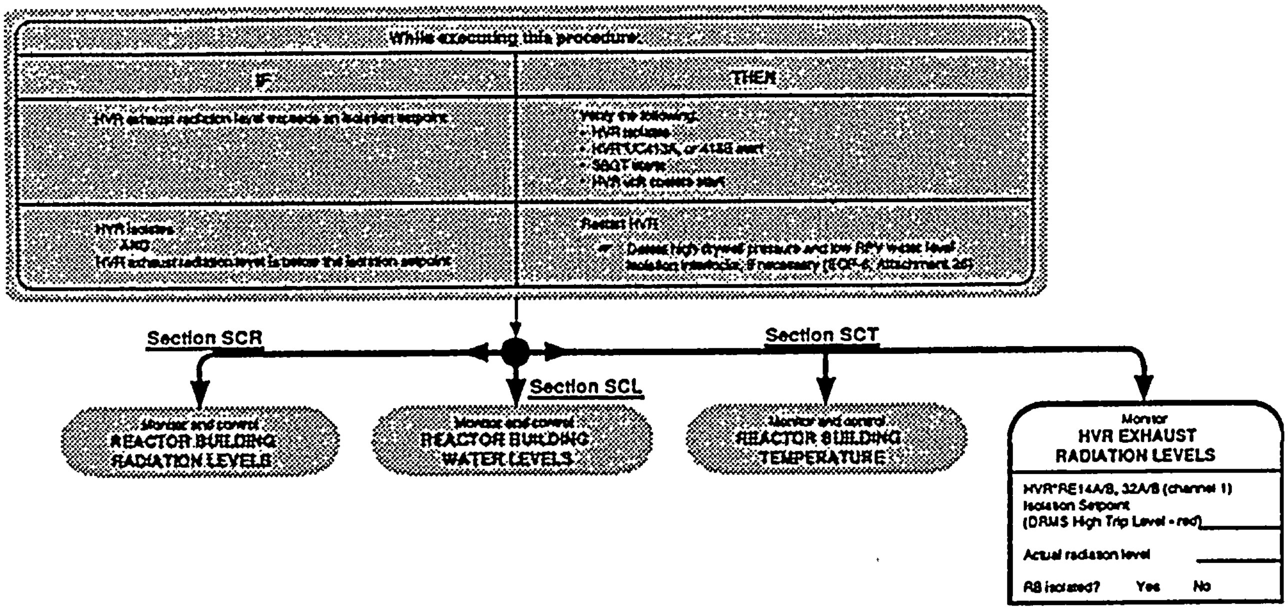


DISCUSSION:

The Secondary Containment Control Procedure is structured along three parallel action paths. Actions taken to control parameters in one path can affect parameters in another path. Therefore, all paths are entered and executed concurrently. Current values and trends of parameters and the status of plant systems during a transient dictate the order and priority of specific actions executed. There is no priority assigned to the execution of any of the individual sections.

Differential pressure is an entry condition to this procedure that has no directly associated operator actions. The procedure addresses secondary containment pressure control by directing the use of HVR and SBGT when available and radiation levels permit.

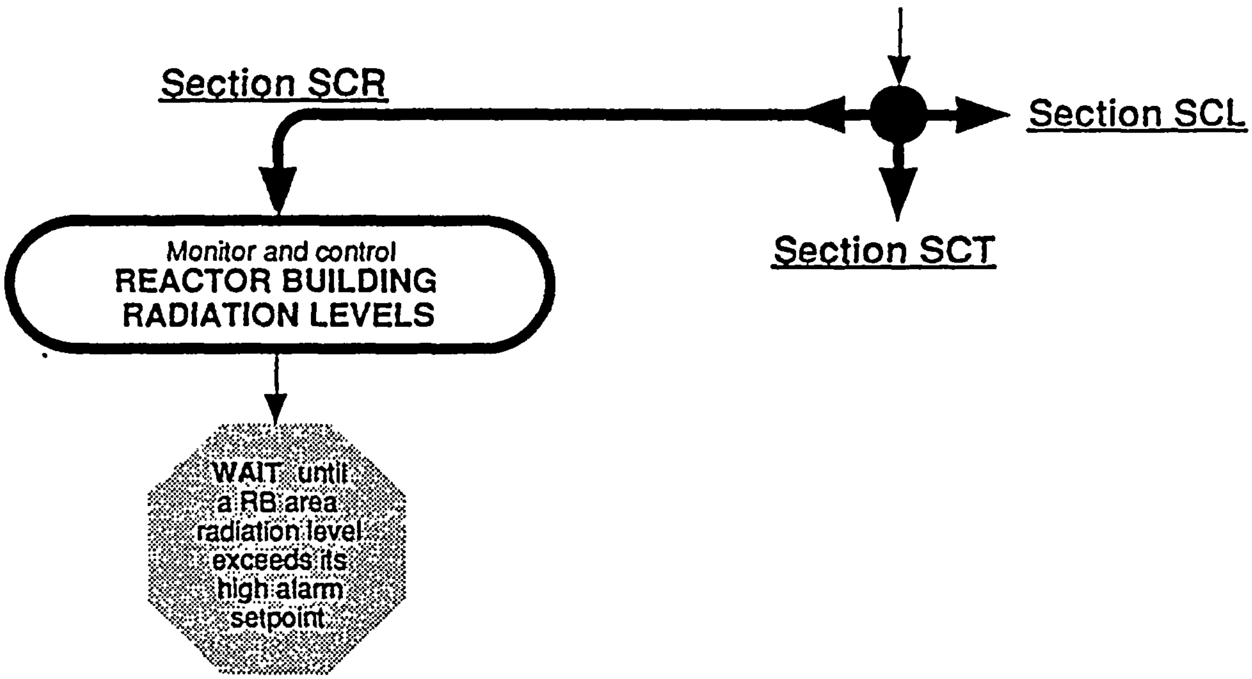
STEP:



DISCUSSION:

This step ensures that the operator is required to monitor HVR exhaust radiation levels. Although no direct actions are specified to control this parameter, this information is required to assess the previous override.

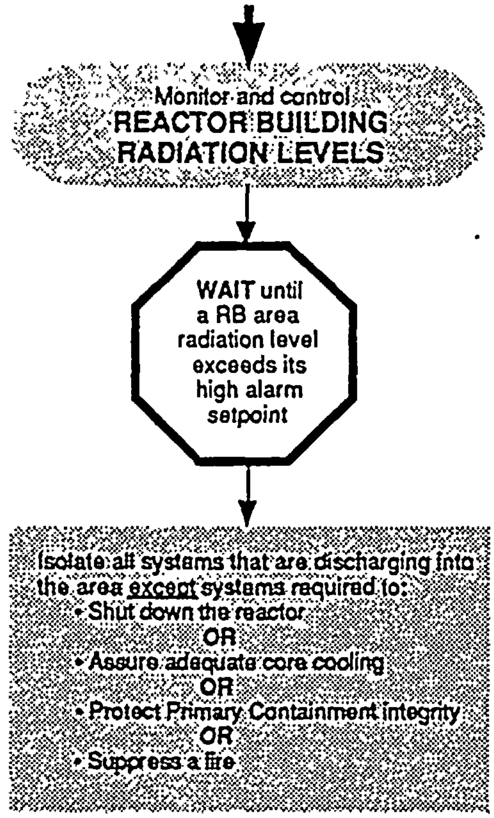
STEP:



DISCUSSION:

Irrespective of entry conditions, the possibility exists that no further actions are required with respect to reactor building radiation levels. This step reminds the operator to continue to control radiation levels by normal means and to be alert to changes in reactor building radiation levels.

STEP:



DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, a Reactor Building area radiation level above the Maximum Normal Operating Radiation Level (high alarm setpoint), has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the normal methods for controlling Reactor Building radiation levels have been unsuccessful and that further actions need to be addressed.

STEP:

WAIT until a RB area radiation level exceeds its high alarm setpoint

↓

Isolate all systems that are discharging into the area <u>except</u> systems required to:

- Shut down the reactor

  OR
- Assure adequate core cooling

  OR
- Protect Primary Containment integrity

  OR
- Suppress a fire

↓

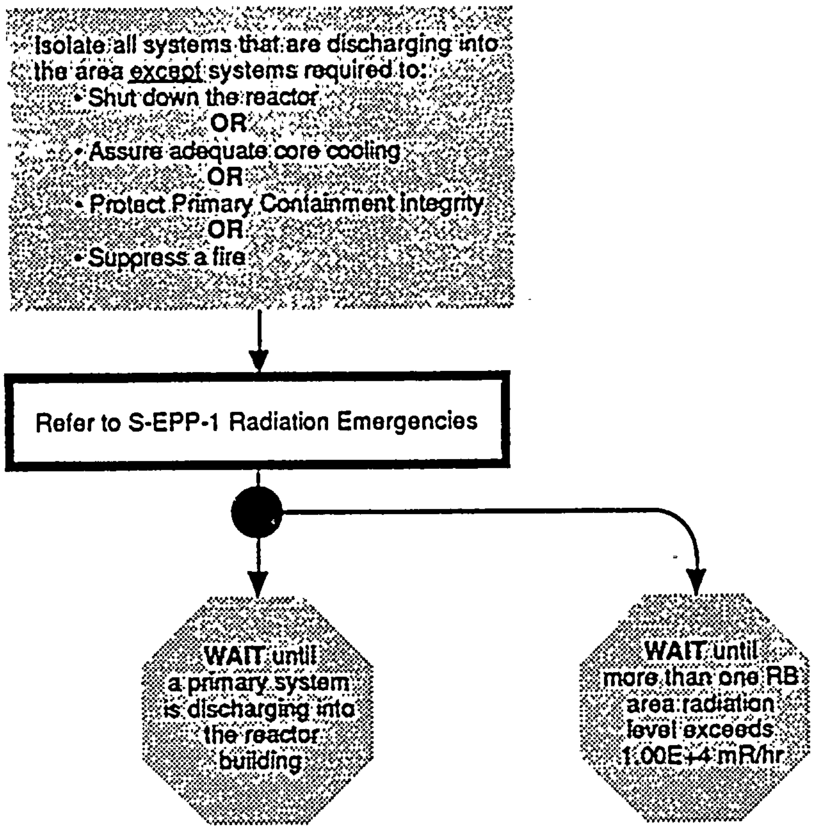
Refer to S-EPP-1 Radiation Emergencies

DISCUSSION:

If the radiation level in one or more Reactor Building areas is above the Maximum Normal Operating Radiation Level, the operator is to terminate any potential radioactivity addition to the area. Systems being used to shut down the reactor, assure adequate core cooling, protect primary containment integrity, or fight a fire are not to be isolated.

The isolation of all systems accommodates the possibility that the source of radioactivity is directly from a primary system or indirectly from a primary system leaking into a secondary system. Fire fighting systems are not sources of radioactivity. The isolation of the other exempt systems is better addressed in RPV Control, Primary Containment Control and the various EOP Contingencies.

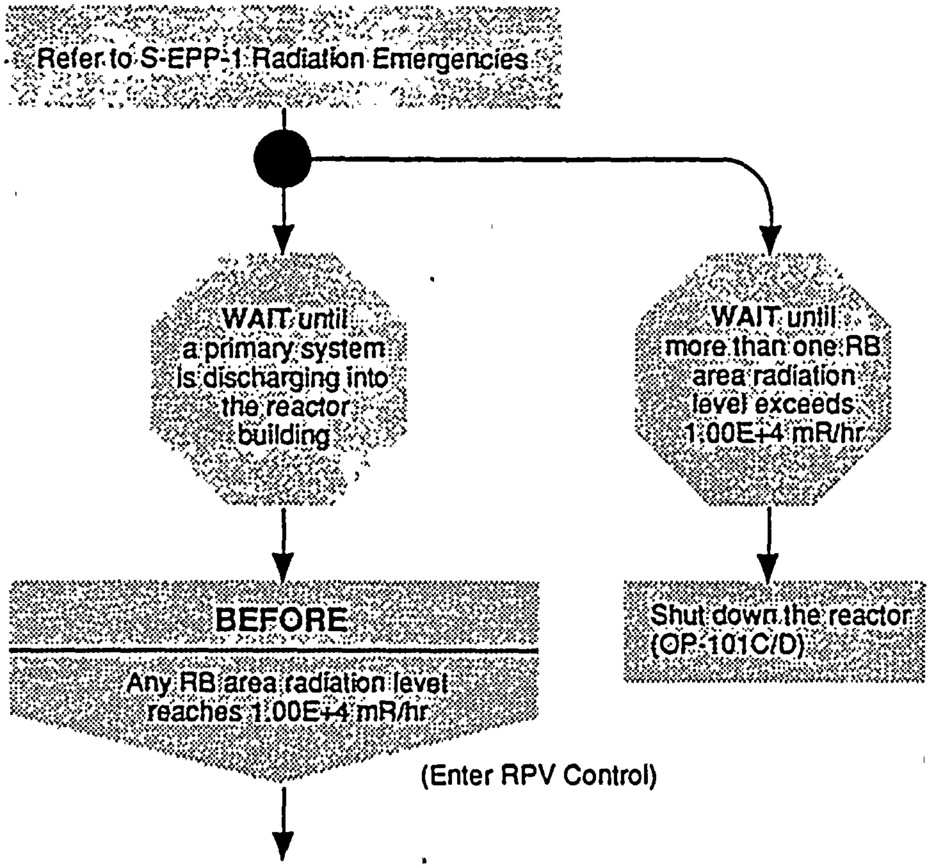
STEP:



DISCUSSION:

This step serves to remind the operator that should a Reactor Building ARM exceed its high alarm setpoint, implementation of S-EPP-1 is required.

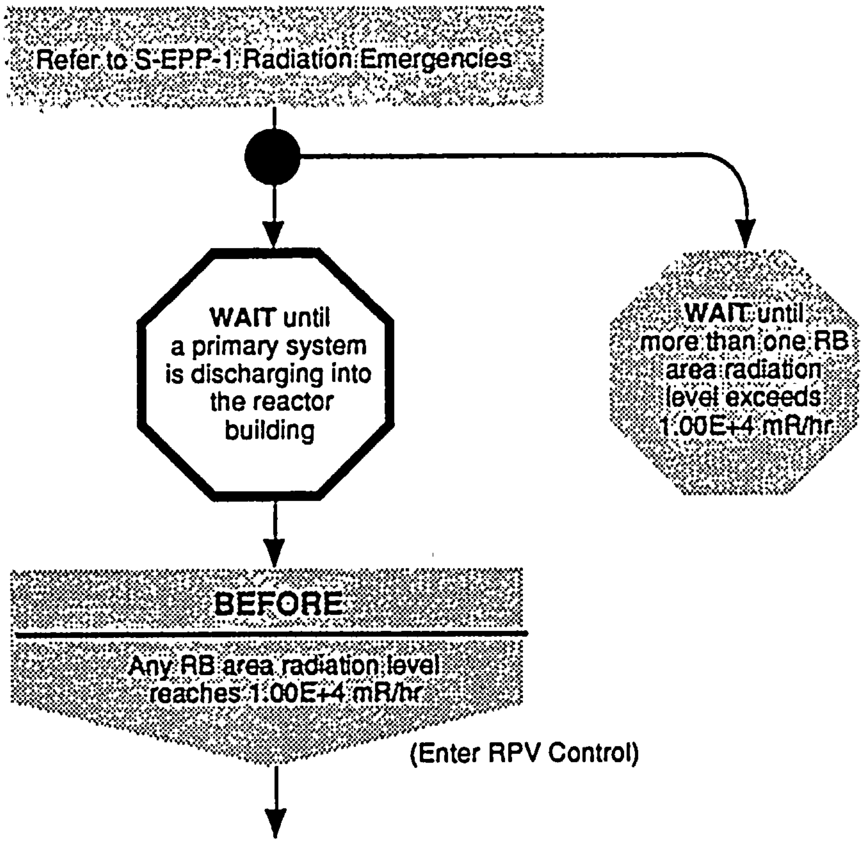
STEP:



DISCUSSION:

The following two procedural flowpaths must be performed concurrently since it may not be possible to determine the reason area radiation levels are above their maximum safe operating radiation level. The flowpaths provide instructions to scram or shutdown the reactor, and to depressurize the RPV, based on the source and magnitude of the radioactivity released into the secondary containment areas. One flowpath provides the proper operator actions if the source of radioactivity increase is from a primary system discharging into the reactor building. The parallel path addresses required actions for other radioactivity sources.

STEP:

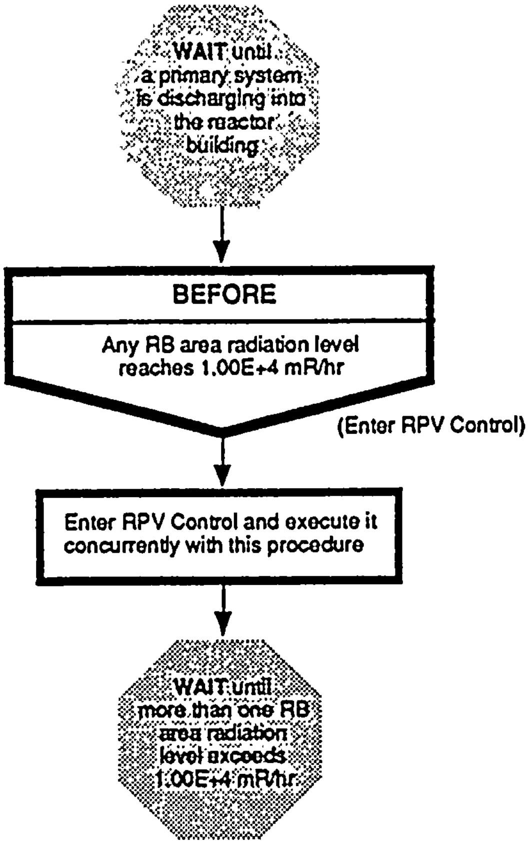


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, a primary system is discharging into the reactor building, has been met.

Delaying the performance of subsequent actions in this procedural leg confirms that the source of the high Reactor Building area radiation level is due in whole, or in part, to a primary system discharging into the Reactor Building.

STEP:



DISCUSSION:

If a primary system is discharging to the reactor building by the time this step is reached, at least one of three conditions must exist:

1. The primary system with the break has not been isolated because the system must be operated to assure adequate core cooling, shut down the reactor or protect primary containment integrity.

2. No isolation valves exist upstream of the break, or if valves exist, they cannot be operated for any reason.

3. The exact source of the discharge cannot be determined.

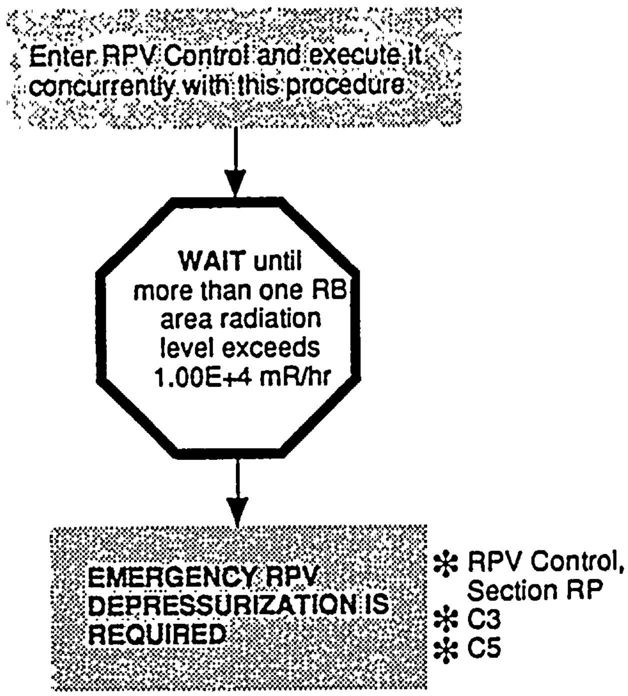
The value of 1.00 E+4 mR/hr, Maximum Safe Operating Radiation Level, is the highest radiation level at which neither (1) Equipment necessary for the safe shutdown of the plant will fail, nor (2) Personnel access necessary for the safe shutdown of the plant will be precluded.

Personnel access necessary for safe shutdown may include alternate control rod insertion or boron injection methods. Although a radiation field is specified here this does not authorize exceeding 10 CFR Emergency Exposure Limits. Refer to EPP-15 Figure 1 for these limits.

DISCUSSION: (Continued)

Initiating a reactor scram to shutdown the reactor will reduce the radioactivity the RPV may be discharging to the reactor building and should be adequate to terminate the increasing radiation levels. The operator is instructed to enter RPV Control directly below the entry conditions and execute the RPV Control EOP concurrently with this procedure

STEP:

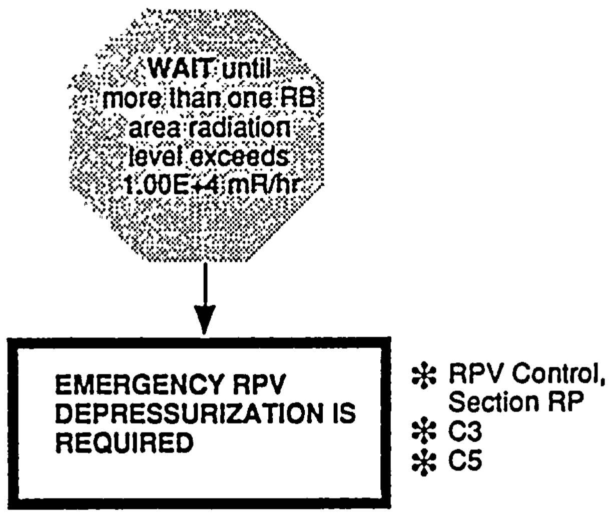


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, radition levels in more than one Reactor Building area are above the Maximum Safe Operating Radiation Level, has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the radiation levels in more than one Reactor Building area are above the Maximum Safe Operating Radiation Level before directing additional actions to terminate the increasing Reactor Building radiation level condition.

STEP:



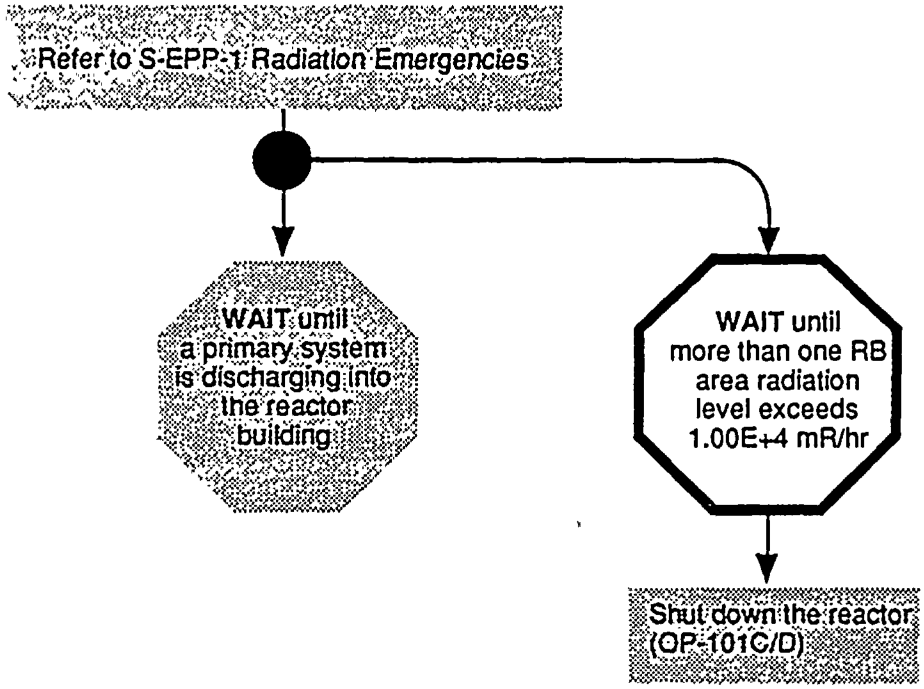
DISCUSSION:

Should radiation levels exceed the Maximum Safe Operating Radiation Level (1.00 E+4 mR/hr), efforts taken in this procedure to reduce area radiation levels have been ineffective. The criteria of "more than one area" is specified to ensure that the reactor building radiation level increase is not an isolated occurrence, but represents a direct, wide-spread threat of significant radioactivity release. The operability of safety-related systems and the accessibility of the reactor building can no longer be assured. The RPV must be rapidly depressurized for several reasons:

1. The RPV is placed in the lowest energy condition due to potential inoperability of safety-related systems
2. The driving head and, therefore, the flow of the unisolated leaking primary systems is reduced
3. It is preferable to reject decay heat to the suppression pool, rather than the reactor building.

The operator will enter Contingency #2, Emergency RPV Depressurization (via the override statement in Section RP of RPV Control), and execute it concurrently with this procedure.

STEP:

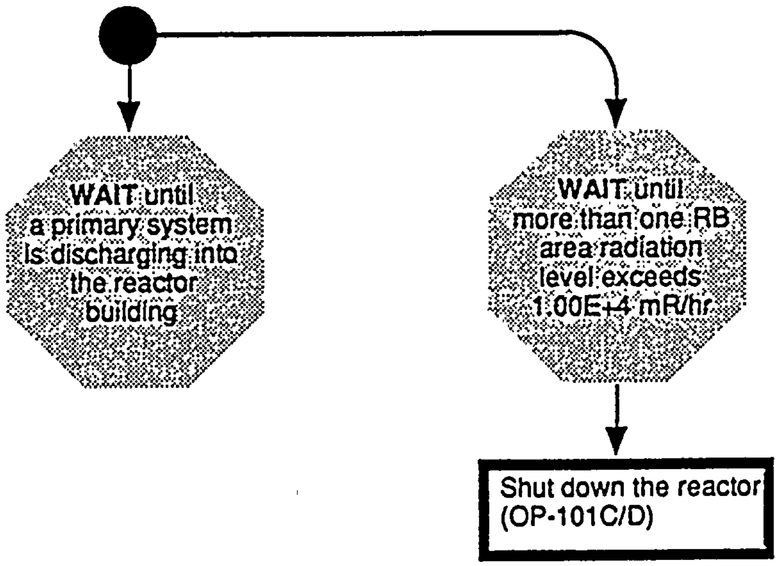


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, radiation levels in more than one Reactor Building area are above the Maximum Safe Operating Radiation Level, has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the radiation levels in more than one Reactor Building area are above the Maximum Safe Operating Radiation Level before directing additional actions to terminate the increasing Reactor Building radiation level condition.

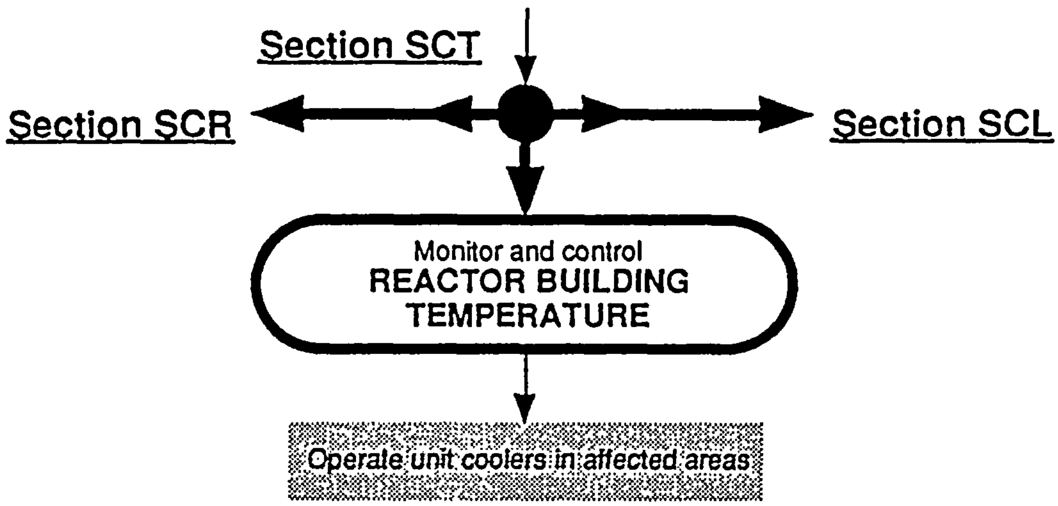
STEP:



DISCUSSION:

It is prudent to commence an orderly reactor shutdown when the maximum safe operating radiation level is exceeded in more than one area. A direct threat exists relative to secondary containment integrity, to equipment located in the secondary containment and to continued plant operation. A reactor scram is not precluded in this step, but will not achieve the desired radiation reduction since a primary system has not been identified as discharging into the secondary containment. Shutting down the reactor in accordance with normal operating procedures is the most appropriate action based on the current secondary containment parameters. Should an operator determine at any time that a primary system is causing, in whole or in part, the radiation level increase, the steps being executed concurrently provide the necessary direction to scram the reactor and depressurize the RPV.

STEP:



DISCUSSION:

All paths in this procedure are entered concurrently, irrespective of entry conditions. This step reminds the operator to continue to monitor and control temperatures by normal means, and to remain alert to changes in reactor building temperatures.

STEP:

Monitor and control
REACTOR BUILDING
TEMPERATURE

↓

Operate unit coolers in affected areas

↓

CAUTION: An RPV water level instrument may be used to determine RPV water level only when:

- RB temperature near instrument legs are below the RPV Saturation Temperature (Figure SC-1, EOP-6, Att 28),

AND

- The instrument reads above the Minimum Indicated Level

MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Narrow Range	150 in.
Wide Range	25 in.
Fuel Zone	-155 in.

DISCUSSION:

Operation of area coolers is the normal mechanism for secondary containment temperature control. This step assures that the normal method of temperature control is used in advance of initiating more complex actions.

If desired, it is permissible to start a 2HVR * UC413 fan to assist in temperature control.

STEP:

Operate unit coolers in affected areas

↓

CAUTION: An RPV water level instrument may be used to determine RPV water level only when:

- RB temperature near instrument legs are below the RPV Saturation Temperature (Figure SC-1, EOP-6, Att 28),

  AND

- The instrument reads above the Minimum Indicated Level

MINIMUM INDICATED LEVEL	
Instrument	Level
Shutdown Range	200 in.
Upset Range	190 in.
Narrow Range	150 in.
Wide Range	25 in.
Fuel Zone	-155 in.

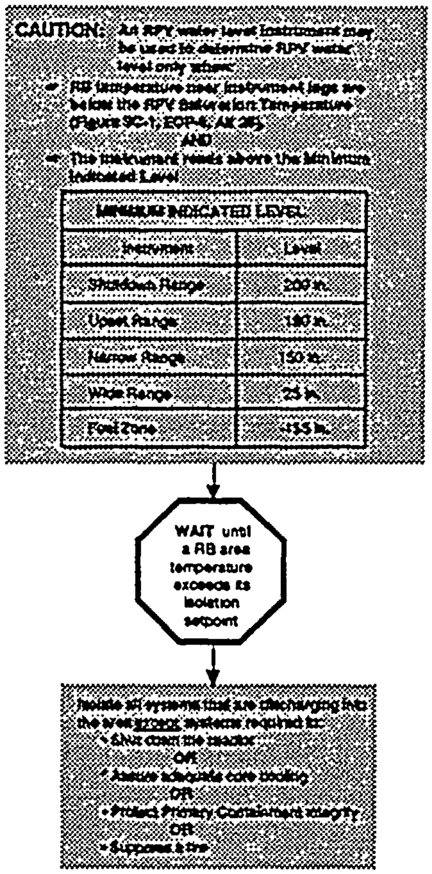
↓

WAIT until a RB area temperature exceeds its isolation setpoint

DISCUSSION:

Caution 1 highlights the effect that high secondary containment temperature has on RPV water level instrument indications.

STEP:

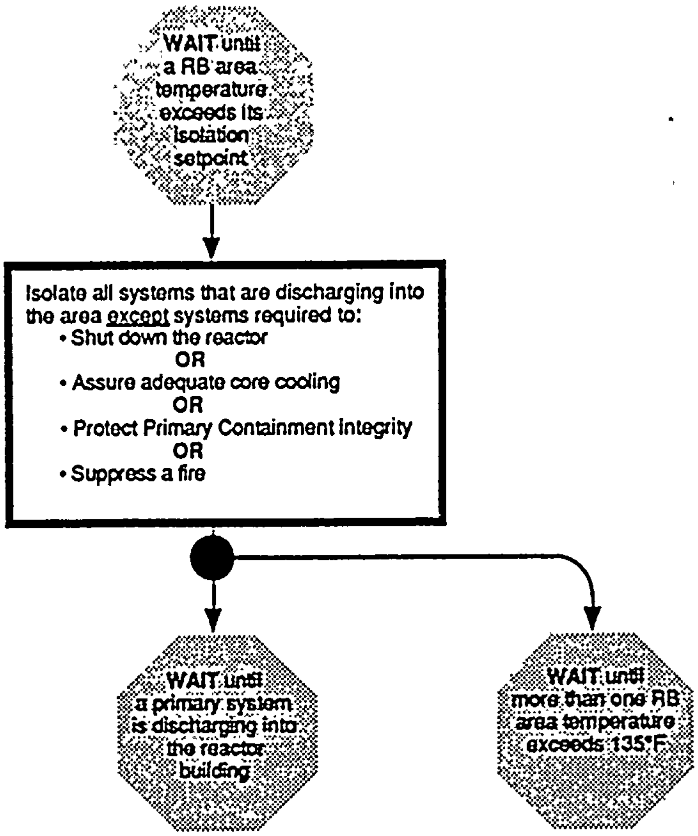


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, a Reactor Building area temperature above the Maximum Normal Operating Temperature (isolation setpoint), has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the normal methods for controlling Reactor Building temperature have been unsuccessful and that further actions need to be addressed.

STEP:

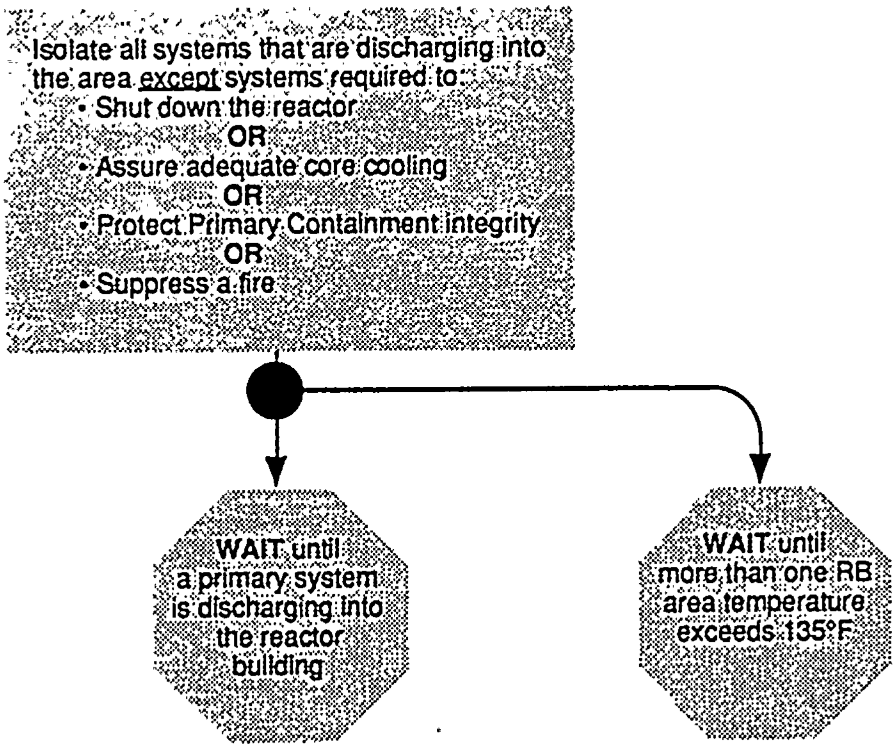


DISCUSSION:

Two possible sources of heat addition to the secondary containment which would cause temperatures to rise above the isolation setpoint are fire and/or a steam/liquid discharge from a high-energy system. Performance of this step should terminate any potential heat addition to the affected area(s).

Systems being used to assure adequate core cooling, shut down the reactor, protect primary containment integrity, or fight a fire are not to be isolated. Preventing core damage, maintaining primary containment integrity and personnel safety have priority over reactor building concerns. When appropriate and necessary, RPV Control, Primary Containment Control, the various EOP Contingencies, and Fire Procedures direct the isolation of the exempted systems.

STEP:

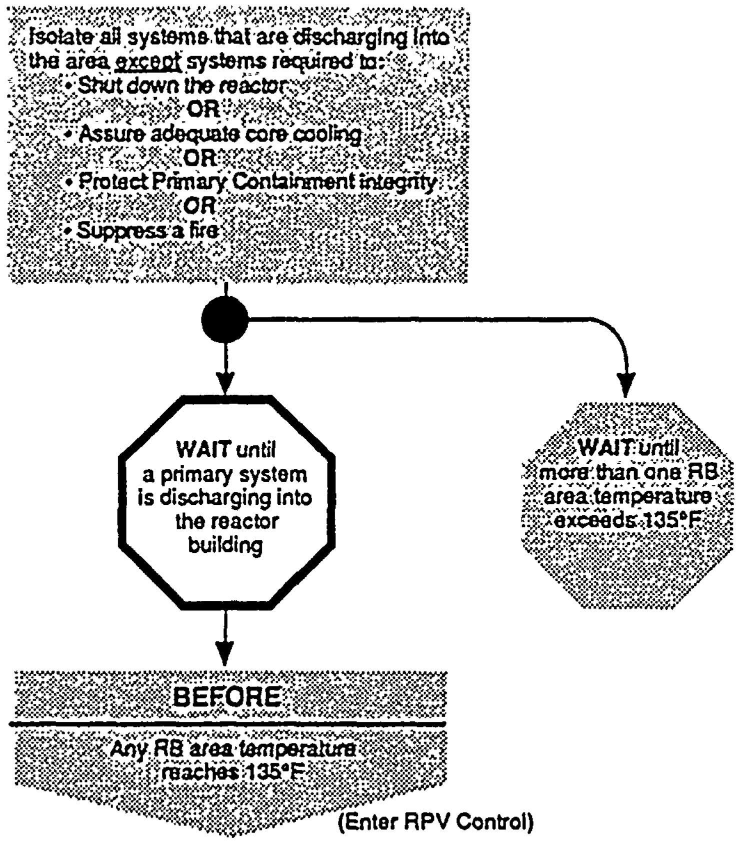


DISCUSSION:

The following two procedural flowpaths must be performed concurrently since it may not be possible to determine the reason area temperatures are above their isolation setpoints. The flowpaths provide instructions to scram or shutdown the reactor, or depressurize the RPV, based on the source or magnitude of the heat addition to the secondary containment.

One flowpath gives the proper operator action if there is a primary system discharging steam or water into the reactor building. The other flowpath provides a proper response if the source of the heat is a fire or a non-primary system that is discharging to the secondary containment.

STEP:

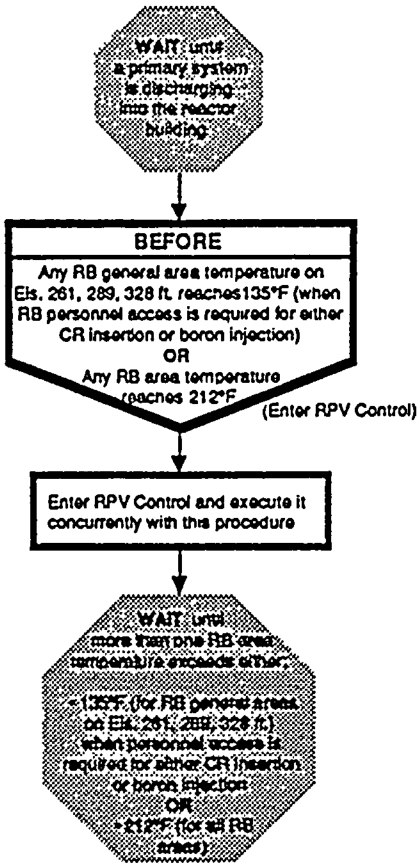


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, a primary system is discharging into the reactor building, has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the source of the high Reactor Building area temperature is due in whole, or in part, to a primary system discharging into the Reactor Building.

STEP:



DISCUSSION:

If a primary system is discharging into the Reactor Building, one of three conditions must exist:

1. The primary system with the break has not been isolated because the system must be operated to assure adequate core cooling, shut down the reactor, or protect primary containment integrity.

2. No isolation valves exist upstream of the break, or if valves exist, they cannot be operated for any reason.

3. The exact source of the discharge cannot be determined.

The area temperature of 135°F or 212°F is based on the Maximum Safe Operating Temperature which is the highest temperature at which neither 1) Equipment necessary for the safe shutdown of the plant will fail nor 2) Personnel access necessary for the safe shutdown of the plant will be precluded. 212°F is the Maximum Safe Operating Temperature for all secondary containment areas for equipment concerns while 135°F is for personnel access.

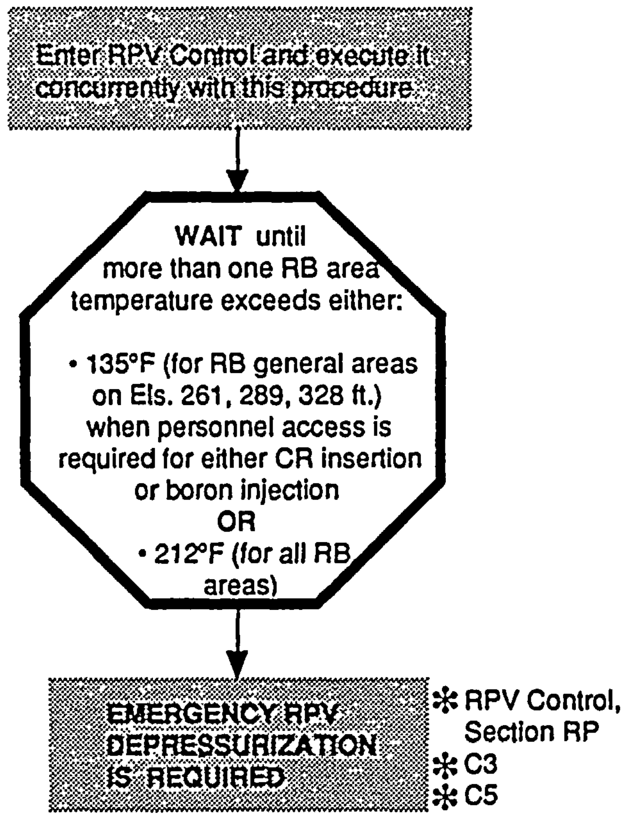
Personnel access necessary for safe shutdown may include alternate control rod insertion or boron injection methods. When access is required and temperatures are elevated, prudency dictates protective equipment be utilized. Stay times and activity levels should be

DISCUSSION: (Continued)

minimized. Consultation with the Safety Department or Site Hygenist is recommended for entries under harsh conditions.

Initiating a reactor scram to shutdown the reactor will reduce the energy the reactor may be discharging to the reactor building and should be adequate to terminate the increasing reactor building temperatures. The operator is instructed to enter RPV Control directly below the entry conditions and execute the RPV Control EOP concurrently with this procedure.

STEP:



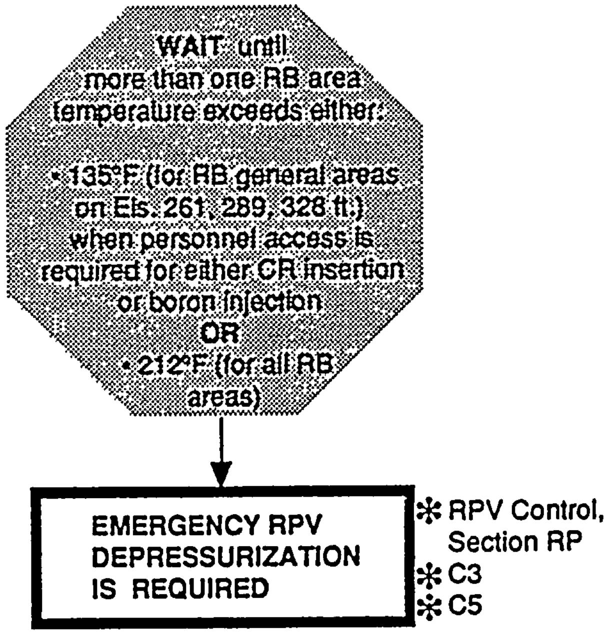
DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, temperatures in more than one Reactor Building area are above the Maximum Safe Operating Temperature, has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the temperatures in more than one Reactor Building area are above the Maximum Safe Operating Temperature before directing additional actions to terminate the increasing Reactor Building temperature condition.

If reactor building access is required during ATWS conditions to insert control rods or inject boron, 135°F is used as the limiting value for RB elevations 261, 289 and 328 ft. If no ATWS exists, 212°F is used for all areas. More than one area may be any combination of 135°F and 212°F areas.

STEP:



DISCUSSION:

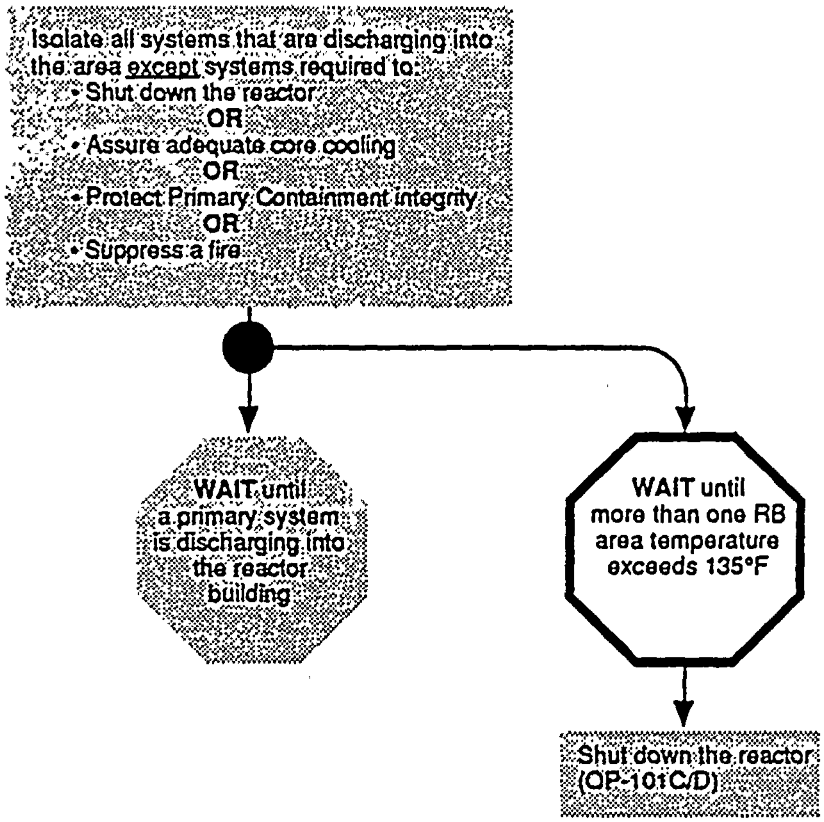
If the temperatures in more than one Reactor Building area are above the Maximum Safe Operating Temperature, efforts taken in this procedure to reduce area temperatures have been ineffective. The criteria of "more than one area" is specified to ensure that the reactor building temperature rise is not an isolated occurrence, but does in fact, present a direct, wide-spread threat to reactor building integrity.

The operability of safety-related systems and the integrity of the reactor building can no longer be assured. The RPV must be rapidly depressurized for several reasons:

1. The RPV is placed in the lowest energy condition due to potential inoperability of safety-related systems.
2. The driving head and, therefore, the flow of the unisolated leaking primary systems is reduced.
3. It is preferable to reject decay heat to the suppression pool, rather than the reactor building.

The operator will enter Contingency #2 (via the override statement in Section RP of RPV Control), Emergency RPV Depressurization, and execute it concurrently with this procedure.

STEP:

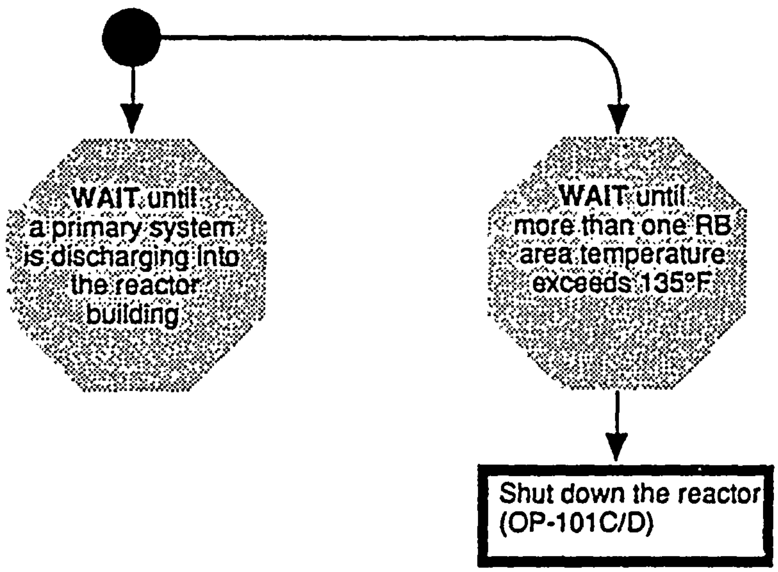


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, temperatures in more than one Reactor Building area are above the Maximum Safe Operating Temperature, has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the temperatures in more than one Reactor Building area are above the Maximum Safe Operating Temperature before directing additional action to terminate the increasing Reactor Building Temperature condition.

STEP:

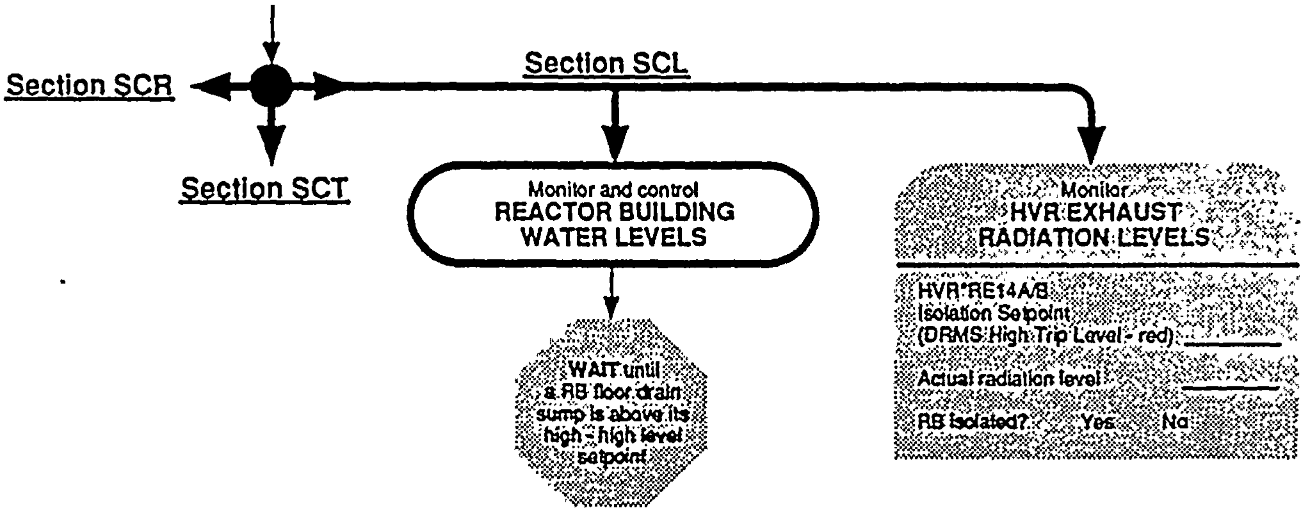


DISCUSSION:

It is prudent to commence an orderly reactor shutdown when the maximum safe operating temperature is exceeded in more than one area. A direct threat exists relative to secondary containment integrity, to equipment located in the secondary containment and to continued safe operation of the plant. A reactor scram is not precluded in this step, but will not achieve the desired temperature reduction since a primary system has not been identified as discharging into the secondary containment.

Shutting down the reactor in accordance with normal operating procedures is the most appropriate action based on the current secondary containment parameters. Should an operator determine at any time that a primary system is causing, in whole or in part, the temperature increase, the steps being executed concurrently provide the necessary direction to scram the reactor and depressurize the RPV.

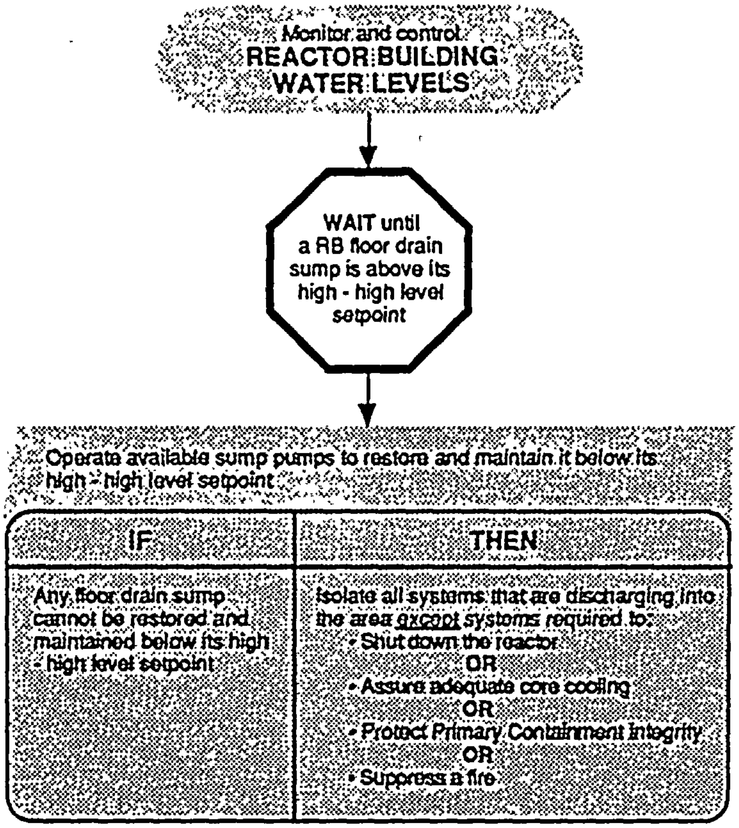
STEP:



DISCUSSION:

This step is entered irrespective of entry conditions. The possibility exists that no further actions are required with respect to reactor building water levels. This step reminds the operator to continue to monitor and control reactor building water levels by normal means, and to remain alert to changes in reactor building water levels.

STEP:



DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, a Reactor Building floor drain sump above the Maximum Safe Operating Water Level (high-high level setpoint), has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the normal methods for controlling Reactor Building water level have been unsuccessful and that further actions need to be addressed.

STEP:

WAIT until a RB floor drain sump is above its high - high level setpoint

Operate available sump pumps to restore and maintain it below its high - high level setpoint

IF	THEN
Any floor drain sump cannot be restored and maintained below its high - high level setpoint	Isolate all systems that are discharging into the area <u>except</u> systems required to: • Shut down the reactor OR • Assure adequate core cooling OR • Protect Primary Containment integrity OR • Suppress a fire

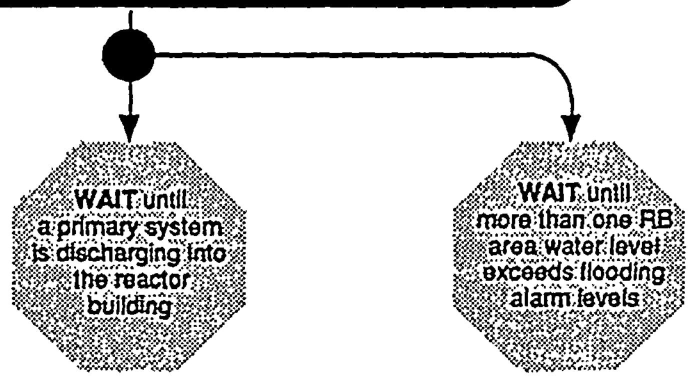
DISCUSSION:

This step provides a means to restore reactor building floor drain sump levels to normal using all available normal methods before more complex actions are taken.

STEP:

Operate available sump pumps to restore and maintain it below its high - high level setpoint

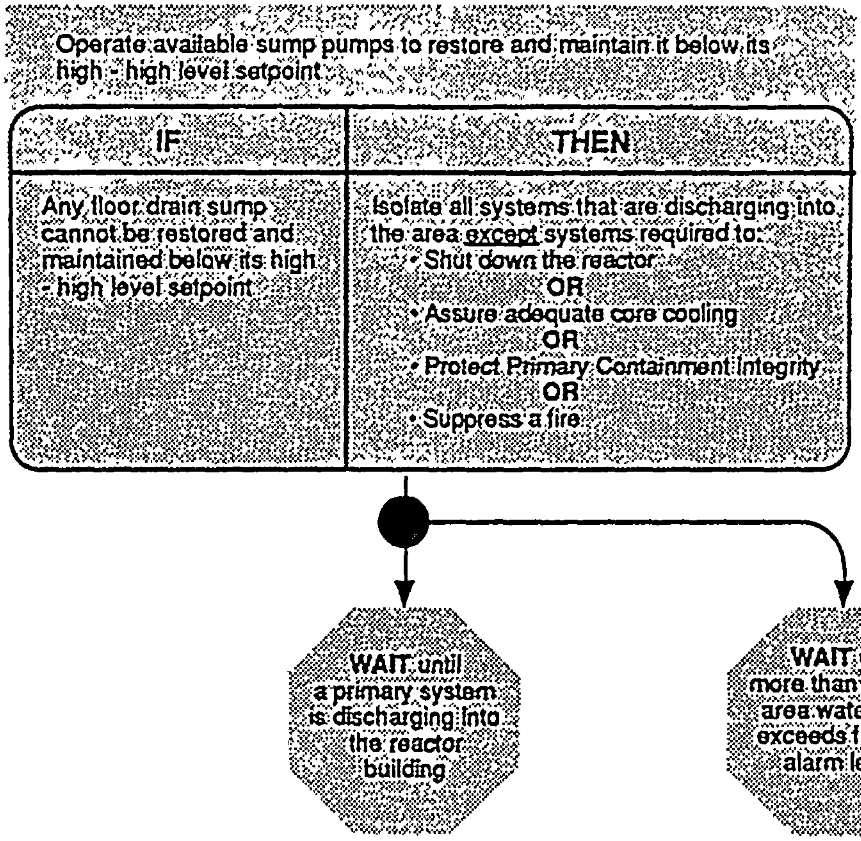
IF	THEN
Any floor drain sump cannot be restored and maintained below its high - high level setpoint	Isolate all systems that are discharging into the area except systems required to: • Shut down the reactor OR • Assure adequate core cooling OR • Protect Primary Containment integrity OR • Suppress a fire



DISCUSSION:

The objective of this step is to terminate any potential water addition to the effected area if the normal methods of water level control are unavailable or ineffective. Systems being used to assure adequate core cooling, shut down the reactor, protect primary containment integrity, or fight a fire are not to be isolated. Preventing core damage, maintaining primary containment integrity and personnel safety have priority over reactor building concerns. Fire Procedures and other EOPs will address the isolation of these exempt systems, if necessary.

STEP:



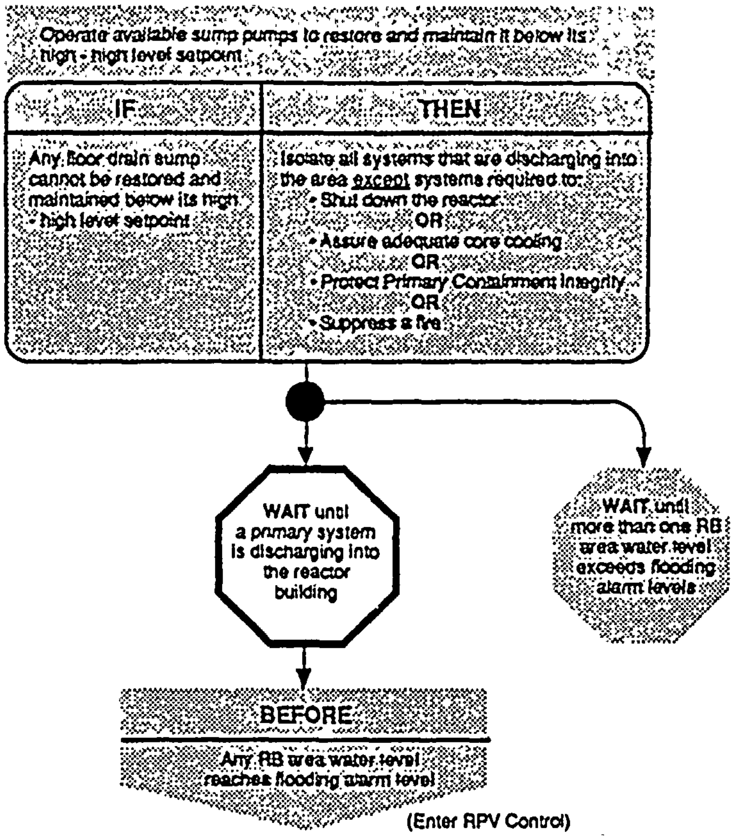
DISCUSSION:

The following two procedural flowpaths must be performed concurrently since it may not be possible to determine the reason for the accumulation of water in secondary containment areas at the time these flowpaths are reached. They provide instructions to scram or shutdown the reactor, or depressurize the RPV based on the source or severity of water addition to the secondary containment.

One flowpath gives the proper operator action if there is a primary system discharging water. The other flowpath provides a proper response if the source of water is from other than a primary system.

The decision to scram the reactor or to depressurize the RPV will depend on whether a primary system is discharging to the reactor building.

STEP:

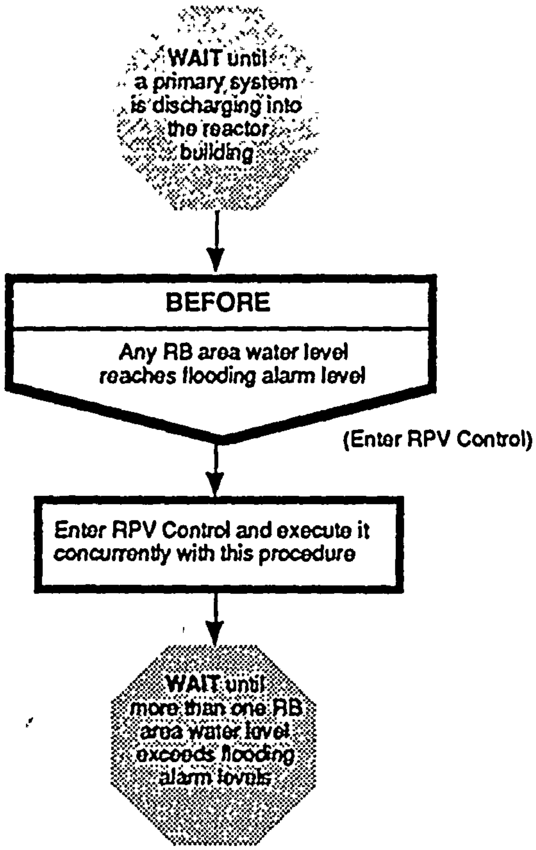


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, a primary system discharging into the Reactor Building, has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the source of the high Reactor Building floor drain sump level is due in whole, or in part, to a primary system discharging into the Reactor Building.

STEP:



DISCUSSION:

If a primary system is discharging to the Reactor Building by the time this step is reached, at least one of three conditions must exist:

1. The primary system with the break has not been isolated because the system must be operated to assure adequate core cooling, shutdown the reactor, or protect primary containment integrity.

2. No isolation valves exist upstream of the break, or if valves exist, they cannot be operated for any reason

3. The exact source of the discharge cannot be determined.

A Reactor Building flooding alarm level, the Maximum Safe Operating Water Level, is defined as the highest water level where neither 1) Equipment necessary for the safe shutdown of the plant will fail nor 2) Personnel access necessary for the safe shutdown of the plant will be precluded.

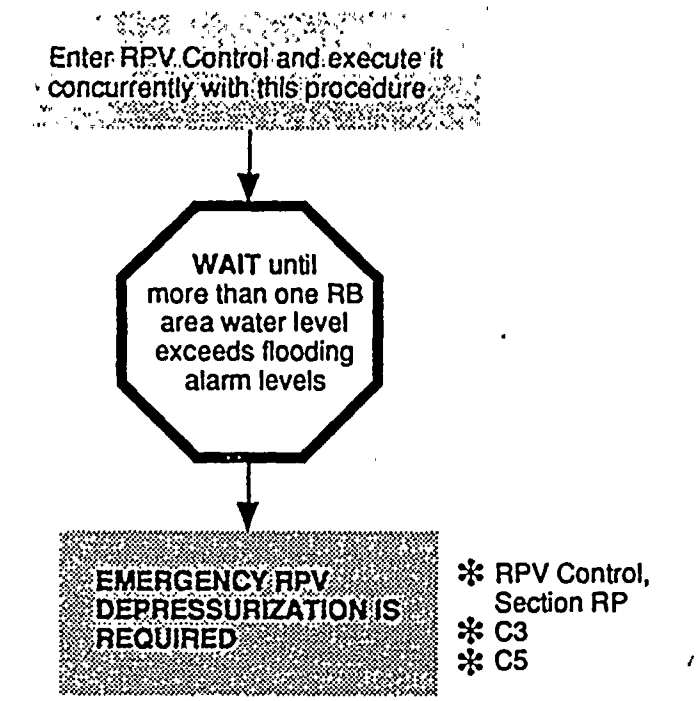
RB flooding alarm levels are set at approximately 2.5 inches above the floor. Flooding above this level may deem equipment necessary for safe shutdown unavailable.

If an area water level reaches a Reactor Building flooding alarm setpoint, continued reactor operation cannot be justified. Execution of these steps may reduce the flow of the leaking primary system and eliminate the need for

DISCUSSION: (Continued)

RPV depressurization. The operator is instructed to initiate a manual scram by entering RPV Control directly below the entry conditions and execute the RPV Control EOP concurrently with this procedure.

STEP:

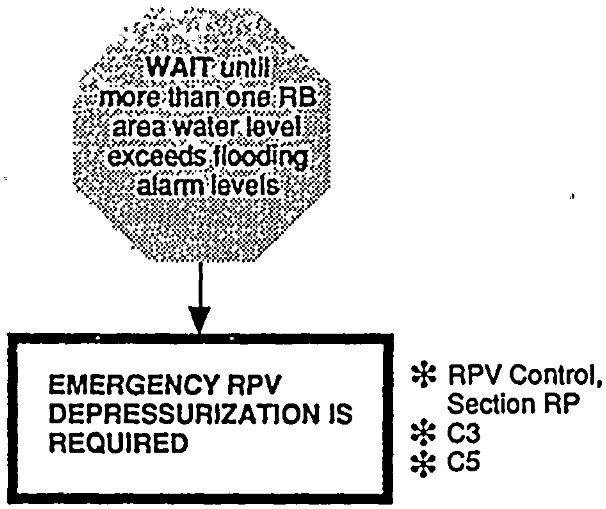


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, water levels in more than one Reactor Building area are above the Maximum Safe Operating Water Level (flooding alarm level), has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the water levels in more than one Reactor Building area are above the Maximum Safe Operating Water Level before directing additional actions to terminate the increasing Reactor Building water level condition.

STEP:



DISCUSSION:

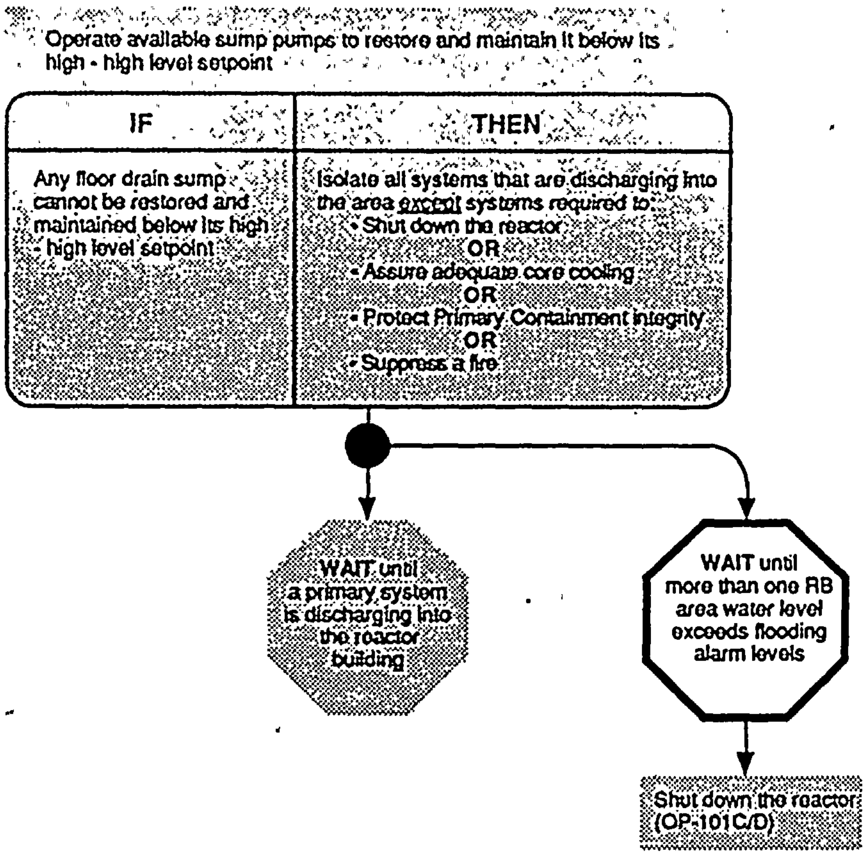
If more than one area water level reaches the Reactor Building flooding alarm setpoint, efforts taken in this procedure to reduce area water levels have been ineffective. The criteria of "more than one area" is specified to ensure that the reactor building water level rise is not an isolated occurrence, but does in fact, present a direct, wide-spread threat to reactor building integrity.

The operability of safety-related systems can no longer be assured. The RPV must be rapidly depressurized for several reasons:

1. The RPV is placed in the lowest energy condition due to potential inoperability of safety-related systems.
2. The driving head and, therefore, the flow of unisolated leaking primary systems is reduced.
3. It is preferable to reject decay heat to the suppression pool, rather than the reactor building.

The operator will enter Contingency #2 (via the override statement in Section RP of RPV Control), Emergency RPV Depressurization, and execute it concurrently with this procedure.

STEP:

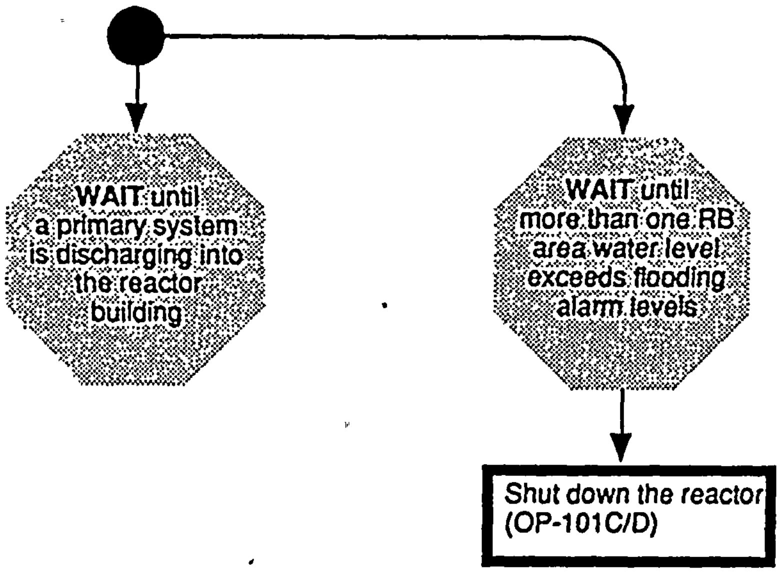


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedural leg until the stated condition, water levels in more than one Reactor Building area are above the Maximum Safe Operating Water Level, has been met.

Delaying the performance of subsequent actions in this procedural leg, confirms that the water levels in more than one Reactor Building area are above the Maximum Safe Operating Water Level before directing additional actions to termainate the increasing Reactor Building water level condition.

STEP:

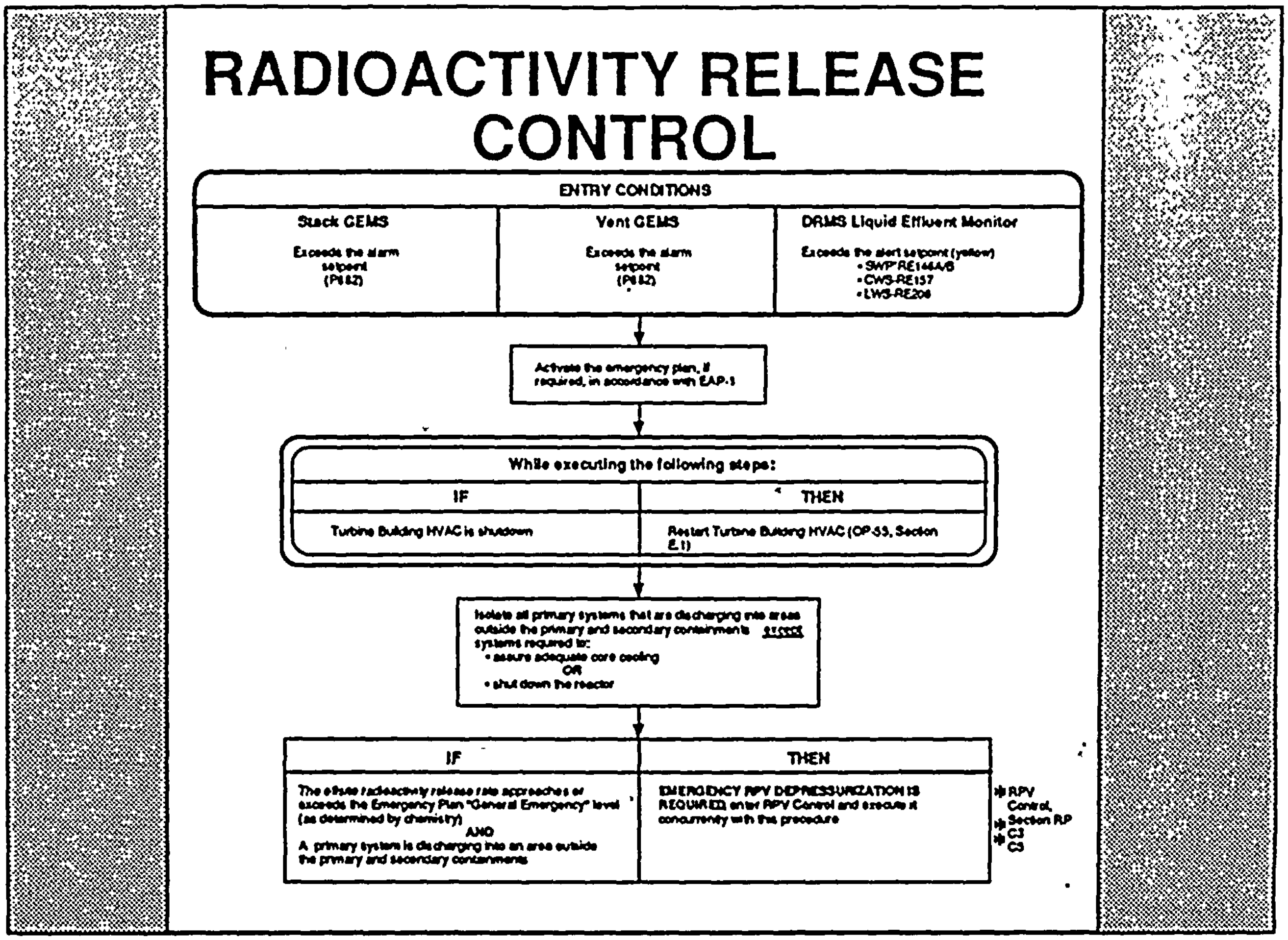


DISCUSSION:

It is prudent to commence an orderly reactor shutdown when the Reactor Building flooding alarm level is exceeded in more than one area. A direct threat exists relative to secondary containment integrity, to equipment located in the secondary containment and to continued safe operation of the plant.

A reactor scram is not precluded in this step, but will not achieve the desired water level reduction since a primary system has not been identified as discharging into the secondary containment. Shutting down the reactor in accordance with normal operating procedures is the most appropriate action based on the current secondary containment parameters. Should an operator determine at any time that a primary system is causing, in whole or in part, the water level increase, the steps being executed concurrently provide the necessary direction to scram the reactor and depressurize the RPV.

RADIOACTIVITY RELEASE CONTROL



PURPOSE:

The purpose of this procedure is to limit the release of radioactivity into areas outside the primary and secondary containments. The procedure provides instructions to the operator for controlling and reducing radioactive discharges outside the primary and secondary containments. This procedure is entered when radioactivity release rates reach levels corresponding to Unusual Event levels in the Emergency Plan. These radioactivity release rate levels are high enough that they will not occur during normal operations, but still low enough that the immediate health and safety of the general public is not threatened by the release.

ENTRY:

ENTRY CONDITIONS

Stack GEMS	Vent GEMS	DRMS Liquid Effluent Monitor
Exceeds the alarm setpoint (P882)	Exceeds the alarm setpoint (P882)	Exceeds the alert setpoint (yellow) • SWP*RE146A/B • CWS-RE157 • LWS-RE206

↓

Activate the emergency plan, if required, in accordance with EAP-1

DISCUSSION:

The radioactivity release rate level which corresponds to an Unusual Event level in the Emergency Plan is used as the Entry Condition. This radioactivity release rate is high enough that it will not occur during normal operations, but is still low enough that the immediate health and safety of the general public is not threatened by the release. The entry condition is broken out to address the three radioactive effluent release paths. The entry condition action level for each corresponds to the Unusual Event action level.

STEP:

ENTRY CONDITIONS

Stack GEMS	Vent GEMS	DRMS Liquid Effluent Monitor
Exceeds the alarm setpoint (P882)	Exceeds the alarm setpoint (P882)	Exceeds the alert setpoint (yellow) • SWP-RE146A/B • CWS-RE157 • LWS-RE206

↓

Activate the emergency plan, if required, in accordance with EAP-1

↓

While executing the following steps:

IF	THEN
Turbine Building HVAC is shutdown	Restart Turbine Building HVAC (OP-55, Section E.1)

DISCUSSION:

It is appropriate to verify that the emergency plan is entered and performed concurrently with this procedure.

STEP:

Activate the emergency plan, if required, in accordance with EAP-1

↓

While executing the following steps:

IF	THEN
Turbine Building HVAC is shutdown	Restart Turbine Building HVAC (OP-55, Section E.1)

↓

Isolate all primary systems that are discharging into areas outside the primary and secondary containments <u>except</u> systems required to:
- assure adequate core cooling

OR

- shut down the reactor

DISCUSSION:

This is an override step and as such applies during the remainder of the procedure. Continued personnel access to the turbine building may be essential for responding to emergencies or transients which may degrade into emergencies. Since the turbine building is not an air-tight structure, a radioactive release inside the turbine building would not only limit personnel access but would eventually lead to an unmonitored ground level release. Operation of the Turbine Building HVAC preserves turbine building accessibility, and assures that radioactivity in turbine building areas is discharged through an elevated monitored release point.

STEP:

While executing the following steps:

IF	THEN
Turbine Building HVAC is shutdown	Restart Turbine Building HVAC (OP-55, Section E.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	THEN
The offsite radioactivity release rate approaches or exceeds the Emergency Plan "General Emergency" level (as determined by chemistry) AND A primary system is discharging into an area outside the primary and secondary containments	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

* RPV Control, Section RP
* C3
* C5

DISCUSSION:

Primary systems comprise the pipes, valves and other equipment connected to the RPV such that a reduction in RPV pressure will effect a decrease in the flow of steam or water being discharged through an unisolated break in the system.

Isolating primary systems that are discharging into areas outside the primary and secondary containments provide the most direct and appropriate action for terminating offsite radioactivity release.

It should be noted that discharges due to malfunctions in non-primary systems could also be a source of an offsite radioactivity release. These potential release paths are addressed in N2-EOP-SC, Secondary Containment Control, where appropriate actions to mitigate releases are addressed.

Isolation of those systems required to assure adequate core cooling or shut down the reactor is not appropriate because continued operation at power or a failure to adequately cool the core may cause significant core damage and ultimately result in much larger releases.

STEP:

Isolate all primary systems that are discharging into areas outside the primary and secondary containments <u>except</u> systems required to:
- assure adequate core cooling

OR

- shut down the reactor

IF	THEN	
The offsite radioactivity release rate approaches or exceeds the Emergency Plan "General Emergency" level (as determined by chemistry) AND A primary system is discharging into an area outside the primary and secondary containments	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure	* RPV Control, Section RP * C3 * C5

DISCUSSION:

An increase in the radioactivity release rate to a level approaching or exceeding the Emergency Plan "General Emergency" level indicates that conditions have degraded substantially and a more immediate threat to the health and safety of the general public exists.

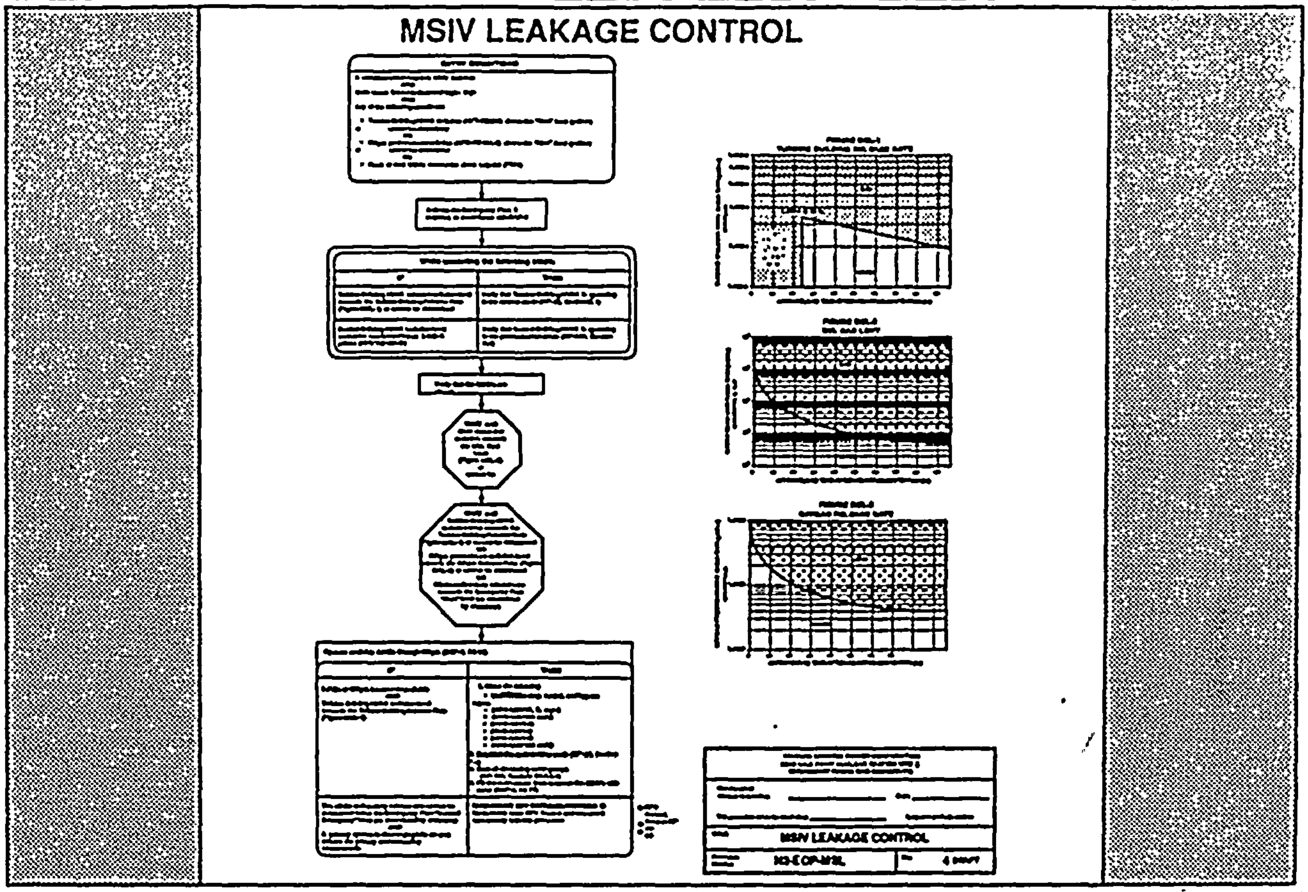
The second condition addressed is a breach in a primary system. If the breach cannot be isolated because:

- The primary system is required to assure adequate core cooling or shutdown the reactor or
- No isolation valves exist upstream of the primary system break or isolation valves cannot be closed due to some electrical mechanical or pneumatic failure, or
- The source of the discharge cannot be determined.

Then entry or re-entry to N2-EOP-RPV, RPV control, is required to initiate a reactor scram if one has not already been initiated. This will reduce the energy that the RPV may be discharging outside of the primary and secondary containments to decay heat levels. RPV depressurization places the primary system in the lowest possible energy state and reduces the thermal driving head and flow of primary systems that are unisolated and discharging outside containment.

Initiation of a reactor scram and depressurization of the RPV are not appropriate if no primary system is discharging outside the primary and secondary containment. It should be noted that shutting down the reactor in accordance with normal operating procedures is not precluded if the operator determines that such action is prudent.

MSIV LEAKAGE CONTROL



PURPOSE

The purpose of this procedure is to limit, treat, and monitor the release of radioactive leakage through the MSIVs. This procedure attempts to control and monitor the radioactive release by using the normal filtered and elevated release paths of the Turbine and Control Building HVAC and Offgas systems. If conditions worsen and release rates cannot be controlled, Emergency RPV Depressurization may be required. The MSIV Leakage Control procedure, N2-EOP-MSL, provides a response to a fuel failure incident concurrent with MSIV leakage. The procedure is designed to compliment the actions addressed in the Secondary Containment Control and Radioactivity Release Control procedures.

ENTRY:

ENTRY CONDITIONS

A condition which requires MSIV isolation
AND
Main steam line radiation level high - high
AND
Any of the following conditions:

- Turbine Building HVAC radiation (HVT-RE206) above the "Alert" level (yellow) or cannot be determined
  OR
- Offgas pretreatment radiation (OFG-RE13A/B) above the "Alert" level (yellow) or cannot be determined
  OR
- Stack or vent GEMs exceed the alarm setpoint (P882)

↓

Activate the Emergency Plan, if required, in accordance with EAP-1

DISCUSSION:

The entry conditions are based on an incident that involves a fuel failure and MSIV leakage. The MSIVs have isolated or are required to isolate and a MSL high-high radiation condition exists. This condition is indicative of a fuel element failure. Furthermore, radiation levels in the Turbine Building HVAC or Offgas system above the "Alert" level or, the main stack or Reactor Building ventilation Gaseous Effluent Monitors above the alarm setpoint on panel 882, indicate that the MSIV closure is not effective at preventing the radioactivity release from entering the environment.

If MSIVs are to be open to support RPV venting or emergency depressurization, the procedure should be exited since the entry condition "a condition which requires MSIV isolation" is no longer being met.

STEP:

ENTRY CONDITIONS

A condition which requires MSIV isolation
AND
Main steam line radiation level high - high
AND
Any of the following conditions:

- Turbine Building HVAC radiation (HVT-RE206) above the "Alert" level (yellow) or cannot be determined
  OR
- Offgas pretreatment radiation (OFG-RE13A/B) above the "Alert" level (yellow) or cannot be determined
  OR
- Stack or vent GEMs exceed the alarm setpoint (P882)

↓

Activate the Emergency Plan, if required, in accordance with EAP-1

↓

While executing the following steps:

IF	THEN
Turbine Building HVAC exhaust radiation level exceeds the Turbine Building Release Rate (Figure MSL-1) or cannot be determined	Verify that Turbine Building HVAC is operating in the normal mode (OP-55, Section E.1)

DISCUSSION:

It is appropriate to activate the emergency plan at this time because the entry conditions of this procedure are above the Alert levels in EAP-1.

STEP:

Activate the Emergency Plan, if required, in accordance with EAP-1

While executing the following steps:

IF	THEN
Turbine Building HVAC exhaust radiation level exceeds the Turbine Building Release Rate (Figure MSL-1) or cannot be determined	Verify that Turbine Building HVAC is operating in the normal mode (OP-55, Section E.1)
Control Building HVAC radiation level cannot be maintained below 5.92E-6 µCi/cc (HVC*RE18A-D)	Verify that Control Building HVAC is operating in the pressurization mode (OP-53A, Section H.6)

Verify that the MSIVs are closed

DISCUSSION:

This step is an override and applies throughout the performance of the remainder of this procedure.

Turbine Building HVAC exhaust radiation level above the values of the Turbine Building Release Rate (Figure MSL-1, refer to Section C) is indicative of leakage through the MSIVs and a fuel failure condition. The operator is directed to ensure the Turbine Building HVAC system is operating in the normal (unisolated) mode, in accordance with procedures. Operating the Turbine Building HVAC system prevents an uncontrolled, unmonitored ground release by providing a filtered, monitored, and elevated release. Operation of the Turbine Building HVAC system aids in reducing Turbine Building activity levels and prevents high Turbine Building radiation levels that contribute to operator radiation dose rates and which may limit access to the Turbine Building. The disadvantage for maintaining Turbine Building HVAC in operation is that the release rate to the environment will be significantly higher than if the HVAC system was isolated.

STEP:

Activate the Emergency Plan, if required, in accordance with EAP-1

While executing the following steps:

IF	THEN
Turbine Building HVAC exhaust radiation level exceeds the Turbine Building Release Rate (Figure MSL-1) or cannot be determined	Verify that Turbine Building HVAC is operating in the normal mode (OP-55, Section E.1)
Control Building HVAC radiation level cannot be maintained below 5.92E-6 μCi/cc (HVC*RE18A-D)	Verify that Control Building HVAC is operating in the pressurization mode (OP-53A, Section H.6)

Verify that the MSIVs are closed

DISCUSSION:

This step is an override and applies throughout the performance of the remainder of this procedure.

This step provides direction to the operator for operation of the Control Building HVAC system. If radiation levels in the Control Building HVAC reach the setpoint (5.92 E-6 μCi/cc) the operator is directed to operate the Control Building HVAC system in the pressurization mode in accordance with procedures.

Utilizing the Control Building HVAC special filter train, minimizes the radiation dose to control room operators.

STEP:

While executing the following steps:

IF	THEN
Turbine Building HVAC exhaust radiation level exceeds the Turbine Building Release Rate (Figure MSL-1) or cannot be determined	Verify that Turbine Building HVAC is operating in the normal mode (OP-55, Section E.1)
Control Building HVAC radiation level cannot be maintained below 5.92E-5 µCi/cc (HVC*RE18A-D)	Verify that Control Building HVAC is operating in the pressurization mode (OP-53A, Section H.6)

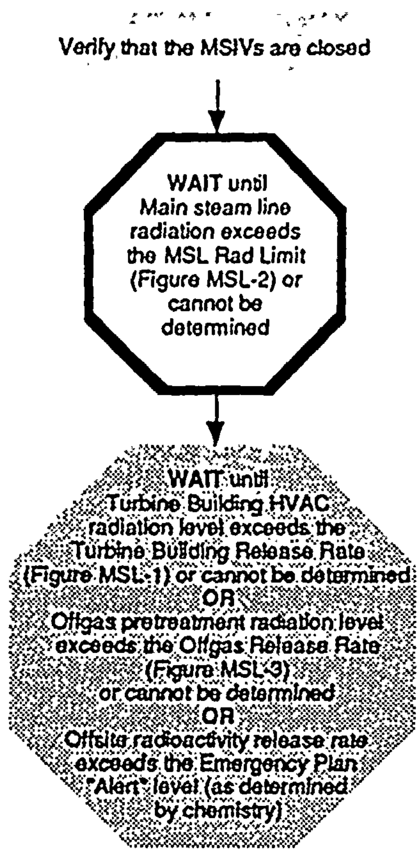
Verify that the MSIVs are closed

WAIT until Main steam line radiation exceeds the MSL Rad Limit (Figure MSL-2) or cannot be determined

DISCUSSION:

The entry conditions require the MSIVs to be isolated. This step directs the operator to verify that the MSIVs are closed. The operator is to ensure that the automatic MSIV isolation has occurred or take appropriate manual action to shut the MSIVs.

STEP:



DISCUSSION:

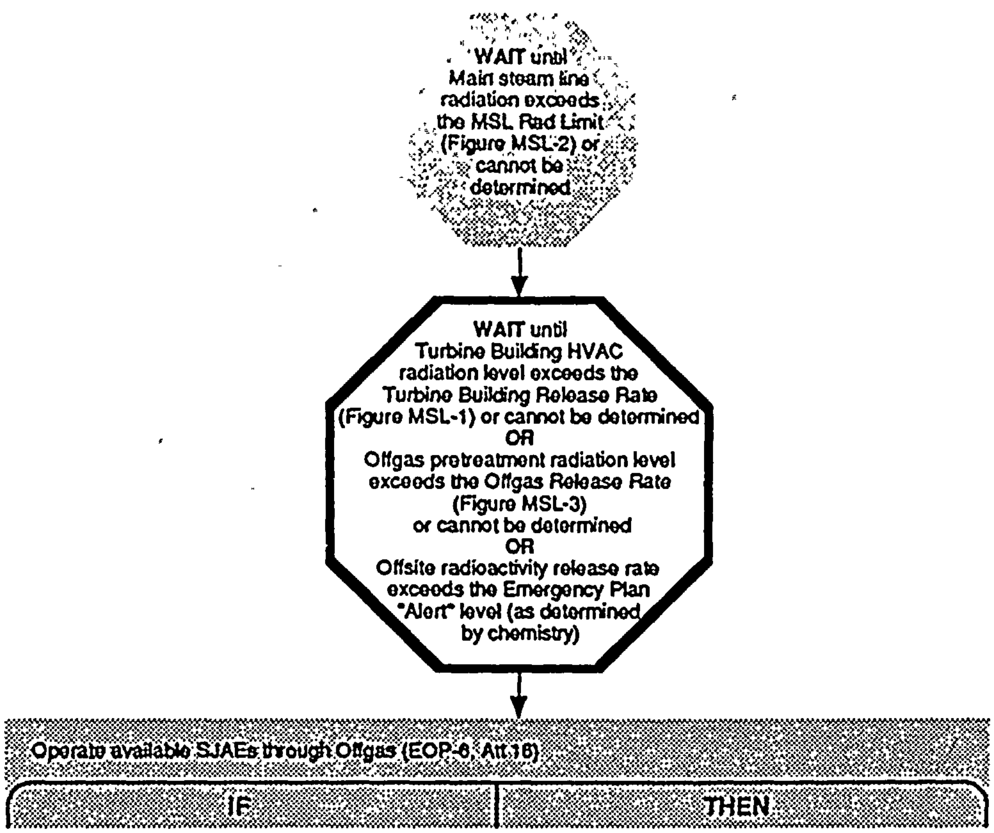
This step is a "hold point" and delays the performance of subsequent actions in this procedure until the stated condition, main steam line radiation exceeds the MSL Rad Limit (Figure MSL-2, refer to Section C) or cannot be determined, has been met.

Delaying the performance of the subsequent actions in this procedure confirms that the available systems are unable to control the leakage of steam and radioactivity past the MSIVs and that further actions need to be addressed.

Main steam line radiation levels are indicative of reactor coolant activity levels. Normally, following a reactor shutdown, the reactor coolant activity levels will decay away at the normal expected rates for shutdown. This step directs the operator to monitor MSL radiation levels.

If a fuel failure has occurred, MSL activity level will be above normal. If the main steam line radiation level exceeds the values for MSL Rad Limit (Figure MSL-2, refer to Section C) or cannot be determined, then the magnitude of the fuel failure poses a significant hazard to personnel in the area of the main steam lines. The condition also threatens areas outside the secondary containment should the steam continue to leak past the MSIVs.

STEP:



DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedure until any of the stated conditions (1) Turbine Building HVAC radiation level exceeds the Turbine Building Release Limit (Figure MSL-1, refer to Section C) OR (2) Offgas pretreatment radiation level exceeds the Offgas Release Limit (Figure MSL-3, refer to Section C) OR (3) Offsite radioactivity release rate exceeds the Emergency Plan "Alert" level, have been met.

Delaying the performance of the subsequent actions in this procedure confirms that the available systems are unable to control the leakage of steam and radioactivity past the MSIVs and that further actions need to be addressed.

STEP:

OR
Offgas pretreatment radiation level exceeds the Offgas Release Rate (Figure MSL-3) or cannot be determined
OR
Offsite radioactivity release rate exceeds the Emergency Plan "Alert" level (as determined by chemistry)

Operate available SJAEs through Offgas (EOP-6, Att 16)

IF	THEN
SJAEs or Offgas become unavailable AND Turbine Building HVAC radiation level exceeds the Turbine Building Release Rate (Figure MSL-1)	1. Close the following valves: • Main turbine stop, control, and bypass valves • 2ARC-MOV5A, B, and C • 2MSS-AOV92A and B • 2MSS-AOV148 • 2TME-AOV121 • 2ARC-AOV105 • 2ARC-MOV15A and B 2. Establish the main turbine seals (OP-25, Section F.4) 3. Start all circulating water pumps (OP-10A, Sections E2.0-5.0) 4. Fill the main steam lines between the MSIVs with water (EOP-6, Att 17)

DISCUSSION:

The operator is directed to operate the Steam Jet Air Ejectors (SJAEs) discharging to the Offgas System. This process allows the Offgas system to treat the radioactivity and steam providing the following advantages:

- **Increased holdup time**

  The large holdup volume provides the radioactive gases additional time to decay away prior to release, thus reducing the activity that is released.

- **Condensation of any steam**

  This increases the efficiency of the charcoal filter, decreasing the amount of radioactivity released.

- **Filtering of particulates**

  This filtration of leakage past the MSIVs removes the radioactive daughter products of radioactive noble gases, thus reducing the overall radioactivity that is released.

- **Adsorption of Iodine by the charcoal filter**

  In the adsorption process, iodine molecules adhere to the charcoal particles as a thin layer. The iodine is "stuck" to the charcoal. This allows the iodine additional time to decay away within the filtration system and reduces the amount of iodine (and total radioactivity) released.

DISCUSSION: (Continued)

- **Elevated release for a better dispersal**

After processing, the release is directed to an elevated release point. This allows natural conditions (i.e.,wind, temperature and moisture) to spread the released radioactivity over a large area and prevents localized high concentrations of radioactivity.

STEP:

Operate available SJAEs through Offgas (EOP-6, Att 16)

IF	THEN
SJAEs or Offgas become unavailable AND Turbine Building HVAC radiation level exceeds the Turbine Building Release Rate (Figure MSL-1)	1. Close the following valves: • Main turbine stop, control, and bypass valves • 2ARC-MOV5A, B, and C • 2MSS-AOV92A and B • 2ASS-AOV148 • 2TME-AOV121 • 2ARC-AOV105 • 2ARC-MOV15A and B 2. Establish the main turbine seals (OP-25, Section F.4) 3. Start all circulating water pumps (OP-10A, Sections E2.0-5.0) 4. Fill the main steam lines between the MSIVs with water (EOP-6, Att 17)
The offsite radioactivity release rate cannot be maintained below the Emergency Plan "General Emergency" level (as determined by chemistry) AND A primary system is discharging into an area outside the primary and secondary containments	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure

✻ RPV Control, Section RP
✻ C3
✻ C5

DISCUSSION:

With the SJAE or Offgas System not available and indication of MSIV leakage (as evidenced by excessive Turbine Building HVAC radiation levels) still present , other methods are used to try and limit the radioactive releases.

The main steam lines and main condenser are closed up to minimize leakage and increase hold-up time. This is accomplished by shutting valves and establishing seals (steam seals on the turbine and water seals on the MSIVs).

Operating the circulating water pumps promotes condensation of any steam in the leakage. Filling the main steam lines provides a water seal against the MSIVs.

STEP:

Operate available SJAEs through Offgas (EOP-6, Att 16)

IF	THEN	
SJAEs or Offgas become unavailable AND Turbine Building HVAC radiation level exceeds the Turbine Building Release Rate (Figure MSL-1)	1. Close the following valves: • Main turbine stop, control, and bypass valves • 2ARC-MOV5A, B, and C • 2MSS-AOV92A and B • 2MSS-AOV148 • 2TME-AOV121 • 2ARC-AOV105 • 2ARC-MOV15A and B 2. Establish the main turbine seals (OP-25, Section F.4) 3. Start all circulating water pumps (OP-10A, Sections E2.0-5.0) 4. Fill the main steam lines between the MSIVs with water (EOP-6, Att 17)	
The offsite radioactivity release rate cannot be maintained below the Emergency Plan "General Emergency" level (as determined by chemistry) AND A primary system is discharging into an area outside the primary and secondary containments	EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; enter RPV Control and execute it concurrently with this procedure	❋ RPV Control, Section RP ❋ C3 ❋ C5

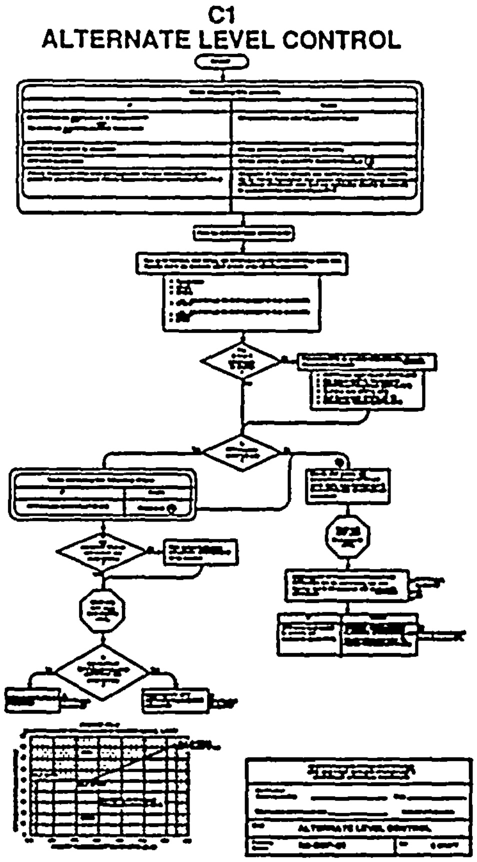
DISCUSSION:

The decision to emergency depressurize the RPV is dependent on the fact that a primary system is discharging to an area outside of the primary and secondary containments and the inability to maintain radioactivity release rates below the "General Emergency" level of the Emergency Plan. If release rates cannot be maintained below the "General Emergency" level, then actions taken up to this point have not been effective at controlling MSIV leakage.

Depressurizing the RPV reduces the driving head and, therefore, the flow from the primary system discharging outside the primary and secondary containments.

Entering RPV Control provides additional guidance for controlling conditions within the RPV. The initial step reminds the operator to ensure a reactor scram has been initiated. The reactor scram ensures that the reactor is shutdown to assist in reducing the driving head and minimize the leakage past the MSIVs. In the RP (Reactor Pressure) leg of RPV Control, N2-EOP-RPV, directions are provided to accomplish an Emergency RPV Depressurization.

ALTERNATE LEVEL CONTROL



PURPOSE

The purpose of this procedure is to provide instructions for reversing a decreasing RPV water level trend that are more detailed and explicit than those specified in the RPV water level control (RL) leg of N2-EOP-RPV, RPV Control. Even though the systems identified in this procedure are identical to those identified in N2-EOP-RPV, RPV Control, this procedure has two main differences. First, this procedure gives directions to use the low pressure ECCS pumps to restore RPV water level above -14 in (top of active fuel, TAF) without being concerned about pump NPSH and vortex limits. Secondly, this procedure addresses the relationships between RPV pressure and the capability of the specified systems utilized to restore RPV water level. This procedure provides directions to effect a reversal of a decreasing RPV water level trend through the selection of injection subsystems consistent with the status of RPV water level, the value of RPV pressure and the availability of individual injection systems/subsystems.

ENTRY:

START

While executing this procedure:

IF	THEN
All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit this procedure and enter C4, RPV Flooding
RPV water level is rising	Exit this procedure and enter RPV Control Section RL at (A)
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C1-1)	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 curve (Figure C1-1)

DISCUSSION:

N2-EOP-C1, Alternate Level Control is entered from the following procedure when it has been determined that RPV water level cannot be maintained above -14 in (TAF):

- **N2-EOP-RPV, RPV Control (RL/eg)**

STEP:

START

While executing this procedure:	
IF	**THEN**
All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit this procedure and enter C4, RPV Flooding
RPV water level is rising	Exit this procedure and enter RPV Control Section RL at (A)
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C1-1)	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 curve (Figure C1-1)

DISCUSSION:

This step is an override step and is applicable throughout the performance of this procedure.

Positive confirmation that the reactor will remain shutdown under all conditions is best obtained by confirming that no control rod is withdrawn beyond the Maximum Subcritical Banked Withdrawal Position (position 02). The Maximum Subcritical Banked Withdrawal Position is defined to be the lowest control rod position to which all control rods may be withdrawn in bank and the reactor will nonetheless remain shutdown under all conditions of reactor coolant temperature and in-core boron concentration.

Criteria other than the Maximum Subcritical Banked Withdrawal Position may be employed to make the determination as to whether reactor shutdown is assured for all conditions. These criteria can include, but are not limited to, confirming the existence of the core design basis shutdown margin with the single highest worth control rod fully withdrawn and all other control rods fully inserted, and compliance with the Technical Specification requirements governing control rod position and the allowable number of inoperable control rods.

If control rod insertion cannot alone assure that the reactor will remain shutdown under all conditions, the actions required for control of RPV water level differ from those prescribed in this procedure. The RPV water level control actions that are appropriate under this condition are specified in N2-EOP-C5, Level/Power Control.

STEP:

START

While executing this procedure:

IF	THEN
All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit this procedure and enter C4, RPV Flooding
RPV water level is rising	Exit this procedure and enter RPV Control Section RL at (A)
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C1-1)	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 curve (Figure C1-1)

DISCUSSION:

This step is an override step and is applicable throughout the performance of this procedure.

If RPV water level cannot be determined, the actions specified in this procedure cannot be performed since RPV water level and water level trend information is necessary for determining which actions to take. Exit from this procedure and entry into N2-EOP-C4, RPV Flooding, is therefore made to assure continued adequate core cooling.

STEP:

START

While executing this procedure:

IF	THEN
All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit this procedure and enter C4, RPV Flooding
RPV water level is rising	Exit this procedure and enter RPV Control Section RL at (A)
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C1-1)	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 curve (Figure C1-1)

DISCUSSION:

This step is an override step and is applicable throughout the performance of this procedure.

The intent of the actions directed in this procedure is to reverse a decreasing RPV water level trend. When this condition is achieved, even if RPV water level has not yet been restored to above the top of active fuel (TAF), the RPV water level control (RL) section (beginning at A) of N2-EOP-RPV, RPV Control, then provides the appropriate steps for continued control of RPV water level.

If RPV water level is rising, the number of pumps in operation must be producing sufficient discharge head to overcome RPV pressure and produce the injection flow required to reverse the previously lowering water level trend. No further action with respect to initiating the operation of additional injection systems is required. As long as RPV pressure remains stable or decreases (as specified by the actions in the RP section of N2-EOP-RPV, RPV Control) and the existing pump capacity remains constant, RPV water level will continue to rise thereby achieving adequate core cooling through core submergence.

STEP:

START

While executing this procedure:

IF	THEN
All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit this procedure and enter C4, RPV Flooding
RPV water level is rising	Exit this procedure and enter RPV Control Section RL at (A)
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (*Figure C1-1*)	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 curve (*Figure C1-1*)

Place the ADS logic inhibit switches in ON

DISCUSSION:

This step is an override step and applies throughout the performance of this procedure.

With a non-isolated primary system break inside the drywell, injection into the primary containment or RPV from sources external to the primary containment will cause primary containment water level to increase. If injection is continued and the Maximum Primary Containment Water Level is exceeded, the structural integrity of the primary containment is no longer assured. The Maximum Primary Containment Water Level Limit is defined to be the lesser of either: (1) The elevation of the highest containment vent capable of rejecting all core decay heat or (2) the highest containment water level which will not result in exceeding the pressure capability of the containment.

Injection from sources external to the primary containment is terminated, irrespective of adequate core cooling concerns as necessary to remain below the Maximum Primary Containment Water Level Limit. This action precludes any further increase in primary containment water level, and is authorized because the consequences of not doing so may be a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the containment may fail, an attendant loss of the suppression pool must be assumed with a consequent complete and unrecoverable loss of adequate core cooling. With a degraded core condition and loss of containment integrity, substantial amounts of radioactivity may be released to the general environment. Therefore, when a mutually exclu-

DISCUSSION: (Continued)

sive decision between maintaining adequate core cooling and assuring primary containment integrity must be made, the NMP2 EOPs preferentially choose to maintain primary containment integrity in order to protect against the uncontrolled release of radioactivity to the general public from a degraded core condition.

STEP:

While executing this procedure:

IF	THEN
All control rods are not inserted to at least position 02 AND The reactor will not remain shutdown without boron	Exit this procedure and enter C5, Level/Power Control
RPV water level cannot be determined	Exit this procedure and enter C4, RPV Flooding
RPV water level is rising	Exit this procedure and enter RPV Control Section RL at (A)
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C1-1)	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 curve (Figure C1-1)

↓

Place the ADS logic inhibit switches in ON

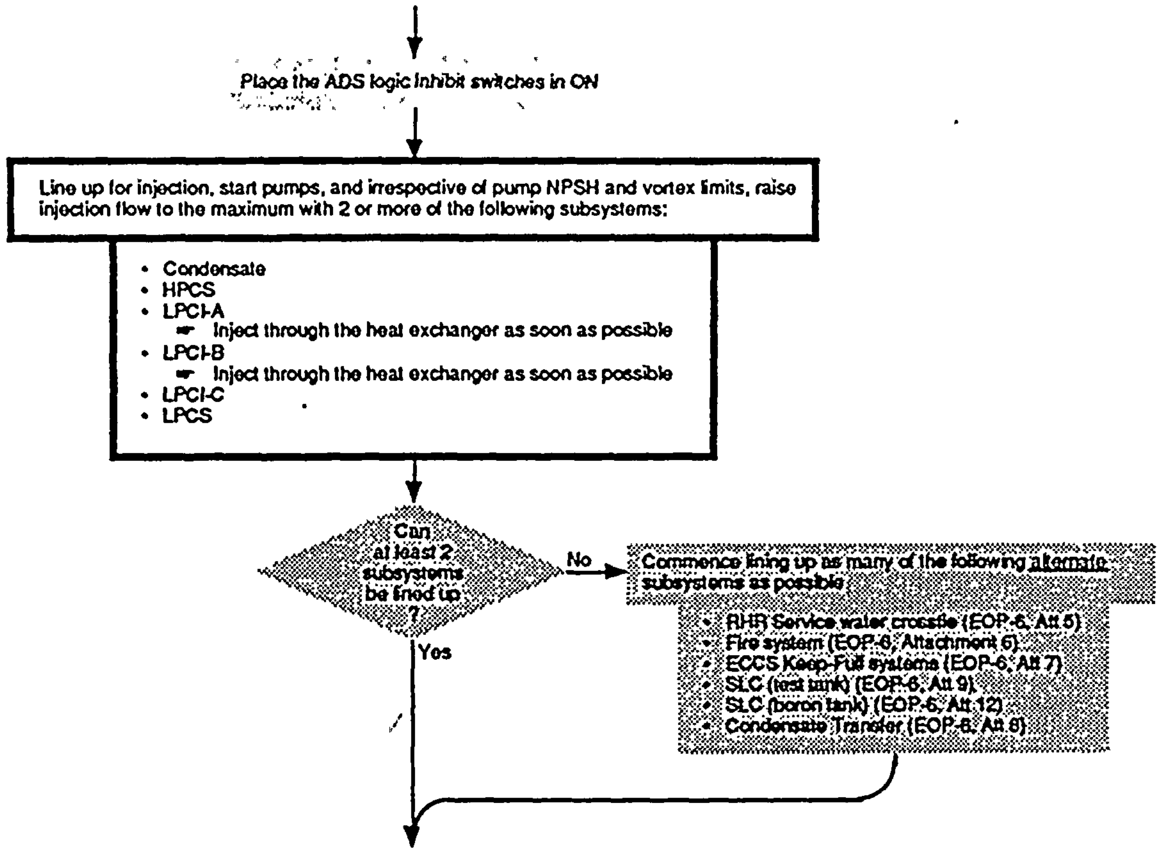
↓

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

DISCUSSION:

ADS actuation with the RPV at pressure imposes a severe thermal transient on the RPV and may significantly complicate efforts to restore and maintain RPV water level as specified in this procedure. In certain cases (e.g. RCIC available but LPCI/LPCS injection valves closed and control power for their operation not available) ADS actuation may directly lead to loss of adequate core cooling and core damage, conditions which might otherwise have been avoided. Further, the conditions assumed in this design of the ADS actuation logic (e.g., no operator action for 10 minutes) do not exist when the actions specified in this procedure are being carried out. Finally, an operator 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 offsite power, etc.) and can thus better judge, based on the logic specified in this procedure, when and how to depressurize the RPV. For all of these reasons it is appropriate to prevent automatic initiation of ADS as specified.

STEP:



DISCUSSION:

The purpose of lining up and starting pumps in two or more RPV injection subsystems is to provide the appropriate assurance that water will be injected into the RPV during and following RPV 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 flowpath of one subsystem.

Unlike the directions given in the RPV water level control (RL) leg of N2-EOP-RPV, RPV Control, for use of motor driven ECCS pumps, operation of these pumps in this procedure is carried out irrespective of associated NPSH and Vortex 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. In addition, immediate and catastrophic pump failure is not expected should operation beyond these limits be required; at most degraded system or pump performance may result from prolonged operation under these conditions.

By increasing injection flow to the maximum, conditions are established whereby maximum flow will be delivered to the RPV as soon as RPV pressure drops below the system shut off head. This promotes rapid recovery of RPV water level; subsequent actions can control injection and maintain RPV water level in the desired band.

DISCUSSION: (Continued)

Injection subsystems are defined by the physical separation of components, flow paths and injection points. A subsystem, as identified in this step, is a motor-driven system loop which is independently capable of supplying makeup water to the RPV. To illustrate:

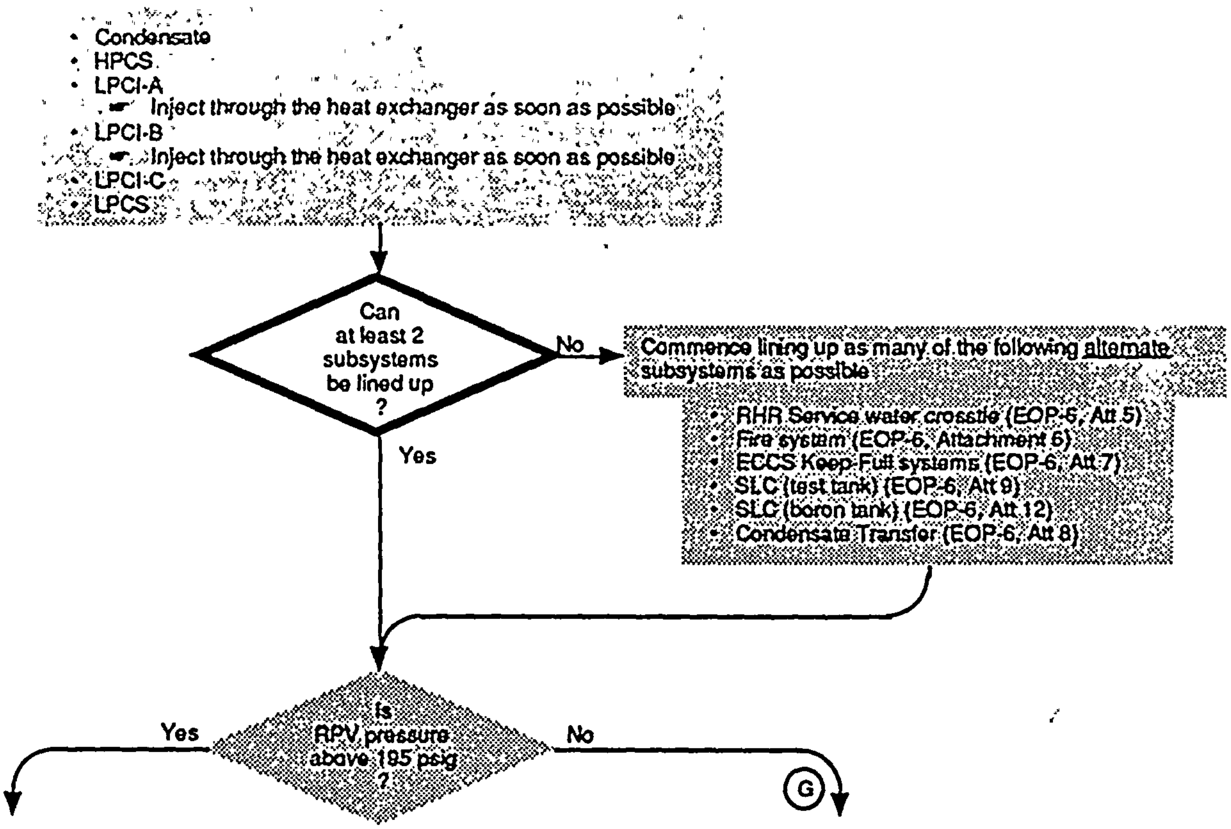
• The NMP2 RHR system is comprised of three LPCI subsystems, each consisting of a pump with independent suction and discharge flow paths into the RPV.

• The NMP2 Condensate system is comprised of three pumps which discharge into a common header. This is one subsystem, not three.

By system design, LPCI flow is interlocked with a timer to temporarily bypass the RHR heat exchangers immediately following automatic system initiation. When this interlock expires, the cooling capacity of this subsystem should be utilized by directing flow through the heat exchangers as soon as conditions permit.

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

STEP:



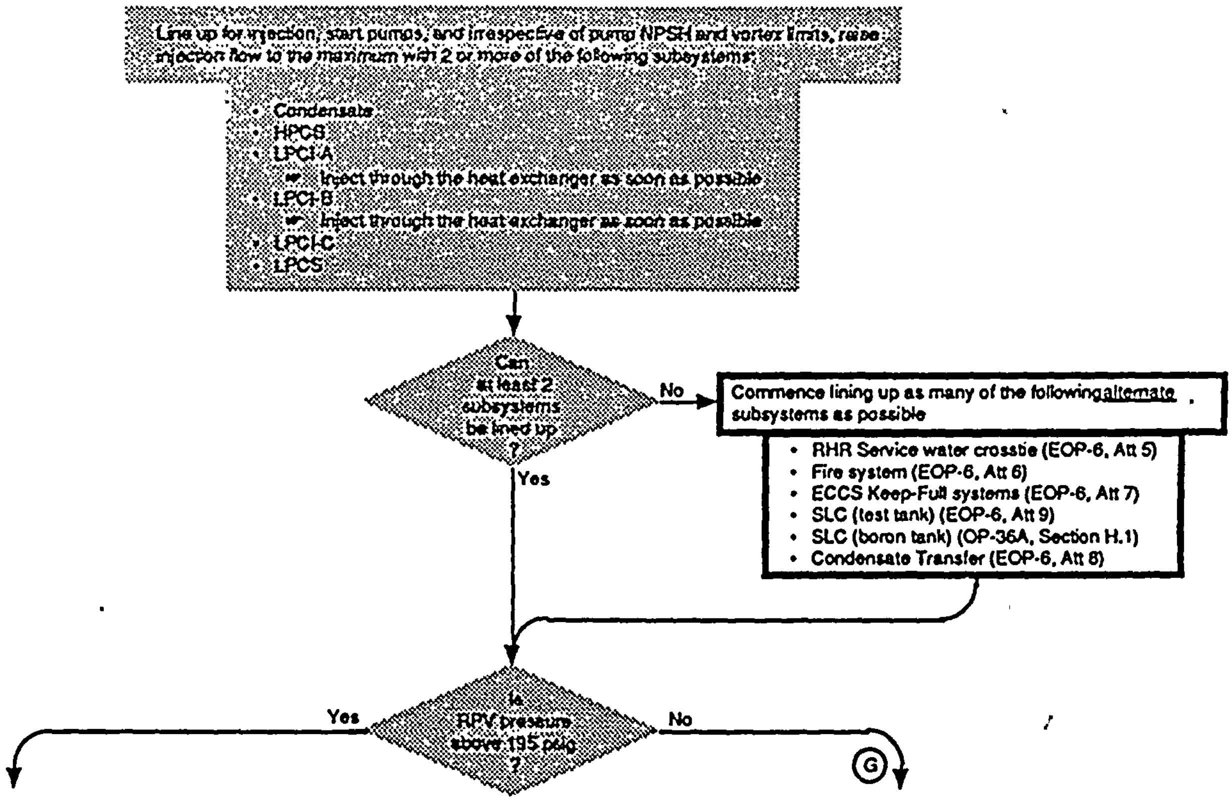
DISCUSSION:

This step has the operator evaluate the present status of the injection subsystems.

If the operator was successful in lining up at least 2 subsystems, as indicated by a "YES" response to this step, sufficient makeup will be available to the RPV if RPV pressure is below, or is depressurized below, the shutoff head of the pumps in service. The operator is therefore directed to continue in this procedure where the status of RPV pressure will be evaluated to determine if RPV depressurization is required.

If the operator was unsuccessful in lining up at least 2 subsystems, as indicated by a "NO" response to this step, insufficient makeup to the RPV will be available irrespective of the value of RPV pressure. The operator is, therefore directed to continue in this procedure where additional RPV makeup systems (alternate subsystems) are lined up for injection.

STEP:



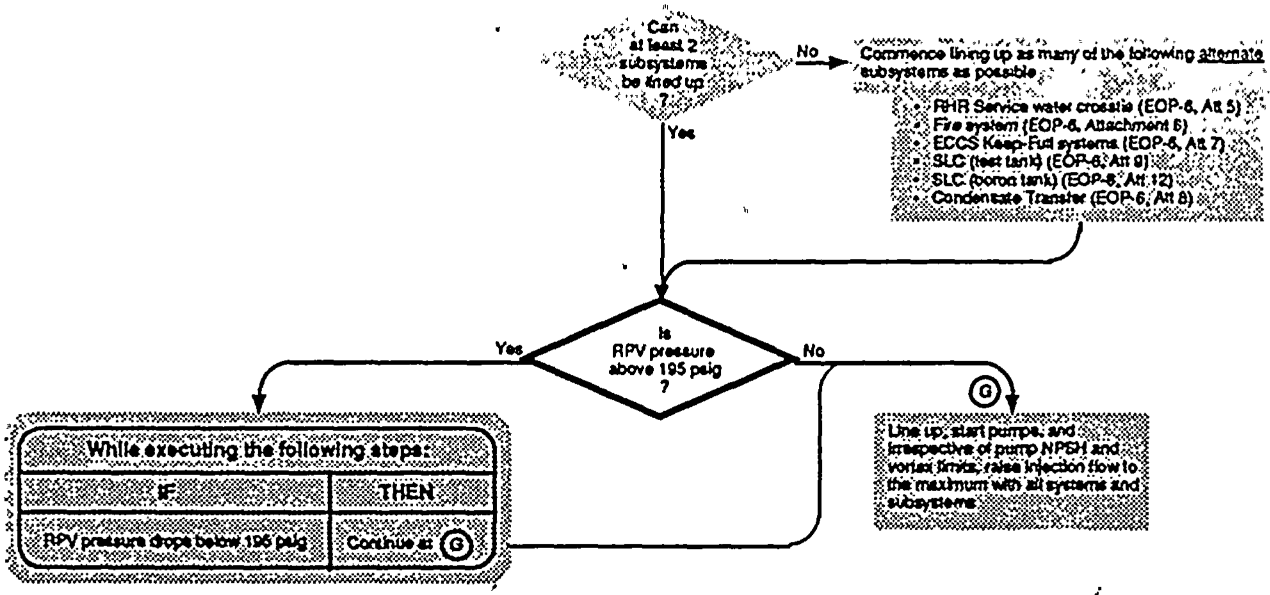
DISCUSSION:

If less than 2 subsystems can be lined up for injection into the RPV, use of alternate subsystems is required to assure that water will be injected into the RPV following depressurization. When at least 2 subsystems can be lined up with pumps running, the operator's time is better spent attempting to establish or increase high pressure injection rather than to establish additional alternate lineups.

Included in the alternate subsystems are those systems and system interconnections capable of injecting water into the RPV, but are not normally utilized for this purpose because of low water quality, the relative difficulty in establishing the injection line-up, or because the line-up may not be permitted during normal plant operation.

This step directs the operator to "Commence lining up" alternate subsystems; line-up need not be completed before proceeding to subsequent steps. The requirements for starting pumps and injecting with the listed alternate subsystems are delineated later in this procedure.

STEP:



DISCUSSION:

This step has the operator evaluate the present status of RPV pressure in order to determine which RPV makeup systems are available for injection.

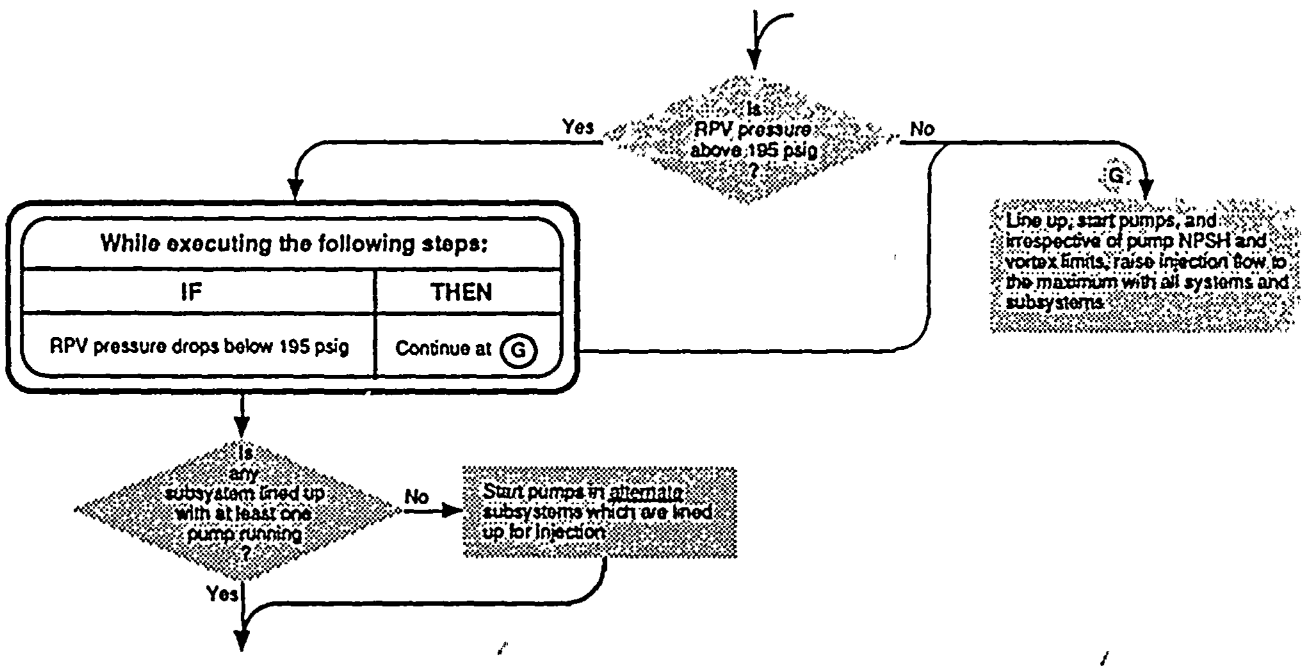
If RPV pressure is above 195 psig, as indicated by a "YES" response to this step, injection from all alternate subsystems is precluded because RPV pressure is above the highest shutoff head of the listed systems (excluding SLC). When this condition exists, the operator is directed to continue in this procedure, where it will be determined if depressurizing the RPV will allow the RPV injection systems and subsystems to restore RPV water level. Use of the alternate subsystems will only be directed as a last resort and only when all RPV injection systems and subsystems are unavailable. Use of alternate subsystems result in the injection of poor quality water into the RPV and should be avoided, when at all possible, to expedite plant restoration following the emergency.

If RPV pressure is at or below 195 psig, as indicated by a "NO" response to this step, injection from all the listed RPV injection systems and subsystems should not be precluded (based on RPV pressure), and injection is also possible from at least one (and maybe more) of the listed alternate subsystems. When this condition exists, the operator is directed to continue in this procedure where actions to restore RPV water by maximum injection flow from the RPV injection systems and subsystems are addressed. Injection with the alternate subsystems will only be directed if the

DISCUSSION: (Continued)

RPV injection systems and subsystems are unable to maintain RPV water level above the TAF.

STEP:

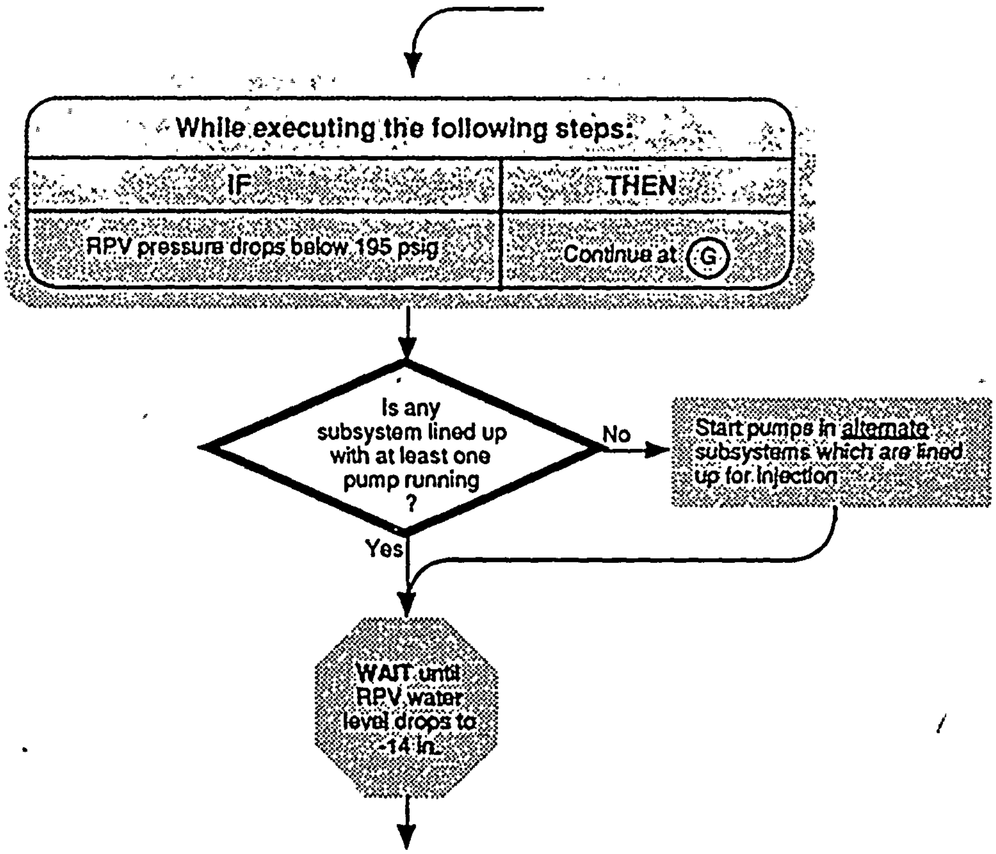


DISCUSSION:

This step is an override step and is applicable throughout the performance of the steps in this procedural leg.

While performing the subsequent steps in this procedure leg, RPV pressure may decrease below that corresponding to the highest shutoff head (195 psig) of a low water quality alternate subsystem. If this condition occurs, appropriate actions to control RPV water level below this pressure begin at G, and operator actions are transferred accordingly.

STEP:



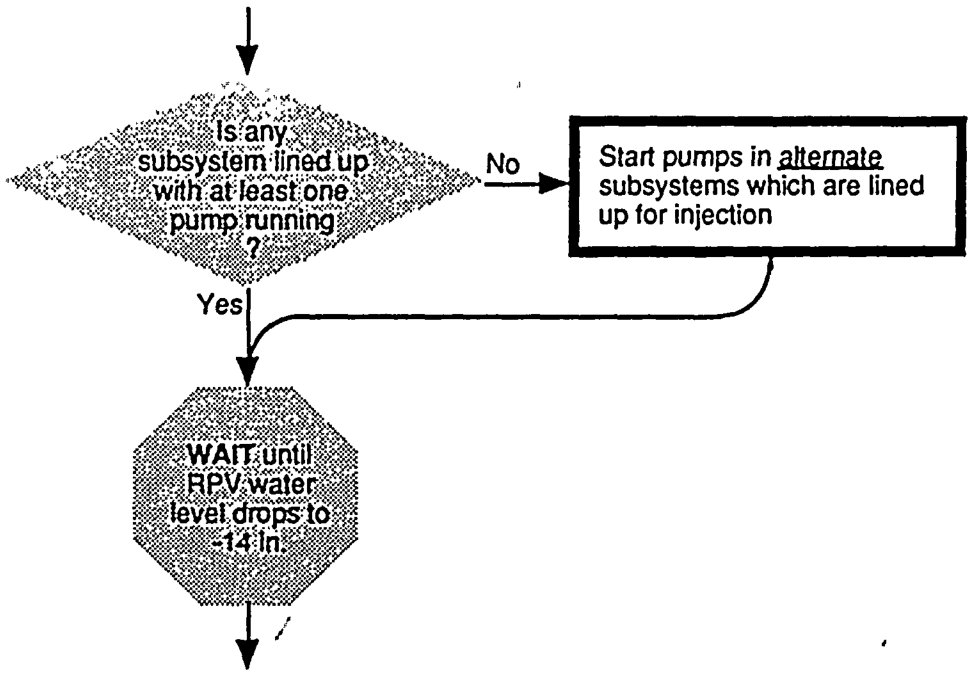
DISCUSSION:

This step has the operator evaluate the present status of the RPV injection subsystems to determine if the use of alternate subsystems will be required to restore RPV water level.

A "NO" response to this step indicates that attempts were unsuccessful in lining up and injecting with any of the RPV injection subsystems. When this condition exists, the pumps in the alternate subsystems must be started to ensure that sufficient makeup to the RPV will be available when the RPV is depressurized in subsequent steps. Therefore, the operator is directed to continue in this procedure where actions to start pumps in the alternate subsystems are addressed.

A "YES" response to this step indicates that attempts were successful in lining up and injecting with at least one RPV injection subsystem. When this condition exists, sufficient makeup will be available to the RPV following depressurization and use of the alternate subsystems will not be required. The operator is therefore, directed to continue in this procedure where actions to depressurize the RPV will be addressed when RPV water level drops to the TAF.

STEP:

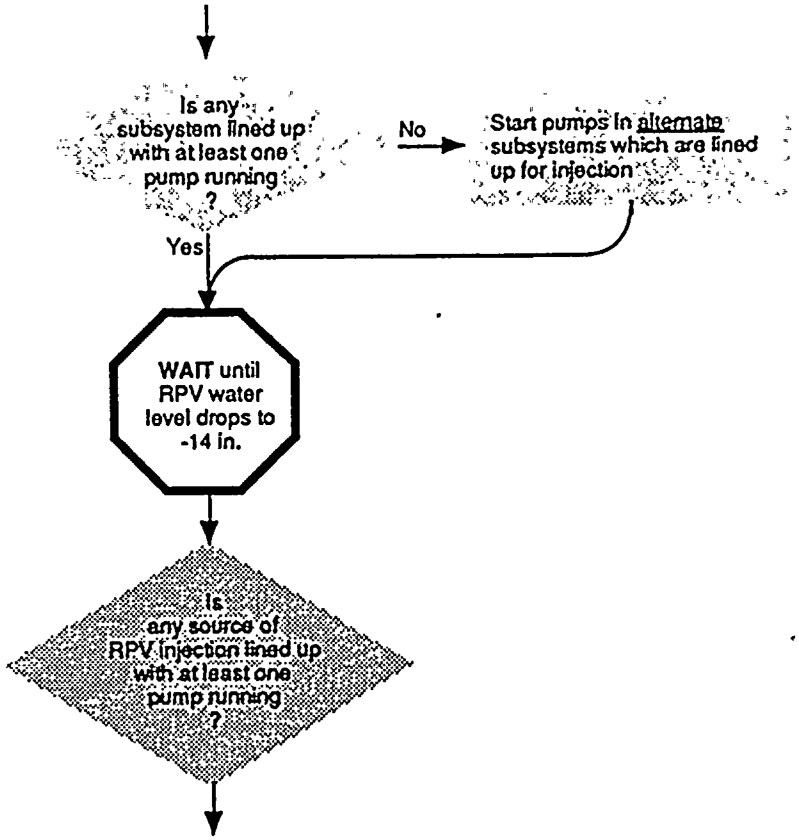


DISCUSSION:

Previous steps contained instructions to line up and start pumps in at least 2 subsystems. If none of the RPV injection subsystems can be aligned with a pump running, use of alternate subsystems is required to reverse the decreasing RPV water level trend.

Although alternate subsystem pumps are started in this step, injection into the RPV will occur only when the RPV is depressurized to below the shutoff head of one of the operating alternate subsystems. All alternate subsystem pumps are started to maximize injection flow rate.

STEP:



DISCUSSION:

This step is a "hold point", and further actions in this procedural leg will not be performed until the stated condition, RPV water level at -14 in. (TAF), has been met.

The actions which follow this step direct, based upon the availability of injection systems, either RPV depressurization or steam cooling.

Actions to emergency depressurize the RPV will be directed when at least one system, subsystem or alternate subsystem is available for injection with at least one pump running. The directions to rapidly depressurize the RPV are delayed until RPV water level drops to -14 in (TAF) because:

1. Adequate core cooling exists so long as RPV water level remains above the TAF, and

2. The time for RPV water level to decrease to the TAF can best be used to line up and start pumps, attempting to reverse the decreasing RPV water level trend before RPV depressurization is required to assure continued adequate core cooling.

Actions to perform steam cooling will be directed when no system, subsystem or alternate subsystem is available for injection. The directions to perform steam cooling are delayed until RPV water level drops to -14 in. (TAF) because:

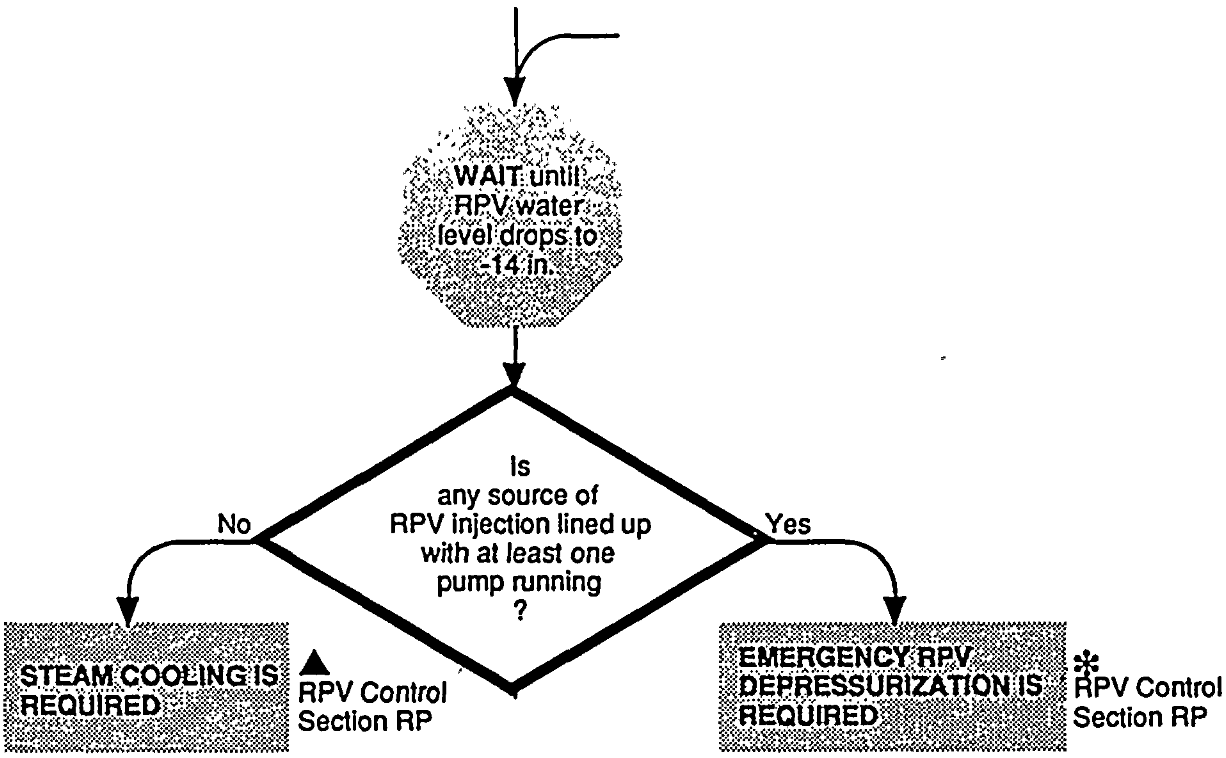
DISCUSSION: (Continued)

1. Adequate core cooling exists so long as RPV water level remains above the TAF,and

2. The time for RPV water level to decrease to the TAF can best be used to line up and start pumps, attempting to re-establish in jection and reverse the decreasing RPV water level trend, and

3. Steam cooling is effective in removing a significant amount of decay heat only when RPV water level has decreased well into the core region.

STEP:



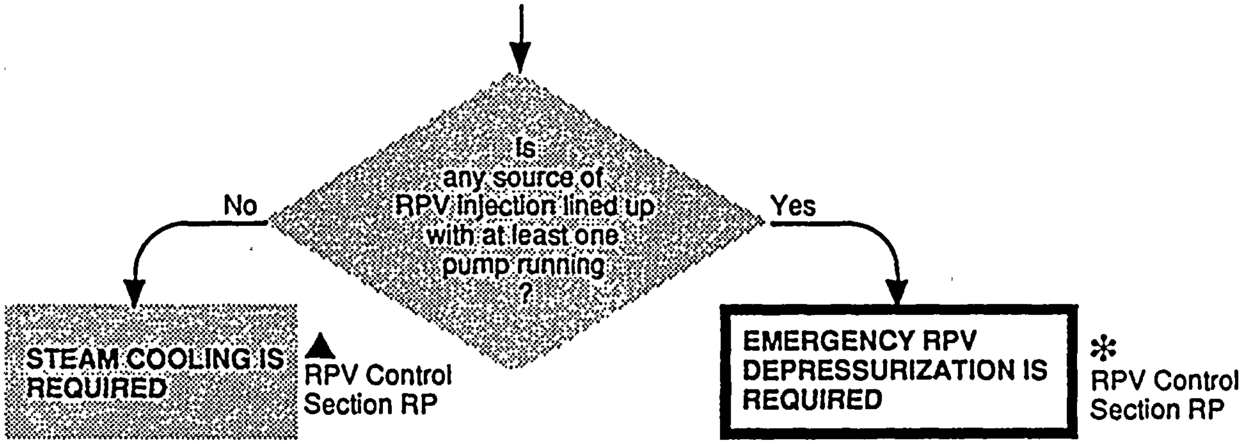
DISCUSSION:

This step has the operator determine the present status of RPV injection systems, subsystems and alternate subsystems.

If attempts were successful in starting pumps in one or more injection systems, subsystems, or alternate injection subsystems as indicated by a "YES" response to this step, the operator will be directed to continue in this procedure where actions to rapidly depressurize the RPV to maximize injection flow rate are addressed.

If attempts were unsuccessful in starting pumps in one or more injection systems, subsystems, or alternate injection subsystems as indicated by a "NO" response to this step, the operator will be directed to continue in this procedure where actions to perform steam cooling are addressed.

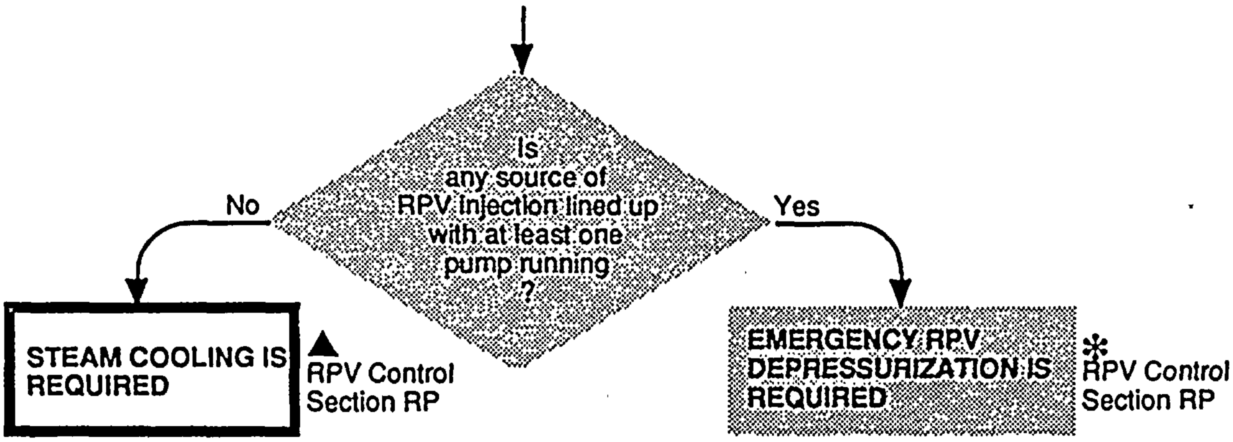
STEP:



DISCUSSION:

In order to maximize injection flow rate with the available systems, directions are given to rapidly depressurize the RPV, in accordance with N2-EOP-C2, Emergency RPV Depressurization. Since N2-EOP-RPV, RPV Control (RP and RQ legs), must be performed concurrently with this procedure, the explicit direction to enter N2-EOP-C2 is provided in the override step in the RP leg denoted with an asterisk (*).

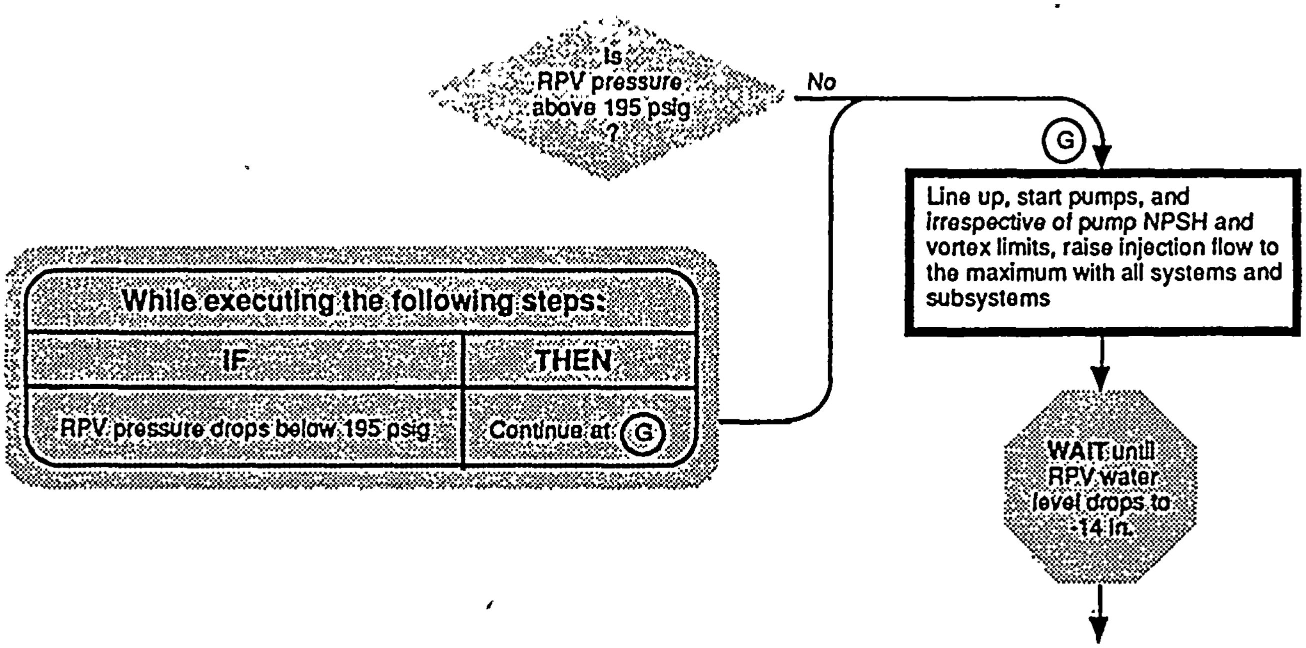
STEP:



DISCUSSION:

Since the decreasing RPV water level trend has not been reversed, and no source of injection into the RPV is available, the only mechanism available to provide adequate core cooling is steam cooling. Therefore, the operator will be directed to perform steam cooling, in accordance with N2-EOP-C3. Since N2-EOP-RPV, RPV Control (RP and RQ legs) must be performed concurrently with this procedure, the explicit direction to enter N2-EOP-C3 is provided in the override step in the RP leg denoted with a black triangle (▲).

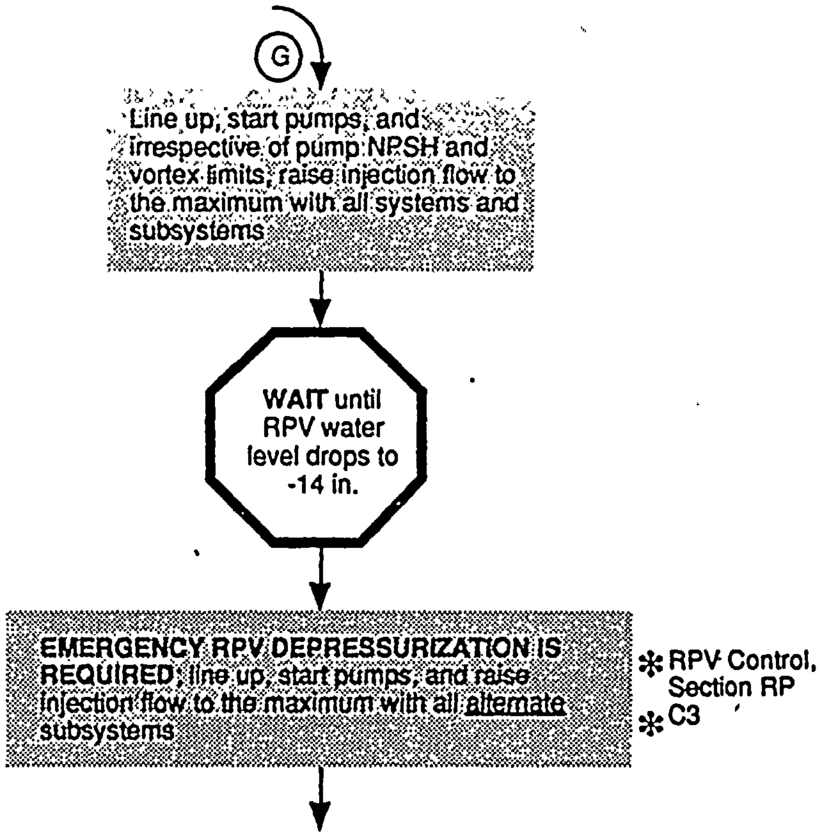
STEP:



DISCUSSION:

The actions taken in this step ensure that all available injection systems and subsystems are operating. System operation is not restricted by pump NPSH and Vortex limits since prompt injection into the RPV to mitigate inadequate core cooling concerns takes precedence over adherence to precautionary limits on equipment operation.

STEP:



DISCUSSION:

This step is a "hold point", and further actions in this procedural leg will not be performed until the stated condition, RPV water level at -14 in. (TAF), has been met.

The actions which follow this step direct rapid depressurization of the RPV in order to utilize the alternate subsystems to restore RPV water level. The directions to rapidly depressurize the RPV are delayed until RPV water level drops to -14 in. (TAF) because:

1. Adequate core cooling exists so long as RPV water level remains above the TAF, and

2. The time required for RPV water level to decrease to the TAF can best be used to line up and start pumps, attempting to re- establish injection and reverse the decreasing RPV water level trend before RPV depressurization is required to assure continued adequate core cooling.

STEP:

WAIT until RPV water level drops to -14 in.

EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; line up, start pumps, and raise injection flow to the maximum with all <u>alternate</u> subsystems

* RPV Control, Section RP
* C3

IF	THEN
RPV water level cannot be restored and maintained above -14 in.	PRIMARY CONTAINMENT FLOODING IS REQUIRED; exit this procedure and enter C6, Primary Containment Flooding

Primary Containment Control Section SPL

DISCUSSION:

This step is entered when the following plant conditions exist:

1. RPV water level is at or below -14 in. (TAF), and
2. RPV water level is constant or decreasing, and
3. Available systems and subsystems are unable to maintain RPV water level above the TAF
4. RPV pressure is less than 195 psig

Since all available systems and subsystems are unable to maintain RPV water level above the TAF, rapid depressurization of the RPV is directed to maximize injection flow rate from the systems. If RPV depressurization does not result in reversing the decreasing RPV water level trend, the use of the alternate subsystems must be initiated.

STEP:

EMERGENCY RPV DEPRESSURIZATION IS REQUIRED; line up, start pumps, and raise injection flow to the maximum with all alternate subsystems

* RPV Control, Section RP
* C3

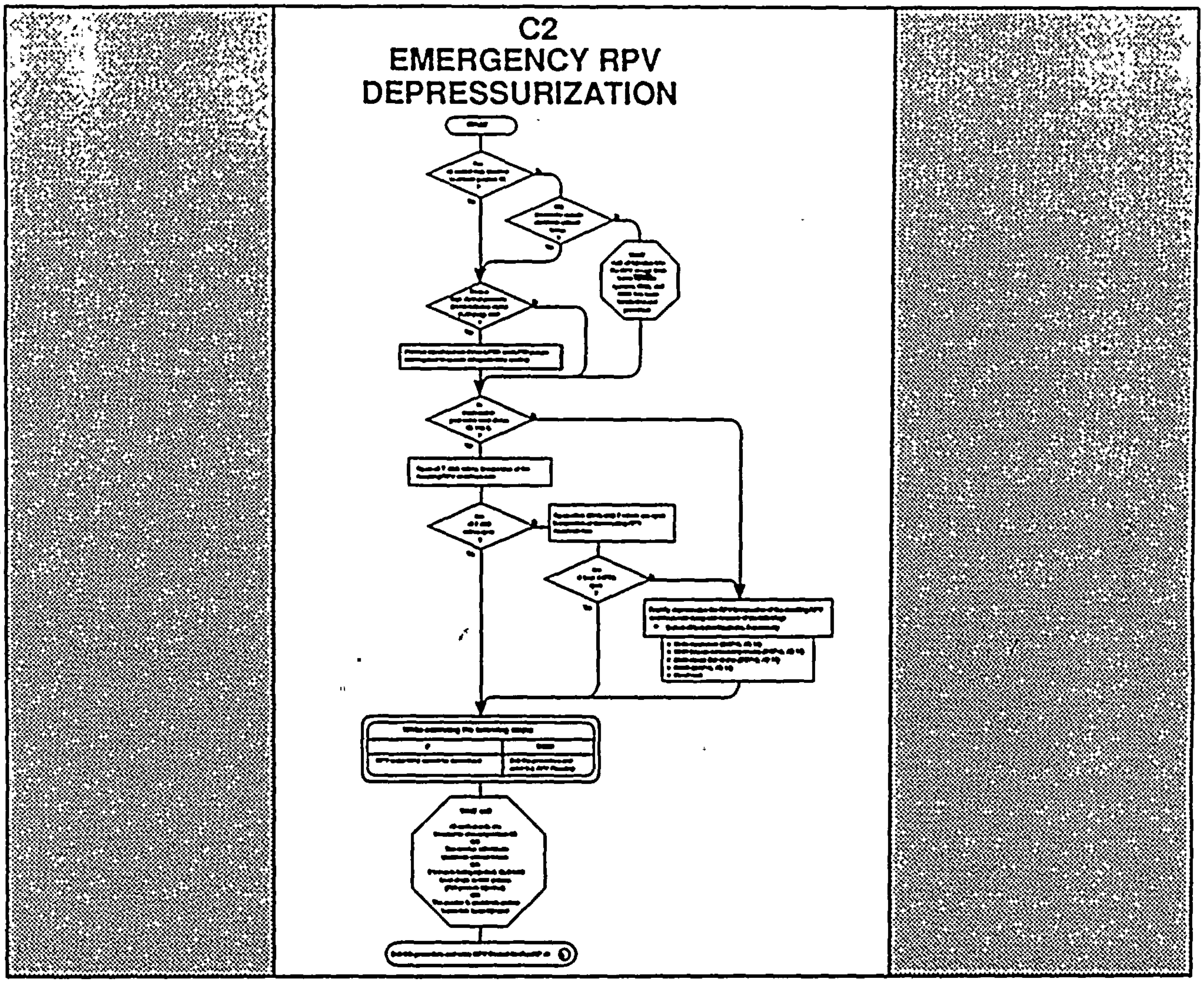
IF	THEN
RPV water level cannot be restored and maintained above -14 in.	PRIMARY CONTAINMENT FLOODING IS REQUIRED; exit this procedure and enter C6, Primary Containment Flooding

Primary Containment Control Section SPL

DISCUSSION:

As a measure of last resort, when all attempts to submerge the core through RPV injection prove unsuccessful, submergence of the core is achieved through primary containment flooding. Operator actions transfer to N2-EOP-C6, Primary Containment Flooding, for this purpose.

EMERGENCY RPV DEPRESSURIZATION

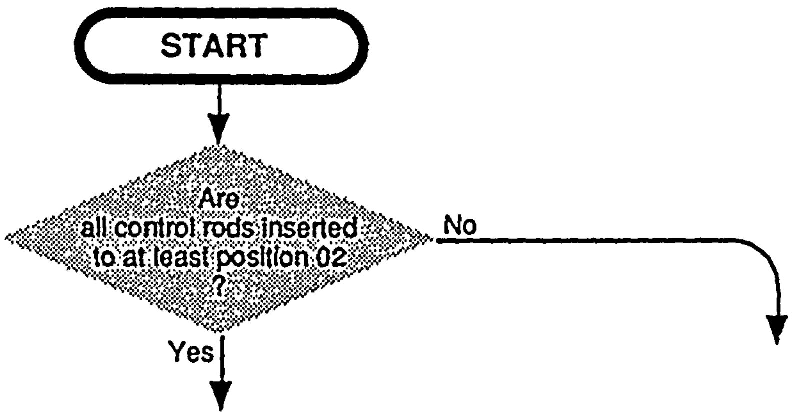


PURPOSE

This procedure gives specific instructions for rapidly depressurizing the RPV. The purpose of Emergency Depressurization is to:

- Establish or maintain adequate core cooling
- Terminate or minimize the discharge of reactor coolant from unisolable primary system breaks
- Reduce the stored energy contained in the RPV prior to reaching plant conditions where insufficient pressure suppression capability may exist to safely accommodate SRV opening or a loss of coolant accident
- Minimize radioactivity released from the RPV to the primary containment, reactor building or surrounding external areas.

ENTRY:



DISCUSSION

This procedure is entered from a number of procedures, due to a variety of conditions. They include:

RPV Control (N2-EOP-RPV)

- Override Statement, If RPV water level cannot be determined and less than 7 SRVs are open (Reactor Pressure leg) or Emergency RPV Depressurization is otherwise required and less than 7 SRVs are open (Reactor Pressure leg).

Primary Containment Control (N2-EOP-PC)

- If drywell temperature cannot be maintained below 340 F (DWT leg).
- If suppression pool water level cannot be maintained above the Heat Capacity Level Limit (Figure PC-5) (SPL leg).
- If suppression water level and RPV pressure cannot be restored and maintained below the SRV Tail Pipe Level Limit (Figure PC-6) (SPL leg).
- If suppression chamber pressure cannot be maintained below the Pressure Suppression Pressure (Figure PC-3) (PCP leg).
- If 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% (PCH leg).

DISCUSSION - (Continued)

- If suppression pool temperature and RPV pressure cannot be maintained below the Heat Capacity Temperature Limit (Figure PC-1) (SPT leg).

Secondary Containment Control (N2-EOP-SC)

- If a primary system is discharging into the reactor building, THEN IF an area radiation level exceeds 10R/hr in more than one area (Reactor Building Radiation Levels leg).
- If a primary system is discharging into the reactor building, THEN IF an area temperature exceeds Maximum Safe RB Temperature in more than one area (Reactor Building Temperature leg).
- If a primary system is discharging into the reactor building, THEN IF an area water level reaches an ECCS equipment room flooding alarm level in more than one area (Reactor Building Water Level leg).

Radioactivity Release Control (N2-EOP-RR)

- If the offsite radioactivity release rate approaches or exceeds the Emergency Plan "General Emergency" level and a primary system is discharging into an area outside the primary and secondary containments (final step of procedure).

MSIV Leakage Control (N2-EOP-MSL)

- If the offsite radioactivity release rate cannot be maintained below the Emergency Plan "General Emergency" level and a primary system is discharging into an area outside the primary and secondary containments (final step of procedure).

Contingency #1 Alternate Level Control (N2-EOP-C1)

- If RPV pressure is at or below 195 psig and RPV water level drops to -14 inches (Top of Active Fuel).
- If RPV pressure is above 195 psig and RPV water level drops to -14 inches (Top of Active Fuel) and any system, subsystem or alternate subsystem is lined up for injection with at least one pump running.

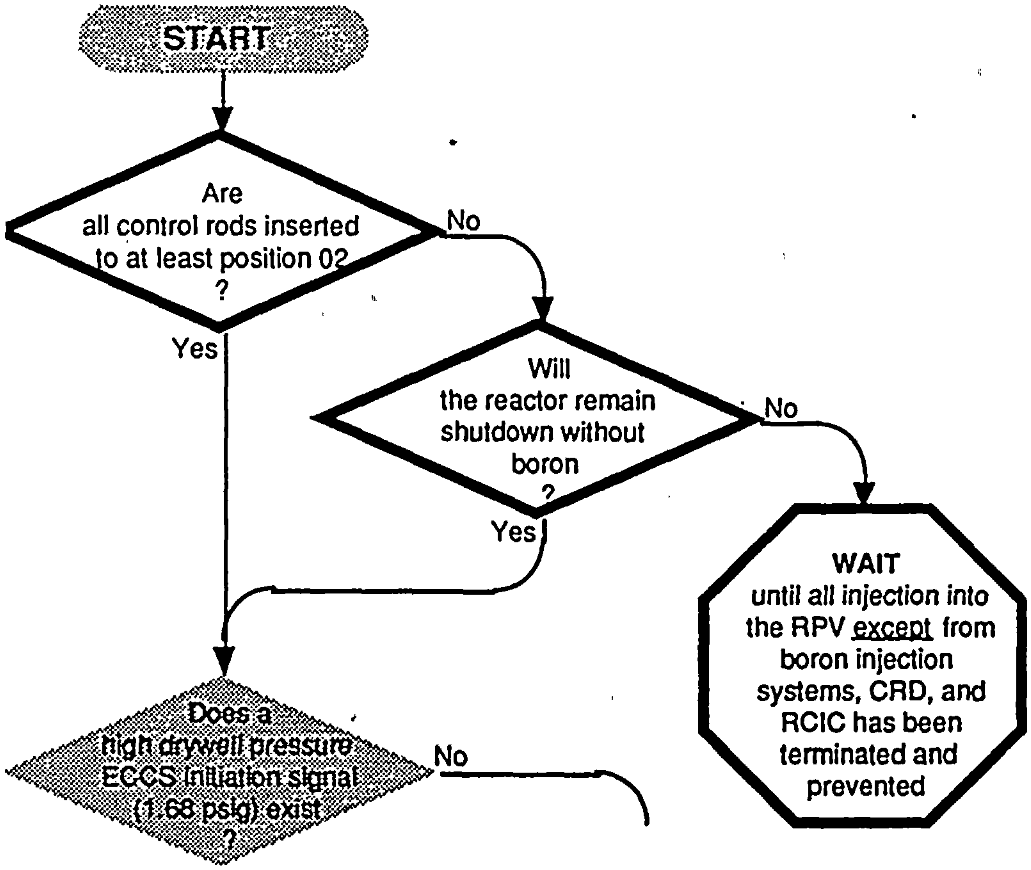
Contingency #3 Steam Cooling (N2-EOP-C3)

- Override Statement, If Emergency RPV Depressurization is required OR RPV water level cannot be determined OR any system, subsystem or alternate subsystem is lined up for injection with at least one pump running, direction is given for the operator to enter Contingency #2, Emergency RPV Depressurization.
- If RPV water level drops to or below -55 inches (Minimum Zero-Injection RPV Water Level) direction is given for the operator to enter Contingency #2, Emergency RPV Depressurization.

Contingency #5 Level/Power Control (N2-EOP-C5)

- If RPV water level cannot be maintained above -45 inches (Minimum Steam Cooling RPV Water Level)

STEP:



DISCUSSION:

Before taking action to depressurize the reactor, positive confirmation that the reactor will remain shutdown under all conditions must be ascertained. This confirmation is best determined by ensuring that no control rod is withdrawn past the Maximum Subcritical Banked Withdrawal Position (position 02). The Maximum Subcritical Banked Withdrawal Position is defined to be the lowest control rod position to which all control rods may be withdrawn in bank and the reactor will remain shutdown under all conditions.

If control rod insertion alone cannot assure the reactor will remain shutdown under all conditions, then extra measures are taken to prevent power excursions which may result from positive reactivity additions caused by subsequent cold water injection.

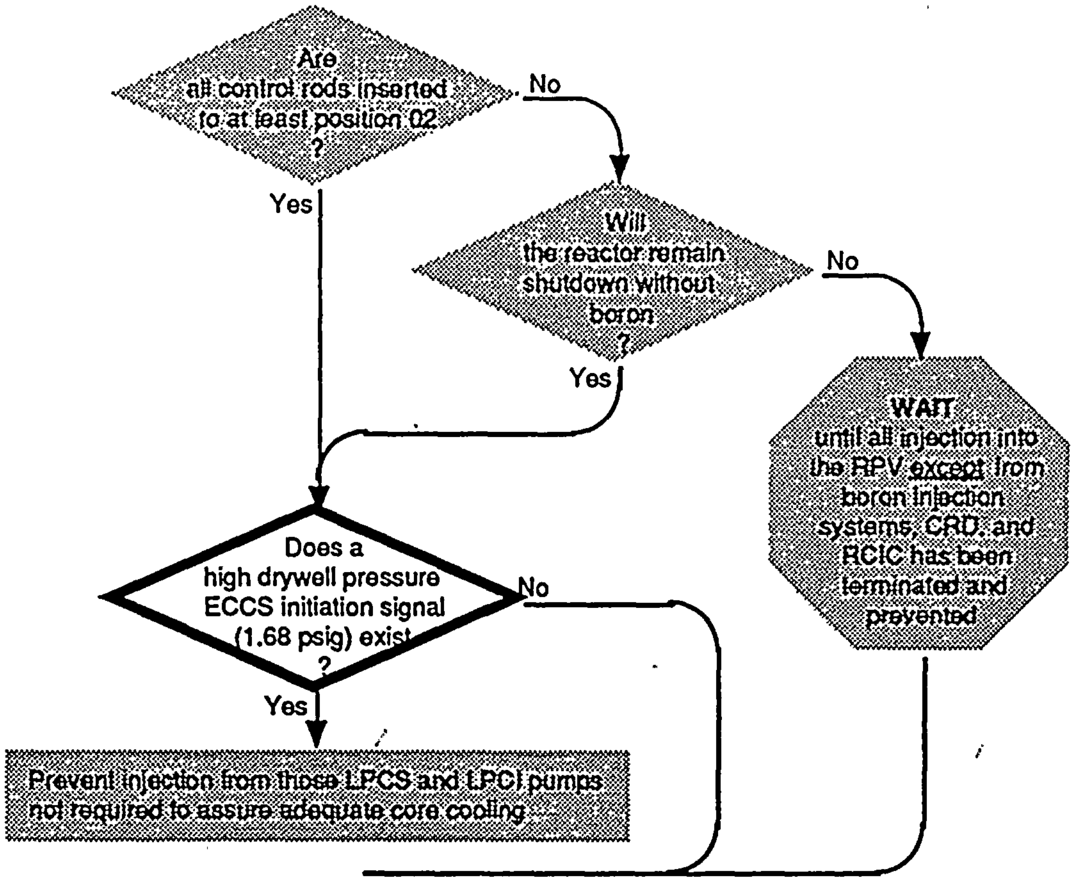
If all control rods are not inserted to or beyond position 02, other criteria may be employed to determine that the reactor will remain shutdown, such as determining that the design basis shutdown margin (SDM) exists with the single control rod of the highest worth full-out and all other control rods full-in.

If it has been determined that the reactor will not remain shutdown under all conditions without boron, depressurization must wait until injection into the RPV is terminated and prevented. This action is taken to preclude power excursions due to rapid addition of cold water

DISCUSSION: (Continued)

into the reactor. Injection from CRD and boron injection systems continues. Boron injection systems are needed to complete boron injection and CRD system operation is needed to support control rod insertion efforts. RCIC injection is not stopped, since operation of the RCIC turbine aids in depressurization and injection flow is small.

STEP:



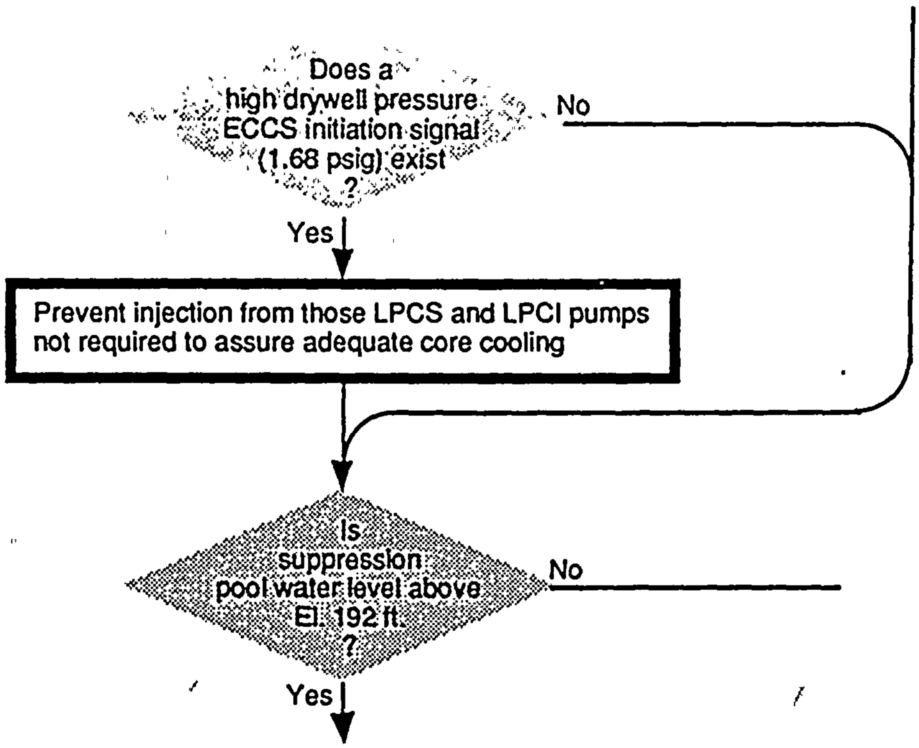
DISCUSSION:

This step reminds the operator of the drywell high pressure input to a Loss of Coolant Accident (LOCA) signal. Subsequent steps in this procedure will cause a rapid and complete depressurization of the RPV. If drywell pressure is above 1.68 psig then an Emergency Core Cooling System (ECCS) initiation signal is present (ECCS pumps may already be running if RPV level has dropped to the RPV low low water level setpoint).

When RPV pressure drops below the low pressure interlock for the injection valves, the valves will automatically open. Continued depressurization of the RPV will reduce RPV pressure below the shutoff head of the low pressure injection system (LPCI/LPCS) pumps. Rapid injection of a large volume of water will follow. A "YES" response will prevent the injection from these pumps unless required to assure adequate core cooling.

A "NO" response bypasses this step because the low pressure injection systems (LPCI/LPCS) may otherwise be required due to a low RPV water level condition.

STEP:

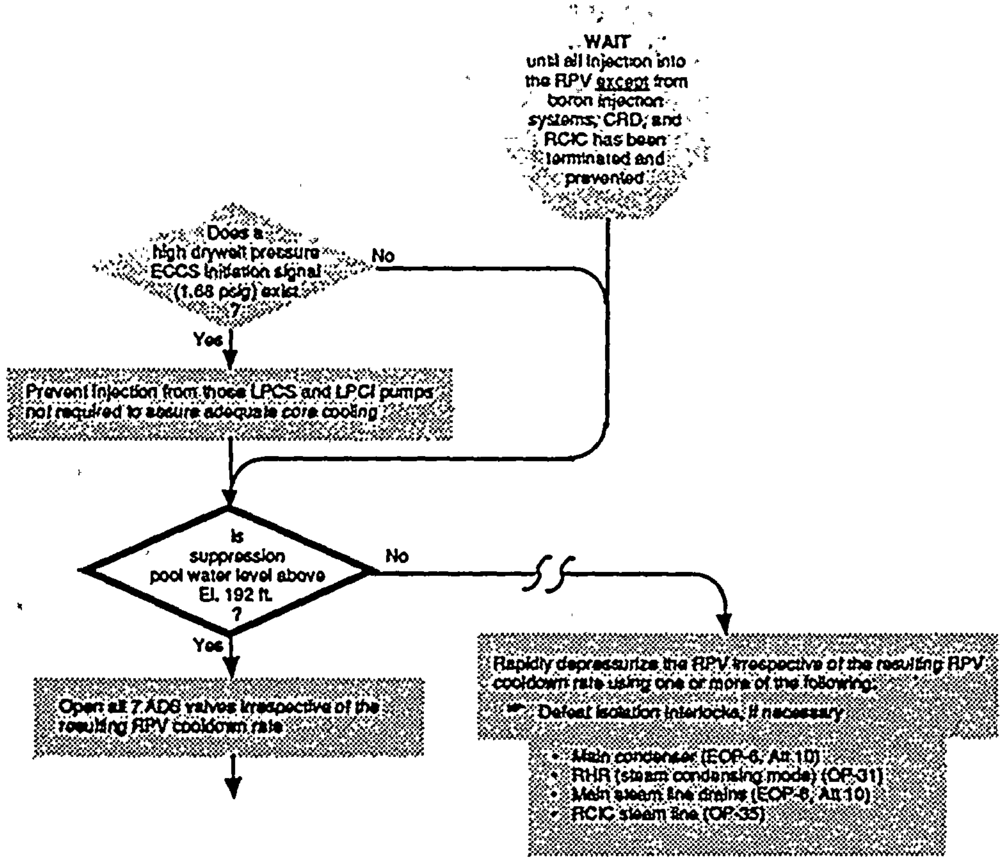


DISCUSSION:

This step gives the operator direction to prevent unwanted injection. The operator is instructed to preclude the possibility of injection from LPCI and LPCS only when adequate core cooling is assured.

Failure to prevent injection from these systems when they are not required to assure adequate core cooling may complicate efforts to control RPV water level, due to the uncontrolled rapid injection of large volumes of water into the RPV.

STEP:



DISCUSSION:

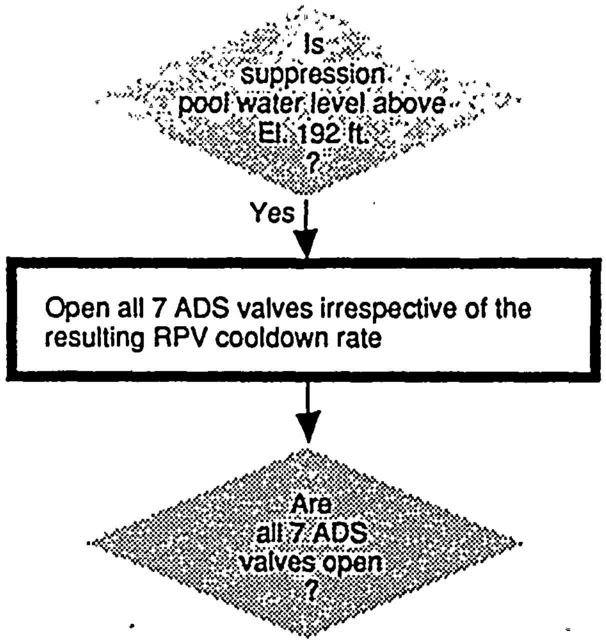
This step directs the operator to determine suppression pool water level. Suppression pool water level is verified to be above El. 192 feet prior to opening SRVs. El. 192 feet is the bottom of the suppression pool water level indicating range and provides assurance that the SRV T-quenchers are submerged. This will prevent rapid containment pressurization during SRV lift.

Operating SRVs with suppression pool water level less than El. 192 feet is not allowed because the extent of the pressurization of the suppression chamber air space cannot be predicted and may exceed the design pressure capability of the primary containment.

A "YES" response directs the operator to begin depressurization using SRVs.

A "NO" response reroutes the operator to alternative depressurization actions, bypassing SRV use.

STEP:



DISCUSSION:

Depressurization of the RPV is most easily and rapidly performed by opening Safety/Relief Valves (SRVs); thus instructions for operation of these valves are specified first, prior to steps directing the use of other depressurization systems and mechanisms.

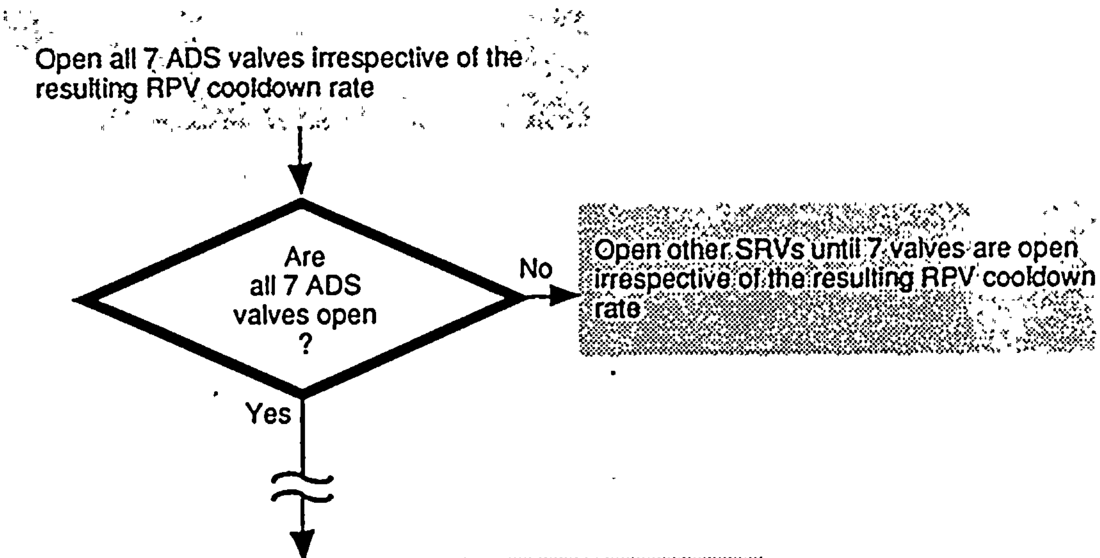
Those SRVs dedicated to the Automatic Depressurization System (ADS) are generally the most reliable because of their qualifications, pneumatic supply systems, the design and operation of initiation circuitry, and the availability of control power. The relative location of their discharge T-quenchers uniformly distributes the heat load around the suppression pool.

The concurrent opening of all seven (7) ADS valves is within analyzed plant design limits.

The operator is directed to rapidly depressurize the RPV, irrespective of the resulting cooldown rate, realizing that the action takes precedence over abiding by the RPV cooldown rate limitations in Technical Specifications.

Implementation of this step may be by use of ADS Initiation Pushbuttons, operation of the "C" solenoid keylock switches on P601, or operation of the "a" or "b" solenoid keylock switches on the back panel. If one or more SRVs are already stuck open when this step is directed, it is appropriate to open only that number which will total 7.

STEP:



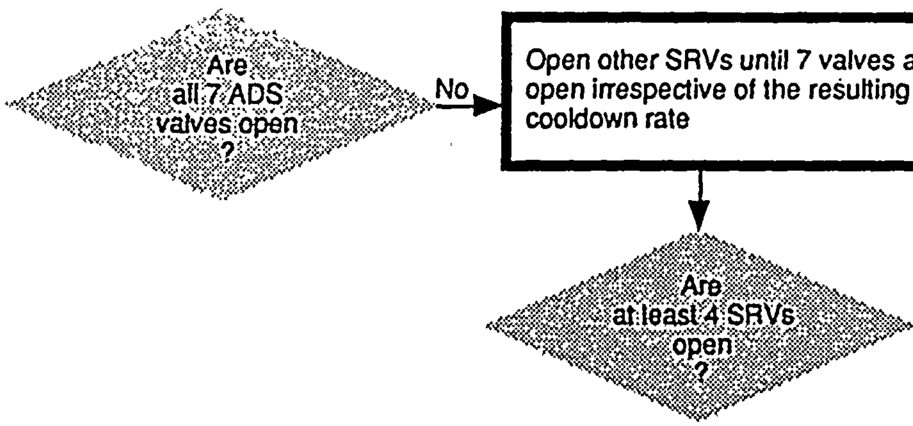
While executing the following steps:	
IF	THEN
RPV water level cannot be determined	Exit this procedure and enter C4, RPV Flooding

DISCUSSION:

This step tests the success of actions taken in the previous step. With 7 ADS valves open, the reactor will depressurize and remain depressurized during a subsequent RPV flooding evolution.

A "NO" response directs the operator to alternative actions to depressurize the RPV.

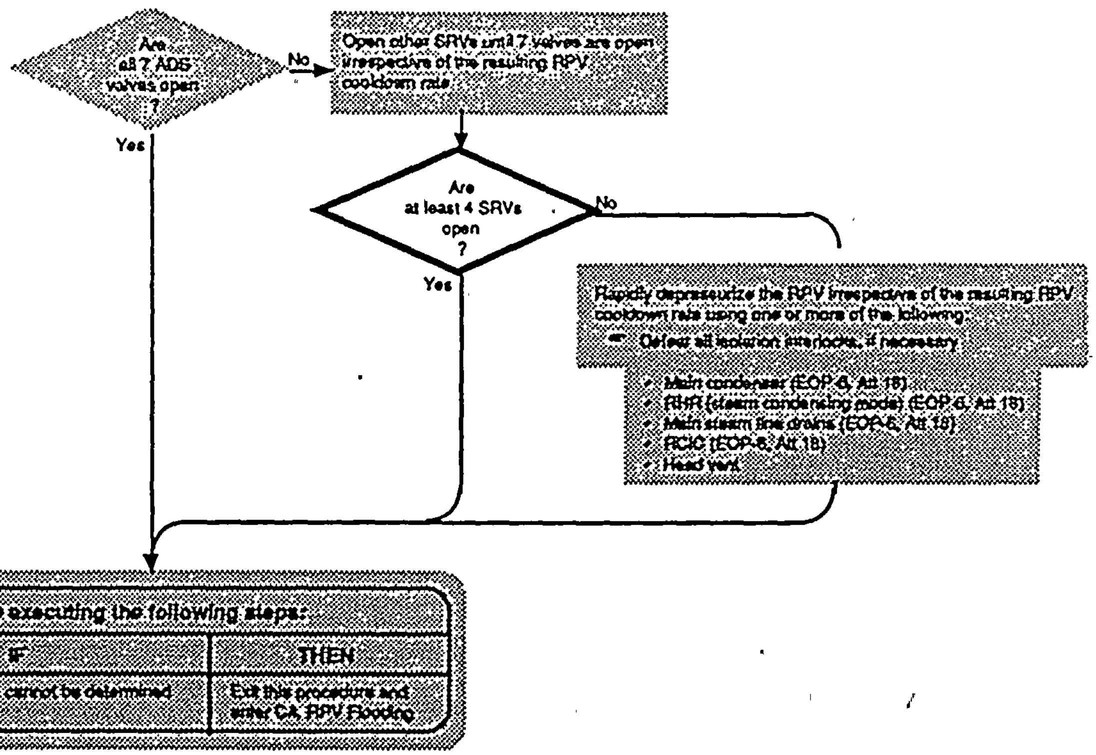
STEP:



DISCUSSION:

This step directs the operator to open additional SRVs until a total of 7 SRVs are open. The operator is given flexibility in choosing which SRVs to open; however, even heat distribution in the suppression pool should be attempted.

STEP:



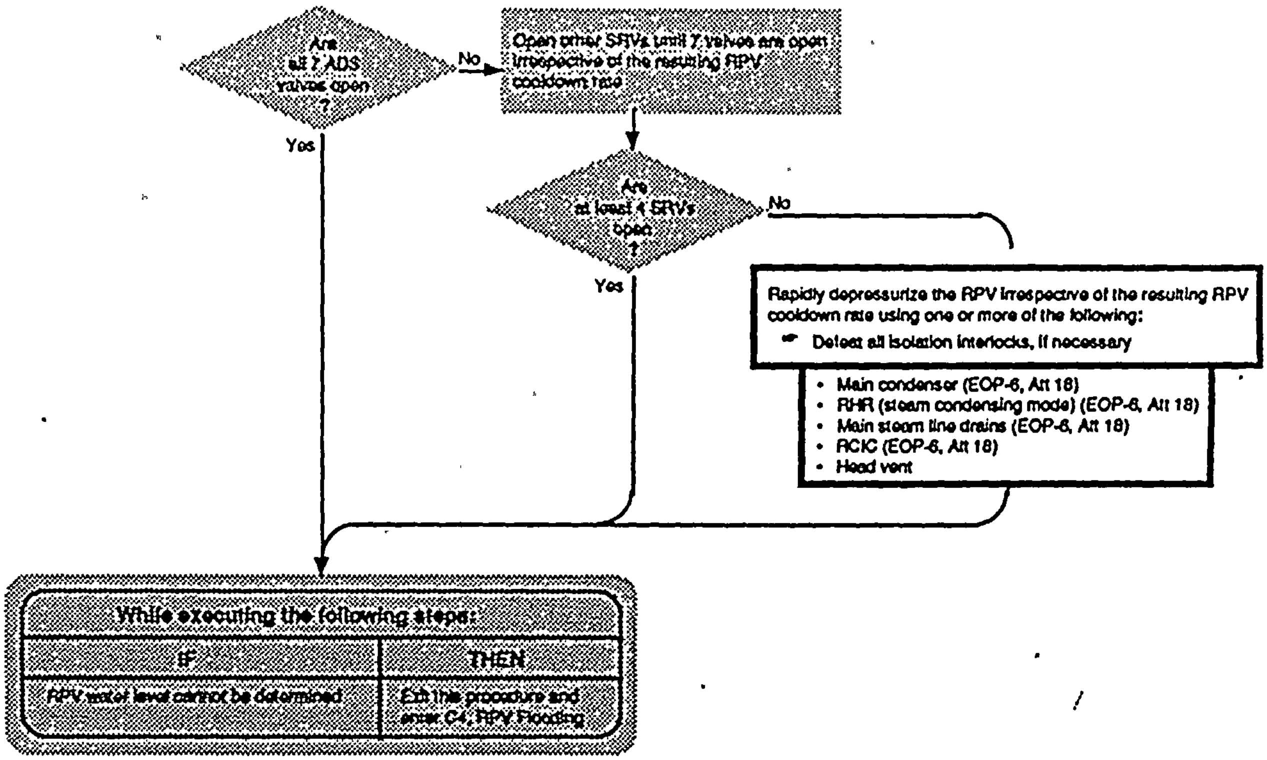
DISCUSSION:

The Minimum Number of SRVs Required for Emergency Depressurization at NMP2 is 4. With 4 SRVs open, there is sufficient steam flow to remove all decay heat at a pressure low enough that the ECCS pump with the lowest head is able to provide makeup for all steam flow.

A "YES" answer signifies that the reactor will depressurize.

A "NO" response directs the operator to alternate actions to depressurize the RPV.

STEP:

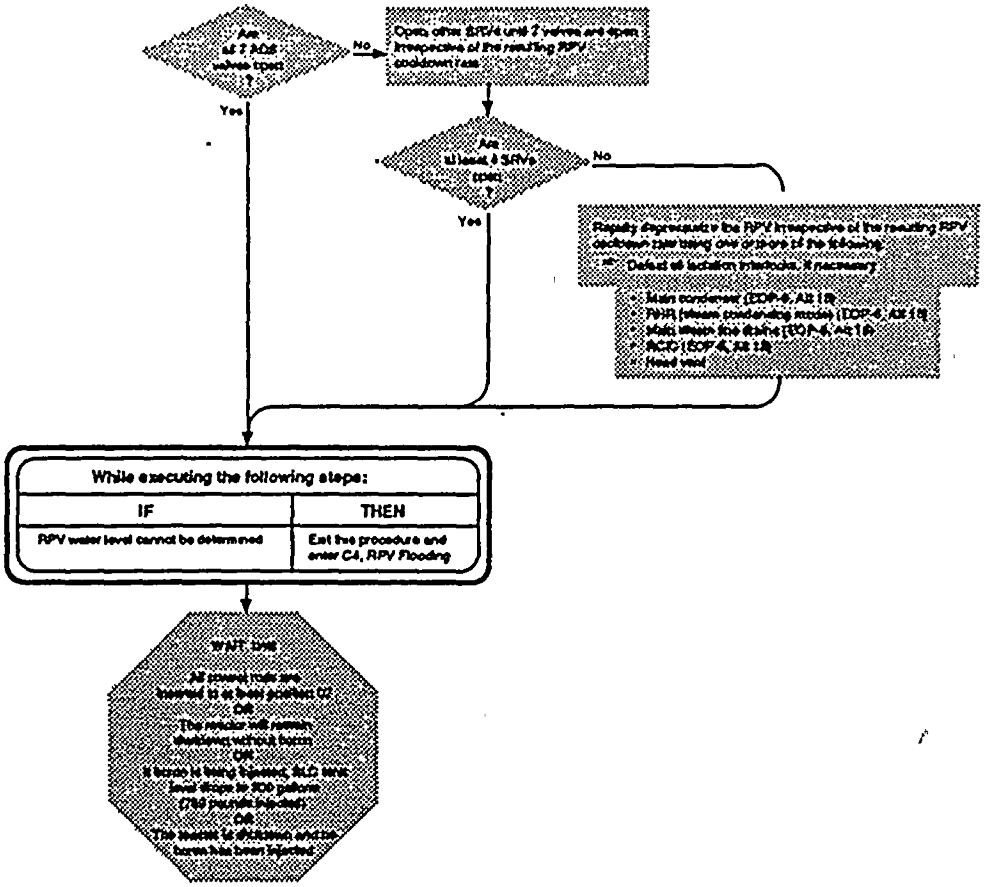


DISCUSSION:

This step is entered as the result of a failed attempt to establish the necessary conditions for depressurizing the RPV utilizing ADS/SRVs. The operator is given a list of systems to use to increase steam flow if less than 4 SRVs are open during SRV depressurization or if SRVs were not opened due to low suppression pool level. The system(s) which will provide the most rapid depressurization, as well as minimizing release, is (are) the best choice.

Defeating isolation interlocks may be required to accomplish this step. Although some radioactive release to the environment may result, this is preferable to severe core damage or loss of containment integrity, both of which could lead to greater releases.

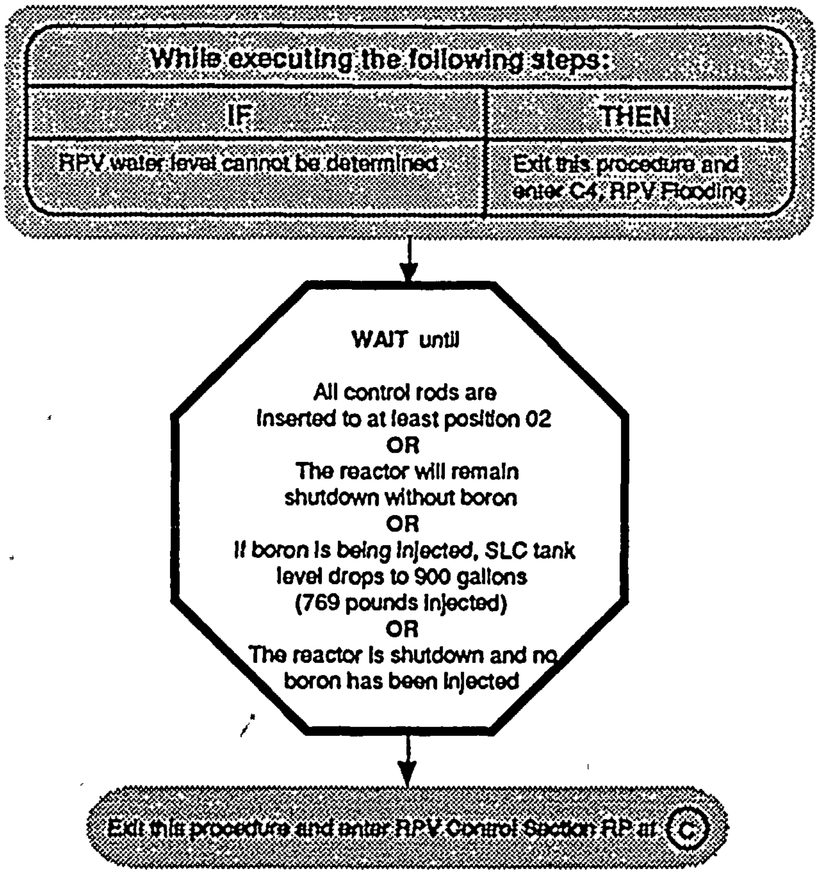
STEP:



DISCUSSION:

This override applies until RPV depressurization is complete and Contingency #2, Emergency RPV Depressurization, is exited. If RPV water level cannot be determined, adequate core cooling cannot be assured and control of RPV water level (and pressure) is transferred to Contingency #4, RPV Flooding, N2-EOP-C4, to ensure core submergence.

STEP:



DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedure until one of the stated conditions, (1) all control rods can be determined to be inserted to or beyond position 02; OR (2) it has been determined that the reactor is shutdown under all conditions without boron; OR (3) if boron is being injected, SLC tank level drops to 900 gallons; OR (4) the reactor is shutdown and no boron has been injected into the RPV, has been met. 769 pounds is provided should boron injection not be by the SLC tank (RWCU).

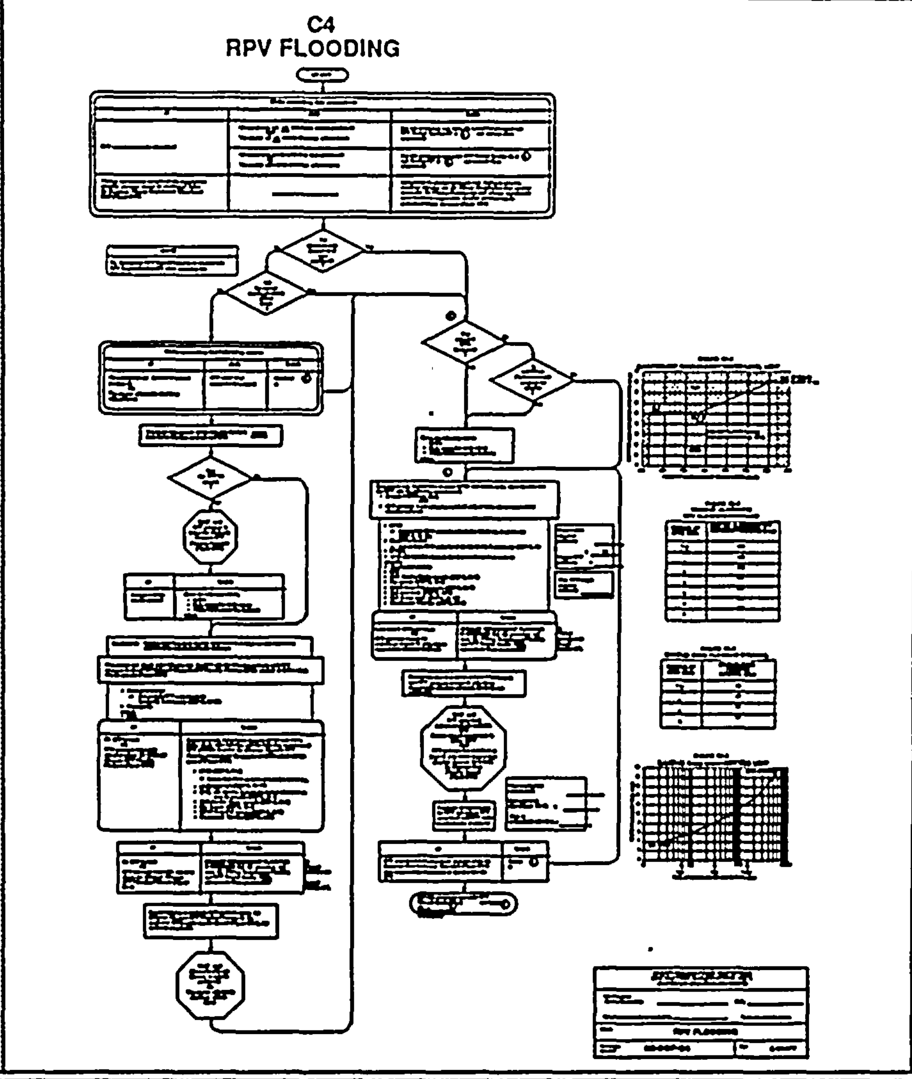
Delaying the performance of the subsequent actions in this procedure confirms that the reactor is shutdown and an Emergency RPV Depressurization is in progress through either the normal or alternate methods established in the previous steps.

This step ensures that RPV depressurization and cooldown will not proceed until the reactor is shutdown by the existence of one of four conditions. These conditions are consistent with RPV Control for placing SDC in service.

The first condition (all control rods inserted to or beyond position 02) requires that all control rods be inserted to or beyond position 02, the Maximum Subcritical Banked Withdrawal Position. If this criteria is met, control rod insertion alone assures the reactor will remain shutdown.

The second condition (it has been determined that the reactor will remain shutdown under all conditions without boron) addresses the con-

RPV FLOODING



PURPOSE

The purpose of Contingency #4, RPV Flooding, is to specify actions to inject water into the RPV and increase RPV water level until either the main steam lines flood, or if the reactor is not shutdown, to assure adequate core cooling by a combination of submergence and steam cooling.

ENTRY:

START

While executing this procedure:

IF	AND	THEN
RPV water level can be determined	All control rods are not inserted to at least position 02 AND The reactor will not remain shutdown without boron	Exit this procedure and enter C5, Level/Power control and RPV Control Section RP at (C) and execute them concurrently
	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C4-1)		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 curve (Figure C4-1)

DISCUSSION:

Since actions taken in Contingency #4 control both RPV water level and RPV pressure, Contingency #4 is entered from both Sections RL and RP of RPV Control.

For RPV water level control from either:

- **RPV Control, Section RL,** if RPV water level cannot be determined.
- **Contingency #1, Alternate Level Control,** if RPV water level cannot be determined.
- **Contingency #5, Level/Power Control,** if RPV water level cannot be determined.

For RPV pressure control from either:

- **RPV Control, Section RP,** if RPV water level cannot be determined and 7 or more SRVs are open.
- **Contingency #2, Emergency RPV Depressurization,** if RPV water level cannot be determined.

STEP:

START

While executing this procedure:

IF	AND	THEN
RPV water level can be determined	All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power control and RPV Control Section RP at (C) and execute them concurrently
	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C4-1)	----------	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 curve (Figure C4-1)

Are all control rods inserted to at least position 02 ?

DISCUSSION:

RPV flooding is accomplished by controlling injection flow to the RPV to establish and maintain RPV pressure at a specified value as determined by the number of open SRVs. The flooding evolution may place severe hydraulic loads on the piping downstream of the SRVs and, therefore, should be discontinued as soon as RPV water level can again be determined. The statement "RPV water level can be determined" is meant to allow the SSS to utilize any method(s) of level determination available to him. This may be a direct or indirect method utilized alone or in conjunction with other methods. Conservatively, the SSS could wait until "RPV water level instrumentation is available", however, other methods could be, but are not limited to, flow through the SRVs, temperature stratification in the vessel, or use of neutron monitoring instrumentation. Recognize however that neutron monitoring instrumentation methods will not be usefull for determining level as far as action levels in C4. If SRVs are being used to determine level, this mechanism will be lost when flooding is secured, thus it is appropriate to stay in C4. When exitingContingency #4, appropriate actions for continued control of RPV pressure are provided in Section RP of RPV Control. Appropriate actions for continued control of RPV water level depend upon the status (shutdown condition) of the reactor. If reactor shutdown cannot be assured for all conditions by control rod insertion alone, the appropriate operator actions for continued control of RPV water level are provided in Contingency #5, Level/Power Control.

STEP:

START

While executing this procedure:		
IF	**AND**	**THEN**
RPV water level can be determined	All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power control and RPV Control Section RP at (C) and execute them concurrently
	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C4-1)	————	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 curve (Figure C4-1)

Are all control rods inserted to at least position 02 ?

DISCUSSION:

RPV flooding is accomplished by controlling injection flow to the RPV to establish and maintain RPV pressure at a specified value as determined by the number of open SRVs. The flooding evolution may place severe hydraulic loads on the piping downstream of the SRVs and, therefore, should be discontinued as soon as RPV water level can again be determined. When making the exit from Contingency #4, appropriate actions for continued control of RPV pressure are provided in Section RP of RPV Control. Appropriate actions for continued control of RPV water level depend upon the status (shutdown condition) of the reactor. If reactor shutdown is assured for all conditions by control rod insertion alone, the appropriate RPV water level and pressure control actions are contained in Sections RL and RP of RPV Control.

STEP:

START

While executing this procedure:

IF	AND	THEN
RPV water level can be determined	All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power control and RPV Control Section RP at (C) and execute them concurrently
	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C4-1)	-------------------------	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 curve (Figure C4-1)

Are all control rods inserted to at least position 02 ?

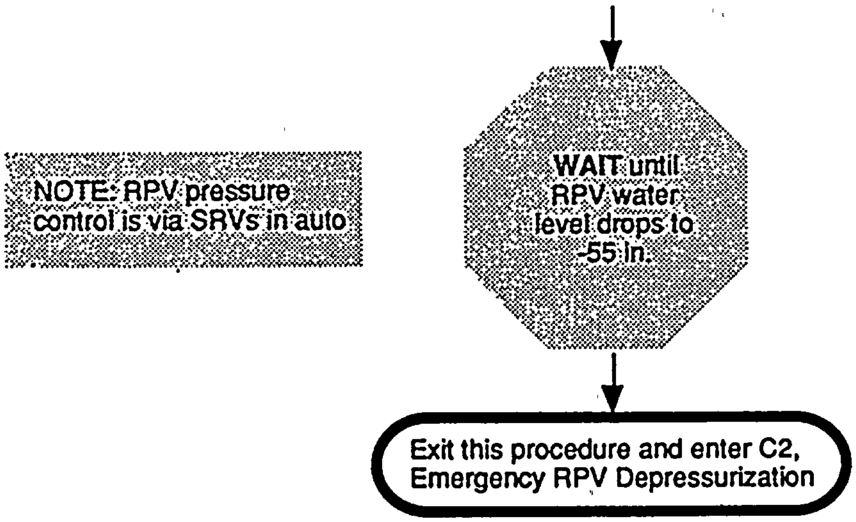
DISCUSSION:

With a non-isolated primary system break inside the drywell, injection into the RPV from sources external to the primary containment will increase RPV level until the elevation of the break is reached. Once this occurs, the makeup water will spill from the break into the primary containment. If injection into the RPV is continued and the Maximum Primary Containment Water Level Limit is exceeded, the structural integrity of the primary containment is no longer assured. The Maximum Primary Containment Water Level Limit is defined to be the lesser of either: (1) the elevation of the highest containment vent capable of rejecting all core decay heat, or (2) the highest containment water level which will not result in exceeding the pressure capability of the containment. The NMP2 limit is based upon (1) above.

Injection into the RPV from systems which cannot be aligned with suction from inside the primary containment is terminated, irrespective of whether adequate core cooling is assured, as necessary to remain below the Maximum Primary Containment Water Level Limit.

This action precludes any further increase in primary containment water level, and is authorized because the consequences of not doing so may be a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the containment may fail, an attendant loss of the suppression pool must be assumed with a consequent unrecoverable loss of adequate core cooling. Substantial amounts of radioactivity may be released to the general environment with a degraded core condition and loss of containment

STEP:



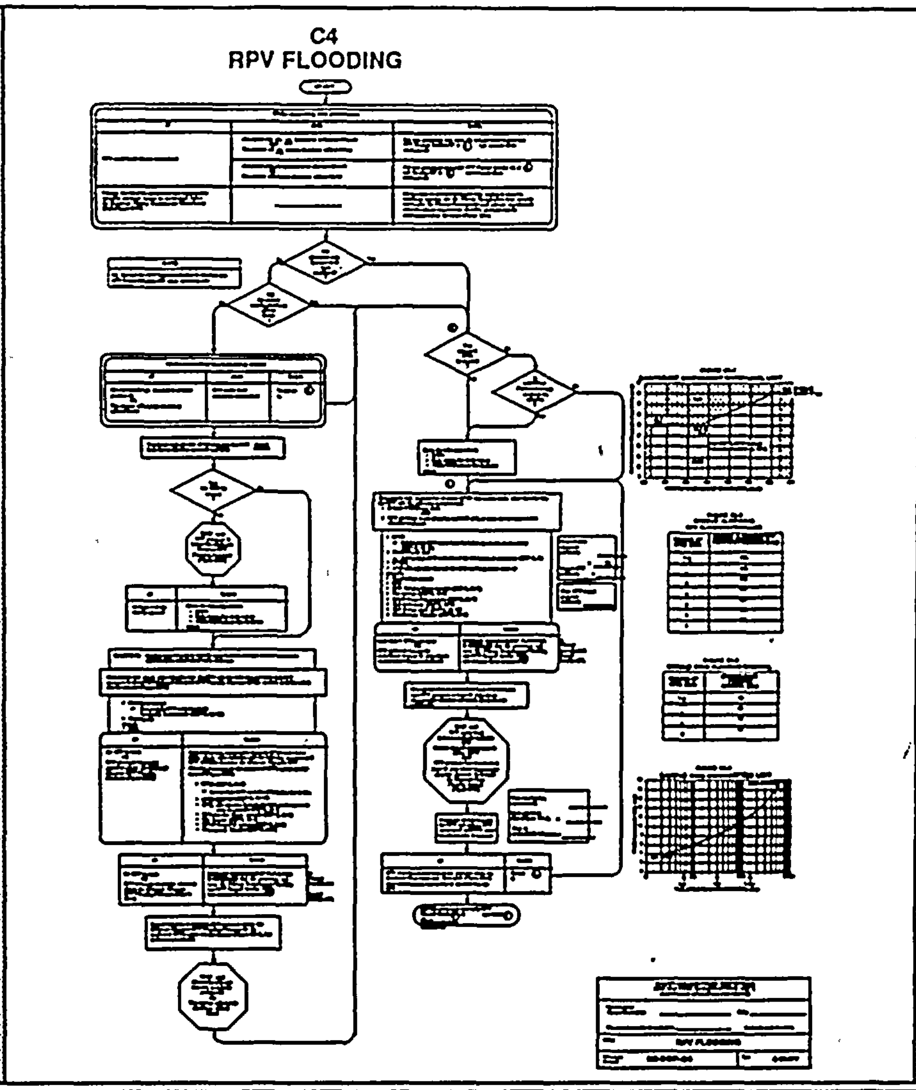
DISCUSSION:

At the Minimum Zero-Injection RPV water level the RPV is rapidly depressurized through the actions specified in contingency #2, Emergency RPV Depressurization. The opening of SRVs draws steam up through the fuel assemblies causing heat transfer from the fuel to the steam resulting in a significant decrease in cladding temperature. As RPV pressure decreases, steam flow up through the core and the open SRVs decreases so less heat is removed from the fuel and the decreasing fuel clad temperature trend reverses.

Opening of the SRVs prior to RPV water level decreasing to the Minimum Zero-Injection RPV water level results in less effective steam cooling due to lower fuel temperatures and reduces the time over which the core remains adequately cooled with no injection.

Delaying the opening of SRVs until RPV water level is below the Minimum Zero-Injection RPV water level may result in excessive fuel temperatures and significant core damage.

RPV FLOODING



PURPOSE

The purpose of Contingency #4, RPV Flooding, is to specify actions to inject water into the RPV and increase RPV water level until either the main steam lines flood, or if the reactor is not shutdown, to assure adequate core cooling by a combination of submergence and steam cooling.

ENTRY:

START

While executing this procedure:

IF	AND	THEN
RPV water level can be determined	All control rods are not inserted to at least position 02 AND The reactor will not remain shutdown without boron	Exit this procedure and enter C5, Level/Power control and RPV Control Section RP at (C) and execute them concurrently
	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C4-1)	————	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 curve (Figure C4-1)

DISCUSSION:

Since actions taken in Contingency #4 control both RPV water level and RPV pressure, Contingency #4 is entered from both Sections RL and RP of RPV Control.

For RPV water level control from either:

- **RPV Control, Section RL,** if RPV water level cannot be determined.
- **Contingency #1, Alternate Level Control,** if RPV water level cannot be determined.
- **Contingency #5, Level/Power Control,** if RPV water level cannot be determined.

For RPV pressure control from either:

- **RPV Control, Section RP,** if RPV water level cannot be determined and 7 or more SRVs are open.
- **Contingency #2, Emergency RPV Depressurization,** if RPV water level cannot be determined.

STEP:

START

While executing this procedure:

IF	AND	THEN
RPV water level can be determined	All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power control and RPV Control Section RP at (C) and execute them concurrently
	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently
Primary containment water level and suppression chamber pressure cannot be maintained below the *Maximum Primary Containment Water Level Limit* (Figure C4-1)	————————	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 curve (Figure C4-1)

Are all control rods inserted to at least position 02 ?

DISCUSSION:

RPV flooding is accomplished by controlling injection flow to the RPV to establish and maintain RPV pressure at a specified value as determined by the number of open SRVs. The flooding evolution may place severe hydraulic loads on the piping downstream of the SRVs and, therefore, should be discontinued as soon as RPV water level can again be determined. The statement "RPV water level can be determined" is meant to allow the SSS to utilize any method(s) of level determination available to him. This may be a direct or indirect method utilized alone or in conjunction with other methods. Conservatively, the SSS could wait until "RPV water level instrumentation is available", however, other methods could be, but are not limited to, flow through the SRVs, temperature stratification in the vessel, or use of neutron monitoring instrumentation. Recognize however that neutron monitoring instrumentation methods will not be usefull for determining level as far as action levels in C4. If SRVs are being used to determine level, this mechanism will be lost when flooding is secured, thus it is appropriate to stay in C4. When exitingContingency #4, appropriate actions for continued control of RPV pressure are provided in Section RP of RPV Control. Appropriate actions for continued control of RPV water level depend upon the status (shutdown condition) of the reactor. If reactor shutdown cannot be assured for all conditions by control rod insertion alone, the appropriate operator actions for continued control of RPV water level are provided in Contingency #5, Level/Power Control.

STEP:

START

While executing this procedure:		
IF	**AND**	**THEN**
RPV water level can be determined	All control rods are <u>not</u> inserted to at least position 02 AND The reactor will <u>not</u> remain shutdown without boron	Exit this procedure and enter C5, Level/Power control and RPV Control Section RP at (C) and execute them concurrently
	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C4-1)	————	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 curve (Figure C4-1)

Are all control rods inserted to at least position 02 ?

DISCUSSION:

RPV flooding is accomplished by controlling injection flow to the RPV to establish and maintain RPV pressure at a specified value as determined by the number of open SRVs. The flooding evolution may place severe hydraulic loads on the piping downstream of the SRVs and, therefore, should be discontinued as soon as RPV water level can again be determined. When making the exit from Contingency #4, appropriate actions for continued control of RPV pressure are provided in Section RP of RPV Control. Appropriate actions for continued control of RPV water level depend upon the status (shutdown condition) of the reactor. If reactor shutdown is assured for all conditions by control rod insertion alone, the appropriate RPV water level and pressure control actions are contained in Sections RL and RP of RPV Control.

STEP:

START

While executing this procedure:		
IF	**AND**	**THEN**
RPV water level can be determined	All control rods are not inserted to at least position 02 AND The reactor will not remain shutdown without boron	Exit this procedure and enter C5, Level/Power control and RPV Control Section RP at (C) and execute them concurrently
	All control rods are inserted to at least position 02 OR The reactor will remain shutdown without boron	Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C4-1)	----------	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 curve (Figure C4-1)

Are all control rods inserted to at least position 02 ?

DISCUSSION:

With a non-isolated primary system break inside the drywell, injection into the RPV from sources external to the primary containment will increase RPV level until the elevation of the break is reached. Once this occurs, the makeup water will spill from the break into the primary containment. If injection into the RPV is continued and the Maximum Primary Containment Water Level Limit is exceeded, the structural integrity of the primary containment is no longer assured. The Maximum Primary Containment Water Level Limit is defined to be the lesser of either: (1) the elevation of the highest containment vent capable of rejecting all core decay heat, or (2) the highest containment water level which will not result in exceeding the pressure capability of the containment. The NMP2 limit is based upon (1) above.

Injection into the RPV from systems which cannot be aligned with suction from inside the primary containment is terminated, irrespective of whether adequate core cooling is assured, as necessary to remain below the Maximum Primary Containment Water Level Limit.

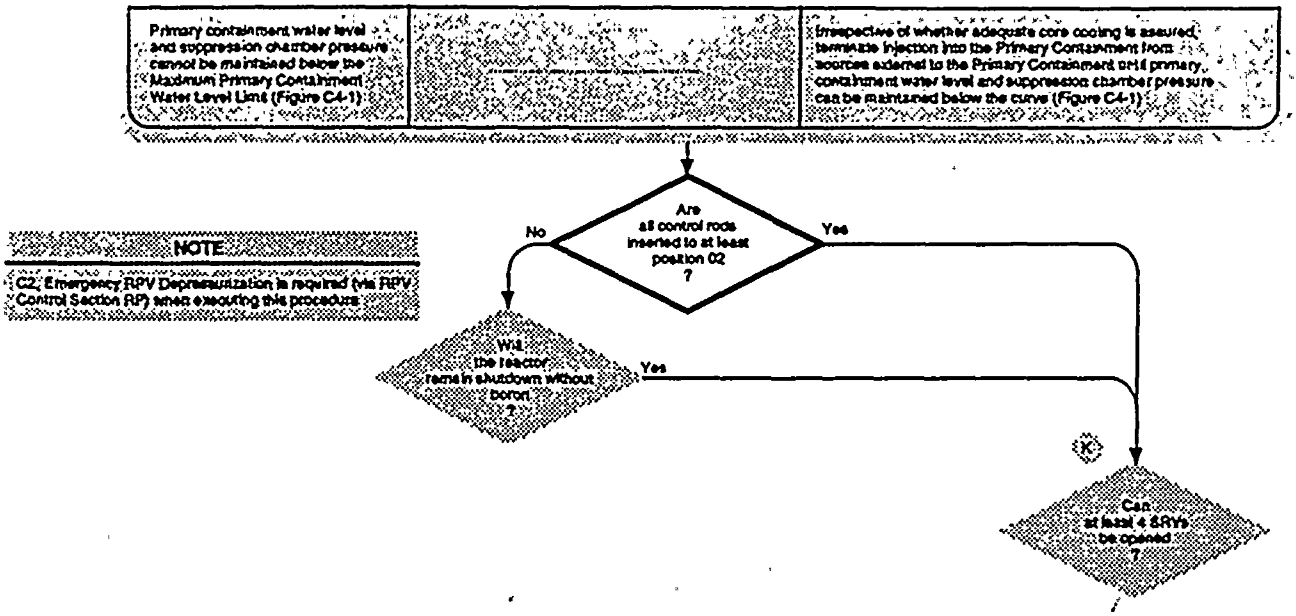
This action precludes any further increase in primary containment water level, and is authorized because the consequences of not doing so may be a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the containment may fail, an attendant loss of the suppression pool must be assumed with a consequent unrecoverable loss of adequate core cooling. Substantial amounts of radioactivity may be released to the general environment with a degraded core condition and loss of containment

DISCUSSION: (Continued)

integrity.

When it is necessary to make a choice between assuring primary containment integrity or adequate core cooling, the preference is toward assuring primary containment integrity, regardless of core conditions, in order to protect the general public.

STEP:

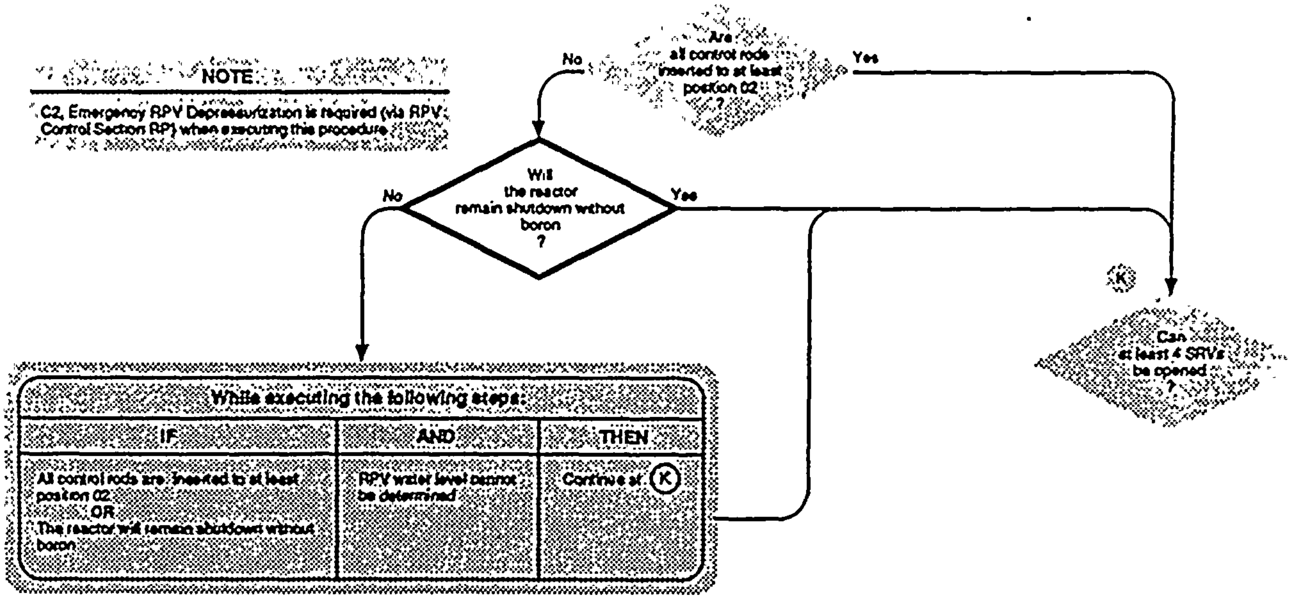


DISCUSSION:

Positive confirmation that the reactor will remain shutdown under all conditions is best obtained by determining that no control rod is withdrawn past the Maximum Subcritical Banked Withdrawal Position. The Maximum Subcritical Banked Withdrawal Position is the lowest control rod position to which all control rods may be withdrawn in bank and the reactor will remain shutdown under all conditions.

A YES answer to this step indicates that the reactor will not reach criticality during the floodup evolution. The operator is directed to continue in this procedure after point K where actions to floodup the RPV are addressed. A NO answer to this step directs the operator to the section where it will be determined if the reactor is shutdown under all conditions without boron, regardless of the position of the control rods.

STEP:



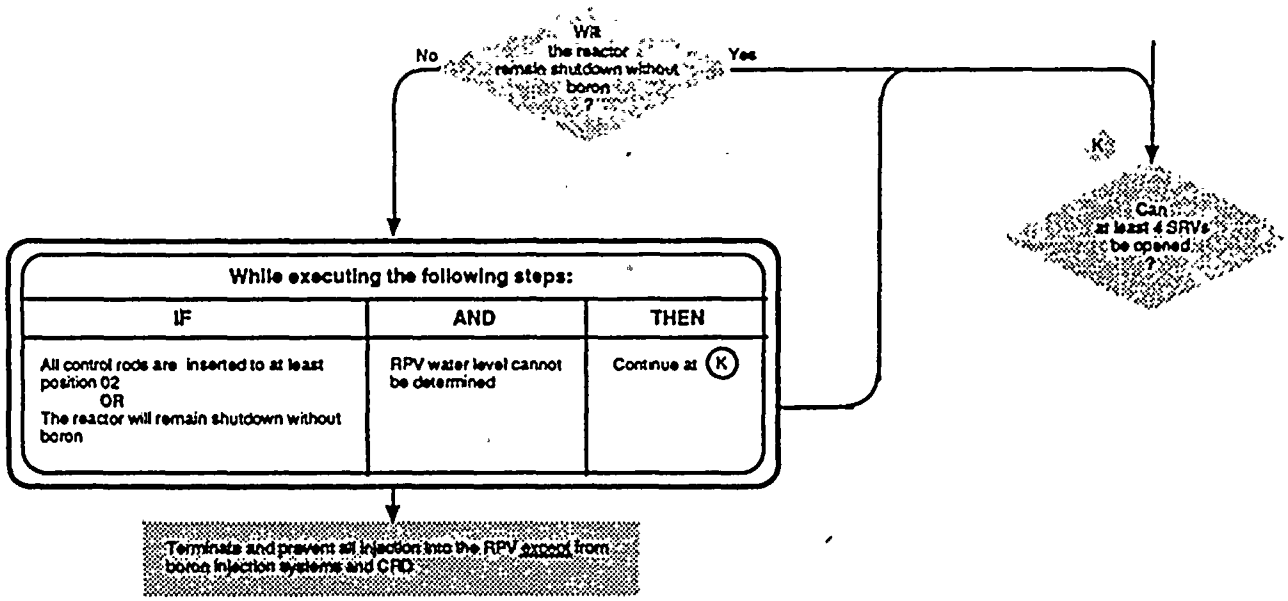
DISCUSSION:

Since it has been determined that all control rods are not inserted to or beyond position 02, the state of the core must be assessed by other means. This step addresses the condition where, even though all control rods may not be inserted to or beyond position 02, it has been determined that the reactor will remain shutdown for all possible conditions. Criteria for the determination that the reactor is, and will remain shutdown, may include the existence of the required shutdown margin with the highest worth control rod full out and all other control rods full in.

A YES answer to this step indicates that the reactor will not reach criticality during the floodup evolution. The operator is directed to continue in this procedure after point K where actions to floodup the RPV are addressed.

A NO answer to this step requires that measures be taken prior to the initiation of the floodup evolution that prevent the occurrence of a reactor power excursion and possible damage to the core.

STEP:

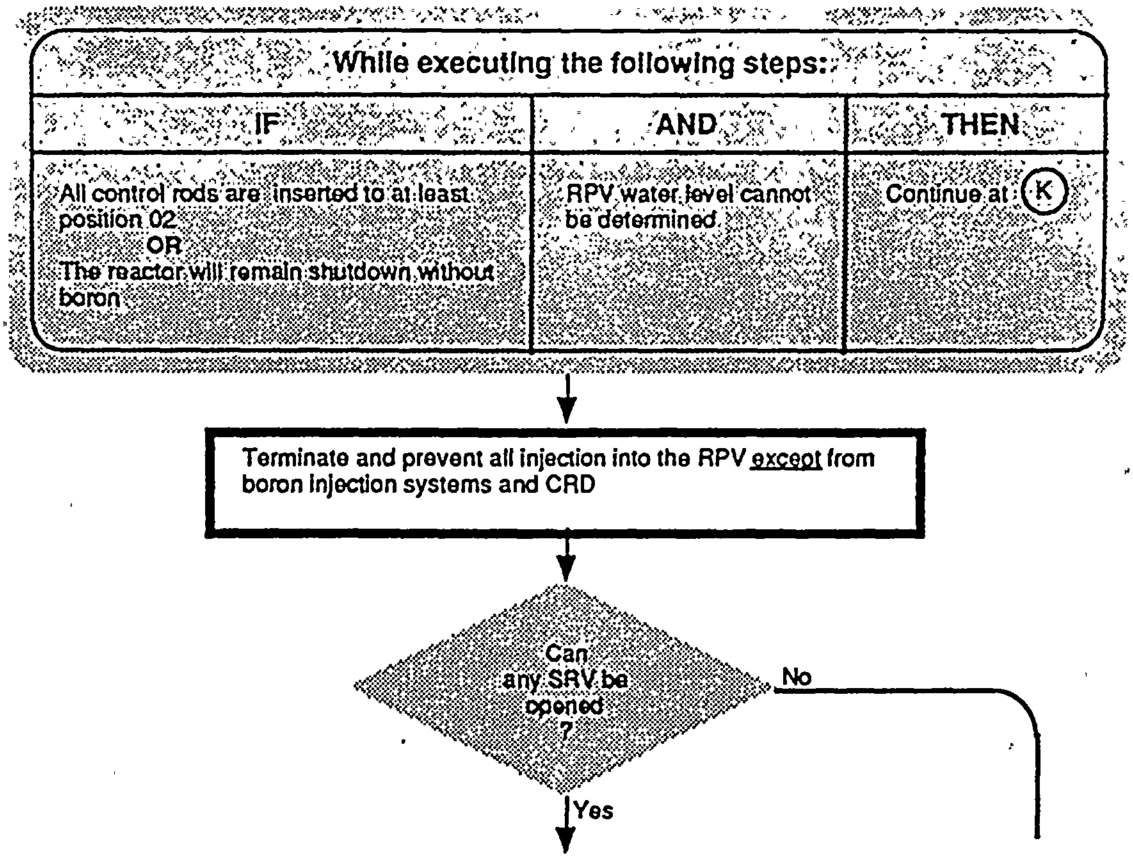


DISCUSSION:

This override will remain in effect as long as RPV flooding actions need to address potential reactor power excursions.

If concurrently executed steps in Section RQ of RPV Control have been successful in inserting a sufficient number of control rods such that reactor shutdown can be assured for all conditions without boron, there is no need to continue flooding the RPV as directed in this leg of the procedure. RPV flooding actions need no longer address potential reactor power excursions, and the instructions beginning at point K provide the appropriate direction.

STEP:



DISCUSSION:

When RPV flooding is required and less than the number of SRVs dedicated to ADS are open, then emergency RPV depressurization is also required. A rapid depressurization of the RPV can result in the rapid injection of large amounts of relatively cold, unborated water from low pressure injection systems as RPV pressure reaches and falls below the shutoff head of the pumps in these systems. The actions taken in this step to terminate and prevent injection into the RPV allow RPV depressurization to proceed safely under failure-to-scram conditions. Injection from boron injection systems and CRD is not terminated because operation of these systems may be required to establish and maintain the reactor in a shutdown condition.

The statement to "Terminate and prevent injection" means to take the most direct action which will stop and preclude injection flow into the RPV. Actions may include, as appropriate, closing the injection flow valve, tripping the pump, and deenergizing the electrical power supplying system components.

The following is a listing of preferred methods of terminating and preventing injection:

- HPCS Placing the pump control switch in PULL-TO-LOCK (PTL) is preferable to closing the injection valve due to the inability to remotely close the injection valve when RPV level is lowered to Level 2.

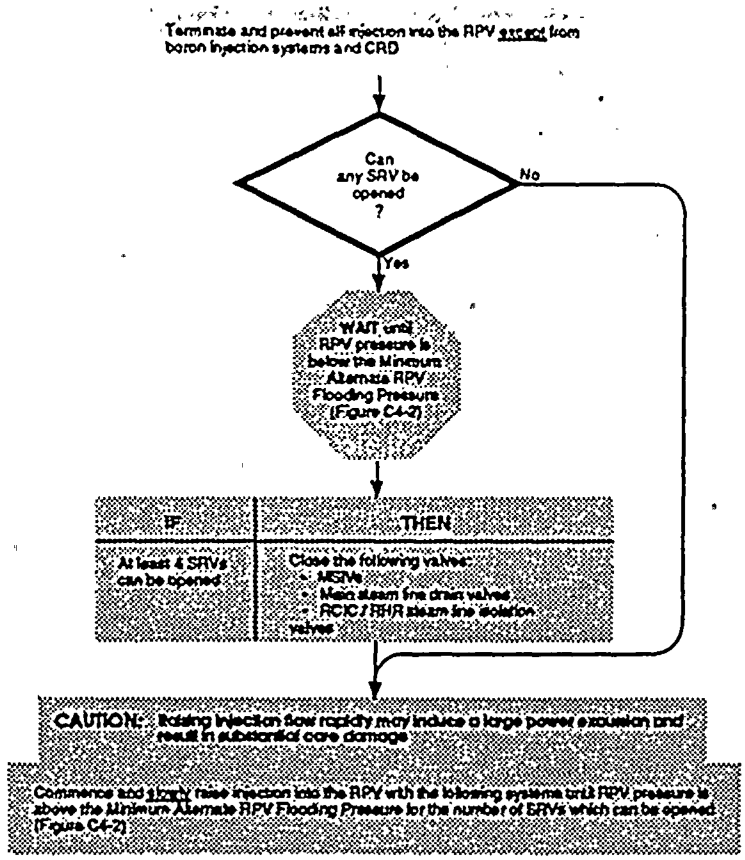
DISCUSSION: (Continued)

- LP ECCS Placing the pump control switch to PTL is preferred. The injection valve override will not work if a sealed in initiation signal does not exist.

- RCIC Tripping the turbine from the control room is preferred. It can be readily reset and restarted if need be from the control room.

When RPV pressure decreases to the Minimum Alternate RPV Flooding Pressure, injection into the RPV must be re-established to maintain adequate core cooling and to ultimately flood the RPV. If no SRV is open, injection into the RPV must be re-established for the same reason.

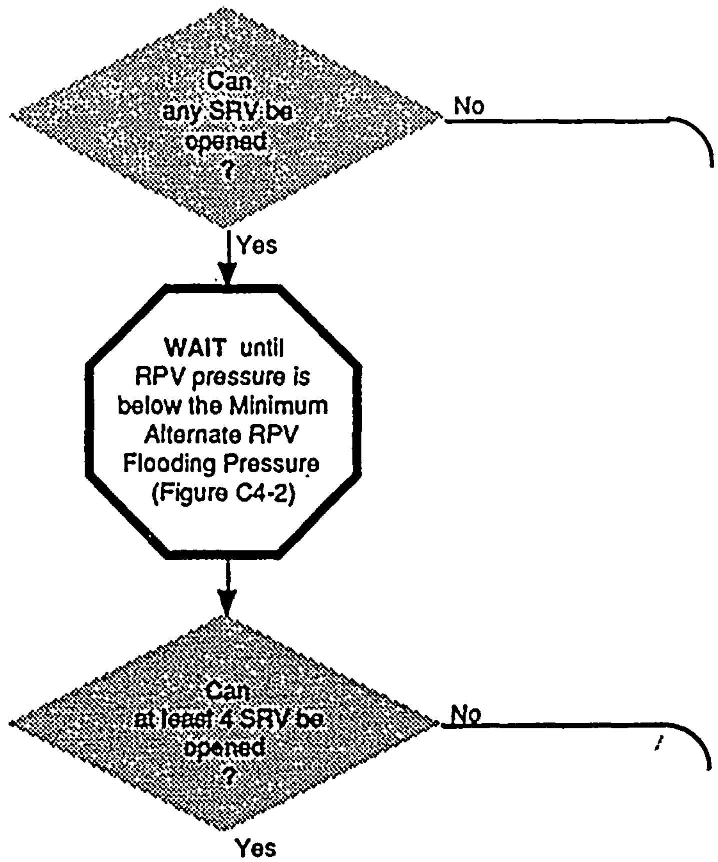
STEP:



DISCUSSION:

This step assures that the action to flood the RPV continues irrespective of the number of SRVs that are open or can be opened.

STEP:

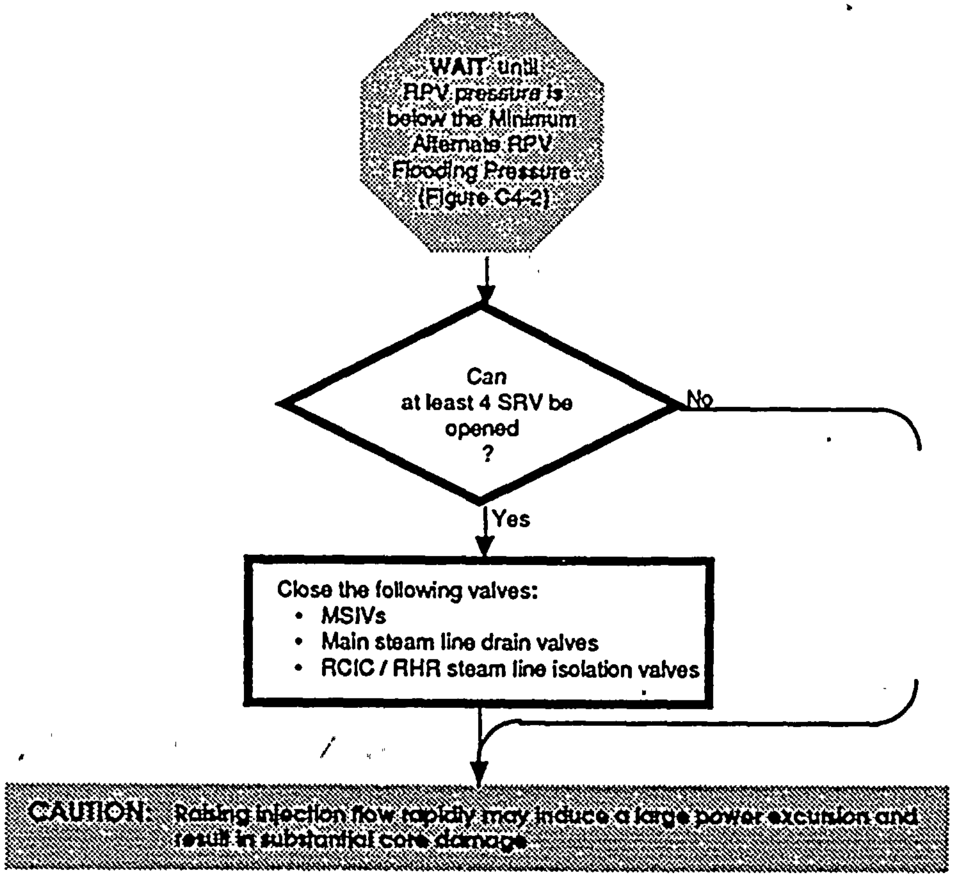


DISCUSSION:

This wait step cannot be exited until the stated condition is met.

The Minimum Alternate RPV Flooding Pressure (Figure C4-2, refer to Section C) is defined to be the lowest RPV pressure at which steam flow through open SRVs is sufficient to preclude the clad temperature of the hottest fuel rod from exceeding 1500°F, even if the reactor core is not completely covered or the reactor is at power. As long as RPV pressure remains above the Minimum Alternate RPV Flooding Pressure, the core is adequately cooled by a combination of submergence and steam cooling, irrespective of whether any water is being injected into the RPV or the reactor is at power. Once RPV pressure is below the Minimum Alternate RPV Flooding Pressure, further actions are directed to assure that the core remains adequately cooled.

STEP:



DISCUSSION:

Steam lines connected to the RPV are isolated prior to initiating actions to flood the RPV to preclude damage which may occur due to excessive thermal stress (cold water coming in contact with the hot RPV metal), excessive loading of lines or hangers not designed to accommodate the weight of water, and flooding of steam driven equipment (RCIC turbine, main turbine, etc.). Steam line isolation is performed, however, only if the status of SRVs assures that the RPV will remain depressurized during the flooding evolution. If less than the Minimum Number of SRVs Required for Emergency Depressurization (4) can be opened, steam line isolation is not appropriate because, as stated previously, the open steam lines provide the means of venting the RPV as the floodup progresses. Execution of the actions directed by this step is contingent upon the number of SRVs which can be opened.

The RCIC System is isolated in order to preserve its ability to provide RPV injection should it later be needed under conditions when all motor driven pumps are incapable of adequately flooding the RPV.

Performance of this step results in a loss of the main condenser when maintaining this heat sink appears most desirable in order to mitigate the consequences of failure-to-scram conditions. However, if the RPV is depressurized in accordance with Emergency Depressurization and significant reactor power is still

DISCUSSION: (Continued)

being generated, boron injection will be required shortly as the energy from RPV blowdown rapidly heats the suppression pool. Therefore, action to isolate steam lines is directed to limit boron depletion from the RPV during the ensuing floodup. Ultimately, failure to close the MSIVs risks damage to downstream equipment which may be needed during subsequent restorative actions.

STEP:

Close the following valves:
- MSIVs
- Main steam line drain valves
- RCIC / RHR steam line isolation valves

CAUTION: Raising injection flow rapidly may induce a large power excursion and result in substantial core damage

Commence and slowly raise injection into the RPV with the following systems until:
- At least one SRV is open

  AND
- RPV pressure is above the Minimum Alternate RPV Flooding Pressure for the number of SRVs which can be opened (Figure C4-2)

- Feedwater pumps
  - ☛ Defeat high RPV water level trip interlocks, if necessary (EOP-6, Att 20)
- Condensate pumps
- CRD (OP-30, Section H.7)

IF	THEN
No SRV is open	Commence and, irrespective of pump NPSH and vortex limits,

DISCUSSION:

Reestablishing injection into the RPV is required in order to adequately cool the core and ultimately flood the RPV. Since the reactor may become critical during this evolution, injection into the RPV is increased slowly to preclude the possibility of large power excursions caused by rapid injection of relatively cold, unborated water.

Injection at a rate sufficient to maintain RPV pressure above the Minimum Alternate RPV Flooding Pressure assures that either the RPV will flood to the main steam lines, or, if the reactor returns to criticality, the core will be adequately cooled by a combination of submergence and steam cooling.

The systems identified for use here are those which utilize motor driven pumps and which inject outside the core shroud. These systems are used in order to mix cold, unborated water injected into the RPV with warm, borated water prior to it reaching the core.

It is appropriate to defeat the high RPV water level trip of the motor driven pumps because the logic controlling these systems cannot sense RPV water level with any greater accuracy than an operator. If the logic could determine RPV water level, then the operator could determine RPV water level as well, and RPV flooding actions would not be necessary.

The operator is reminded that a rapid increase in injection with cold, unborated water into the RPV may induce a large power excursion and result in substantial core damage.

STEP:

CAUTION: Raising injection flow rapidly may induce a large power excursion and result in substantial core damage.

Commence and slowly raise injection into the RPV with the following systems until:

- At least one SRV is open

  AND
- RPV pressure is above the Minimum Alternate RPV Flooding Pressure for the number of SRVs which can be opened (Figure C4-2)

  - Feedwater pumps
    - Defeat high RPV water level trip interlocks, if necessary (EOP-6, Att 20)
  - Condensate pumps
  - CRD (OP-30, Section H.7)

IF	THEN
No SRV is open OR RPV pressure cannot be raised to above the Minimum Alternate RPV Flooding Pressure (Figure C4-2)	Commence and, irrespective of pump NPSH and vortex limits, slowly raise injection with the following systems until: • At least one SRV is open AND • RPV pressure is above the Minimum Alternate RPV Flooding Pressure for the number of SRVs which can be opened (Figure C4-2) • HPCS (EOP-6, Att 3) Defeat high RPV water level isolation interlocks, if necessary by placing E22A-S26 to TEST • LPCS (EOP-6, Att 3) • LPCI, with injection through the heat exchangers as soon as possible (EOP-6, Att 3) • RHR Service Water crosstie (EOP-6, Att 5) • Fire System (EOP-6, Att 6) • ECCS Keep-Full systems (EOP-6, Att 7) • Condensate Transfer (EOP-6, Att 8)

IF	THEN
No SRV is open OR RPV pressure cannot be raised to above the Minimum Alternate RPV Flooding Pressure (Figure C4-2)	PRIMARY CONTAINMENT FLOODING IS REQUIRED; exit this procedure and enter C6, Primary Containment Flooding and RPV Control Section RF at (C) and execute them concurrently.

(C) Primary Containment Control Section SPL

DISCUSSION:

If no SRVs are open or if RPV pressure cannot be maintained above the Minimum Alternate Flooding Pressure using the preferred systems, use of alternate systems is required. The systems identified here are those which either inject inside the core shroud or which take suction on sources of comparatively low quality water.

This step directs the operator to utilize these additional systems in order to assure adequate core cooling while the floodup evolution continues. Prompt restoration of injection flow to assure adequate core cooling dictates that adherence to NPSH and Vortex limits is not required.

In order to maximize the availability of HPCS System, permission is given to defeat the high RPV water level interlock. Defeating this interlock is specifically appropriate when RPV water level cannot be determined because water level instruments may have failed in the off-scale high direction and, coincidentally, may be the only reason this system is unavailable for injection.

STEP:

IF	THEN
No SRV is open OR RPV pressure cannot be raised to above the Minimum Alternate RPV Flooding Pressure (Figure C4-2)	Commence and, irrespective of pump NPSH and vortex limits, slowly raise injection with the following systems until RPV pressure is above the Minimum Alternate RPV Flooding Pressure for the number of SRVs which can be opened (Figure C4-2) • HPCS (EOP-6, Att 3) ☛ Defeat high RPV water level isolation interlocks, if necessary (EOP-6, Att 19) • LPCS (EOP-6, Att 3) • LPCI, with injection through the heat exchangers as soon as possible (EOP-6, Att 3) • RHR Service Water crosstie (EOP-6, Att 5) • Fire System (EOP-6, Att 6) • ECCS Keep-Full systems (EOP-6, Att 7) • Condensate Transfer (EOP-6, Att 8)

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IF	THEN	
No SRV is open OR RPV pressure cannot be raised to above the Minimum Alternate RPV Flooding Pressure (Figure C4-2)	PRIMARY CONTAINMENT FLOODING IS REQUIRED; Exit this procedure and enter C6, Primary Containment Flooding and RPV Control Section RP at (C) and execute them concurrently.	O Primary Containment Control Section SPL

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Control injection to maintain RPV pressure above the Minimum Alternate RPV Flooding Pressure for the number of SRVs which can be opened (Figure C4-2); but as low as practicable

DISCUSSION:

This step once again asks the operator if the injection systems currently being operated are assuring adequate core cooling while the floodup evolution is in progress.

If conditions indicate that adequate core cooling is assured, the operator is directed to continue in this procedure where actions to control and maintain injection flow rate are addressed.

When injection into the RPV with the indicated systems fails to maintain the required number of SRVs open and RPV pressure cannot be increased to the Minimum Alternate RPV Flooding Pressure (Figure C4-2, refer to Section C), RPV flooding is not being effected and adequate core cooling is threatened. As a last resort, RPV flooding actions are abandoned and submergence of the core is attempted through flooding of the primary containment. Control of RPV pressure is returned to the actions specified in RPV Control, Section RP point C, while instructions to restore RPV water level are transferred to Contingency #6, Primary Containment Flooding.

STEP:

IF	THEN	
No SRV is open OR RPV pressure cannot be raised to above the Minimum Alternate RPV Flooding Pressure (Figure C4-2)	PRIMARY CONTAINMENT FLOODING IS REQUIRED; Exit this procedure and enter C6, Primary Containment Flooding and RPV Control Section RP at (C) and execute them concurrently.	Primary Containment Control Section SPL

Control injection to maintain RPV pressure above the Minimum Alternate RPV Flooding Pressure for the number of SRVs which can be opened (Figure C4-2), but as low as practicable

WAIT until
All control rods are inserted to at least position 02
OR
The reactor will remain shutdown without boron

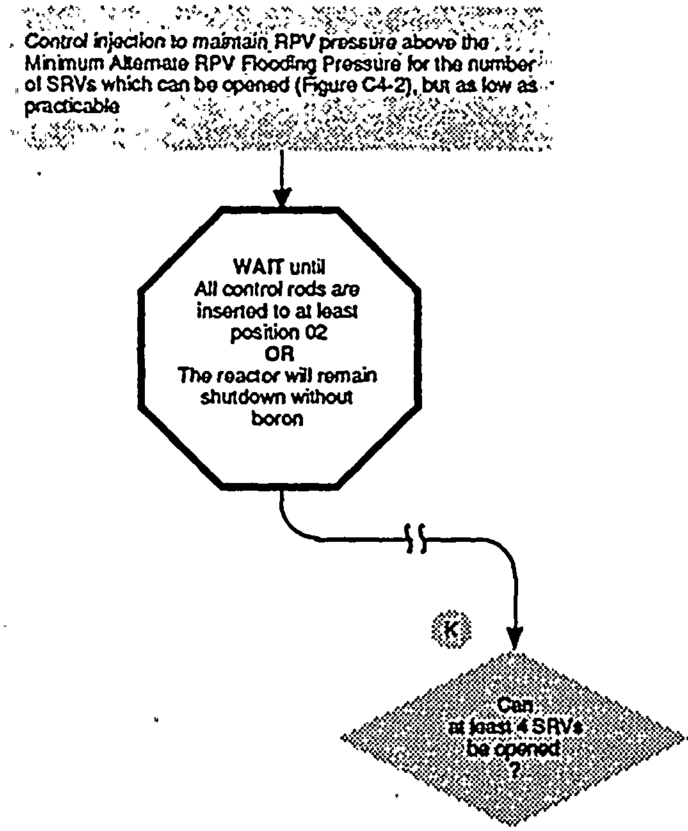
DISCUSSION:

Once the required conditions for RPV Flooding have been established, throttling injection flow to maintain RPV pressure above the Minimum Alternate RPV Flooding Pressure (Figure C4-2, refer to Section C) assures that either the RPV will ultimately be flooded to the main steam lines or that the core will be adequately cooled by a combination of submergence and steam cooling.

RPV pressure should be maintained above the Minimum Alternate RPV Flooding Pressure (Figure C4-2, refer to Section C), but as low as practicable to minimize injection flow requirements, SRV tail pipe loading, primary containment heatup, and boron dilution.

Should the reactor be shutdown with boron with RPV water level raised to the main steam lines, boron dilution will follow and the reactor may return to criticality. The subsequent increase in reactor power will require a reduction in injection to maintain RPV pressure near the Minimum Alternate RPV Flooding Pressure (Figure C4-2, refer to Section C). This action will result in a reduction in RPV water level to below the main steam lines, limiting the boron dilution.

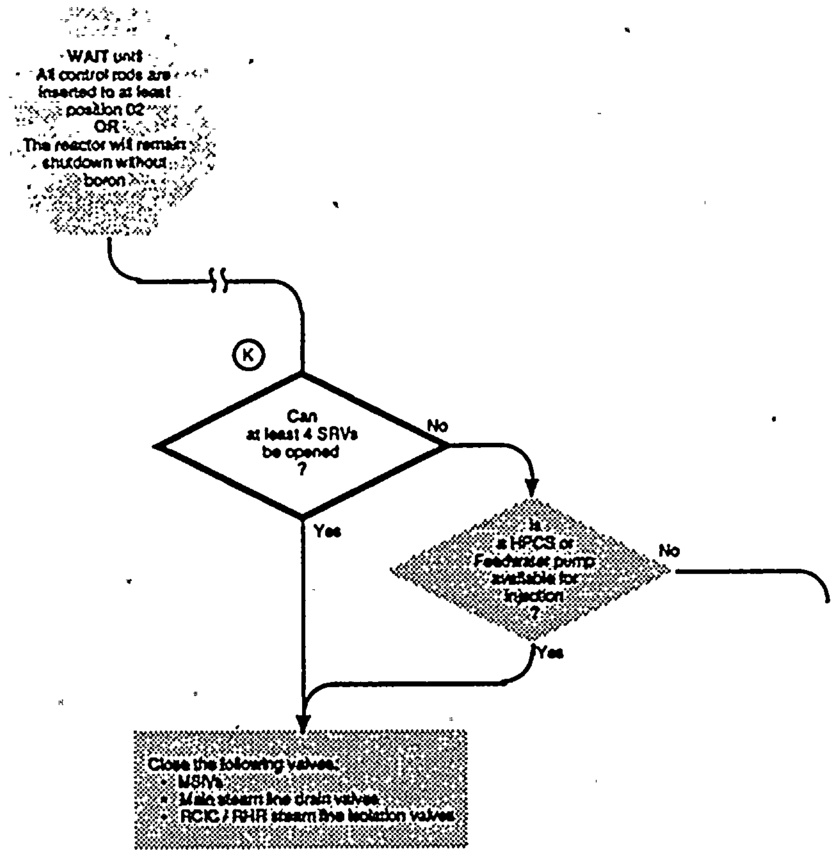
STEP:



DISCUSSION:

When either condition specified in this step has been satisfied, the reactor is shutdown and will remain shutdown with the RPV flooded. It is appropriate to continue in this procedure and carry out steps which specify actions required to flood a shutdown reactor when the addition of cold, unborated water is no longer a concern.

STEP:



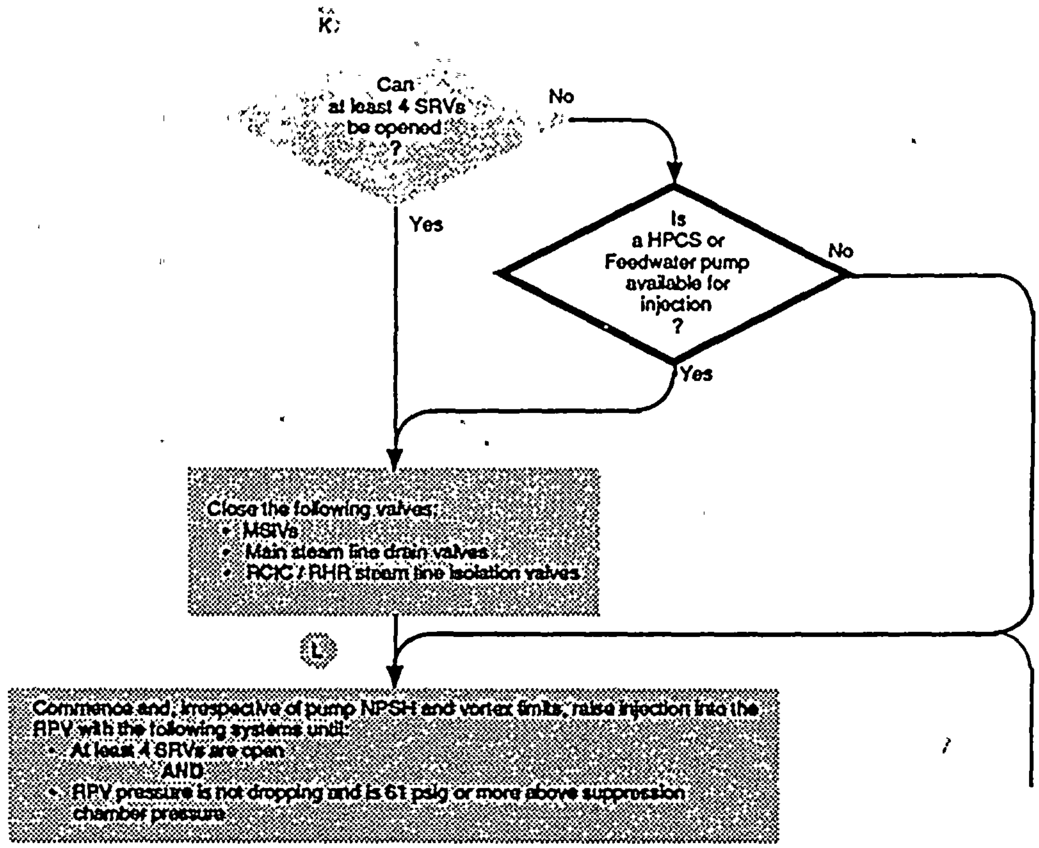
DISCUSSION:

The operator is directed to this step when either of two conditions have been met: All control rods are inserted to or beyond position 02; or it has been determined that the reactor will remain shutdown under all conditions without boron.

This step asks the operator about the status of the number of SRVs open to determine whether the RPV will be adequately vented during the floodup evolution. Four SRVs are required to be open during floodup to ensure that the RPV will remain depressurized. If at least four SRVs can be opened, the operator is directed to the step where actions are specified for isolating steam driven equipment.

If less than four SRVs can be opened, the operator is directed to a second condition that determines if RPV flooding should commence without isolation of steam equipment.

STEP:

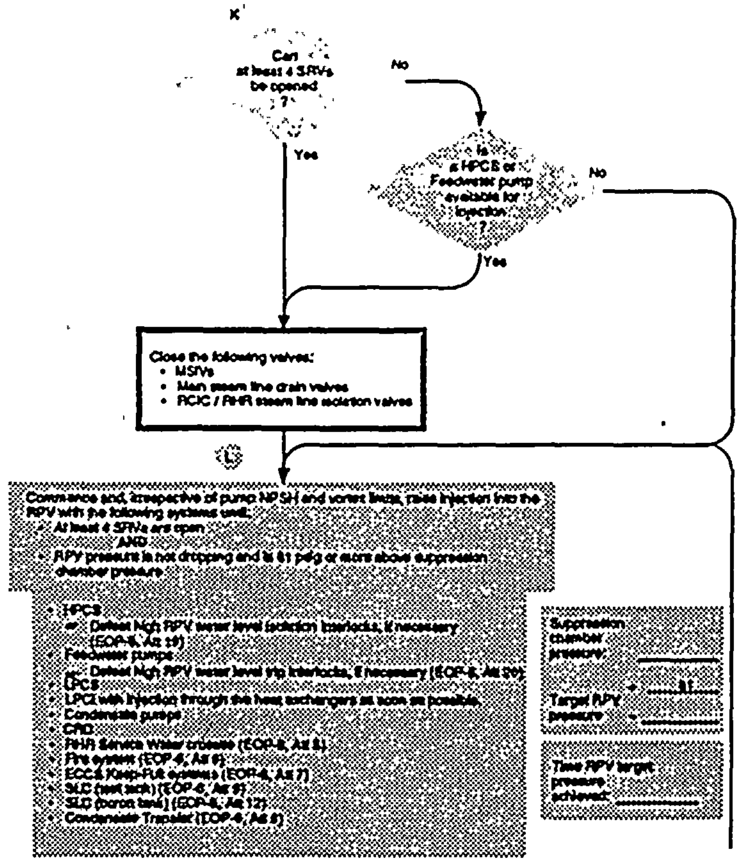


DISCUSSION:

If either the High Pressure Core Spray (HPCS) pump or a feedwater pump is available for injection, then the operator is directed to isolate the steam lines in the next step. These pumps are capable of flooding the RPV at high pressure. Steam driven equipment and piping need to be protected during the RPV floodup.

If neither a HPCS nor a Feedwater pump is available, the step for isolation of the steam lines is not performed in order to maximize the availability of additional depressurization paths.

STEP:

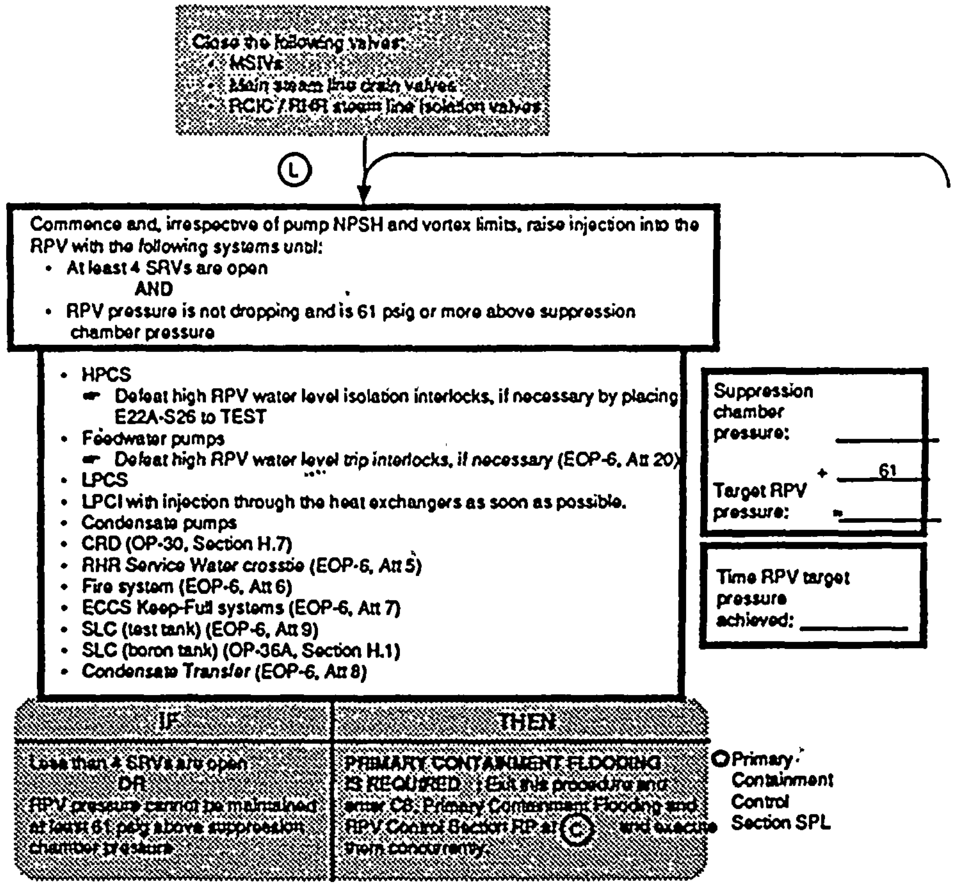


DISCUSSION:

This step is performed if at least four SRVs can be opened or if the HPCS or a feed pump is available for injection into the RPV. Steam lines connected to the RPV must be isolated prior to initiating actions to flood the RPV to preclude damage which may occur due to excessive thermal stress (cold water coming in contact with the hot RPV metal), excessive loading of lines or hangers not designed to accommodate the weight of water, and flooding of steam driven equipment (RCIC turbine, main turbine, etc.).

If less than the Minimum Number of SRVs Required for Emergency Depressurization (4) can be opened or the HPCS or a feed pump is not available for injection into the RPV, steam line isolation is not appropriate because, the open steam lines provide the means of venting the RPV as the floodup progresses.

STEP:



DISCUSSION:

This step requires that injection into the RPV be increased until the following three conditions are satisfied:

RPV pressure must be greater than suppression chamber pressure by at least the Minimum RPV Flooding Pressure. This ensures more than enough steam is flowing through the SRVs to remove all decay heat.

RPV pressure must not be decreasing. This ensures that the required steam flow will be maintained.

At least the Minimum Number of SRVs Required for Emergency Depressurization must be open. This ensures that the requisite steam flow will exist when RPV pressure is above the Minimum RPV Flooding Pressure.

The Minimum RPV Flooding Pressure has been determined to be 61 psig. It is defined to be the lowest differential pressure between the RPV and the suppression chamber at which steam flow through the Minimum Number of SRVs Required for Emergency Depressurization (4) is sufficient to remove decay heat.

The decay heat generation rate used in making the determination of this minimum pressure is that which corresponds to conditions ten minutes after shutdown from full power. Since ten minutes is the earliest that RPV flooding could reasonably be expected to be required, establishing and maintaining RPV pressure above the Minimum RPV Flooding Pressure assures that more than enough steam flows through the SRVs to carry away all core decay heat. This

DISCUSSION: (Continued)

requires that a sufficient quantity of water reach the core to carry away decay heat by boiling, which in turn requires that RPV water level increase. Maintaining this minimum RPV pressure (and thus steam flow) assures that the RPV will ultimately flood to the main steam lines. Since the primary containment could be pressurized during performance of this step, the Minimum RPV Flooding Pressure is expressed as a differential pressure across the SRVs (i.e., RPV pressure minus suppression chamber pressure).

The injection systems identified in this step consist of all of the motor driven systems which may be used for injection into the RPV. As many of these systems as necessary should be used to establish and maintain the three conditions required for verification of RPV flooding.

In order to maximize the availability of the HPCS and Feedwater Systems, authorization is provided to defeat the high RPV water level interlock. Defeating this interlock is appropriate when RPV water level cannot be determined because RPV water level instruments may have failed in the off-scale high direction an may be the only reason these systems are unavailable for injection.

The purpose of injecting through the RHR heat exchangers as soon as possible is to promote rapid removal of heat from the primary containment, thus minimizing suppression pool heatup and prolonging the availability of the suppression pool as a heat sink. As used in this step, the phrase "as soon as possible" means the earliest practical time within the constraints imposed by system conditions, valve control logic, and concurrently required operator actions.

STEP:

- HPCS
  - Defeat high RPV water level isolation interlocks, if necessary (EOP-6, Att 19)
- Feedwater pumps
  - Defeat high RPV water level trip interlocks, if necessary (EOP-6, Att 20)
- LPCS
- LPCI with injection through the heat exchangers as soon as possible
- Condensate pumps
- CRD
- RHR Service Water crosstie (EOP-6, Att 5)
- Fire system (EOP-6, Att 6)
- ECCS Keep-Full systems (EOP-6, Att 7)
- SLC (test tank) (EOP-6, Att 9)
- SLC (boron tank) (EOP-6, Att 12)
- Condensate Transfer (EOP-6, Att 8)

Suppression chamber pressure: ______
\+ 61
Target RPV pressure = ______

Time RPV target pressure achieved: ______

IF	THEN
Less than 4 SRVs are open OR RPV pressure cannot be maintained at least 61 psig above suppression chamber pressure	PRIMARY CONTAINMENT FLOODING IS REQUIRED; Exit this procedure and enter C6, Primary Containment Flooding and RPV Control Section RP at (C) and execute them concurrently.

Primary Containment Control Section SPL

Control injection to maintain at least 4 SRVs open and RPV pressure at least 61 psig above suppression chamber pressure, but as low as practicable

DISCUSSION:

When injection into the RPV with the indicated systems fails to maintain the required Minimum Number of SRVs Required for Emergency Depressurization (4) open and RPV pressure cannot be increased to 61 psig above suppression chamber pressure, RPV flooding is not being effected and adequate core cooling is threatened. As a last resort, RPV flooding actions are abandoned and submergence of the core is attempted through flooding of the primary containment. Control of RPV pressure is returned to the actions specified in RPV Control, Section RP point C, while instructions to restore RPV water level are transferred to Contingency #6, Primary Containment Flooding.

STEP:

IF	THEN
Less than 4 SRVs are open OR RPV pressure cannot be maintained at least 61 psig above suppression chamber pressure	PRIMARY CONTAINMENT FLOODING IS REQUIRED; Exit this procedure and enter C6, Primary Containment Flooding and RPV Control Section RP at (C) and execute them concurrently.

Primary Containment Control Section SPL

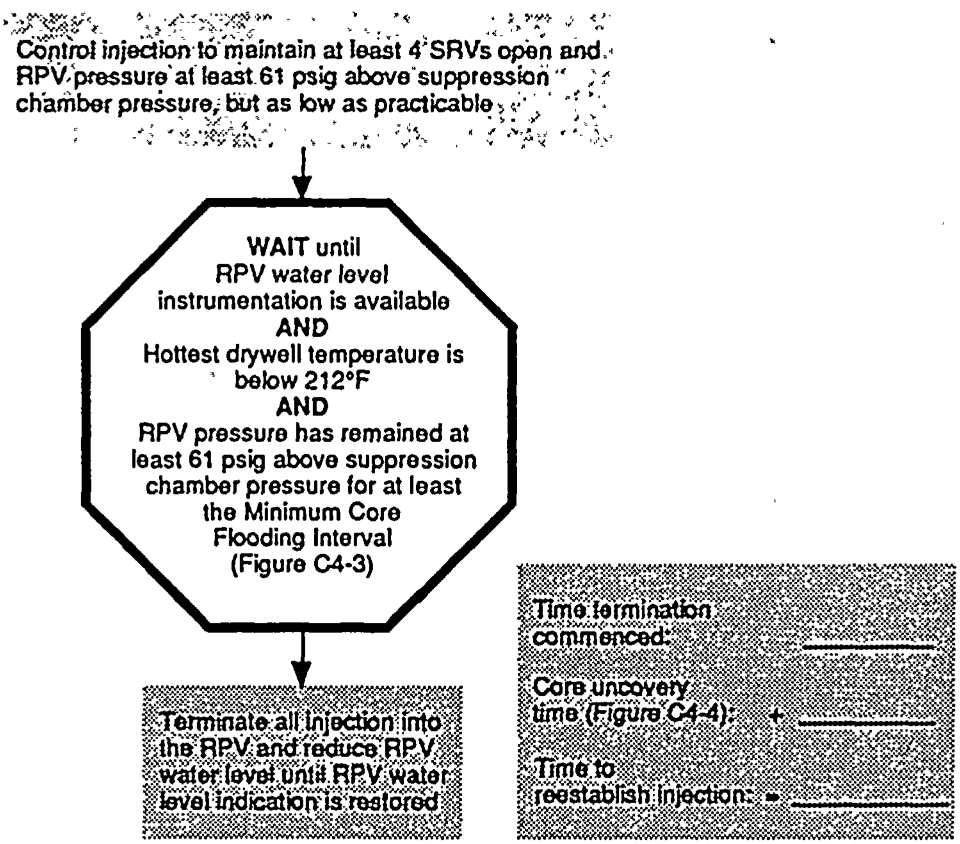
Control injection to maintain at least 4 SRVs open and RPV pressure at least 61 psig above suppression chamber pressure, but as low as practicable

WAIT until RPV water level instrumentation is available
AND
Hottest drywell temperature is below 212°F
AND
RPV pressure has remained at least 61 psig above suppression chamber pressure for at least the Minimum Core Flooding Interval (Figure C4-3)

DISCUSSION:

Once 4 SRVs have been opened and the Minimum RPV Flooding Pressure has been established, these conditions must be maintained to assure that the RPV will flood and remain flooded. Throttling injection flow to as low as practicable, yet consistent with maintaining the required RPV pressure, minimizes the hydraulic loads on the RPV, SRVs, and downstream piping.

STEP:



DISCUSSION:

Injection into the RPV should not be terminated until RPV water level instrumentation is available for direct determination of RPV water level. Since the RPV will be flooded when this step is reached, most RPV water level indicators will be off-scale high. Determination of instrument availability must include an evaluation of the hottest drywell temperature, instrument power supply, system piping integrity, etc., to verify that the upscale indication is not the result of a failed instrument or instrument system. This may also include filling all RPV water level instrument reference legs if such action is deemed necessary.

The Minimum Core Flooding Interval (Figure C4-3, refer to Section C) is defined to be the greatest amount of time required to flood the RPV to the top of the active fuel with RPV pressure at the Minimum RPV Flooding Pressure (for the number of SRVs open).

RPV flooding is continued with RPV pressure raised to at least the Minimum RPV Flooding Pressure for at least the amount of time required by the Minimum Core Flooding Interval (Figure C4-3, refer to Section C). This will provide the required assurance that the RPV is filled to or above the top of the active fuel before recovery from the flooding evolution is initiated.

The flooding time may be reduced by opening additional SRVs and raisinginjection flow to maintain the required RPV flooding pressure rather than raising injection flow and raising

DISCUSSION: (Continued)

RPV pressure with no change in the number of open SRVs. This serves to limit hydraulic loads on the RPV and primary systems by conducting the flooding evolution at the lowest possible RPV pressure above the Minimum RPV Flooding Pressure (61 PSIG).

Once the Minimum Core Flooding Interval (Figure C4-3, refer to Section C) begins, it is mandatory that RPV pressure always remain above the Minimum RPV Flooding Pressure (61 PSIG) and the number of open SRVs be held constant. Otherwise, the flooding interval must be repeated in its entirety with no credit taken for time previously spent in flooding the RPV. The operator records the time injection is terminated in order to determine if RPV water level indication is restored within the allowed time limits of the Maximum Core Uncovery Time Limit (Figure C4-4, refer to Section C).

STEP:

WAIT until
RPV water level
instrumentation is available
AND
Hottest drywell temperature is
below 212°F
AND
RPV pressure has remained at
least 61 psig above suppression
chamber pressure for at least
the Minimum Core
Flooding Interval
(Figure C4-3)

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

Time termination commenced: ________

Core uncovery time (Figure C4-4): + ________

Time to reestablish injection: = ________

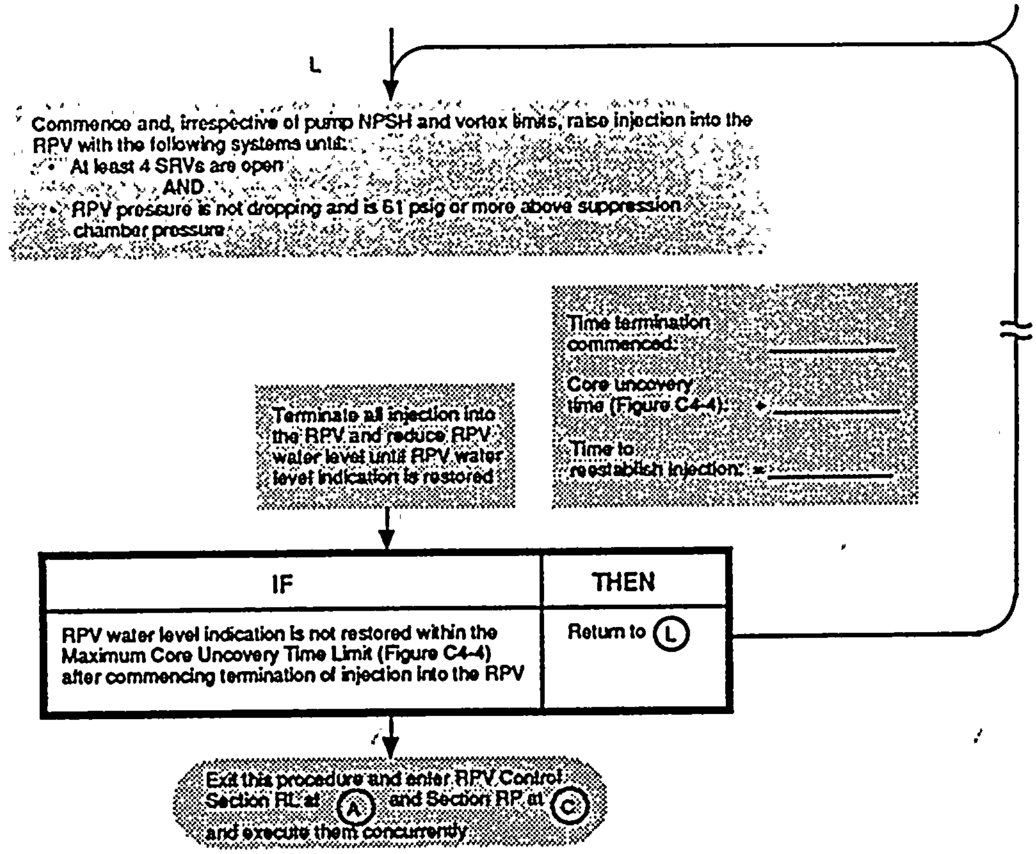
IF	THEN
RPV water level indication is not restored within the Maximum Core Uncovery Time Limit (Figure C4-4) after commencing termination of injection into the RPV	Return to (L)

DISCUSSION:

This step directs the operator to terminate injection into the RPV and reduce RPV water level until RPV water level indication is restored.

Restoration of RPV water level indication is achieved when a consistent change in a RPV water instrument reading is observed or a trend between RPV water level instruments is established.

STEP:



DISCUSSION:

The time allowed for RPV water level to be restored following termination of injection must be bounded to assure that adequate core cooling is not compromised while waiting for on-scale indication. This time limit is termed the Maximum Core Uncovery Time Limit (Figure C4-4). It is defined as the greatest amount of time that the reactor core can remain completely uncovered with no heat transfer to water or steam, and the clad temperature of the hottest fuel rod not exceeding 1500°F.

If RPV water level indication is not restored per the time limit, injection into the RPV must be reestablished to assure continued adequate core cooling. The operator is directed to continue in this procedure at point L where actions to reflood the RPV will be addressed.

STEP:

IF	THEN
RPV water level indication is not restored within the Maximum Core Uncovery Time Limit (Figure C4-4) after commencing termination of injection into the RPV	Return to (L)

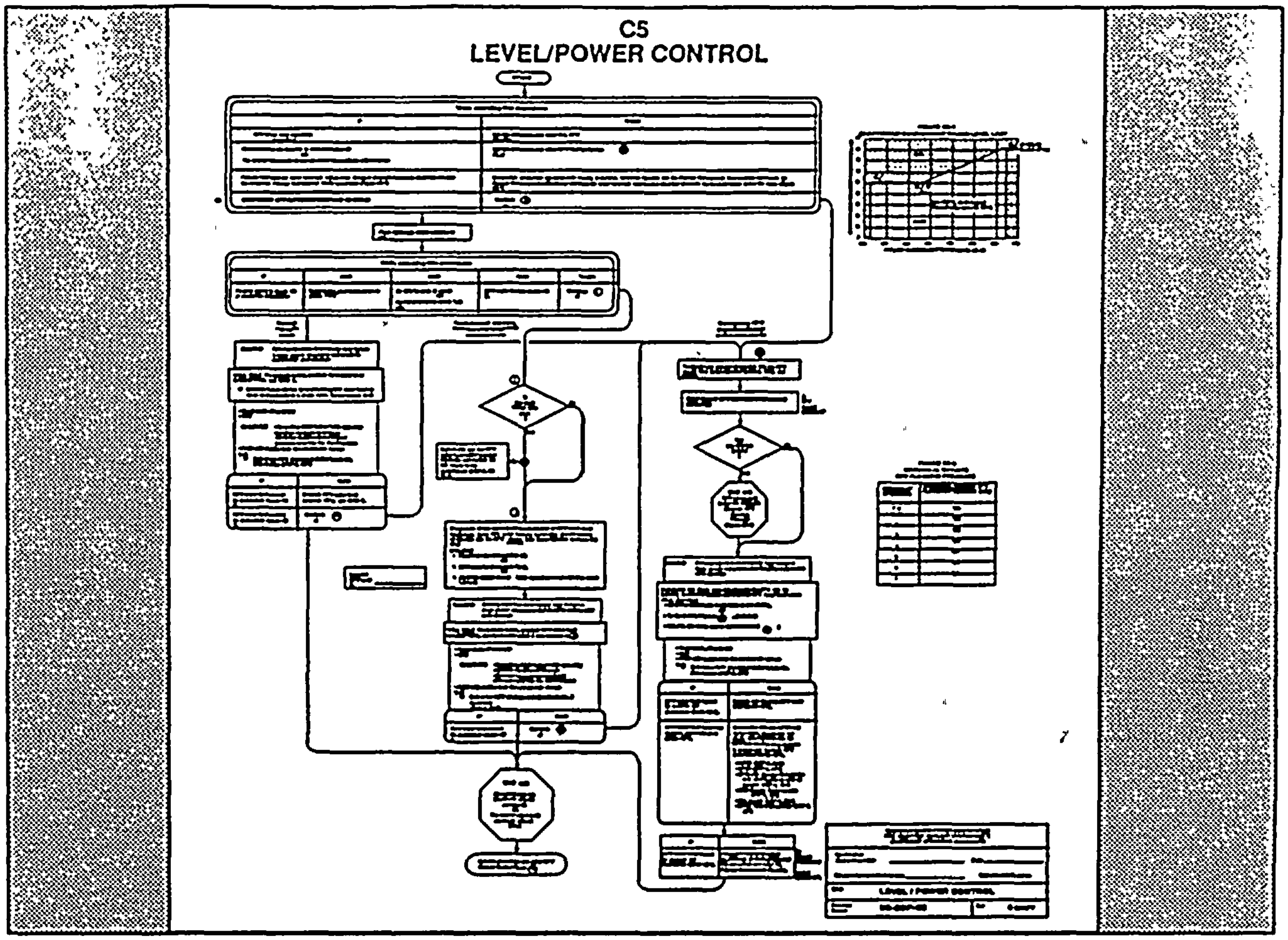
↓

Exit this procedure and enter RPV Control Section RL at (A) and Section RP at (C) and execute them concurrently

DISCUSSION:

This step directs the operator to exit the RPV Flooding procedure once RPV water level can be determined. Appropriate actions for controlling RPV pressure and RPV water level are provided in RPV Control, Section RL at point A and Section RP at point C. Since the reactor must be shutdown under all conditions without boron or on control rod insertion alone to reach this step, it is not necessary for the operator to enter Section RQ of RPV Control.

LEVEL/POWER CONTROL



PURPOSE:

The actions specified in N2-EOP-C5, Level/ Power Control, effect control of RPV water level when it cannot be determined that control rod insertion alone will assure that the reactor will remain shutdown under all conditions.

The actions to control RPV water level in N2-EOP-C5, Level/Power Control, differ from those in the N2-EOP-RPV, RPV Control, Section RL, and address the following three basic concerns:

- When boron is injected into the RPV, the systems used for control of RPV water level must be operated so as to minimize boron dilution, minimize water injection, and promote boron mixing.
- If the reactor cannot be shutdown and suppression pool temperature continues to rise, RPV water level must be controlled not only to adequately cool the core, but also to minimize suppression pool heatup.
- Even if boron has not been injected into the RPV and the reactor is shutdown with control rods under hot conditions, injection of cold water could cause criticality with no negative feedback to turn power until reactor power increases to the heating range.

PURPOSE: (Continued)

When necessary, N2-EOP-C5, Level/Power Control, specifies unique actions to address these concerns. Some of these unique actions are:

- Reducing reactor power by deliberately lowering RPV water level.
- Prioritizing and restricting the use of injection systems.
- Controlling the injection of cold water.
- Delaying RPV cooldown until reactor shutdown has been assured by control rod insertion.

The procedure is broken down into three sections which correspond to the three columns on the flowchart:

1. Normal level,
2. Containment concern, lowered level, and
3. Emergency RPV Depressurization.

ENTRY:

START

While executing this procedure:

IF	THEN
RPV water level cannot be determined	Exit this procedure and enter C-4, RPV Flooding
All control rods are inserted to at least position 02 OR The reactor will remain shutdown under all conditions without boron	Exit this procedure and enter RPV Control Section RL at (A)
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C5-1)	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 curve (Figure C5-1)
* EMERGENCY RPV DEPRESSURIZATION IS REQUIRED	Continue at (H)

DISCUSSION:

N2-EOP-C5, Level/Power Control, is entered from the following procedures:

N2-EOP-RPV, RPV Control, from the RPV water level (RL) section, IF any control rod cannot be determined to be inserted to position 02 (Maximum Subcritical Banked Withdrawal Position) AND it has not not been determined that the reactor will remain shutdown under all conditions without boron.

N2-EOP-C1, Alternate Level Control, IF any control rod cannot be determined to be inserted to or beyond position 02 (Maximum Subcritical Banked Withdrawal Position) AND it has not been determined that the reactor will remain shutdown under all conditions without boron.

N2-EOP-C4, RPV Flooding, IF RPV water level can be determined AND any control rod cannot be determined to be inserted to or beyond position 02 (Maximum Subcritical Banked Withdrawal Position) AND it has not been determined that the reactor will remain shutdown under all conditions without boron.

When RPV water level cannot be determined, N2-EOP-C4, RPV Flooding, provides the appropriate instructions for flooding the RPV when any control rod cannot be determined to be inserted to or beyond position 02. If while

DISCUSSION: (Continued)

performing N2-EOP-C4, RPV Flooding, plant conditions change such that RPV flooding is no longer required, the appropriate steps for continued control of RPV water level are provided in N2-EOP-C5, Level/Power Control.

When a condition occurs which requires entry into N2-EOP-C5, Level/Power Control, the previously effective RPV water level control portions of the EOPs are exited (N2-EOP-RPV, RPV Control, Section RL, N2-EOP-C1, Alternate Level Control, or N2-EOP-C4, RPV Flooding) and subsequent direction for controlling RPV water level is provided in N2-EOP-C5, Level/Power Control. This hierarchical structure for transferring operator actions avoids any possibility of having concurrent but, conflicting instructions for controlling RPV water level.

STEP:

START

While executing this procedure:	
IF	**THEN**
RPV water level cannot be determined	Exit this procedure and enter C-4, RPV Flooding
All control rods are inserted to at least position 02 OR The reactor will remain shutdown under all conditions without boron	Exit this procedure and enter RPV Control Section RL at (A)
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C5-1)	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 curve (Figure C5-1)
* EMERGENCY RPV DEPRESSURIZATION IS REQUIRED	Continue at (H)

DISCUSSION:

This step is an override and applies throughout the performance of the remainder of this procedure.

The actions performed in N2-EOP-C5, Level/ Power Control, require the ability to determine that RPV water level is being maintained within a specified range. When RPV water level cannot be determined, N2-EOP-C5, Level/ Power Control, cannot be executed, and N2-EOP-C4, RPV Flooding, must be entered to assure continued adequate core cooling.

STEP:

START

While executing this procedure:

IF	THEN
RPV water level cannot be determined	Exit this procedure and enter C-4, RPV Flooding
All control rods are inserted to at least position 02 OR The reactor will remain shutdown under all conditions without boron	Exit this procedure and enter RPV Control Section RL at (A)
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C5-1)	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 curve (Figure C5-1)
* EMERGENCY RPV DEPRESSURIZATION IS REQUIRED	Continue at (H)

DISCUSSION:

This step is an override and applies throughout the performance of the remainder of this procedure.

When the condition which required entry into N2-EOP-C5, Level/Power Control, no longer exists (i.e. the reactor will remain shutdown on control rod insertion alone for all conditions of boron concentration and RPV water temperature), it is appropriate to return to the RPV Water Level (RL) Section (at point A) of N2-EOP-RPV, RPV Control, in order to restore and maintain RPV water level in its normal range.

STEP:

START

While executing this procedure:	
IF	**THEN**
RPV water level cannot be determined	Exit this procedure and enter C-4, RPV Flooding
All control rods are inserted to at least position 02 OR The reactor will remain shutdown under all conditions without boron	Exit this procedure and enter RPV Control Section RL at (A)
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C5-1)	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 curve (Figure C5-1)
* EMERGENCY RPV DEPRESSURIZATION IS REQUIRED	Continue at (H)

DISCUSSION:

This step is an override step and applies throughout the performance of the remainder of this procedure.

With a non-isolated primary system break inside the drywell, injection into the primary containment or RPV from sources external to the primary containment will cause primary containment water level to increase. If injection is continued and the Maximum Primary Containment Water Level Limit is exceeded, the structural integrity of the primary containment is no longer assured. The Maximum Primary Containment Water Level Limit is defined to be the lesser of either: (1) The elevation of the highest containment vent capable of rejecting all core decay heat, or (2) the highest containment water level which will not result in exceeding the pressure capability of the containment. The Nine Mile Point Station Unit 2 limit is based on (1) the primary containment vent elevation concern.

Injection from sources external to the primary containment is terminated, irrespective of adequate core cooling concerns as necessary to remain below the Maximum Primary Containment Water Level Limit. This action precludes any further increase in primary containment water level, and is authorized because the consequences of not doing so at this point may be a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the containment may fail, the resulting loss of the suppression pool must be assumed resulting in a complete and unre-

DISCUSSION: (Continued)

coverable loss of the ability to ensure adequate core cooling. With a degraded core condition and loss of containment integrity substantial amounts of radioactivity may be released to the general environment. Therefore when a mutually exclusive decision between maintaining adequate core cooling and assuring primary containment integrity must be made, the Nine Mile Point Station Unit 2 EOPs preferentially choose to maintain primary containment integrity, versus a degraded core condition, in order to protect against the uncontrolled release of radioactivity to the general public.

STEP:

START

While executing this procedure:

IF	THEN
RPV water level cannot be determined	Exit this procedure and enter C-4, RPV Flooding
All control rods are inserted to at least position 02 OR The reactor will remain shutdown under all conditions without boron	Exit this procedure and enter RPV Control Section RL at (A)
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C5-1)	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 curve (Figure C5-1)
✻ EMERGENCY RPV DEPRESSURIZATION IS REQUIRED	Continue at (H)

Place ADS logic inhibit switches in ON

<u>Emergency RPV Depressurization</u>

(H)

Terminate and prevent all injection into the RPV <u>except</u> from boron injection systems, CRD, and RCIC

DISCUSSION:

This step is an override step and applies throughout the performance of the remainder of this procedure.

The actions directed in N2-EOP-C5, Level/Power Control, specify the use of various systems to control RPV water level. If emergency depressurization of the RPV is required, the procedure provides direction for the operation of these systems to minimize the potential for rapid injection of large amounts of cold, unborated water into the core region as RPV pressure decreases below pump shut off head. The actions beginning at point H provide appropriate instructions for controlling injection systems consistent with the objectives of N2-EOP-C5, Level/Power Control.

This override, as well as the following one which will direct RPV level lowering due to a containment problem are applicable to the remainder of the procedure. Should the condition of both overrides be met simultaneously, it is appropriate to follow the guidance of emergency depressurization which will effectively lower RPV water level as well as complete the depressurization function.

STEP:

While executing this procedure:

IF	THEN
RPV water level cannot be determined	Exit this procedure and enter C-4, RPV Flooding
All control rods are inserted to at least position 02 OR The reactor will remain shutdown under all conditions without boron	Exit this procedure and enter RPV Control Section RL at (A)
Primary Containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C5-1)	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 curve (Figure C5-1)
* EMERGENCY RPV DEPRESSURIZATION IS REQUIRED	Continue at (H)

↓

Place ADS logic inhibit switches in ON

↓

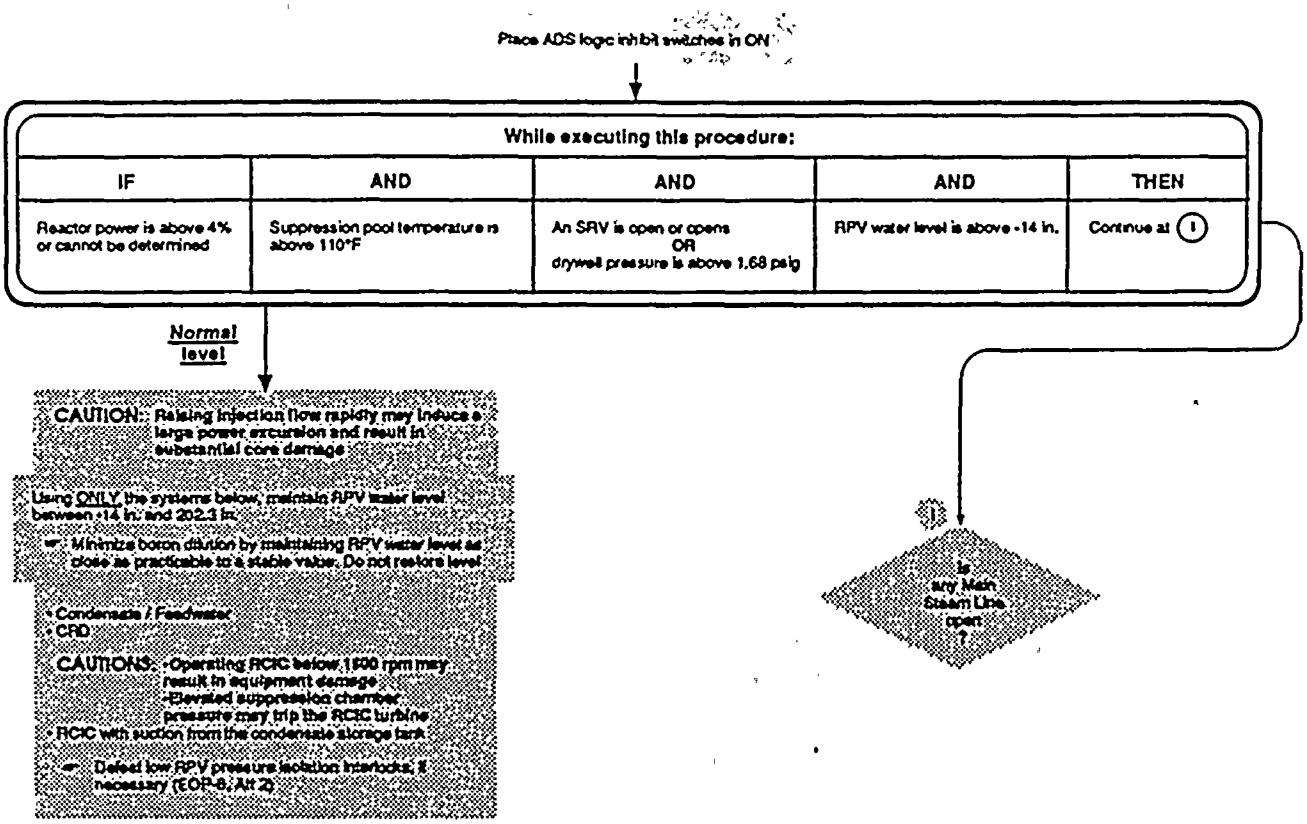
While executing this procedure:

IF	AND	AND	AND	THEN
Reactor power is above 4% or cannot be determined	Suppression pool temperature is above 110°F	An SRV is open or opens OR drywell pressure is above 1.68 psig	RPV water level is above -14 in.	Continue at (I)

DISCUSSION:

In order to effect a reduction in reactor power, actions directed in this procedure may deliberately lower RPV water level to a level below the automatic initiation setpoint of the Automatic Depressurization System (ADS). Actuation of ADS imposes severe a thermal transient on the RPV and complicates efforts to maintain RPV water level within the ranges specified in N2-EOP-C5, Level/Power Control. Further, rapid and uncontrolled injection of large amounts of relatively cold, unborated water from low pressure injection systems may occur as RPV pressure decreases to and below the shut off heads of the pumps. Such an occurrence would quickly dilute in-core boron concentration and reduce reactor coolant temperature. When the reactor is not shutdown, or when the shutdown margin is small, sufficient positive reactivity might be added in these ways which may cause a reactor power excursion large enough to severely damage the core. Therefore, ADS initiation is purposely prevented as the first action of the Level/Power Control procedure. It should be noted that the intent of this step is to use the "ADS Actuation Timer (INHIBIT)" switch, rather than simply resetting the timer periodically. Placing the ADS logic inhibit switches in "ON" is the specific Nine Mile Point Station Unit 2 method for preventing automatic initiation. If depressurization of the RPV is subsequently required, explicit direction is provided in the appropriate EOP. Thus any requirement to maintain the automatic initiation capability of ADS is not required.

STEP:



DISCUSSION:

This step is an override step and applies throughout the performance of the remainder of the following steps.

The concurrent existence of high reactor power (above the APRM downscale trip), high suppression pool temperature (above the boron injection initiation temperature), and an open SRV or high drywell pressure (above the high drywell pressure scram setpoint) is symptomatic of heat being rejected to the suppression pool at a rate in excess of that which can be removed by normal suppression pool cooling systems. Unless actions are taken to mitigate these conditions, ECCS pumps which take suction on the suppression pool could lose adequate NPSH and primary containment integrity could be lost. This could lead to a loss of adequate core cooling and the uncontrolled release of radioactivity to the environment.

Therefore when these conditions exist concurrently, combined with the inability to shutdown the reactor through control rod insertion (as indicated by the need to enter this procedure) and RPV water level is above -14 inches, actions to promptly reduce reactor power, by lowering RPV water level, are required. These actions begin at point I.

The fourth condition, RPV water level above -14 inches (Top of Active Fuel), is required because actions to reduce reactor power by RPV water level reduction are only appropriate if RPV water level is initially above the Top of Active Fuel. This requirement ensures

DISCUSSION: (Continued)

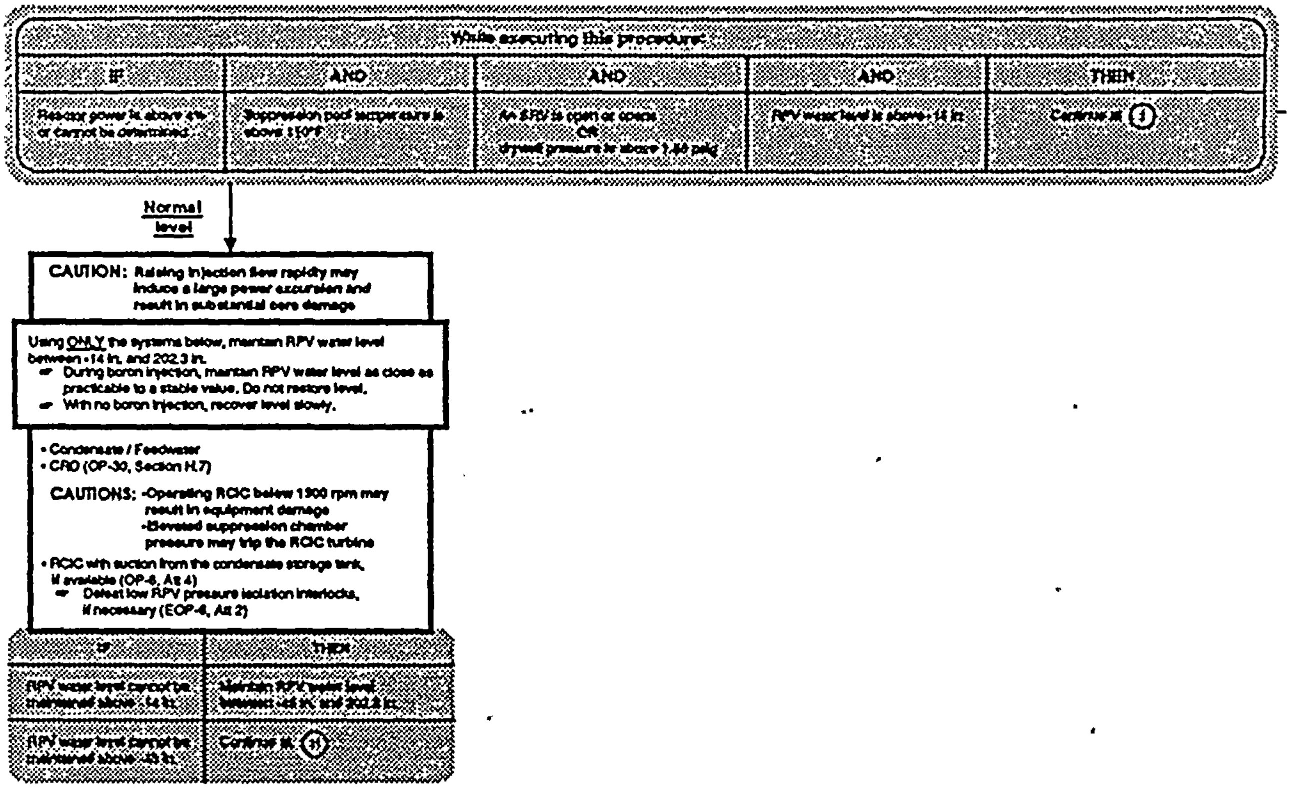
that the fuel remains covered and that adequate core cooling is assured.

If ALL of the stated conditions DO NOT exist, the rate of suppression pool heatup (if occurring) is within the capacity of the suppression pool cooling system. Therefore, no requirement to promptly reduce reactor power by lowering RPV water level is needed. The operator is directed to continue in this procedure to maintain RPV water level as directed. However, since this is an override step, the operator should continue to monitor the status of the stated conditions and take actions as necessary if ALL of the stated conditions subsequently occur.

When these 4 conditions exist, the operator is directed to reject as much heat as possible to the main condenser (in the RPV Pressure (RP) leg of N2-EOP-RPV, RPV Control), place all available suppression pool cooling into operation (in the Suppression Pool Temperature (SPT) leg of N2-EOP-PC, Primary Containment Control), and to concurrently inject boron and manually insert control rods (in the Reactor Power (RQ) leg of N2-EOP-RPV, RPV Control).

The Boron Injection Initiation Temperature is defined to be the greater of either: (1) The suppression pool temperature at which a reactor scram is required by Technical Specifications, or (2) The highest suppression pool temperature at which initiation of boron injection will result in injection of the hot shutdown boron weight of boron before suppression pool temperature exceeds the Heat Capacity Temperature Limit. At Nine Mile Point Station Unit 2, the Boron Injection Initiation Temperature is conservatively chosen to be 110°F for ease of procedural use and memory (same as Technical Specification LCO).

STEP:



DISCUSSION:

The operator is alerted to the hazards of rapidly injecting water into the RPV by the CAUTION statement preceding this action step.

This step directs the operator to maintain RPV water level between the high level trip setpoint (202.3 inches) and the Top of Active Fuel (-14 inches) using only the systems listed, all of which inject outside the core shroud. These systems are preferred, because the flowpath is to outside the core shroud, allowing the relatively cold injected water to mix with the warmer water in the downcomer region and lower plenum prior to reaching the core.

Additional guidance is given for the situation where boron is being injected. The intent of this step is to minimize the dilution of boron, so level is to be maintained at or below the level noted when this step is reached, but above the Top of Active Fuel (-14 inches). Level restoration to the normal control band is not allowed at this point due to the concern of power excursions as boron is diluted. If no boron is being injected, level restoration is allowed, but only under slowly controlled injection rates to minimize the potential of a power excursion.

DISCUSSION:-(Continued)

The first caution related to RCIC informs the operator that operating the RCIC turbine at speeds less than 1500 RPM could result in unstable system operation and system damage.

The second caution related to RCIC informs the operator that the RCIC turbine may trip due to elevated pressure in the suppression chamber. This would result in the inability to inject water to the RPV with the low volume RCIC system.

The operator is instructed to operate the Reactor Core Isolation Cooling (RCIC) System with suction from the Condensate Storage Tank (CST) to ensure that the highest quality water is utilized for injection into the RPV.

Direction to defeat the RCIC low RPV pressure isolation interlock is given to allow operation of the RCIC turbine at low pressure. Even if RPV pressure is below the isolation setpoint, but above the turbine stall pressure, RCIC can still provide some injection into the RPV.

STEP:

CAUTION: Raising injection flow rapidly may induce a large power excursion and result in substantial core damage

Using ONLY the systems below, maintain RPV water level between -14 in. and 202.3 in.

☛ Minimize boron dilution by maintaining RPV water level as close as practicable to a stable value. Do not restore level

- Condensate / Feedwater
- CRD

CAUTIONS:
- Operating RCIC below 1500 rpm may result in equipment damage
- Elevated suppression chamber pressure may trip the RCIC turbine

- RCIC with suction from the condensate storage tank

☛ Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)

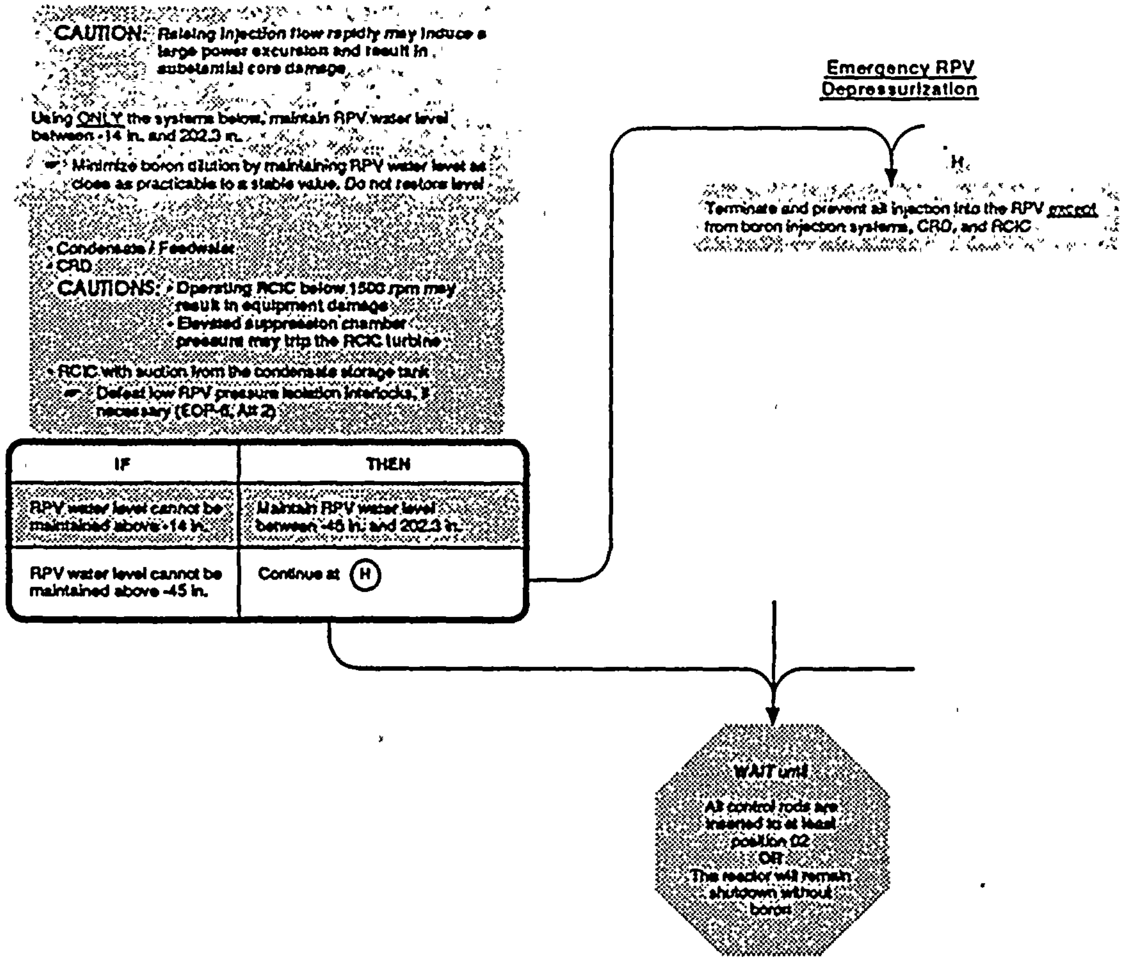
IF	THEN
RPV water level cannot be maintained above -14 in.	Maintain RPV water level between -45 in. and 202.3 in.
RPV water level cannot be maintained above -45 in.	Continue at (H)

DISCUSSION:

If RPV water level cannot be maintained within the limits previously specified, (-14 inches to 202.3 inches) an alternate control range with a lower limit is defined. The widened RPV water level control range provides added operational flexibility while still assuring adequate core cooling through steam cooling. This may provide the operator with additional time to place injection systems (identified in the previous step) in service. The widened control range also accommodates controlling RPV water level, without employing additional contingency actions for a condition where a break exists between -14 inches (Top of Active Fuel) and -45 inches (the Minimum Steam Cooling RPV water level) and break flow cannot be overcome by injection flow.

-45 inches is the Minimum Steam Cooling RPV Water Level and is defined to be lowest RPV water level at which the covered portion of the core will generate sufficient steam to preclude any clad temperature in the uncovered portion of the core from exceeding 1500°F.

STEP:



DISCUSSION:

When RPV water level cannot be maintained above -45 inches (Minimum Steam Cooling RPV Water Level), Emergency RPV Depressurization is required to maximize injection flow from high-head pumps and to permit injection from low-head pumps. Prior to this step, high RPV pressure may have prevented injection from the low-head pumps.

Depressurizing the RPV is preferred over restoring RPV water level through the use of systems which inject inside the shroud because:

1. A large reactor power excursion may result from in-shroud injection of relatively cold water.

2. Rapid depressurization, by itself, will shutdown the reactor due to a substantial increase in voids.

3. Following the depressurization, reactor power will stabilize at a lower level.

Emergency RPV depressurization is not required until RPV water level has dropped to -45 inches (Minimum Steam Cooling RPV Water Level) because:

DISCUSSION: (Continued)

1. Adequate core cooling is maintained so long as RPV water level remains above -45 inches (Minimum Steam Cooling RPV Water Level).

2. The time during which RPV water level decreases to -45 inches (Minimum Steam Cooling RPV Water Level) can best be used to line up and start pumps in the previously indicated injection systems, which might not yet have been placed in service.

Consistent with the override step at the beginning of this procedure, this step directs the operator to continue in this procedure at point H when RPV depressurization is required.

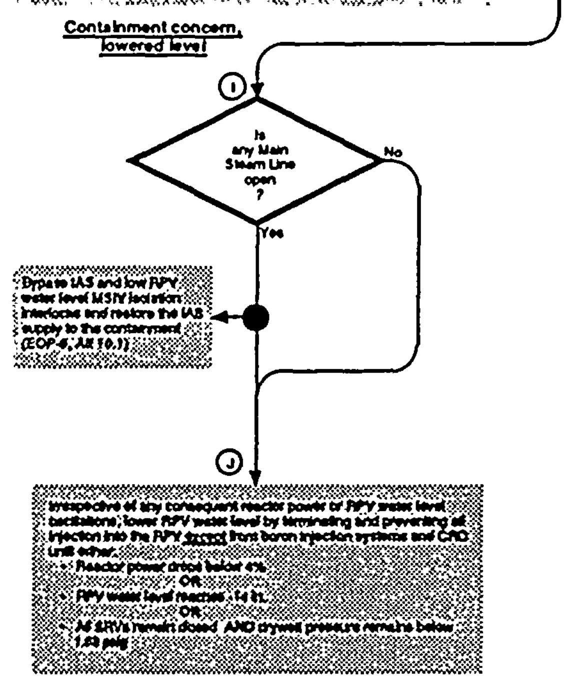
The Minimum Steam Cooling RPV Water Level (-45 inches) is slightly higher then the Minimum Zero-Injection RPV Water Level (-55 inches). This is attributed to two key factors:

1. Injection of subcooled water requires that part of the energy which would be used to generate the steam for cooling the uncovered portion of the core must now be expended in heating subcooled liquid to saturation temperature (the Minimum Zero-Injection RPV Water Level is calculated assuming no injection into the RPV).

2. More steam is required to maintain clad temperature below 1500°F as compared to the 1800°F limit assumed for the Minimum Zero-Injection RPV Water Level calculation.

STEP:

While executing this procedure:				
IF	AND	AND	AND	THEN
Reactor power is above 4% or cannot be determined	Suppression pool temperature is above 110°F	An SRV is open or opens OR drywell pressure is above 1.68 psig	RPV water level is above +14 in.	Continue at (I)



DISCUSSION:

This step has the operator evaluate the present status of the main steam lines to determine the availability of the main condenser as a heat sink.

The actions taken prior to this step may lower RPV water level to or below the low RPV water level setpoint for Main Steam Isolation Valve (MSIV) isolation, under conditions when it is most desirable to maintain use of the main condenser as the heat sink for the energy being generated in the RPV.

If any main steam line is open, as indicated by a "YES" response to this step, the main condenser is available for use as a heat sink. The operator is, therefore, directed to bypass Instrument Air System (IAS) and low RPV water level MSIV isolation interlocks, thereby preventing subsequent MSIV closure (on low RPV water level) and maintaining the availability of the main condenser.

If no main steam line is open, as indicated by a "NO" response to this step, the main condenser is already isolated from the RPV. The steps in this procedure do not direct reopening the MSIVs.

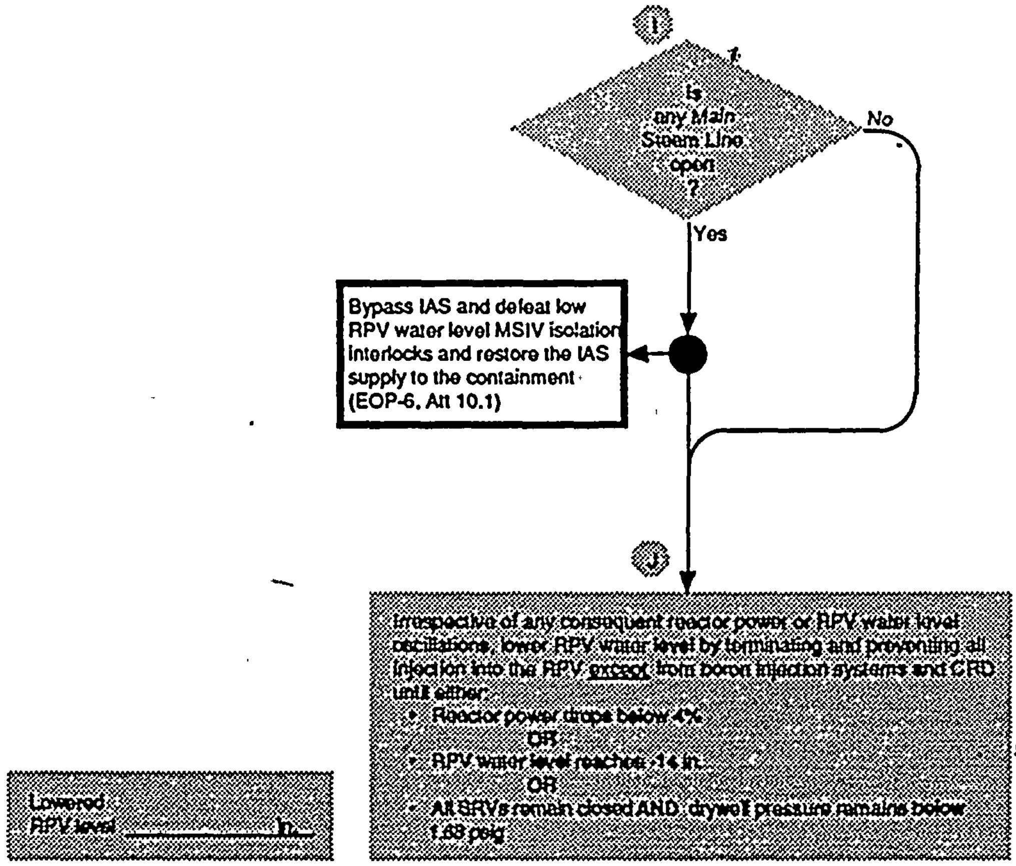
However, the RPV Pressure (RP) section of N2-EOP-RPV, RPV Control, which is being executed concurrently with this procedure at this time, does allow the MSIVs to be re-opened if the main condenser is available and there is no indication of gross fuel failure or steam line break. But since re-opening the

DISCUSSION: (Continued)

MSIVs is guidance for RPV pressure control, those actions are not provided in this procedure.

If no main steam line is open, the operator is directed to continue in this procedure to reduce reactor power by lowering RPV water level.

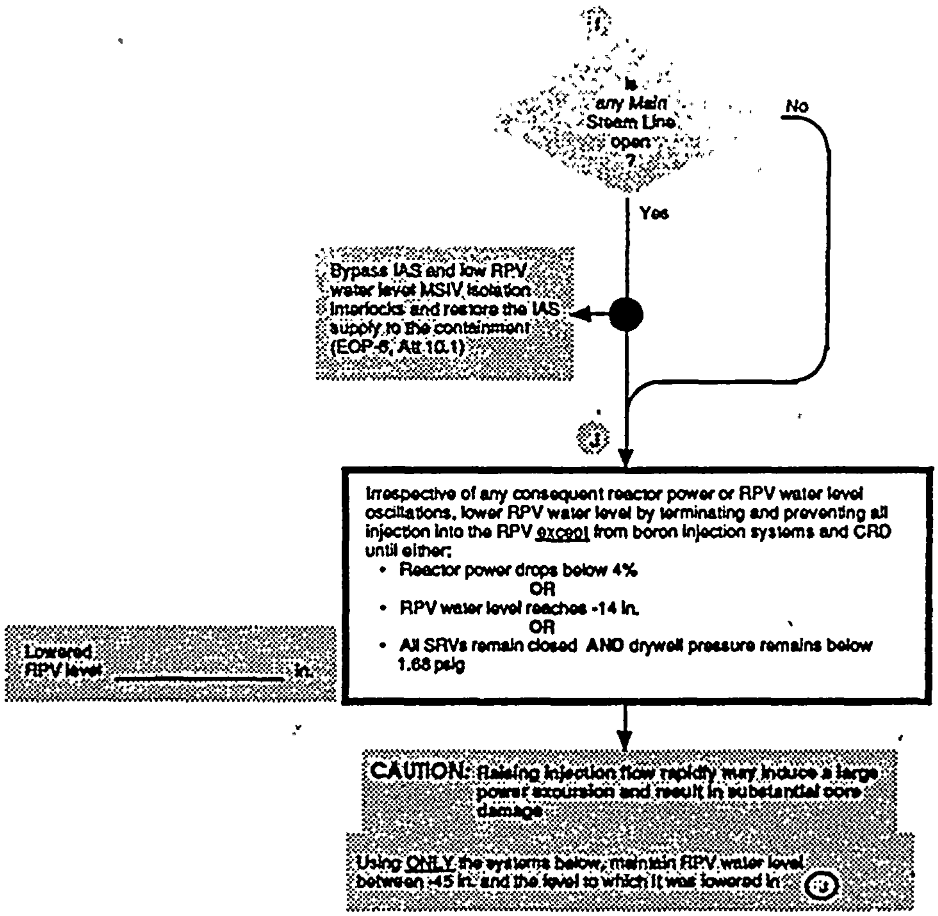
STEP:



DISCUSSION:

Subsequent actions may lower RPV water level to or below the low RPV water level setpoint for MSIV isolation under conditions when it is most desirable to maintain use of the main condenser as the heat sink for energy being generate in the RPV. Direction is given to bypass the IAS isolation logic and the low RPV water level portion of the MSIV isolation logic to prevent closure of presently open MSIVs. Other MSIV isolation interlocks (i.e., main steam line high radiation, main steam high flow) are not bypassed because they are required to provide automatic protection for conditions where preventing the closure of the MSIVs is not appropriate.

STEP:



DISCUSSION:

One additional action remains available to mitigate the consequence of a failure-to-scram condition: deliberately lowering RPV water level to effect a reduction in reactor power. Lowering RPV water level results in a reduction in reactor power and the subsequent reduction in the addition of heat to the suppression pool. This process occurs as follows:

1. Following recirculation pump trips (Reactor Power (RQ) leg of N2-EOP-RPV, RPV Control), the reactor is in a natural circulation mode. The natural circulation driving head is a function of the height of the fluid columns (RPV water level) and the fluid density differences between the regions inside and outside the core shroud (void fraction directly affects the fluid density inside the shroud).

2. As RPV water level is lowered, the height of the fluid columns is reduced, thereby reducing the natural circulation driving head.

3. As the natural circulation driving head is reduced, the flow (now solely due to natural circulation) through the core is reduced.

4. The reduced core flow results in a reduced rate of steam removal from the core.

DISCUSSION: (Continued)

5. The reduced rate of steam removal results in an increased void fraction inside the shroud.

6. The increased void fraction adds negative reactivity to the reactor.

7. The negative reactivity drives the reactor slightly subcritical and reactor power begins to decrease.

8. The reduced power results in a reduced steam generation rate.

9. The reduced steam generation rate results in a reduced void fraction.

10. When the void fraction drops to its original value (with some slight adjustment to account for reduced doppler reactivity), the reactor returns to criticality at a lower power level.

These interrelationships between RPV water level, natural circulation core flow and reactor power have been observed in BWRs with RPV water level in or near the normal operating band. Computer analyses and scale model tests have confirmed the continued validity of these fundamental thermal hydraulics and reactor physics principles for RPV water levels at and below the elevation of the steam separators.

Lowering RPV water level is accomplished by terminating and preventing all injection into the RPV, except from boron injection systems and Control Rod Drive (CRD). Injection from these two systems is not terminated because operation of these systems may be needed to establish and maintain the reactor shutdown. Further, the injection flow rates from these systems are small compared to those of other systems used to control RPV water level. With essentially no makeup of reactor coolant, RPV water level will then decrease by boil off.

"Terminate and Prevent Injection" means to take the most direct action which will stop and preclude the injection flow into the RPV. This may include, as appropriate, closing the injection valve, tripping the pump, deenergizing the electrical power supplying system components. System interlocks and plant conditions may dictate that some methods of terminating and preventing are more desirable than others for existing conditions. Assuming normal system configurations the following is a listing of preferred methods of terminating and preventing injection:

- **HPCS** Placing the pump control switch in Pull-To-Lock (PTL) is preferable to closing the injection valve due to the inability to remotely close the injection valve when RPV level is lowered to Level 2 (L2)

- **LP ECCS** Placing the pump control switch in PTL is preferred. The injection valve override will not work if a sealed in initiation signal does not exist.

- **RCIC** Tripping the turbine from the control room is preferred. It can be readily reset and restarted if need be from the control room.

No action to re-establish injection to the RPV is to be taken until either:

1. Suppression pool heatup is terminated or reduced to near that which results from the absorption of decay heat
   OR
2. RPV water level decreases to -14 inches (Top of Active Fuel).

DISCUSSION: (Continued)

If the suppression pool heatup is terminated or heat being rejected to the suppression pool is reduced to near that of decay heat (as indicated by reactor power level below the Average Power Range Monitors (APRM) downscale trip setpoint or the combination of all SRVs closed and drywell pressure below the high drywell pressure scram setpoint), the potential for reaching the high suppression pool temperatures which directly threaten continued adequate core cooling and primary containment integrity has been substantially reduced, and no further reduction in reactor power is required.

Power oscillations may occur when RPV water level is lowered significantly below the normal operating range with the reactor still at power. These oscillations have been analyzed and determined to result in thermal transients well within the design capabilities of the fuel. The oscillations are discussed here to indicate to the operator that they are to be expected, and were considered in developing the steps which require deliberately lowering RPV water level with the reactor at power.

STEP:

Lowered RPV level: ______________ in.

Irrespective of any consequent reactor power or RPV water level oscillations, lower RPV water level by terminating and preventing all injection into the RPV except from boron injection systems and CRD until either:

- Reactor power drops below 4%

OR

- RPV water level reaches -14 in.

OR

- All SRVs remain closed AND drywell pressure remains below 1.68 psig

CAUTION: Raising injection flow rapidly may induce a large power excursion and result in substantial core damage

Using ONLY the systems below, maintain RPV water level between -45 in. and the level to which it was lowered in (J)

- Condensate / Feedwater
- CRD

CAUTIONS:
- **Operating RCIC below 1500 rpm may result in equipment damage**
- **Elevated suppression chamber pressure may trip the RCIC turbine**

- RCIC with suction from the condensate storage tank
  - Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)

IF	THEN
RPV water level cannot be maintained above -45 in.	Continue at (H)

DISCUSSION:

The operator is alerted to the hazards of rapidly injecting water into the RPV in the CAUTION preceding this action step.

This step directs the operator to maintain RPV water level between the Minimum Steam Cooling RPV Water Level (-45 inches) and the level to which it was lowered in the previous step (minimum level would be -14 inches, Top of Active Fuel), using only the systems listed, all of which inject outside the core shroud. These systems are preferred, because the flowpath is to outside the core shroud, allowing the relatively cold injected water to mix with the warmer water in the downcomer region and lower plenum prior to reaching the core.

Maintaining RPV water level in the specified control band results in continued reduction of reactor power while still maintaining adequate core cooling.

-45 inches is the Minimum Steam Cooling RPV Water Level and is defined to be the lowest RPV water level at which the covered portion of the reactor core will generate sufficient steam to preclude and clad temperature in the uncovered portion of the core from exceeding 1500°F.

DISCUSSION: (Continued)

When RPV water level is lowered, power instabilities may produce noticeable oscillations in RPV water level and make it difficult to maintain water level exactly at the Top of Active Fuel (-14 inches). The low end of the RPV water level control range (-45 inches) can therefore be safely utilized to preclude fuel damage if RPV water level must be lowered below the Top of Active Fuel (-14 inches).

The first caution related to RCIC informs the operator that operating the RCIC turbine at speeds less than 1500 RPM could result in system damage due to inadequate pump cooling.

The second caution related to RCIC informs the operator that the RCIC turbine may trip due to elevated pressure in the suppression chamber. This would result in the inability to inject water into the RPV with the low volume RCIC system.

The operator is instructed to operate the Reactor Core Isolation Cooling (RCIC) system with suction from the Condensate Storage Tank (CST) to ensure that the highest quality water is utilized for injection into the RPV.

Direction to defeat the RCIC low RPV pressure isolation interlock is given to allow operation of the RCIC turbine at low pressure. Even if RPV pressure is below the isolation setpoint, but above the turbine stall pressure, RCIC can still provide some injection into the RPV.

STEP:

CAUTION: Raising injection flow rapidly may induce a large power excursion and result in substantial core damage

Using ONLY the systems below, maintain RPV water level between -45 in. and the level to which it was lowered in (J)

- Condensate / Feedwater
- CRD

CAUTIONS:
- Operating RCIC below 1500 rpm may result in equipment damage
- Elevated suppression chamber pressure may trip the RCIC turbine

- RCIC with suction from the condensate storage tank
  - Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)

IF	THEN
RPV water level cannot be maintained above -45 in.	Continue at (H)

WAIT until

All control rods are inserted to at least position 02
OR
The reactor will remain shutdown without boron.

Emergency RPV Depressurization

(H)

Terminate and prevent all injection into the RPV except from boron injection systems, CRD, and RCIC

EMERGENCY RPV DEPRESSURIZATION IS REQUIRED

* RPV Control Section RP

DISCUSSION:

When RPV water level cannot be maintained above -45 inches (Minimum Steam Cooling RPV Water Level), Emergency RPV Depressurization is required to maximize injection flow from high-head pumps and to permit injection from low-head pumps. Prior to this step, high RPV pressure may have prevented injection from the low-head pumps.

Depressurizing the RPV is preferred over restoring RPV water level through the use of systems which inject inside the shroud because:

1. A large reactor power excursion may result from in-shroud injection of relatively cold water.

2. Rapid depressurization, by itself, will shutdown the reactor due to substantial increase in voids.

3. Following the depressurization, reactor power will stabilize at lower level.

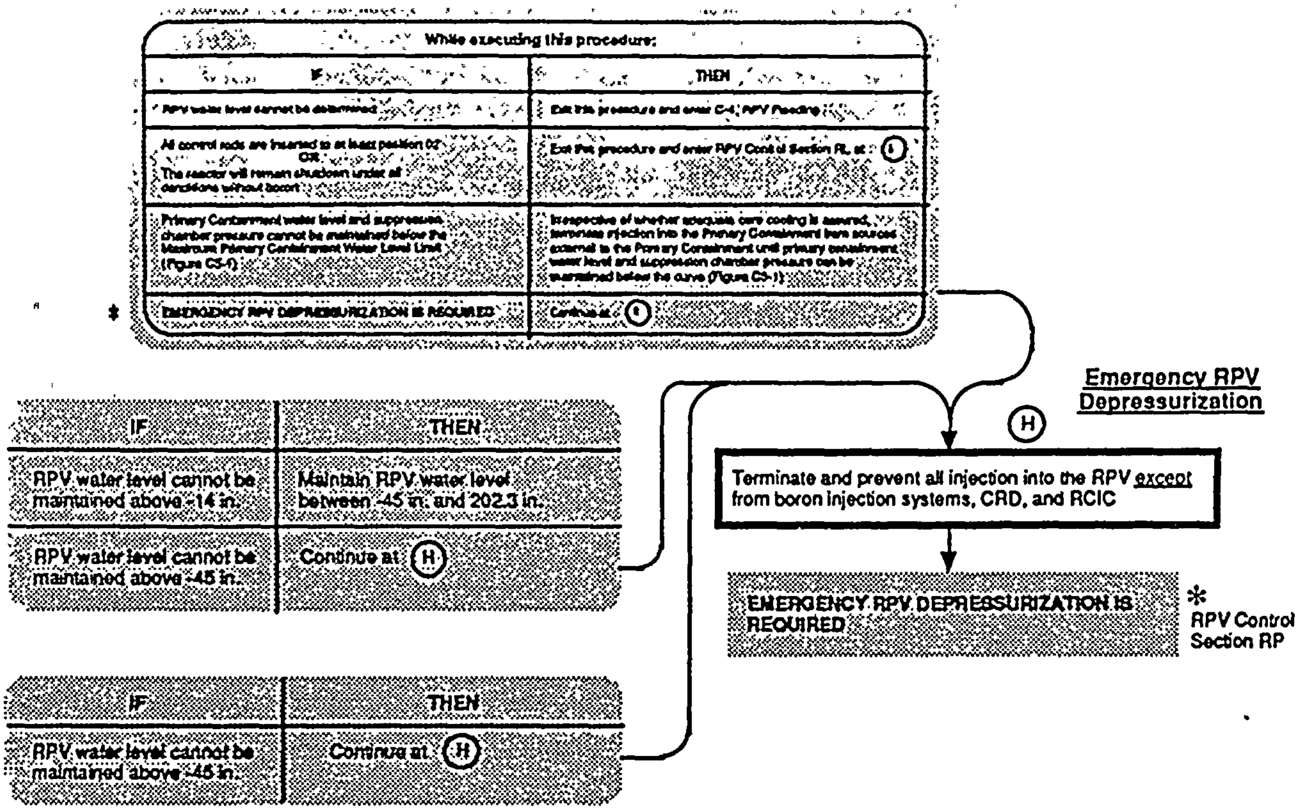
DISCUSSION: (Continued)

Emergency RPV depressurization is not required until RPV water level has dropped to -45 inches (Minimum Steam Cooling Water Level) because:

1. Adequate core cooling is maintained so long as RPV water level remains above -45 inches (Minimum Steam Cooling RPV Water Level).
2. The time during which RPV water level decreases to -45 inches (Minimum Steam Cooling RPV Water Level) can best be used to line up and start pumps in the previously indicated injection systems, which might not yet have been placed in service.

Consistent with the override step at the beginning of this procedure, this step directs the operator to continue at point H when Emergency RPV Depressurization is required.

STEP:



DISCUSSION:

Injection into the RPV is terminated and prevented while Emergency RPV Depressurization proceeds, in order to prevent uncontrolled injection of large amounts of cold water as RPV pressure decreases below the shutoff head of operating system pumps. Injection from boron injection systems and CRD is not terminated because operation of these systems may be needed to establish and maintain the reactor shutdown. Further, the injection flow rates from these systems are small compared to those of the other systems used to control RPV water level. Injection from RCIC is not terminated because the injection flow rate from this system is small, and continued operation of the RCIC turbine aids in depressurization of the RPV. RCIC operation during RPV depressurization is not expected to result in significant injection flow rate variations.

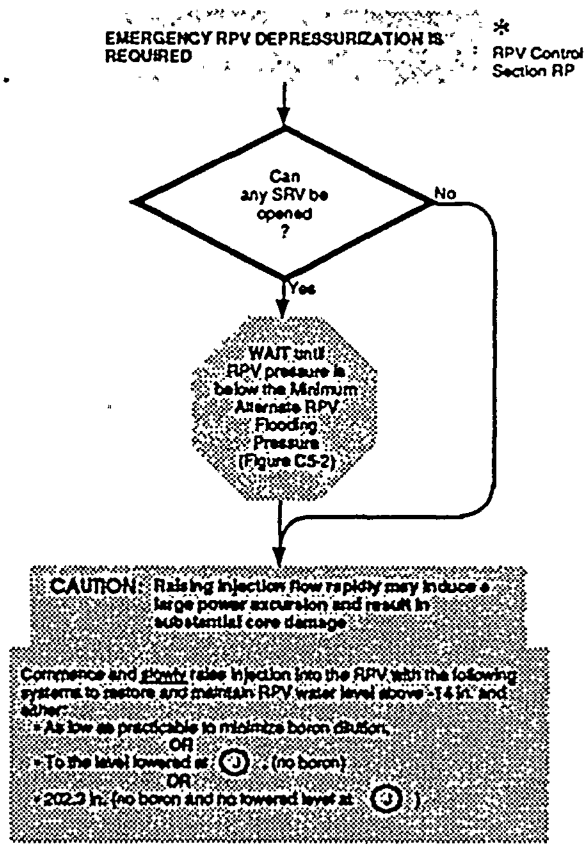
The Minimum Alternate RPV Flooding Pressure (Figure C5-2, refer to Section C) is defined to be the lowest RPV p

"Terminate and Prevent Injection" means to take the most direct action which will stop and preclude the injection flow into the RPV. This may include, as appropriate, closing the injection valve, tripping the pump, deenergizing the electrical power supplying system components. System interlocks and plant conditions may dictate that some methods of terminating and preventing are more desirable than others for existing conditions. Assuming normal system configurations the following is a listing of preferred methods of terminating and preventing injection:

DISCUSSION: (Continued)

- HPCS Placing the pump control switch in Pull-To-Lock (PTL) is preferable to closing the injection valve due to the inability to remotely close the injection valve when RPV level is lowered to Level 2 (L2).
- LPECCS Placing the pump control switch in PTL is preferred. The injection valve override will not work if a sealed in initiation signal does not exist.

STEP:



DISCUSSION:

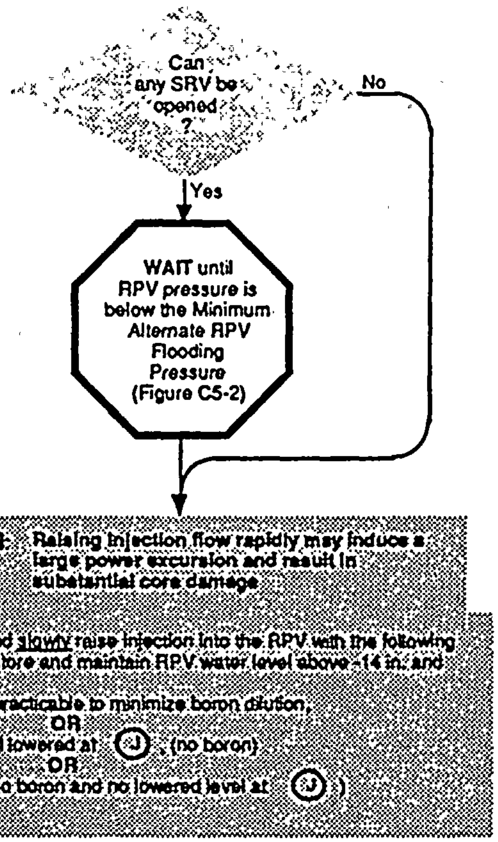
This step has the operator determine if an SRV can be opened.

If an SRV can be opened, as indicated by a "YES" response to this step, the operator will wait until RPV pressure is below the Minimum Alternate RPV Flooding Pressure (for the appropriate number of open SRVs) (Figure C5-2, refer to Section C) before taking actions to restore RPV water level to above the Top of Active Fuel because adequate core cooling exists so long as RPV pressure remains above the Minimum Alternate RPV Flooding Pressure. The operator is, therefore, directed to continue in this procedure where actions to restore RPV water level to above -14 inches (Top of Active Fuel) will be addressed when RPV pressure drops below the Minimum Alternate RPV Flooding Pressure.

If no SRV can be opened, injection into the RPV must be re-established to maintain adequate core cooling. Therefore the operator is directed to continue in this procedure where actions to restore RPV water level above -14 inches (Top of Active Fuel) are addressed.

The Minimum Alternate RPV Flooding Pressure is defined to be the lowest RPV pressure at which steam flow through open SRVs is sufficient to preclude any clad temperature from exceeding 1500°F, even if the reactor core is not completely covered.

STEP:

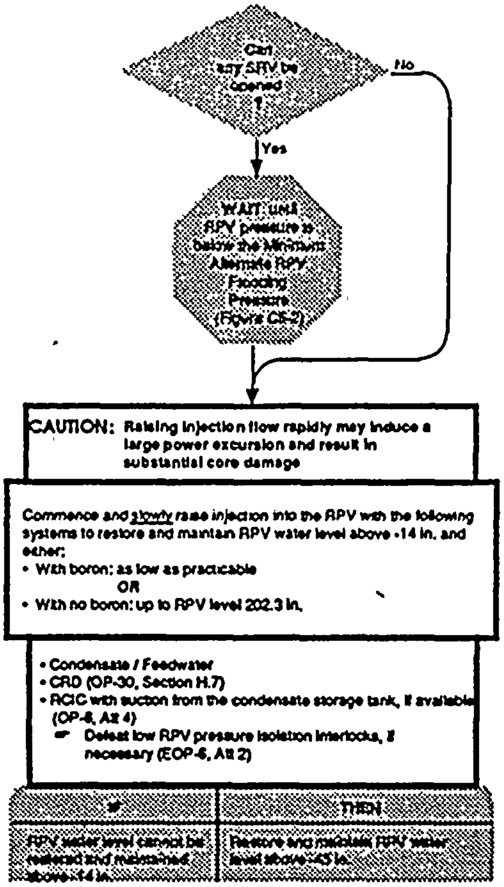


DISCUSSION:

Actions to restore RPV water level to above -14 inches (Top of Active Fuel) are delayed until RPV pressure falls below the applicable Minimum Alternate RPV Flooding Pressure value (Figure C5-2, refer to Section C). As long as RPV pressure remains above the Minimum Alternate RPV Flooding Pressure adequate core cooling is assured, and there is no need to commence injection. However, once RPV pressure drops below the Minimum Alternate RPV Flooding Pressure, adequate core cooling is no longer assured, and injection must be re-established in order adequately cool the core.

The Minimum Alternate RPV Flooding Pressure is defined to be the lowest RPV pressure at which steam flow through open SRVs is sufficient to preclude any, clad temperature from exceeding 1500°F, even if the reactor core is not completely covered.

STEP:



DISCUSSION:

The operator is alerted to the hazards of rapidly injecting water into the RPV in the CAUTION statement preceding this action step.

Injection into the RPV is re-established to maintain adequate core cooling. Irrespective of whether the reactor is shutdown, injection is controlled to makeup the mass of steam being rejected through open SRVs and to keep the core submerged. Injection is increased slowly to a point where RPV water level is restored and maintained above -14 inches. The slow injection increase is to preclude the possibility of large reactor power excursions due to the rapid injection of relatively cold, unborated water in conditions where the reactor may not be shutdown.

The upper limit for RPV water level is dependent upon the existing conditions. If boron is being injected, minimize the dilution of boron by maintaining RPV level above -14 in. but as low as possible and as stable as injection sources allow. Do not restore level to the normal band.

If no boron is being injected and level was not, or should not have been, previously lowered, then the operator is allowed to slowly recover RPV water level and maintain it between -14 in. and 202.3 in.

DISCUSSION: (Continued)

The systems listed here all injected outside the core shroud and are preferred, because the flowpath outside the core shroud allows the relatively cold injected water to mix with the warmer water in the downcomer region and lower plenum prior to reaching the core.

The operator is instructed to operate the Reactor Core Isolation Cooling (RCIC) system with suction from the Condensate Storage Tank (CST) to ensure that the highest quality water is utilized for injection into the RPV.

Direction to defeat the RCIC low RPV pressure isolation interlock is given to allow operation of the RCIC turbine at low pressure. Even if RPV pressure is below the isolation setpoint, but above the turbine stall pressure, RCIC can still provide some injection into the RPV.

STEP:

CAUTION: Raising injection flow rapidly may induce a large power excursion and result in substantial core damage

Commence and slowly raise injection into the RPV with the following systems to restore and maintain RPV water level above -14 in. and either:

- As low as practicable to minimize boron dilution,

OR

- To the level lowered at (J) (no boron)

OR

- 202.3 in. (no boron and no lowered level at (J)

- Condensate / Feedwater
- CRD
- RCIC with suction from the condensate storage tank
  - Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)

IF	THEN
RPV water level cannot be restored and maintained above -14 in.	Restore and maintain RPV water level above -45 in.
RPV water level cannot be restored and maintained above -45 in.	Irrespective of pump NPSH and vortex limits, commence and slowly raise injection into the RPV with the following systems to restore and maintain RPV water level above -45 in. • HPCS (EOP-6, Att 3) • LPCS (EOP-6, Att 3) • LPCI with injection through the heat exchangers as soon as possible (EOP-6, Att 3) • RHR Service Water crosstie (EOP-6, Att 5) • Fire system (EOP-6, Att 6) • ECCS Keep-Fill systems (EOP-6, Att 7)

DISCUSSION:

This step directs the operator to restore and maintain RPV water level above the Minimum Steam Cooling RPV Water Level (-45 inches) when level cannot be maintained above Top of Active Fuel (-14 inches). Specifying an alternate lower limit for control of RPV water level, at -45 inches (the Minimum Steam Cooling RPV Water Level) may permit the operator to control RPV water level to within the capacity of the systems which inject outside the shroud. Such action maintains adequate core cooling, and may avoid the need to inject with systems that discharge directly inside the core shroud (which could cause an excessive power excursion) or systems which draw on water of relatively low quality.

-45 inches is the Minimum Steam Cooling RPV Water Level and is defined to be the lowest RPV water level at which the covered portion of the core will generate sufficient steam to preclude any clad temperature in the uncovered portion of the core from exceeding 1500°F.

STEP:

- Condensate / Feedwater
- CRD
- RCIC with suction from the condensate storage tank

➡ Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)

IF	THEN
RPV water level cannot be restored and maintained above -14 in.	Restore and maintain RPV water level above -45 in.
RPV water level cannot be restored and maintained above -45 in.	Irrespective of pump NPSH and vortex limits, commence and <u>slowly</u> raise injection into the RPV with the following systems to restore and maintain RPV water level above -45 in. • HPCS (EOP-6, Att 3) • LPCS (EOP-6, Att 3) • LPCI with injection through the heat exchangers as soon as possible (EOP-6, Att 3) • RHR Service Water crosstie (EOP-6, Att 5) • Fire system (EOP-6, Att 6) • ECCS Keep-Full systems (EOP-6, Att 7)

↓

IF	THEN	
RPV water level cannot be restored and maintained above -45 in.	PRIMARY CONTAINMENT FLOODING IS REQUIRED; Exit this procedure and enter C6, Primary Containment Flooding.	○ Primary Containment Control Section SPL

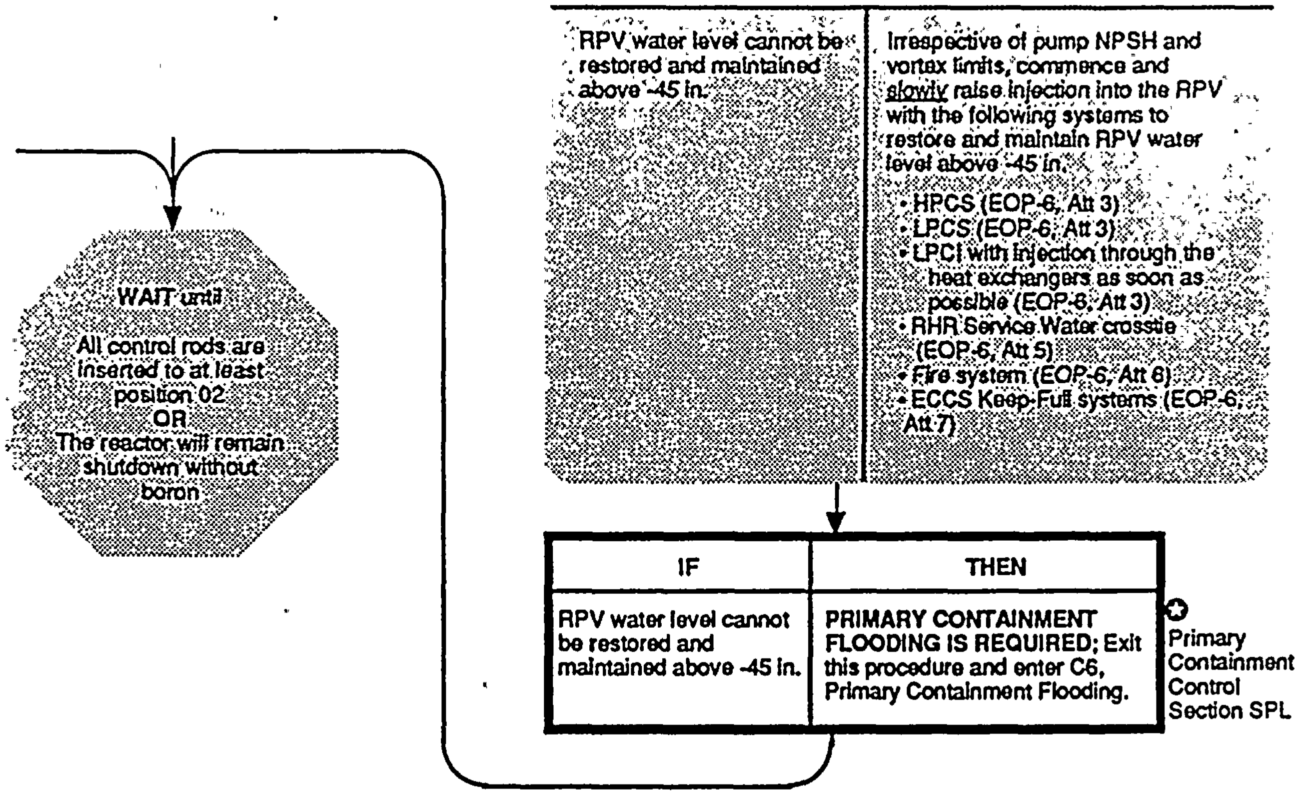
DISCUSSION:

If RPV water level cannot be restored and maintained above the Minimum Steam Cooling RPV Water Level (-45 inches) using the preferred systems, use of additional systems identified in this step is then required. These systems either inject inside the core shroud or take suction on sources of comparatively lower water quality.

-45 inches is the Minimum Steam Cooling RPV Water Level and is defined to be the lowest RPV water level at which the covered portion of the core will generate sufficient steam to preclude any clad temperature in the uncovered portion of the core from exceeding 1500°F.

Unlike the directions given in the RPV Water Level (RL) leg of N2-EOP-RPV, RPV Control, for use of motor driven ECCS pumps, operation of the pumps identified in this procedure is carried out irrespective of NPSH and Vortex limits. The undesirable consequences of uncovering the reactor core far outweigh the risk of equipment damage which could result if NPSH or Vortex limits are exceeded. In addition, immediate and catastrophic failure is not expected should operation beyond these limits be required; at most degraded system or pump performance may result from prolonged operation under these conditions.

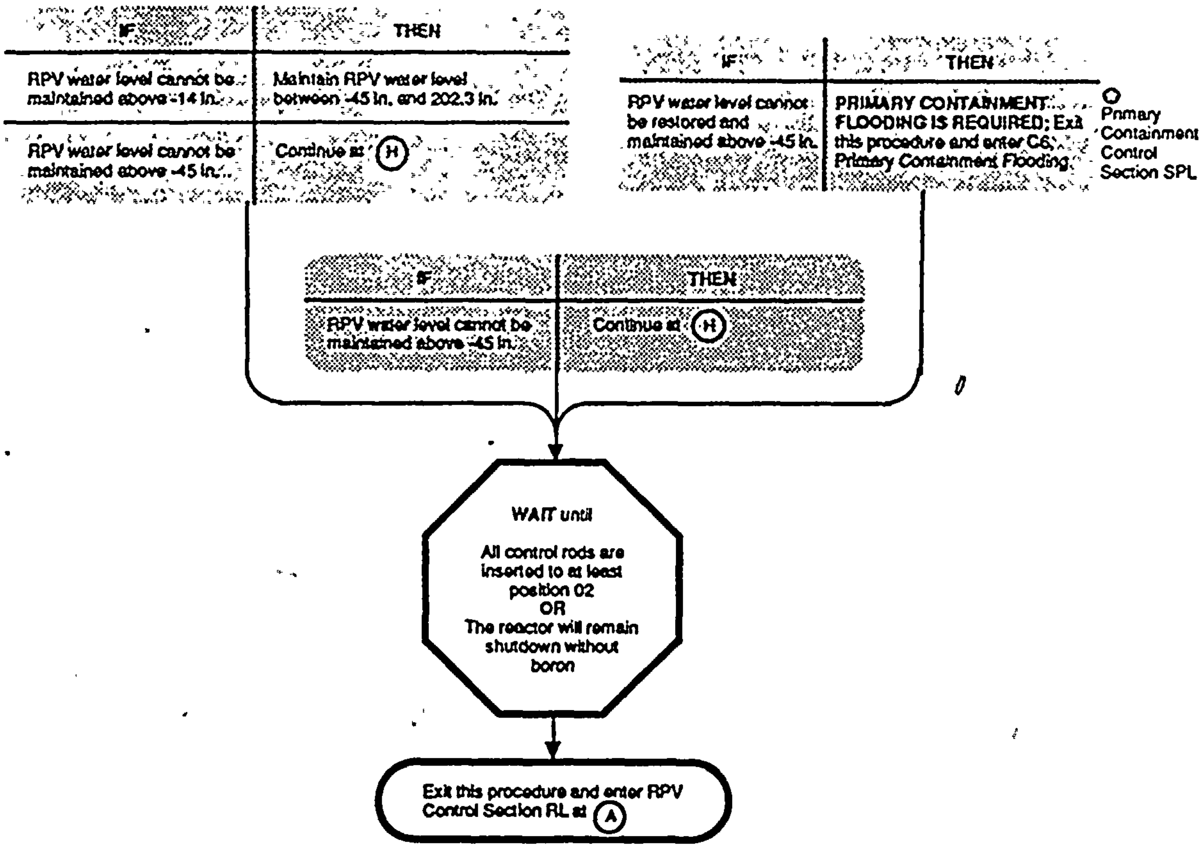
STEP:



DISCUSSION:

If injection with all available systems and alternate systems fails to provide sufficient injection to establish and maintain adequate core cooling, submergence of the core is attempted by flooding up the primary containment. Appropriate instructions for performing this evolution are contained in N2-EOP-C6, Primary Containment Flooding. Accordingly, the instruction to enter N2-EOP-C6, Primary Containment Flooding, is provided at this point.

STEP:

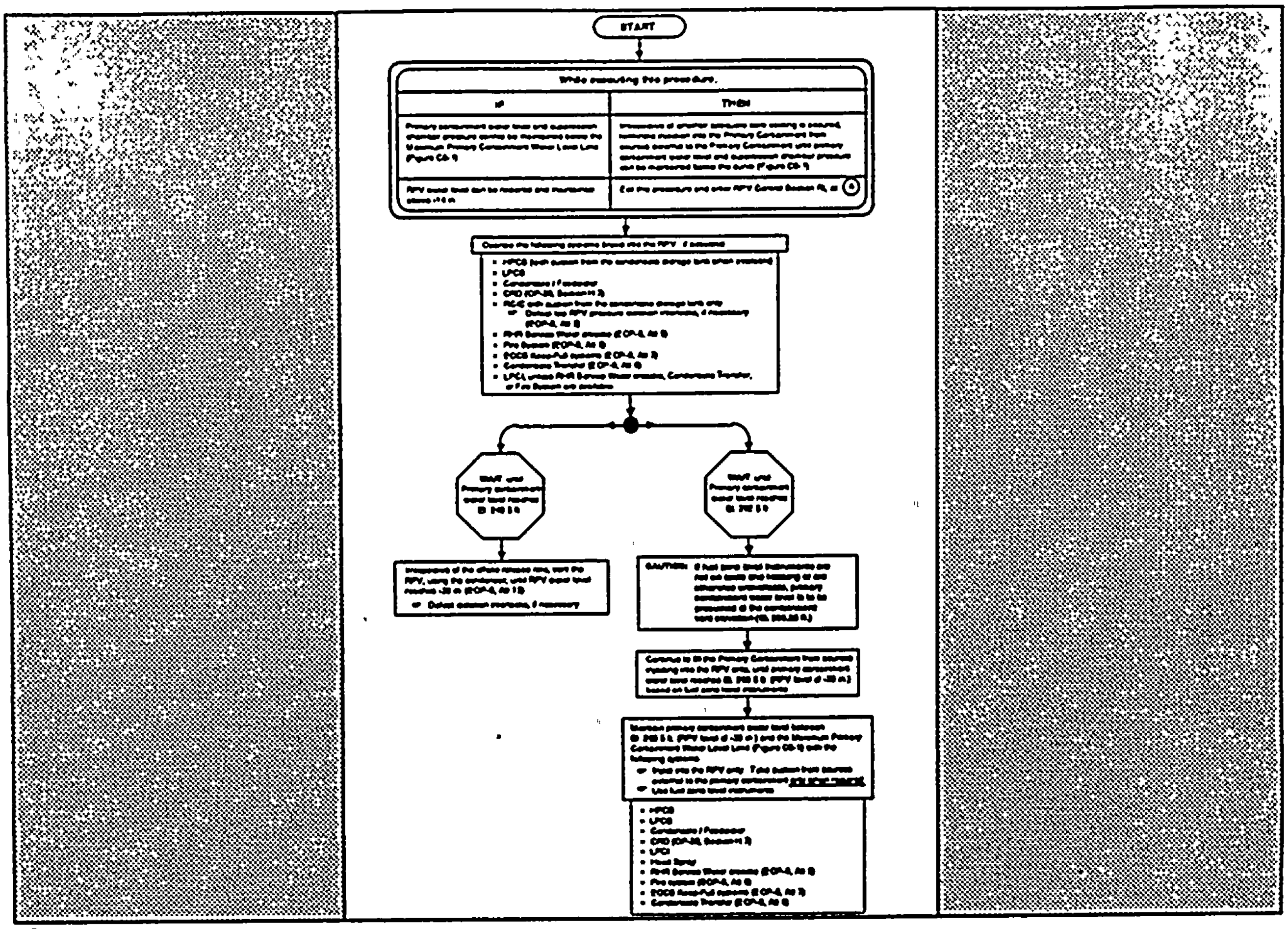


DISCUSSION:

Exiting this procedure is delayed until the reactor will remain shutdown without boron, either by insertion of all control rods to position 02 (Maximum Subcritical Banked Withdrawal Position), or by sufficient rod insertion such that the reactor will remain shutdown during and after reactor cooldown.

RPV water level cannot be restored to the normal range when boron is being injected because of the SLC system injection location, depositing boron inside the shroud. Boron remixing has only been demonstrated for those plants where SLC injects below the core. Raising RPV water level at Nine Mile Point Station Unit 2 will cause borated water inside the shroud to be displaced by non-borated water drawn from outside the shroud and below the core, causing an uncontrolled rise in reactor power. Therefore, the operator is directed to wait until the reactor shutdown determination can be made.

PRIMARY CONTAINMENT FLOODING



PURPOSE:

The purpose of Contingency #6, Primary Containment Flooding, is to restore adequate core cooling when previous actions have been unsuccessful in doing so. Prior to entering this procedure, attempts were made to restore RPV water level to above -14 inches (Top of Active Fuel), by injecting directly into the RPV with all available motor-driven and steam-driven pumps. Since these attempts were unsuccessful, the only remaining option to assure adequate core cooling is to flood the entire primary containment to a level above the Top of Active Fuel.

At NMP2, because of limitations in the physical plant, design exceptions have been taken to the generic guide. The stated purpose of this procedure (to flood the entire primary containment to a level above the Top of Active Fuel) cannot be performed due to the containment vent elevation lower than TAF. Thus a new level band has been chosen.

Two options existed for short term resolution of this problem. The first option is to violate the minimum, ie: set a lower minimum such that water level may be maintained below the

DISCUSSION: (Continued)

existing minimum of El. 298.5 ft. (TAF). The second option is to violate the maximum, ie: set a higher maximum such that water level may be maintained above the Maximum Primary Containment Water Level Limit (elevation of the primary containment vent).

Without minimizing the importance of maintaining water level above the top of active fuel, it is considered more critical to assure the integrity of the primary containment. This integrity cannot be assured if water level is not always maintained below the primary containment vent, otherwise the primary containment design pressure may be exceeded.

Therefore, a new minimum is established in lieu of El. 298.5 ft. This new minimum is at El. 296.5 ft., the minimum steam cooling RPV water level plus a safety factor of six inches. This one foot-nine inch resultant band is achievable considering water flow rates and the surface area of the primary containment at this elevation.

Additionally, due to instrumentation limitations, the actions and resultant action levels of the procedure have been modified. Long term modifications to the physical plant will enable a rewrite of the procedure such that the stated purpose of the EPG can be accomplished. (PR 9170)

ENTRY:

START

While executing this procedure:

IF	THEN
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C6-1)	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 curve (Figure C6-1)
RPV water level can be restored and maintained above -14 in.	Exit this procedure and enter RPV Control Section RL at (A)

DISCUSSION:

Entry to this contingency is addressed from four other procedures:

Primary Containment Control (N2-EOP-PC)

- If entry into Primary Containment Flooding is required by any of the below listed procedures, an override statement at the start of the Suppression Pool Water Level (SPL) leg of Primary Containment Control, N2-EOP-PC, has you exit the SPL leg. Exiting SPL avoids any potentially conflicting and concurrent instructions concerning control of suppression pool water level control. Additionally, in this degraded condition, Primary Containment Flooding takes priority over previous instructions concerning suppression pool water level control.

Contingency #1 Alternate Level Control (N2-EOP-C1)

- When, after an Emergency RPV Depressurization has been initiated, RPV water level cannot be restored above -14 inches (Top of Active Fuel) using any source of water. This indicates that with RPV pressure below the shutoff head of low-water-quality alternate injection subsystems, RPV water level still cannot be restored and maintained above -14 inches (Top of Active Fuel).

DISCUSSION: (Continued)

Contingency #4 Reactor Flooding (N2-EOP-C4)

- When no SRVs are open OR RPV pressure cannot be raised above the Minimum Alternate RPV Flooding Pressure.
- When less than four (4) SRVs are open OR RPV pressure cannot be maintained at least 61 psig (Minimum RPV Flooding Pressure) above suppression chamber pressure).

Contingency #5 Level/Power Control N2-EOP-C5)

- When RPV water level cannot be restored to and maintained above -45 inches (Minimum Steam Cooling RPV Water Level), using even the lowest quality makeup water source.

STEP:

START

While executing this procedure:

IF	THEN
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C6-1)	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 curve (Figure C6-1)
RPV water level can be restored and maintained above -14 in.	Exit this procedure and enter RPV Control Section RL at (A)

Operate the following systems (inject via the RPV, if possible):

DISCUSSION:

This is an override step and applies throughout the performance of the remainder of this procedure. This condition addresses the concern for maintaining primary containment integrity. With a non-isolable primary system break, injection systems will increase RPV water level until it reaches the elevation of the break. Once this occurs, the makeup water will spill from the break into the primary containment.

With systems operating which take a suction external to the primary containment, the suppression pool water level and eventually primary containment water level will increase from water spilling into the primary containment. If this situation were to continue, primary containment water level would eventually reach the Maximum Primary Containment Water Level Limit (MPCWLL, Figure C6-1, refer to Section C) of 298.25 feet.

The MPCWLL is the lesser of two water levels, (1) the water level associated with the elevation of the highest containment vent or (2) the highest containment water level where it is calculated that the containment will not fail. The NMP2 limit is based on the primary containment vent elevation concern.

With primary containment water level above the MPCWLL (298.25 feet), primary containment integrity is no longer assured. Therefore, irrespective of whether adequate core cooling is assured, injection into the primary containment from systems which can only take suction from outside the primary containment,

DISCUSSION: (Continued)

must be terminated. The MPCWLL (Figure C6-1, refer to Section C) was allowed to rise to 82.9 psig suppression chamber pressure to account for the increased pressure due to the height of water over the pressure instrument tap (El. 224 ft.). The limiting components are the drywell closure bolts. Maintaining suppression chamber pressure below the MPCWLL (Figure C6-1) will ensure that the drywell airspace pressure will not exceed the design limit of the drywell closure bolts. For NMP2, the limiting components (drywell closure bolts) are located above the elevation of the vent valves, thus are also above the water elevation. Therefore, they are not impacted by submergence, but by pressure and temperature. Many other primary containment limiting components (such as concrete structure, equipment hatch opening, rebar, primary containment liner, hatches and air locks, penetrations, embedments, and more) were reviewed by structural engineering (Calculation EM3.295). It was ascertained that they can withstand the pressures and water levels as depicted in the curve.

The actions specified in this step are required because failure to perform the actions may eventually result in a complete and uncontrolled loss of primary containment integrity. With no assurance as to where the primary containment may fail, a resulting loss of the suppression pool must be assumed accompanied by a complete and unrecoverable loss of core cooling. The resulting degraded core condition and loss of primary containment integrity has the potential to release substantial amounts of radioactivity to the environment.

When it is necessary to make a choice between assuring primary containment integrity or adequate core cooling, the NMP2 EOPs direct that preference will be made toward assuring primary containment integrity, regardless of core conditions, in order to protect the general public.

STEP:

While executing this procedure:	
IF	THEN
Primary containment water level and suppression chamber pressure cannot be maintained below the Maximum Primary Containment Water Level Limit (Figure C6-1)	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 curve (Figure C6-1)
RPV water level can be restored and maintained above -14 in.	Exit this procedure and enter RPV Control Section RL at (A)

Operate the following systems (inject via the RPV, if possible):

- HPCS (with suction from the condensate storage tank when available)
- LPCS
- Condensate / Feedwater
- CRD
- RCIC with suction from the condensate storage tank only
  - ☛ Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)
- RHR Service Water crosstie (EOP-6, Att 5)
- Fire System (EOP-6, Att 6)
- ECCS Keep-Full systems (EOP-6, Att 7)
- Condensate Transfer (EOP-6, Att 8)
- LPCI, unless RHR Service Water crosstie, Condensate Transfer, or Fire System are available.

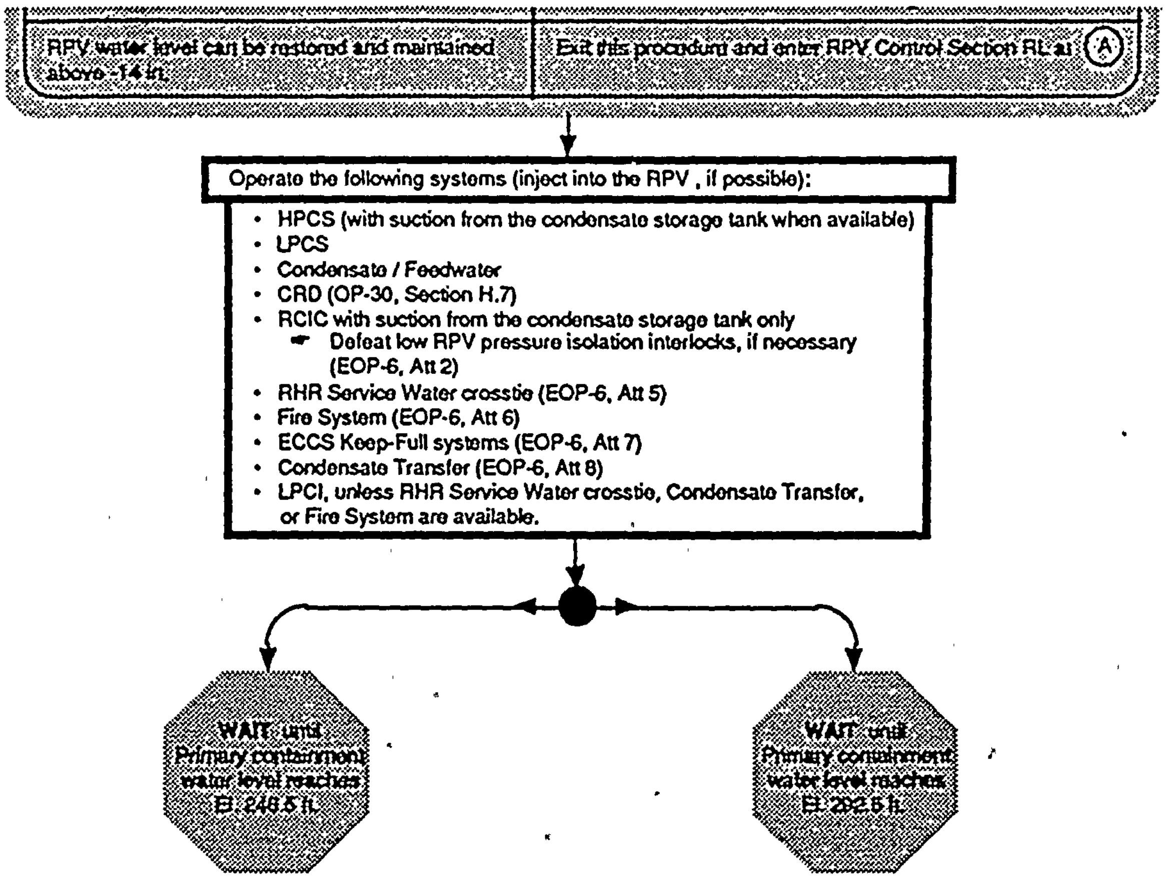
DISCUSSION:

This is an override step and applies throughout the performance of the remainder of this procedure.

The action taken in this step addresses the ability to restore and maintain RPV water level above -14 inches (Top of Active Fuel). Since this procedure may have been entered because RPV water level could not be maintained above a level that assures adequate core cooling, it is appropriate to discontinue containment floodup when water level is restored, and can be maintained above -14 inches (Top of Active Fuel).

With core submergence (and therefore adequate core cooling) existing, the operator is directed to exit this procedure and enter RPV Control at point A, which is at the start of the RPV Water Level (RL) control leg. This leg of RPV Control will provide the operator with detailed directions to restore RPV water level to the normal operating range.

STEP:



DISCUSSION:

In this step, the operator is given direction to operate all available systems with a water source external to the primary containment which can add water to the primary containment. Injection into the RPV is the preferred flowpath to raise primary containment water level.

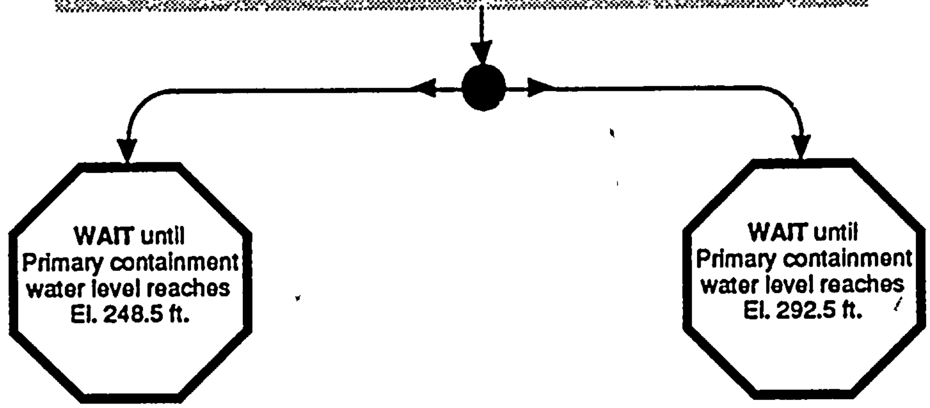
Since some of the systems listed above may already be providing some core cooling, it is not desirable to alter the flowpath of these systems.

In order to operate the RCIC System under the conditions which require entry into this procedure, it will be necessary to defeat the low RPV pressure isolation interlock. This allows the RCIC system to run and inject to the RPV, even at speeds approaching turbine stall speed.

STEP:

Operate the following systems (inject via the RPV, if possible):

- HPCS (with suction from the condensate storage tank when available)
- LPCS
- Condensate / Feedwater
- CRD
- RCIC with suction from the condensate storage tank only
  - Defeat low RPV pressure isolation interlocks, if necessary (EOP-6, Att 2)
- RHR Service Water crosstie (EOP-6, Att 5)
- Fire System (EOP-6, Att 6)
- ECCS Keep-Full systems (EOP-6, Att 7)
- Condensate Transfer (EOP-6, Att 8)
- LPCI, unless RHR Service Water crosstie, Condensate Transfer, or Fire System are available.

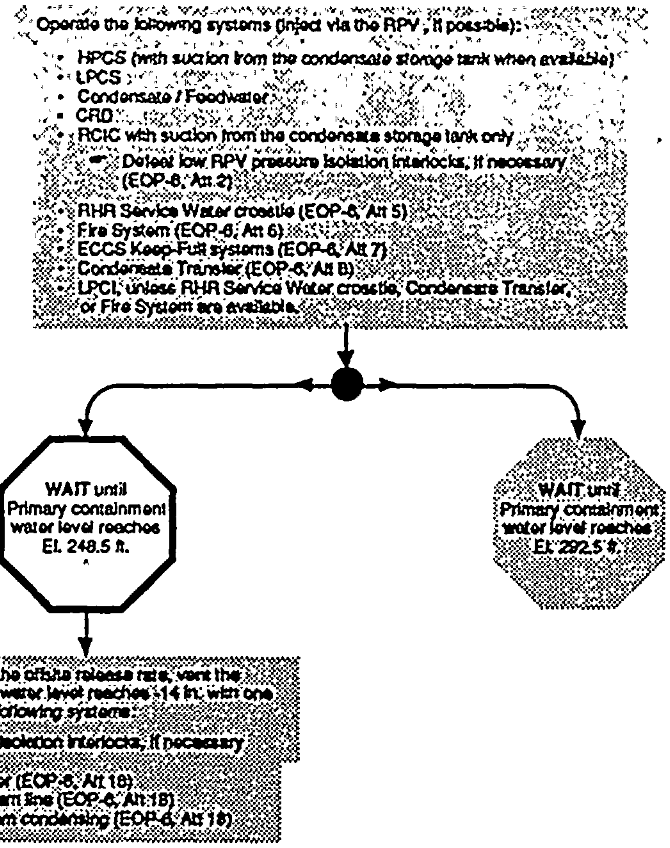


DISCUSSION:

These following steps address RPV venting and primary containment flooding. The steps must be performed concurrently, since the length of time to flood the containment may vary greatly.

Flooding the primary containment will accomplish the objective of core cooling only if the RPV is vented and is at nearly the same pressure as the primary containment. Otherwise, RPV water level and primary containment water level will differ due to a manometer effect. If the RPV is not vented, pressure "bottled up" in the RPV will prevent water in the flooded primary containment from entering the RPV and primary containment water level will no longer provide reasonable assurance that the RPV is flooding as the containment is filled.

STEP:

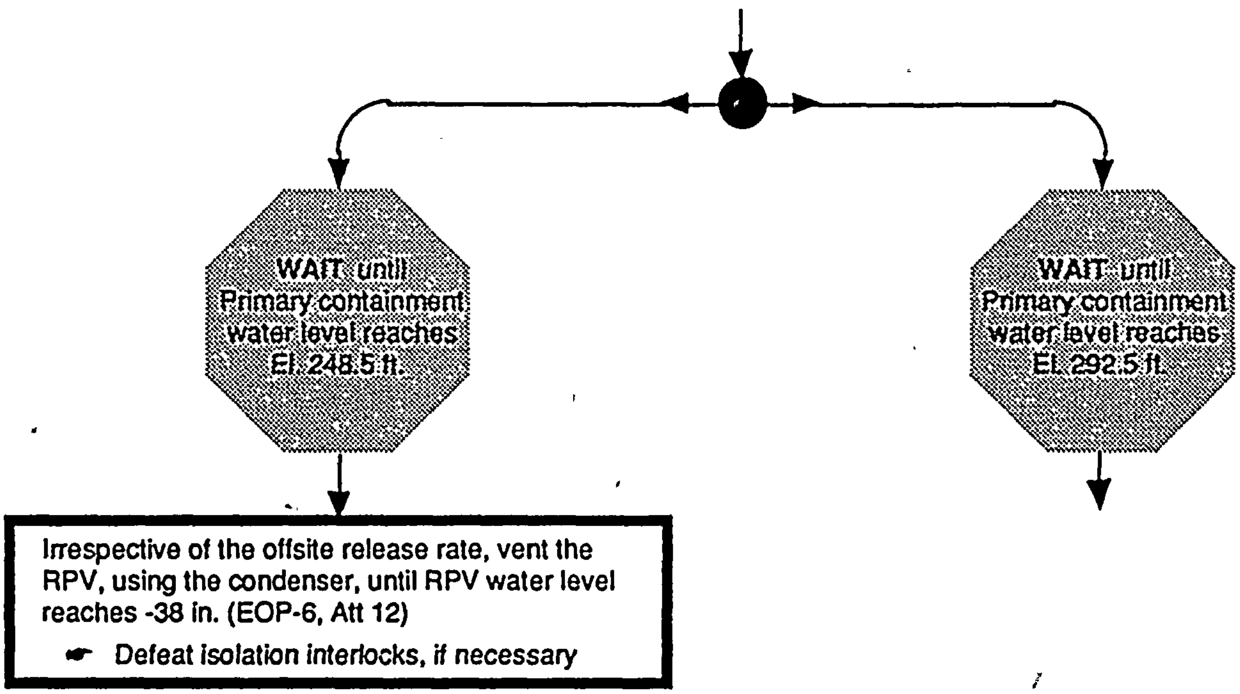


DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedure until the stated condition, primary containment water level reaches El. 248.5 feet, has been met.

Delaying the performance of the subsequent actions in this procedure minimizes needless venting of radioactive gases, yet ensures sufficient time to adequately vent the RPV in order to submerge the core with water from the primary containment.

STEP:



DISCUSSION:

The earliest point at which water could begin entering the RPV through a break in a primary system, during the primary containment flooding evolution (other than WCS), is when primary containment water level is at the elevation of the lowest portion of the Recirculation System piping. It is at this time that RPV venting must commence, to allow steam and non-condensibles to be vented from the RPV and the entry of water into the break to the RPV.

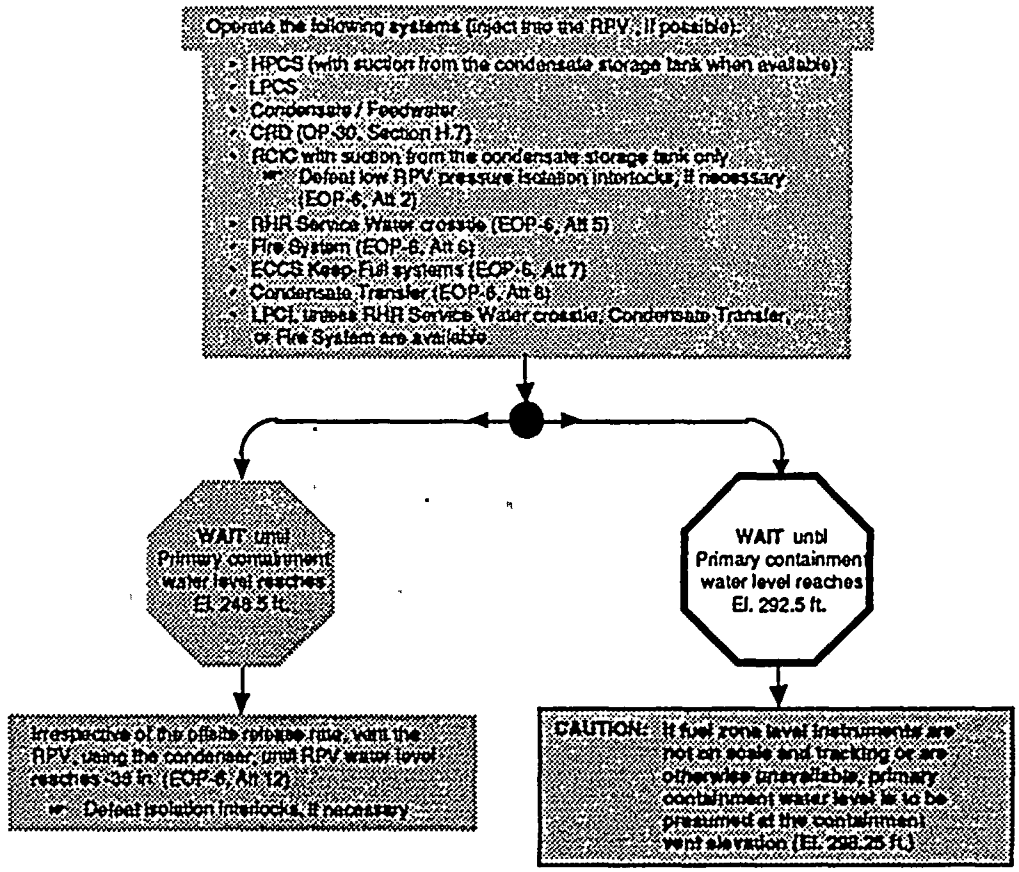
The importance of quickly submerging the core justifies RPV venting irrespective of offsite release rate. Venting the RPV earlier (less than El. 248.5 ft.) would needlessly prolong the time the RPV was vented and could increase total activity vented. Venting at a later time than instructed may not provide sufficient time to submerge the core prior to reaching 298.25 ft. of water level in the primary containment. This is particularly important if the venting capacity is much less than the rate of primary containment flooding.

When the core is submerged to -38 in., the objective of this step is met, and venting must be terminated. When RPV water level is restored, and can be maintained above -14 inches (Top of Active Fuel), the override step at the top of this procedure directs the operator to enter RPV Control at point A. The specific directions in the RPV Water Level control (RL) leg will then provide directions for controlling RPV water level.

DISCUSSION: (Continued)

The preferred vent path is to the condensor to ensure the RPV will remain at a higher RPV water level than the containment when injection is shifted to the RPV (due to lower presure in the RPV). Alternately, the RCIC steam line or RHR system may be used for venting, although it is recognized that these systems may not be as successful as venting to the main condenser.

STEP:



DISCUSSION:

This step is a "hold point" and delays the performance of subsequent actions in this procedure until the stated condition, primary containment water level reaches 292.5 ft., has been met.

Delaying the performance of the subsequent actions in this procedure confirms that the available systems are unable to restore and maintain RPV water level above -14 inches (Top of Active Fuel) and that further actions need to be addressed.

The value of El. 292.5 ft. takes into account inaccuracies of those instruments used to determine containment level at this point. At this level (as determined by EOP-6 Attach 23) actual containment water level could be as high as the containment vent. RPV water level instruments (Fuel zone) should be on-scale at this point (even considering the same amount of instrument inaccuracy in the opposite direction). This is the point at which containment level determination will shift to utilizing RPV level instruments.

STEP:

WAIT until Primary containment water level reaches El. 292.5 ft.

CAUTION: **If fuel zone level instruments are not on scale and tracking or are otherwise unavailable, primary containment water level is to be presumed at the containment vent elevation (El. 298.25 ft.)**

Continue to fill the Primary Containment from sources injecting into the RPV only, until primary containment water level reaches El. 298.5 ft. (RPV level of -38 in.) based on fuel zone level instruments

DISCUSSION:

This caution ensures that when fuel zone level instruments are not on scale and tracking or are otherwise unavailable, primary containment water level is to be considered to be at the elevation of the containment vent. This will ensure that injection from outside sources will be terminated to preserve containment venting capability and hence preserve containment integrity.

STEP:

CAUTION: If fuel zone level instruments are not on scale and tracking or are otherwise unavailable, primary containment water level is to be presumed at the containment vent elevation (El. 298.25 ft.)

↓

Continue to fill the Primary Containment from sources injecting into the RPV only, until primary containment water level reaches El. 296.5 ft. (RPV level of -38 in.) based on fuel zone level instruments

↓

Maintain primary containment water level between El. 296.5 ft. (RPV level of -38 in.) and the Maximum Primary Containment Water Level Limit (Figure C6-1) with the following systems:

- Inject into the RPV only. Take suction from sources external to the primary containment only when required
- Use fuel zone level instruments

- HPCS
- LPCS
- Condensate / Feedwater
- CRD (OP-30, Section H.7)
- LPCI
- Head Spray
- RHR Service Water crosstie (EOP-6, Att 5)
- Fire system (EOP-6, Att 6)
- ECCS Keep-Full systems (EOP-6, Att 7)
- Condensate Transfer (EOP-6, Att 8)

DISCUSSION:

As discussed previously, at El. 292.5 ft. the operator must use RPV water level instruments to determine containment level. If the RPV venting was inadequate and the fuel zone level instrument has not come on scale or is otherwise unavailable, primary containment water level should be considered at the elevation of the vent and further addition to the containment from external sources must be ceased.

If fuel zone level is on scale and tracking with the containment level determination procedure (EOP-6 Attach 23) water level is raised to an RPV level of -38 in. corresponding to a containment level of El. 296.5 ft. Injection is shifted from the containment proper to via the RPV only. This will help to assure that RPV level will not be lower than containment level.

Factors affecting the differences between RPV water level and primary containment water level are:

1. Adequacy of venting the RPV
2. Size of leak from RPV
3. Location of leak from RPV, and
4. Injection systems in use (flowpath and flowrates).

STEP:

Continue to fill the Primary Containment from sources injecting into the RPV only, until primary containment water level reaches El. 296.5 ft. (RPV level of -38 in.) based on fuel zone level instruments

↓

Maintain primary containment water level between El. 296.5 ft. (RPV level of -38 in.) and the Maximum Primary Containment Water Level Limit (Figure C6-1) with the following systems:

- Inject into the RPV only. Take suction from sources external to the primary containment only when required
- Use fuel zone level instruments

- HPCS
- LPCS
- Condensate / Feedwater
- CRD (OP-30, Section H.7)
- LPCI
- Head Spray
- RHR Service Water crosstie (EOP-6, Att 5)
- Fire system (EOP-6, Att 6)
- ECCS Keep-Full systems (EOP-6, Att 7)
- Condensate Transfer (EOP-6, Att 8)

DISCUSSION:

This step provides direction for primary containment water level control, including long term concerns. The lower level limit (El. 296.5 ft.) primary containment water level corresponds to a RPV water level of -38 inches.

The upper level limit (El. 298.25 feet) is the Maximum Primary Containment Water Level Limit and should not be exceeded in order to assure primary containment integrity.

Once primary containment water level is established within the specified range (El. 298.25 ft. to El. 296.5 ft.) long term cooling considerations become important.

For long term considerations, it is appropriate to recirculate the water in the primary containment with systems taking suction from the primary containment, using sources outside the primary containment only as required for makeup. The same systems, previously identified, are used except:

- Because floodup is complete the operator is given flexibility as to suction sources and operating modes of systems.
- RCIC is not included due to being inoperable from low RPV pressure and high suppression pool water level.
- Head Spray may now be used, if desired.

DISCUSSION: (Continued)

When RPV level is restored and maintained above -14 inches (Top of Active Fuel) the override step at the top of this procedure directs the operator to enter RPV Control at point A. The specific directions in the RPV Water Level control (RL) leg will then provide directions for controlling RPV water level.