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PSEG
Nuclear LLC

SEP 12 2001

LRN-01-267
LCR H01-002

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Gentlemen:

REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS-
SUPPLEMENTAL INFORMATION
INCREASE IN ALLOWABLE MSIV LEAKAGE RATE AND
ELIMINATION OF MSIV SEALING SYSTEM
HOPE CREEK GENERATING STATION
FACILITY OPERATING LICENSE NPF-57
DOCKET NO. 50-354

This letter requests that Attachment 9, "References" to our letter LRN-01-254, dated August 6, 2001, which contains GE Nuclear Energy, GE-NE-T2300759-00-02, "Hope Creek Generating Station Containment Analysis with 100 ^{0}F Safety Auxiliary Cooling System Temperature." be withdrawn and returned to PSEG Nuclear LLC. This report is GE proprietary and it is our understanding that this report is not being used by any of the reviewers associated with License Change Request H01-002. In addition, it has been determined that Attachment 1 to Attachment A, to Calculation No. H-1-ZZ-MDC-1886, Rev. 0, "Hope Creek Post Accident pH Calculation" (attachment 4 to LRN-01-254) is not proprietary and should also have been included with "Redacted Calculation No. PSAT 224CT.QA.03", (attachment 6 to LRN-01-254). A complete copy of the redacted calculation is included as Attachment 1

In accordance with 10CFR50.91(b)(1), a copy of this submittal has been sent to the State of New Jersey.

A017

SEP 12 2001

Should you have any additional questions regarding this request, please contact Mr. Michael Mosier at (856) 339-5434.

Sincerely,

D. F. Garchow

D. Garchow
Vice President – Operations

Attachments (1)

SEP 12 2001

I declare under penalty of perjury that the foregoing is true and correct.

Executed on SEP 12 2001

D. Garchow
Vice President – Operations

C: USNRC Senior Resident Inspector – HC (X24)

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Attachment 1

Redacted Calculation No. PSAT 224CT.QA.03

CALCULATION TITLE PAGE

CALCULATION NUMBER: PSAT 224CT.QA.03

CALCULATION TITLE:

"Calculation of Post-Accident pH for Hope Creek Nuclear Power Plant"

	ORIGINATOR		CHECKER		IND REVIEWER	
	Print/Sign	Date	Print/Sign	Date	Print/Sign	Date
REVISION: 0						
1						
2						
3						
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REASON FOR REVISION:	Nonconformance Rpt
0 - Initial Issue	N/A
1	
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Purpose

The purpose of this calculation is to determine the pH of the suppression pool of the Hope Creek plant as a function of time following a severe accident in support of alternate source term studies. This calculation is being performed using Polestar QA software STARpH 1.04 code [1] in accordance with the reference [2] and [3] procedures and the reference [4] PSEG request, included as Attachment 1.

Methodology

- Apply the Radiolysis of Water model from the STARpH 1.04 code [1] to calculate the [HNO_3] concentration in the water pool vs. time.
- Calculate conversion factors for cable geometry, including shielding of conduit.
- Apply the Radiolysis of Cable model of STARpH 1.04 to calculate the [HCl] concentration in the water pool vs. time.
- Manually calculate the [H^+] concentration added to the pool vs. time from the Radiolysis of Water model results and from the Radiolysis of Cable model results.
- Determine the sodium pentaborate buffer concentration added to the pool from the standby liquid control system (SLCS), the buffer dissociation constant, and the buffer starting pH.

- Calculate the pH of the water pool considering the concentration of sodium pentaborate in the pool and [H^+] additions as a function of time using the Add Acid model of STARpH 1.04.

Assumptions

Assumption 1: The fission product inventory is based on values for BWRs of similar thermal power, including a multiplication factor of 1.1 [5].

Justification: The fission product inventory currently available for the Hope Creek plant is in terms of curies of the fission product isotopes, but the STARpH code requires the inventory in terms of mass per fission product element. The inventory used for the Hope Creek plant in this calculation is based on those of BWRs of similar thermal power, scaled to the 3458 MWth power of Hope Creek, including a multiplier of 1.1 to provide conservatism in the radiolytic production of nitric acid.

Assumption 2: The fraction of the aerosol source term in the water pool is 0.75.

Justification: If drywell sprays were being credited, a value of 0.9 could be justified. Since sprays are not being credited, this number will be somewhat lower. PSEG concurs with the Polestar estimate of 0.75 for this value [6].

Assumption 3: Organic acid from paints can be neglected.

Justification: Proprietary information deleted

Assumption 4: The SLCS is actuated and the sodium pentaborate is injected into the pool within several hours of accident initiation.

Justification: A core damage event large enough to release the substantial quantities of fission products in the time frame considered for the alternate source term in reference [8] will be very evident to the operators (e.g., core outlet temperature, radiation level in the drywell, pressure and temperature in the drywell, hydrogen level in the drywell) within minutes of the initiating event. Thus it is reasonable to assume for purposes of this calculation that the Hope Creek EOPs and SAMGs provide for SLCS actuation within ~1 hour of accident initiation.

If SLCS injection is into the pool (i.e., into the reactor vessel with the vessel communicating with the pool as in a recirculation line break), significant mixing will occur quickly, on the order of 1 hour based on a total RHR flow rate of about 10,000 gpm and the pool volume of 1E6 gallons.

If the reactor vessel is not immediately communicating with the pool, an additional few hours is assumed to transpire before the operators flood the vessel up to the break to assure communication with the pool or inject sodium pentaborate to the pool via an alternate pathway.

Assumption 5: The unbuffered pH of the pool should remain above 7 for at least several hours.

Justification: Proprietary information deleted

Assumption 6: The Hypalon jacket and EPR insulation are modeled as a single unit with a thickness of 0.158 in (0.401 cm) and a weighted average density of 1.40 g/cm^3.

Justification: The EPR insulation contains 11% chlorine and the 9000 lbs of jacket includes the weight of the insulation [Attachment 1]. The thickness of the entire jacket plus EPR insulation is that given by ref. [11] as is the value for the average weighted density. The radiation G value for the production of HCl from Hypalon in the STARpH 1.04 code is applied to the entire thickness of Hypalon jacket plus EPR insulation.

Design Inputs

1. Reactor power = 3458 MWth
2. Suppression pool volume = 118,200 ft^3 (min) and 121,900 ft^3 (max)
3. RCS inventory = 11,721 ft^3 liquid, 9089 ft^3 saturated steam at 1040 psia
4. Pool initial pH = 5.8
5. Pool temperature vs. time, see Table 3
6. Fission product inventory - see Assumption 1
7. Electrical cable insulation (Hypalon jacket + EPR insulation) mass = 9,000 lbm
8. Electrical cable OD = 1.0 in
9. Electrical cable insulation thickness (Hypalon jacket + EPR insulation) thickness = 0.158 in, see Assumption 6
10. Electrical cable insulation average weighted density = 0.140 g/cm^3, see Assumption 6
11. Fraction of cable with chloride-bearing insulation that is in conduit = 38%
12. Average conduit diameter = 2 in

13. Average conduit wall thickness = 0.154 in
14. Drywell free volume = 165,520 ft^3
15. Torus free volume = 133,311 ft^3
16. Mass of sodium pentaborate in SLCS available for injection = 5776 lbm
17. Chemical formula for sodium pentaborate = $Na_2B_{10}O_{16} \bullet 10H_2O$
18. Boron enrichment in the sodium pentaborate is natural
19. Containment surface area covered with paint: drywell, 32,750 ft^2; torus, 34,537 ft^2
20. Date since last painting: 1985

Items 1 to 5, 7, 8, and 11 to 20 are from Attachment 1. Item 6 is from Assumption 1, and items 9, and 10 are from Assumption 6.

References

1. PSAT C107.02, STARpH, A code for Evaluating Containment Water Pool pH During Accidents, Code Description and Validation and Verification Report, Revision 4, February, 2000.
2. PSAT 224CT.QA.01, Project QA Plan for Calculation of Post-Accident pH for Hope Creek Nuclear Power Plant, July 2, 2001.
3. PSAT 224CT.QA.02, Implementing Procedure for Calculation of Post-Accident pH for Hope Creek Nuclear Power Plant, July 2, 2001.
4. PSEG, e-mail from B. L. Barkley to D. E. Leaver, "Final Transmittal of pH Data", June 29, 2001.
5. R. R. Hobbins, e-mail to D. E. Leaver, "Hope Creek Inventory", June 14, 2001.
6. PSEG, e-mail from B. L. Barkley to D. E. Leaver, "Design Input for Hope Creek pH Calculation", June 8, 2001.
7.
8. "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," Regulatory Guide 1.183, July, 2000.

10.

11.

12. W. C. Reynolds and H. C. Perkins, "Engineering Thermodynamics," McGraw-Hill.
13. D. R. Lide, Editor-in-Chief, Handbook of Chemistry and Physics, 77th Edition, CRC Press, 1996.

14.

15.

16.

17.

Calculation

Calculation of [OH^-] and [HNO_3] in Water Pool vs. Time
The BWR version of the Radiolysis of Water model in the STARpH 1.04 code [1] calculates the hydroxyl ion concentration, [OH^-], from fission product cesium, and nitric acid concentration, [HNO_3], in the containment water pool generated by radiolysis. Per Assumption 3, organic acid from paints is neglected.

Inputs to the Radiolysis of Water model are based on the Design Inputs, Items 1 to 4 [Attachment 1] and Assumptions 1 and 2. The core inventories by radionuclide group are:

Group Title	Elements in Group	Core Inventory (Kg)
I	I, Br	31.8
Cs	Cs, Rb	349
Te	Te, Sb, Se	67.0
Sr	Sr	91.7
Ba	Ba	154
Ru	Ru, Rh, Mo, Tc, Pd	954
Ce	Ce, Pu, Np	1305
La	La, Zr, Nd, Eu, Nb, Pm, Pr, Sm, Y, Cm, Am	1209

Containment water pool volume = water volume of wetwell + RCS liquid volume

Calculate mass of liquid from condensation of saturated steam at 1040 psia in RCS,

$$9080\ ft^3 \bullet 2.33\ lbm/ft^3 = 21{,}156\ lbm$$

where 2.33 lbm/ft^3 is the density of saturated steam at 1040 psia [12].

At an average pool temperature of 155 °F (see Table 3), the volume of this condensed steam is

$$21{,}156\ lbm \bullet cm^3/0.979\ g \bullet 454 g/lbm \bullet ft^3/2.83E4\ cm^3 = 347\ ft^3$$

where 0.979 g/cm^3 is the density of water at 155 °F (68 C) [13].

Thus, the containment water pool volume is

$$(121{,}900\ ft^3 + 11{,}721\ ft^3 + 347\ ft^3) \bullet 2.83E1\ L/ft^3 = 3.79E6\ L$$

The maximum suppression pool volume is used here to maximize the moles of H^+ associated with the initial pH of the water (5.8).

The core inventory of fission products in the table above is entered in column F of the Radiolysis of Water model spread sheet and a burnup value of 33,000 MWd/t is used in cell K2 so that the fission product inventory is not modified when calculating values for HI and CsOH.

The output of the calculation with the Radiolysis of Water model in the form of net $[OH^-]$ and $[HNO_3]$ as a function of time is provided in the first and last columns of the output portion of Exhibit 1.

Calculation of [HCl] in Water Pool vs. Time

The concentration of HCl in the water pool as a result of radiolysis of electrical cable insulation is calculated using the Radiolysis of Cable model of the STARpH 1.04 code. Inputs to the Radiolysis of Cable model are based on the Design Inputs, Items 1 to 3 [Attachment 1] and Items 7 to 15 [Attachment 1], and Assumptions 2 and 6.

The containment free volume is the sum of the drywell free volume and the torus free volume (Design Input, Items 14 and 15 [Attachment 1]). The minimum torus free volume is used since the containment volume appears in the denominator of expression for HCl production, maximizing the result.

Containment free volume = drywell free volume + torus free volume
$= 165{,}520 \text{ ft}^3 + 133{,}311 \text{ ft}^3$
$= 2.988\text{E}5 \text{ ft}^3 \times (12 \text{ in/ft})^3 \times (2.54 \text{ cm/in})^3$
$= 8.46\text{E}9 \text{ cm}^3$

To account for gamma radiation leakage from the containment, the STARpH 1.04 BWR Mark 1 default value of 0.068 for one minus fraction of gamma leakage is used [1].

The cable insulation characteristics are listed in the Design Inputs [Attachment 1] and are shown in Table 1 in both English and metric units. As described in [Attachment 1] the EPR insulation layer contains 11.33% chlorine, so the insulation thickness in Table 1 is the sum of the EPR and Hypalon jacket thicknesses. Although the density of the Hypalon is given as 1.55 g/cm^3 in [Attachment 1], the value of 1.40 g/cm^3 is used for the combined EPR/Hypalon thickness per reference [11].

Table 1. Hope Creek Containment Cable Characteristics

Insulation Thickness (in)	Insulation Thickness (cm)	Cable OD (in)	Cable OD (cm)	Insulation ID (in)	Insulation ID (cm)	Insulation Mass (lbm)
0.158	0.401	1.0	2.54	0.684	1.74	9,000

The conversion factors, R_γ and R_β, found in cells H2 and I2 of STARpH [1], have been calculated for this Hope Creek cable geometry.

Proprietary information deleted.

Proprietary information deleted.

The output of the calculation with the Radiolysis of Cable model in the form of [HCl] as a function of time is provided as Exhibit 2.

Calculation of $[H^+]$ Added to the Pool

The net hydrogen ion concentration added to the pool is the sum of the Net $[OH^-]$ and [HCl] shown as a function of time in Exhibit 1 and Exhibit 2, respectively. These data are combined in Table 2 below to give Net $[H^+]$ Added. The parenthetical values for Net $[H^+]$ Added mean that the values indicated are actually $[OH^-]$ since the amount of hydroxide in the Net $[OH^-]$ column exceeds the [HCl]. The Net $[OH^-]$ is taken from the first column of Exhibit 1, and is the $[OH^-]$ concentration in mol/L which results from the $[OH^-]$ from CsOH less the $[H^+]$ from initial pH, HI, and HNO_3. Also shown in Table 2 is the hydrogen ion concentration, $[H^+]$ Added, due to $[HNO_3]$ and [HCl] only (i.e., neglecting the $[OH^-]$ from CsOH).

Table 2. Calculation of [H+] added to pool

Time	$[HNO_3]$	Net $[OH^-]$	[HCl]	$[H^+]$ Added	Net $[H^+]$ Added
1h	5.18E-6	1.08E-4	5.37E-6	1.06E-5	(1.03E-4)
2h	7.11E-6	1.06E-4	1.01E-5	1.72E-5	(9.59E-5)
5h	1.11E-5	1.02E-4	2.16E-5	3.27E-5	(8.04E-5)
12h	1.76E-5	9.52E-5	4.05E-5	5.81E-5	(5.47E-5)
1d	2.63E-5	8.66E-5	6.43E-5	9.06E-5	(2.23E-5)
3d	5.07E-5	6.22E-5	1.28E-4	1.79E-4	6.58E-5
10d	9.60E-5	1.68E-5	2.19E-4	3.15E-4	2.02E-4
20d	1.25E-4	(1.2E-5)	2.55E-4	3.80E-4	2.67E-4
30d	1.44E-4	(3.1E-5)	2.66E-4	4.10E-4	2.97E-4

Calculation of Sodium Pentaborate Buffer Added to Pool

The concentration of B is calculated below.

The molecular weight of sodium pentaborate ($Na_2B_{10}O_{16} \bullet 10H_2O$) is, with natural boron,

$2 \bullet 22.9898 + 10 \bullet 10.811 + 26 \bullet 15.9994 + 20 \bullet 1.00797 = 590.2$ g/mol

The mass of sodium pentaborate in the SLCS available for injection is 5,776 lbm. Therefore,

5,776 lbm • 454 g/lbm • mol/590.2 g = 4.44E3 mol of sodium pentaborate

There are 10 moles of B per mole of sodium pentaborate, so there are 4.44E4 mol of B and the concentration of B in the water pool is

4.44E4 mol B/3.79E6 L = 1.17E-2 mol B/L

where the pool volume of 3.79E6 L was calculated earlier.

Calculation of pH

The Add Acid model of STARpH 1.04 is used to determine pH vs. time for the above system using the $[H^+]$ Added values from Table 2, 1.17E-2 mol B/L, the boron buffer dissociation constant, and the starting pH of the buffer solution. The dissociation constant, K_A, and the starting pH are temperature dependent and the temperature of the pool as a function of time is shown in Table 3. The average temperature over the period of 30 days

Table 3. Pool temperature

Time (h)	Temp (F)
0	110
3	203
6	212
24	200
96	168
240	153
480	145
720	141

(720 h) is calculated to be 155 °F (68 C).

Proprietary information deleted.

Results

Proprietary information deleted.

For time points 1 hr and 2 hr, pH is indicated simply as >8.0 on the basis of Assumption 5. From 5 hours on, the effect of cesium is neglected and pH is obtained by applying the Table 2, [H^+] Added column to Exhibit 3. The results are shown in Table 4.

Table 4. pH results vs. time

Time	pH
1h	>8.0
2h	>8.0
5h	8.4
12h	8.4
1d	8.4
3d	8.3
10d	8.3
20d	8.3
30d	8.3

Conclusion

The pH of the containment water pool for the Hope Creek plant radiological DBA LOCA is above 8 over a period of 30 days following accident initiation.

			Exhibit 1 Radiolysis of Water Input and Output							
Input										
Proprietary information deleted										
Output										
Proprietary information deleted										

			Exhibit 2 Radiolysis of Cable					
Input:								
Proprietary information deleted								
Output:								
Proprietary information deleted								

		Exhibit 3 Add Acid Input and Output					
Input:				**Output:**			
Proprietary information deleted					Proprietary information deleted		

ATTACHMENT 1

Data Input for pH Calculation

Evaluation for AST for RF10

DCP 4EC-3513: Delete the MSIV Sealing System (MSIVSS or KP) & the Outboard MSIV Before Seat Drain (OMBSD) With No MSIV Leakage Treatment Path Required

Background MSIVSS Deletion Using AST:

The use of Alternate Source Term (AST) in the subject DCP requires that the pH of the post-DBA-LOCA water be kept at a pH of 7 or above (SLC will be credited based on the Severe Accident Management procedure SAG-1). The pH requirement is needed to keep the iodine from re-evolving from the water solution, which can occur if the pH goes below 7. For the License Change Request we will have to have a pH calc that shows the pH of the suppression pool from 1 to 30 days after a DBA-LOCA. Polestar Applied Technology, Inc. has been contracted to do this calculation. The numbered items below refer to the Polestar question numbers of e-mail dated 4-13-2001.

HC Thermal Power & Fuel Information Provided

1. **Reactor power (MWt)**

Current TS 1.35 states: RATED THERMAL POWER shall be a total reactor core heat transfer rate to the reactor coolant of 3293 MWT.
Uprate In Progress: 1.4% power uprate (3339 MWT).
Current DBA-LOCA radiological analysis (H-1-ZZ-MDC-1822, Rev. 0, "LOSS OF COOLANT ACCIDENT AMENDMENT 30 MODEL") indicates that core inventory used is based on 3458 MWT (5% above current rated thermal power).
Future uprates may be as high as 20% above current rated thermal power (3952 MWT).

Use 5% above current rated power **3458 MWth**

2. **EOC fission product inventory (mass by radionuclide group)**

Use the Hope Creek nuclides inventory of Attachment 2. (Thermal power from #1 above is 3458 MWth.)

ATTACHMENT 1

HC Reactor, Drywell & Suppression Chamber Information Provided

3. Suppression pool volume

The Bases for TS 3/4.6.2, DEPRESSURIZATION SYSTEMS, states: Maximum water volume of 122,000 ft^3 ... and the minimum volume of 118,000 ft^3.

Calculation 12-0025, Rev. 3, "DRYWELL VOLUME & TORUS AIR & WATER VOLUMES & POOL SURFACE", shows values of 121,900 ft^3 and 118,200 ft^3, respectively for torus maximum and minimum water volume.

4. RCS inventory

TS 5.4.2, Design Features states: The total water and steam volume of the reactor vessel and recirculation system is approximately 21,970 cubic feet at a nominal steam dome saturation temperature of 547°F.

VTD PN1-B11-A001-0563, Sheet 1, Rev. 1, "REACTOR PRIMARY SYSTEM WEIGHTS & VOLUMES", and Sheet 3, Rev. 1, show the following based on 1040 psia:

For the reactor vessel, a free volume of 20,810 cu ft

Rated power	7833 cu ft	(subcooled water)
	3888 cu ft	(saturated water)
	9089 cu ft	(saturated steam)
	570.1 kips	
Hot standby	13,257 cu ft	(saturated water)
	7552 cu ft	(saturated steam)
	629.4 kips	

For recirculation piping, a fluid volume of 1168.4 cu ft

5. Pool temperature vs. time out to 30 days: See Attachment 1

6. Drywell free volume

TS 5.2, CONTAINMENT, states: The drywell has a nominal free air volume of 169,000 cubic feet.

Calculation 12-0025 shows 165,520 ft3.

ATTACHMENT 1

7. Torus free volume

Calculation 12-0025, "D/W Volume & Torus Air & Water Volumes & Pool Surface") states: The suppression chamber has a minimum air volume of 133,311 cubic feet and a maximum air volume of 136,866 cubic feet.
HC Suppression Chamber pH Information Provided

8. Suppression Pool initial pH (typically 5.3 - 6)

The Hope Creek torus has a Torus Water Cleanup System (TWCU) with a demineralizer that runs with high availability. The bounding historical value (since 1-1997) of torus pH is the range of 5.8 to 8.1. The data excludes pH excursions during refueling outages (e.g., ECCS Suction Strainer Mods). The weighted or typical minimum value is 6.0. The suggested value to use is 5.8 if there is no significant penalty or consequence. Refer to Attachment 3.

HC Drywell & Suppression Chamber Cable Information Provided

Background: One of the design inputs for this calculation is the total mass of chloride bearing cable jacket material in the primary containment (drywell and torus) and what fraction of it is in conduit. We do not have cable quantities in the drywell & torus for the purposes of the fire load analysis, Calc E-22, "Fire Hazards Analysis" (Drywell Room 4220 and Torus Internals inside Room 4102). EE580/CARTs/Genesis and SAP was used for determining cable type, sizes, and quantities.

In general: The containment cable is approximately 80% Okonite, 15% Rockbestos, & 5% other. The typical conduit is 2-inch or larger. Thirty-eight percent of the containment cable is routed in conduit or flex conduit. The torus cabling quantity (penetrations) is 12% of the total of the containment (drywell + torus) cable quantity. It has lighting and solenoids & redundant position switches on the 8 D/W-to-Torus vacuum breakers. All (except limited non-Q vendor skid) containment cable is EQ qualified and flame retardant. All (except limited non-Q vendor skid) containment cable was bought "Q" and is EQ qualified for greater than the drywell specified environment (340°F, 62 psig, 7.2 E 7 Rad gamma, and 1.6 E Rad beta). Over 99% (99.9%) of the containment cable has a hypalon jacket.

Okonite cable has Okonite-FMR insulation and Okolon (hypalon) jacket. Okonite FMR is an ethylene-propylene rubber (EPR) based insulation compound modified with a chlorinated, flame retardant additive to impart fire retardant properties. The EPR insulation is 11.33 weight percent chlorine. The average EPR insulation thickness is based on the average cable conductor size of Calc E-22 which is #9 AWG. Per Bechtel Spec E-033 and Spec A-0-ZZ-EDS-0227-0 #9 AWG wire has an insulation thickness of 45 mils. For a conservative average conductor use #6 AWG or 55 mils (55 mils is

ATTACHMENT 1

applicable to #8, 6, 4, & 2 AWG.). The NUREG 1081 value of 86 mils is acceptable and conservative.

Rockbestos cable is primarily Firewall III Irradiation Cross-Linked Polyethelene Construction, which has a hypalon jacket.

Cable Information Provided is as Follows:

Total containment cable weight is 12,000 pounds (11,530 pounds) and 38% is in conduit. The average power, control, and instrumentation cable size was estimated (Engr Calc E-22). The average total cable weight per foot was taken and the weight per foot of the copper was deducted. Seventy five percent of this total weight is jacket and insulation. Therefore, 9000 pounds is the conservative value to be used for the total containment jacket weight.

9. **Cable insulation jacket mass in containment (jacket with hypalon)** **9000**

10. **Cable insulation jacket mass in containment (jacket with PVC)** **None**

11. **Fraction of cable with chloride-bearing jacket that is in conduit** **38%**
(The remaining 62% is in cable trays)

The following is based on using an average size of all the small and large cable and conduit in the containment:

12. **Average conduit wall thickness (Average conduit 2"):** **0.154 inches**

13. **Average jacket thickness for chloride-bearing cable insulation:**
Use NUREG value of 0.072 inches

14. **Average OD for chloride-bearing cable** **1.0 inch**

15. **Density of PVC insulation jacket** **N/A**

16. **Density of hypalon insulation jacket** **1.55 g/cc**

ATTACHMENT 1

HC SLC Information Needed

17. **Mass of sodium pentaborate in SLCS available for injection**

Current TS 4.15.b.2 states: The available weight of sodium pentaborate is greater than or equal to 5776 lbs

18. **Chemical formula for the sodium pentaborate** $Na_2B_{10}O_{16} \cdot 10H_2O$

19. **Boron enrichment of the boron in the sodium pentaborate** natural boron

Containment Coating Information Needed

This information is necessary to estimate the production of organic acids.
The Containment Surface area covered with paint:

Drywell: 32,750 ft^2

Reference: Vendor Document 324361, "Investigation of Primary Containment Coatings HC & Photographic Appendix"

Torus: 34,537 ft^2

Reference: Hand Calculation with the torus as a cylinder: (Torus radius 15.33 feet the 16 sections each have a centerline of 22.41 feet) (Reference Calc 12-0025, "D/W Volume & Torus Air & Water Volumes & Pool Surface")

The date since the last painting: 1985

Data Verification (Line-by Line Check)

This information including Attachments 1 and 2 but not including the containment cable quantities data of Calc H-1-ZZ-MDC-1887) was verified to be accurate as stated. Calc H-1-ZZ-MDC-1887 is separately verified.

Prepared By: Barry L. Barkley Date: 6-28-2001

Verified By: John F. Duffy Date: 6-29-2001

ATTACHMENT 1:

Long Term Drywell and Supp Pool Temp. (4 hours - 100 days) Calc H-1-ZZ-MDC-0364, "Drywell Temperature after Recirculation Line Break," 1-22-90 *

Post-LOCA Time (Hr)	D/W Temperature, in °F,	Supp Pool Temperature, in °F,
0	340**	95 (110)***
3	320****	203****
6	225	212
24	207	200
96	173	168
240	156	153
480	145	145
720 (30 days)	144	141

* 5°F has been added to generate all the above values: This calc is dated 2-22-90. Since that time the revisions to interfacing calcs (e.g., RHR heat exchanger heat transfer) represent a small correction. The 5°F bounds all effects of the changes since 1990. This is an open item to this calc that will be resolved with a calc update.

** Maximum Drywell temperature after the accident. (Reference Tech Spec Design Features 5.2 Containment Design Temperature & Pressure)

*** Maximum Torus Water temperature before the accident is taken from Tech Specs 3/4.6.2 (95°F) and HC.OP-EO.ZZ-0102, "Primary Containment Control" (110°F is the temperature that requires an immediate recirc runback and reactor scram)

****These data points are a conservative extrapolation using the Short Term Drywell and Suppression Pool Temp. (0 - 80 sec.) data from UFSAR Figures 6.2-4.