

ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Friday, February 10, 2012 1:20 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (AREVA); DELANO Karen (AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); GUCWA Len (EXTERNAL AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 434, FSAR Ch. 6, Supplement 6
Attachments: RAI 434 Supplement 6 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 434 on November 15, 2010. AREVA NP submitted Supplement 1, Supplement 2 and Supplement 3 to the response on January 26, 2011, February 24, 2011, and March 16, 2011 to provide revised response schedules. Supplement 4 response to RAI 434 was submitted on March 31, 2011 to provide responses to the remaining eleven questions. Supplement 5 response to RAI 434 was submitted on December 15, 2011 to provide revised responses to Question 06.02.02-71, Question 06.02.02-72 and Question 06.02.02-77.

The attached file, "RAI 434 Supplement 6 Response US EPR DC.pdf" provides a revised response to Question 06.02.02-72. The only change is the deletion of a sentence in the Supplement 5 response that stated: *The rooms listed in Table 06.02.02-72-8 do not include the core spreading area and the reactor cavity.*

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to Question 06.02.02-72.

The following table indicates the respective pages in the response document, "RAI 434 Supplement 6 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 434 — 06.02.02-72	2	26

This concludes the formal AREVA NP response to RAI 434 and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.

7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, December 15, 2011 5:32 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 434, FSAR Ch. 6, Supplement 5

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 434 on November 15, 2010. AREVA NP submitted Supplement 1, Supplement 2 and Supplement 3 to the response on January 26, 2011, February 24, 2011, and March 16, 2011 to provide revised response schedules. Supplement 4 response to RAI 434 was submitted on March 31, 2011 to provide responses to the remaining eleven questions.

The attached file, "RAI 434 Supplement 5 Response US EPR DC.pdf" provides revised responses to Question 06.02.02-71, Question 06.02.02-72 and Question 06.02.02-77.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the responses to Question 06.02.02-71 and Question 06.02.02-72.

The following table indicates the respective pages in the response document, "RAI 434 Supplement 5 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 434 — 06.02.02-71	2	5
RAI 434 — 06.02.02-72	6	30
RAI 434 — 06.02.02-77	31	32

This concludes the formal AREVA NP response to RAI 434 and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.

7207 IBM Drive, Mail Code CLT 2B

Charlotte, NC 28262

Phone: 704-805-2223

Email: Dennis.Williford@areva.com

From: WELLS Russell (RS/NB)

Sent: Thursday, March 31, 2011 7:13 PM

To: 'Tesfaye, Getachew'

Cc: GUCWA Len (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 434, Supplement 4

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 434 on November 15, 2010. AREVA NP submitted Supplement 1, Supplement 2 and Supplement 3 to the response on January 26, 2011, February 24, 2011, and March 16, 2011 to provide revised response schedules.

The attached file, "RAI 434 Supplement 4 Response US EPR DC.pdf" provides technically correct and complete responses to the remaining 11 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 434 Questions 06.02.02-71, 06.02.02-72, 06.02.02-74, and 06.02.02-75.

The following table indicates the respective pages in the response document, "RAI 434 Supplement 4 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 434 — 06.02.02-69	22	2
RAI 434 — 06.02.02-70	33	4
RAI 434 — 06.02.02-71	55	8
RAI 434 — 06.02.02-72	99	34
RAI 434 — 06.02.02-73	3535	36
RAI 434 — 06.02.02-74	3737	37
RAI 434 — 06.02.02-75	3838	38
RAI 434 — 06.02.02-76	3939	39
RAI 434 — 06.02.02-77	4040	41
RAI 434 — 06.02.02-78	4242	43
RAI 434 — 06.02.02-79	4444	44

This concludes the formal AREVA NP response to RAI 434 and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

From: WELLS Russell (RS/NB)

Sent: Wednesday, March 16, 2011 4:31 PM

To: Tesfaye, Getachew

Cc: GUCWA Len (External RS/NB); BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 434, FSAR Ch. 6, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 434 on November 15, 2010. AREVA NP submitted Supplement 1 to the response on January 26, 2011 to provide a revised response schedule. Supplement 2 response to RAI 434 was provided on February 24, 2011 to provide a revised schedule for responding to Questions 06.02.02-70, 06.02.02-75 and 06.02.02-77.

To provide an opportunity for additional interaction with the NRC staff, AREVA NP is providing a revised schedule for responding to Questions 06.02.02-69, 06.02.02-71, 06.02.02-72, 06.02.02-73, 06.02.02-74, 06.02.02-76, 06.02.02-78, and 06.02.02-79. The schedule for the remaining questions is unchanged.

The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 434 — 06.02.02-69	March 31, 2011
RAI 434 — 06.02.02-70	March 31, 2011
RAI 434 — 06.02.02-71	March 31, 2011
RAI 434 — 06.02.02-72	March 31, 2011
RAI 434 — 06.02.02-73	March 31, 2011
RAI 434 — 06.02.02-74	March 31, 2011
RAI 434 — 06.02.02-75	March 31, 2011
RAI 434 — 06.02.02-76	March 31, 2011
RAI 434 — 06.02.02-77	March 31, 2011
RAI 434 — 06.02.02-78	March 31, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

3315 Old Forest Road, P.O. Box 10935

Mail Stop OF-57

Lynchburg, VA 24506-0935

Phone: 434-832-3884 (work)

434-942-6375 (cell)

Fax: 434-382-3884

Russell.Wells@Areva.com

From: WELLS Russell (RS/NB)

Sent: Thursday, February 24, 2011 5:11 PM

To: 'Tsfaye, Getachew'

Cc: DELANO Karen (RS/NB); BENNETT Kathy (RS/NB); ROMINE Judy (RS/NB); BRYAN Martin (External RS/NB); GUCWA Len (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 434, FSAR Ch. 6, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 434 on November 15, 2010. AREVA NP submitted Supplement 1 to the response on January 26, 2011 to provide a revised response schedule. To provide an opportunity for additional interaction with the NRC staff, AREVA NP is providing a revised schedule for responding to Questions 06.02.02-70, 06.02.02-75 and 06.02.02-77. The schedule for the remaining questions is unchanged.

The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 434 — 06.02.02-69	March 16, 2011
RAI 434 — 06.02.02-70	March 31, 2011
RAI 434 — 06.02.02-71	March 25, 2011
RAI 434 — 06.02.02-72	March 25, 2011
RAI 434 — 06.02.02-73	March 16, 2011
RAI 434 — 06.02.02-74	March 16, 2011
RAI 434 — 06.02.02-75	March 31, 2011
RAI 434 — 06.02.02-76	March 16, 2011
RAI 434 — 06.02.02-77	March 31, 2011
RAI 434 — 06.02.02-78	March 16, 2011
RAI 434 — 06.02.02-79	March 16, 2011

Sincerely,

Russ Wells

U.S. EPR Design Certification Licensing Manager

AREVA NP, Inc.

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Russell.Wells@Areva.com

From: BRYAN Martin (External RS/NB)

Sent: Wednesday, January 26, 2011 12:16 PM

To: 'Tesfaye, Getachew'

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); GUCWA Len (External RS/NB)

Subject: Response to U.S. EPR Design Certification Application RAI No. 434, FSAR Ch. 6, Supplement 1

Getachew,

AREVA NP Inc. provided a schedule for technically correct and complete responses to the 11 questions in RAI No. 434 on November 15, 2010. To allow additional time to finalize the responses and interact with the NRC, a revised schedule is provided.

The schedule for providing a complete response to the remaining questions has been revised as indicated below.

Question #	Response Date
RAI 434 — 06.02.02-69	March 16, 2011
RAI 434 — 06.02.02-70	March 16, 2011
RAI 434 — 06.02.02-71	March 25, 2011
RAI 434 — 06.02.02-72	March 25, 2011
RAI 434 — 06.02.02-73	March 16, 2011
RAI 434 — 06.02.02-74	March 16, 2011
RAI 434 — 06.02.02-75	March 16, 2011
RAI 434 — 06.02.02-76	March 16, 2011
RAI 434 — 06.02.02-77	March 25, 2011
RAI 434 — 06.02.02-78	March 16, 2011
RAI 434 — 06.02.02-79	March 16, 2011

Sincerely,

Martin (Marty) C. Bryan

U.S. EPR Design Certification Licensing Manager

AREVA NP Inc.

Tel: (434) 832-3016

702 561-3528 cell

Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)

Sent: Monday, November 15, 2010 4:58 PM

To: 'Tesfaye, Getachew'

Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); GUCWA Len (External RS/NB); 'Miernicki, Michael'

Subject: Response to U.S. EPR Design Certification Application RAI No. 434, FSAR Ch. 6

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 434 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the 11 questions is not provided.

The following table indicates the respective pages in the response document, "RAI 434 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 434 — 06.02.02-69	2	2
RAI 434 — 06.02.02-70	3	3
RAI 434 — 06.02.02-71	4	5
RAI 434 — 06.02.02-72	6	6
RAI 434 — 06.02.02-73	7	7
RAI 434 — 06.02.02-74	8	8
RAI 434 — 06.02.02-75	9	9
RAI 434 — 06.02.02-76	10	10
RAI 434 — 06.02.02-77	11	11
RAI 434 — 06.02.02-78	12	12
RAI 434 — 06.02.02-79	13	13

A complete answer is not provided for 11 of the 11 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 434 — 06.02.02-69	January 26, 2011
RAI 434 — 06.02.02-70	January 26, 2011
RAI 434 — 06.02.02-71	January 26, 2011
RAI 434 — 06.02.02-72	January 26, 2011
RAI 434 — 06.02.02-73	January 26, 2011
RAI 434 — 06.02.02-74	January 26, 2011
RAI 434 — 06.02.02-75	January 26, 2011
RAI 434 — 06.02.02-76	January 26, 2011
RAI 434 — 06.02.02-77	January 26, 2011
RAI 434 — 06.02.02-78	January 26, 2011
RAI 434 — 06.02.02-79	January 26, 2011

Sincerely,

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Martin.Bryan.ext@areva.com

From: Tesfaye, Getachew [<mailto:Getachew.Tesfaye@nrc.gov>]

Sent: Friday, October 15, 2010 11:11 AM

To: ZZ-DL-A-USEPR-DL

Cc: Ashley, Clinton; Jackson, Christopher; McKirgan, John; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource

Subject: U.S. EPR Design Certification Application RAI No. 434 (4897), FSAR Ch. 6

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 6, 2010, and discussed with your staff on September 24, 2010. No changes were made to the draft RAI as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 3737

Mail Envelope Properties (2FBE1051AEB2E748A0F98DF9EEE5A5D4AE8DD3)

Subject: Response to U.S. EPR Design Certification Application RAI No. 434, FSAR Ch. 6, Supplement 6
Sent Date: 2/10/2012 1:19:51 PM
Received Date: 2/10/2012 1:19:47 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

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Response to
Request for Additional Information No. 434, Supplement 6

10/15/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 06.02.02 - Containment Heat Removal Systems
Application Section: 6.3

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects)
(SPCV)

Question 06.02.02-72:**Follow-up to RAI 111, Question 06.02.02-8, and RAI 233, Question 06.02.02-29 Regarding Upstream Effects and water hold-up:**

Upstream effects and water holdup is an important aspect of Generic Safety Issue (GSI) 191 and NEI 04-07, especially where curbs or weirs or flooding berms are used to hold up debris and water. In RAI 111, Question 06.02.02-8 responses, AREVA provides a discussion of the US EPR upstream effects and provides water hold-up information in the Supplement 4 response to RAI 233, Question 06.02.02-29. This information is an important design detail to support resolution of GSI-191 upstream effects and water hold-up. However, minimal upstream effects and water hold information is provided in the FSAR. In addition, ANP 10293 Rev 1, "US EPR Design Features to Address GSI-191", assesses the US EPR design with respect to NEI 04-07 and RG 1.82 but provides a limited discussion on upstream effects and water holdup. The staff requests that AREVA document their upstream effects and water hold-up evaluation in ANP-10293 or the FSAR and include a summary of design information such as a table listing hold-up volumes and their location (floors, steam, condensate, trapped in compartments etc.).

Response to Question 06.02.02-72:

This response supersedes the prior response to RAI 434, Supplement 5, Question 06.02.02-72 (submitted December 15, 2011) in its entirety.

The water holdup work analyzes a large break loss of coolant accident (LBLOCA), two small break LOCA cases, and a small break in a pressurizer line. Table 06.02.02-72-11 lists the water retention results for each case and the margin of water remaining in the in-containment refueling water storage tank (IRWST) required for net positive suction head (NPSH). The LBLOCA is found to be the most limiting case, and will be used in the tables and discussions for this response.

The mass of water holdup in the Reactor Building (RB) is examined during various phases of the transient: blowdown, refill/reflood, post reflood, peak containment pressure, peak IRWST temperature, and half peak containment pressure. There are several different categories analyzed for water holdup:

- Condensate on walls and ceilings.
- Water retained in steam and droplet phase within the containment atmosphere.
- Water retained on floors.

During blowdown there may be sufficient pressure difference between the equipment space and the service space to force water from the IRWST into the annular area. The exact amount of IRWST water that could be displaced is dependent on a number of interrelated factors for each break scenario. In the water retention analysis for a LBLOCA, a worst case evaluation was made assuming that the annular area would instantly fill with IRWST liquid to the height of the weir. The results showed that the water holdup is still within the margin of allowable IRWST inventory for NPSH.

Table 06.02.02-72-1 lists the wall condensation film thickness during each phase. The mass of condensation on walls in each compartment is listed in Table 06.02.02-72-2.

Table 06.02.02-72-3 lists the volume of condensation drops on ceilings per square foot. The mass of condensation on the ceiling of each compartment during each phase is listed in Table 06.02.02-72-4.

Table 06.02.02-72-5 lists the mass of water retained during the steam and droplet phase in the containment atmosphere.

Table 06.02.02-72-6 lists the depths of flooding level within the lower annular region during the different phases. Table 06.02.02-72-7 lists the depths of flooding level on the heavy floor at the different phases. Table 06.02.02-72-8 lists the flooding depths of the compartments, which will flood due to curbs/doors. Table 06.02.02-72-9 lists the mass of water retained on floors in the annular region, heavy floor, and behind doors/curbs in other compartments.

The mass of retained water re-injected into the reactor coolant system (RCS) is calculated using the maximum flow of safety injection pumps in the beginning of the transient. After the end of reflood, the mass of retained water re-injected into the RCS is calculated based on the RCS volumes. The values of the mass of retained water re-injected into the RCS for each phase are listed in Table 06.02.02-72-10.

In the water retention analysis, it is assumed that one of the double compartment retaining baskets becomes clogged and is completely filled with water. Based on the volume of the retention compartments above the IRWST level, the retained mass for the clogged basket is 68,064 lbm. This mass is conservatively applied during each phase.

Table 06.02.02-72-10 lists the total mass of retained water in the RB for each analysis during a transient.

A summary of the water holdup evaluation is included in Section 3.2.5 of Technical Report ANP-10293P, Revision 4, "U.S. EPR Design Features to Address GSI-191." U.S. EPR FSAR Tier 2, Table 1.6-1, Section 6.1.3, Section 6.3.6 and Section 15.6.6 will be revised to include this revision of the technical report.

U.S. EPR FSAR Tier 2, Section 6.3.3 will be revised to reflect the change in the peak, post-LOCA IRWST temperature from 230°F to 246.2°F.

U.S. EPR FSAR Tier 2, Table 6.3-2 will be revised to correct a typographical error regarding Low Head Safety Injection (LHSI) pump flow rate.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 1.6-1, Section 6.1.3, Section 6.3.3, Section 6.3.6, Table 6.3-2 and Section 15.6.6 will be revised as described in the response and indicated on the enclosed markup.

Table 06.02.02-72-1—Film Thickness of Wall Condensate

Parameter	During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure
Time (s)	29.18	60.09	600.10	3600.11	12304.73	40122.71
Containment Pressure (psia)	66.37	63.44	65.15	69.27	61.63	41.97
Liquid Conductivity (Btu/°F·ft·h)	0.397	0.398	0.397	0.397	0.398	0.398
Liquid Viscosity (lbm/ft·h)	0.443	0.447	0.445	0.439	0.452	0.504
Liquid Density (lbm/ft³)	57.33	57.42	57.37	57.24	57.49	58.24
Vapor Density (lbm/ft³)	0.1532	0.1468	0.1505	0.1595	0.1429	0.0996
Latent Heat of Vaporization (Btu/lbm)	910.60	912.69	911.48	908.52	914.19	932.9
Tsat – Ts (°F)	195.38	180.97	52.93	17.41	11.39	9.64
Height, L (ft)	134.2	134.2	134.2	134.2	134.2	134.2
Average Film Thickness (ft)	0.00157	0.00154	0.00113	0.00086	0.00077	0.00075

Table 06.02.02-72-2—Mass of Condensation on Walls

Room	Description	Area of Walls (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
-20ft Room 1	Spreading Area	2390.8	215.14	211.71	155.41	117.26	106.35	104.95
-20ft Room 2	IRWST Area	2763.4	248.67	244.70	179.63	135.54	122.92	121.30
-20ft Room 3	KT(NI DVS) Sump Room	561.8	50.55	49.74	36.51	27.55	24.99	24.66
-20ft Room 4	Flooding Device Compartment	1907.2	171.62	168.88	123.97	93.54	84.83	83.72
-20ft Room 5	Flooding Device Compartment	1907.2	171.62	168.88	123.97	93.54	84.83	83.72
-20ft Room 6	Elevator	533.8	48.03	47.26	34.70	26.18	23.74	23.43
-8ft Room 1	Elevator	437.1	39.34	38.71	28.41	21.44	19.44	19.19
-8ft Room 2	Access Area	1985.8	178.70	175.84	129.08	97.40	88.33	87.17
-8ft Room 3	Area for JND, JNG & JMQ (MHSI, LHSI, SAHRS) Pipe Penetrations	2752.0	247.64	243.69	178.88	134.98	122.41	120.80
-8ft Room 4	Area for JND, JNG & JMQ (MHSI, LHSI, SAHRS) Pipe Penetrations	2806.4	252.54	248.50	182.42	137.65	124.83	123.19
-8ft Room 5	Area for Hot Pipe Penetrations from UFA	3340.9	300.64	295.84	217.16	163.86	148.61	146.65
-8ft Room 6	Venting Area for Spreading Compartment	548.1	49.32	48.53	35.63	26.88	24.38	24.06
-8ft Room 7	LCQ (SGBS) HX Room	1533.3	137.98	135.77	99.67	75.20	68.20	67.31
-8ft Room 8	KT (NI DVS) Sump Room	592.0	53.27	52.42	38.48	29.04	26.33	25.99
-8ft Room 9	KT (NI DVS) Floor Drain and Tank Room	1587.6	142.86	140.58	103.20	77.87	70.62	69.69
-8ft Room 10	KTA10 (NI DVS) HX Room	574.5	51.70	50.87	37.34	28.18	25.55	25.22
-8ft Room 11	KTA10 (NI DVS) Pumps Room	900.3	81.01	79.72	58.52	44.16	40.04	39.52
-8ft Room 13	KT (RCDDT) Tank Room	772.0	69.47	68.36	50.18	37.87	34.34	33.89
-8ft Room 14	KBA12 (CVCS) HX Room	713.9	64.24	63.21	46.40	35.01	31.75	31.34
-8ft Room 15	KBA11 (CVCS) HX Room	733.7	66.02	64.97	47.69	35.98	32.63	32.21
-8ft Room 16	KBA (CVCS) Valve Room	740.6	66.64	65.58	48.14	36.32	32.94	32.51
-8ft Room 17	KBA (CVCS) Valve Room	582.1	52.38	51.55	37.84	28.55	25.89	25.55
-8ft Room 24	Reactor Cavity	1709.7	153.85	151.39	111.13	83.86	76.05	75.05
+5ft Room 1	JAA10 (RPV) Room	1096.0	98.63	97.05	71.24	53.76	48.75	48.11
+5ft Room 2	JEB10 (RCP) Oil Collection Tank Area	932.5	83.91	82.57	60.61	45.73	41.48	40.93
+5ft Room 3	JEA10 (SG) Supports Area	504.5	45.39	44.67	32.79	24.74	22.44	22.14
+5ft Room 4	JEA20 (SG) Supports Area	504.5	45.39	44.67	32.79	24.74	22.44	22.14
+5ft Room 5	JEB20 (RCP) Oil Collection Tank Area	936.2	84.25	82.90	60.85	45.92	41.64	41.10
+5ft Room 6	JEB30 (RCP) Oil Collection Tank Area	936.2	84.25	82.90	60.85	45.92	41.64	41.10
+5ft Room 7	JEA30 (SG) Supports Area	504.5	45.39	44.67	32.79	24.74	22.44	22.14
+5ft Room 8	JEA40 (SG) Supports Area	504.5	45.39	44.67	32.79	24.74	22.44	22.14

Room	Description	Area of Walls (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+5ft Room 9	JEB40 (RCP) Oil Collection Tank Area	932.5	83.91	82.57	60.61	45.73	41.48	40.93
+5ft Room 10	South Staircase	575.1	51.75	50.93	37.38	28.21	25.58	25.25
+5ft Room 11	Elevator	419.9	37.78	37.18	27.29	20.59	18.68	18.43
+5ft Room 12	Loop 1 Annular Area 180-270 Deg	2489.1	223.98	220.41	161.79	122.08	110.72	109.26
+5ft Room 13	Loop 2 Annular Area 270-0 Deg	1820.2	163.79	161.18	118.31	89.28	80.96	79.90
+5ft Room 14	Loop 3 Annular Area 0-90 Deg	1905.8	171.49	168.75	123.88	93.47	84.77	83.65
+5ft Room 15	Loop 4 Annular Area 90-180 Deg	2504.7	225.39	221.79	162.81	122.85	111.41	109.94
+5ft Room 16	LCQ50 (SGBS) Tank room	2146.6	193.17	190.08	139.53	105.29	95.48	94.23
+5ft Room 17	JEG (PRT) Tank room	1536.9	138.30	136.09	99.90	75.38	68.36	67.46
+5ft Room 18	Access to Personnel Airlock	1711.0	153.97	151.51	111.22	83.92	76.11	75.10
+5ft Room 19	FAL (FPPS) Valve Room	591.3	53.21	52.36	38.44	29.00	26.30	25.96
+5ft Room 20	KBA (CVCS) Valve Room	857.2	77.13	75.90	55.72	42.04	38.13	37.63
+5ft Room 21	KBA (CVCS) Valve Room	1398.7	125.86	123.85	90.91	68.60	62.21	61.40
+5ft Room 22	KBA10 (CVCS) HX Room	812.7	73.13	71.97	52.83	39.86	36.15	35.68
+5ft Room 23	JND & JNG (MHSI & LHSI) Valve 1 Room	818.1	73.62	72.44	53.18	40.12	36.39	35.91
+5ft Room 24	JND & JNG (MHSI & LHSI) Valve 2 Room	746.5	67.18	66.10	48.52	36.61	33.21	32.77
+5ft Room 25	JND & JNG (MHSI & LHSI) Valve 3 Room	746.5	67.18	66.10	48.52	36.61	33.21	32.77
+5ft Room 26	JND & JNG (MHSI & LHSI) Valve 4 Room	818.1	73.62	72.44	53.18	40.12	36.39	35.91
+5ft Room 27	Access to Loop 1 & 2 Area	477.6	42.98	42.29	31.04	23.42	21.24	20.96
+5ft Room 28	Access to Loop 3 & 4 Area	477.6	42.98	42.29	31.04	23.42	21.24	20.96
+5ft Room 29	Venting Area for Spreading Compartment	724.5	65.20	64.15	47.09	35.53	32.23	31.80
+17ft Room 1	Reactor Cavity	1446.6	130.17	128.09	94.03	70.95	64.35	63.50
+17ft Room 2	JEB10 Pump (RCP) Room	1241.9	111.76	109.97	80.73	60.91	55.24	54.52
+17ft Room 3	JEA10 (SG) Support Area	1382.2	124.38	122.39	89.84	67.79	61.48	60.67
+17ft Room 4	JEA20 (SG) Support Area	1409.0	126.79	124.77	91.59	69.11	62.68	61.85
+17ft Room 5	JEB20 Pump (RCP) Room	1303.1	117.26	115.38	84.70	63.91	57.96	57.20
+17ft Room 6	JEB30 Pump (RCP) Room	1303.1	117.26	115.38	84.70	63.91	57.96	57.20
+17ft Room 7	JEA30 (SG) Support Area	1409.0	126.79	124.77	91.59	69.11	62.68	61.85
+17ft Room 8	JEA40 (SG) Support Area	1382.2	124.38	122.39	89.84	67.79	61.48	60.67
+17ft Room 9	JEB40 Pump (RCP) Room	1241.9	111.76	109.97	80.73	60.91	55.24	54.52
+17ft Room 10	South Staircase	646.7	58.19	57.26	42.04	31.72	28.77	28.39

Room	Description	Area of Walls (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+17ft Room 11	North Staircase	806.3	72.55	71.39	52.41	39.55	35.86	35.39
+17ft Room 12	Elevator	313.5	28.21	27.76	20.38	15.37	13.94	13.76
+17ft Room 13	JNG13 (LHSI) Tank & Loop 1 Annular Area	2295.5	206.56	203.26	149.21	112.59	102.11	100.76
+17ft Room 14	JNG23 (LHSI) Tank & Loop 2 Annular Area	2932.5	263.89	259.67	190.62	143.83	130.44	128.72
+17ft Room 15	JNG33 (LHSI) Tank & Loop 3 Annular Area	3109.9	279.85	275.38	202.15	152.53	138.33	136.51
+17ft Room 16	JNG43 (LHSI) Tank & Loop 4 Annular Area	2526.3	227.33	223.70	164.21	123.91	112.37	110.89
+17ft Room 17	Core Internals Storage Room	426.5	38.38	37.77	27.73	20.92	18.97	18.72
+17ft Room 18	Spray Lines Area	937.9	84.40	83.05	60.96	46.00	41.72	41.17
+17ft Room 19	Surge Line area	1125.1	101.24	99.62	73.13	55.18	50.04	49.38
+17ft Room 20	Access to Transfer Tube Compartment	793.5	71.40	70.26	51.58	38.92	35.29	34.83
+17ft Room 21	Transfer Tube Compartment	797.7	71.79	70.64	51.85	39.13	35.48	35.02
+17ft Room 22	Instrumentation Lances Storage Room	504.3	45.38	44.65	32.78	24.73	22.43	22.14
+17ft Room 23	Access to Reactor Cavity	396.6	35.69	35.12	25.78	19.45	17.64	17.41
+17ft Room 24	FAL (FPPS) Room	563.6	50.72	49.91	36.64	27.64	25.07	24.74
+17ft Room 25	HVAC	648.1	58.32	57.39	42.13	31.79	28.83	28.45
+17ft Room 26	HVAC	648.1	58.32	57.39	42.13	31.79	28.83	28.45
+29ft Room 1	Reactor Cavity	2098.5	188.84	185.82	136.41	102.93	93.34	92.12
+29ft Room 2	Transfer Tube Compartment	1088.0	97.91	96.35	70.72	53.37	48.40	47.76
+29ft Room 3	JEB10 Pump (RCP) Room	1784.2	160.55	157.99	115.97	87.51	79.36	78.32
+29ft Room 4	JEA10 (SG) Room	1356.6	122.07	120.12	88.18	66.54	60.34	59.55
+29ft Room 5	JEA20 (SG) Room	1395.1	125.54	123.54	90.69	68.43	62.06	61.24
+29ft Room 6	JEB20 Pump (RCP) Room	1872.0	168.45	165.76	121.68	91.82	83.27	82.17
+29ft Room 7	JEB30 Pump (RCP) Room	1872.0	168.45	165.76	121.68	91.82	83.27	82.17
+29ft Room 8	JEA30 (SG) Room	1395.1	125.54	123.54	90.69	68.43	62.06	61.24
+29ft Room 9	JEA40 (SG) Room	1356.6	122.07	120.12	88.18	66.54	60.34	59.55
+29ft Room 10	JEB40 Pump (RCP) Room	1784.7	160.60	158.04	116.01	87.54	79.39	78.34
+29ft Room 11	South Staircase	929.0	83.60	82.27	60.39	45.57	41.32	40.78
+29ft Room 12	North Staircase	1158.3	104.23	102.57	75.29	56.81	51.52	50.84
+29ft Room 13	Elevator	586.7	52.79	51.95	38.14	28.78	26.10	25.75
+29ft Room 14	JNG13 (LHSI) Tank & Loop 1 Annular Area	3762.4	338.57	333.16	244.56	184.54	167.36	165.15

Room	Description	Area of Walls (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+29ft Room 15	JNG23 (LHSI) Tank & Loop 2 Annular Area	4493.3	404.34	397.88	292.07	220.39	199.87	197.24
+29ft Room 16	JNG33 (LHSI) Tank & Loop 3 Annular Area	4202.8	378.20	372.16	273.19	206.14	186.95	184.49
+29ft Room 17	JNG43 (LHSI) Tank & Loop 4 Annular Area	3829.6	344.61	339.11	248.93	187.83	170.35	168.10
+29ft Room 18	Spray Lines Area	1723.5	155.09	152.61	112.03	84.53	76.66	75.65
+29ft Room 19	Surge Line area	1723.5	155.09	152.61	112.03	84.53	76.66	75.65
+29ft Room 20	Corridor	1002.0	90.16	88.72	65.13	49.14	44.57	43.98
+29ft Room 21	HVAC	931.0	83.78	82.44	60.52	45.67	41.41	40.87
+29ft Room 22	HVAC	931.0	83.78	82.44	60.52	45.67	41.41	40.87
+29ft Room 28	Instrumentation Lances Storage Room	1189.6	107.05	105.34	77.33	58.35	52.91	52.22
+29ft Room 30	Core Internals Storage Room	1706.7	153.58	151.13	110.94	83.71	75.92	74.92
+45ft Room 1	JEB10 Pump (RCP) Room	1644.8	148.01	145.64	106.91	80.67	73.16	72.20
+45ft Room 2	JEA10 (SG) Room	1516.2	136.44	134.26	98.55	74.36	67.44	66.55
+45ft Room 3	JEA20 (SG) Room	1559.3	140.31	138.07	101.36	76.48	69.36	68.45
+45ft Room 4	JEB20 Pump (RCP) Room	2092.2	188.27	185.27	136.00	102.62	93.06	91.84
+45ft Room 5	JEB30 Pump (RCP) Room	2092.2	188.27	185.27	136.00	102.62	93.06	91.84
+45ft Room 6	JEA30 (SG) Room	1559.3	140.31	138.07	101.36	76.48	69.36	68.45
+45ft Room 7	JEA40 (SG) Room	1516.2	136.44	134.26	98.55	74.36	67.44	66.55
+45ft Room 8	JEB40 Pump (RCP) Room	1644.8	148.01	145.64	106.91	80.67	73.16	72.20
+45ft Room 9	South Staircase	1038.3	93.44	91.94	67.49	50.93	46.19	45.58
+45ft Room 10	North Staircase	1294.6	116.49	114.63	84.15	63.50	57.58	56.83
+45ft Room 11	Elevator	655.7	59.01	58.06	42.62	32.16	29.17	28.78
+45ft Room 12	JNG13 (LHSI) Tank & Loop 1 Annular Area	3781.2	340.26	334.82	245.78	185.46	168.19	165.98
+45ft Room 13	JNG23 (LHSI) Tank & Loop 2 Annular Area	4110.7	369.90	364.00	267.20	201.62	182.85	180.44
+45ft Room 14	JNG33 (LHSI) Tank & Loop 3 Annular Area	3842.7	345.79	340.27	249.78	188.48	170.93	168.68
+45ft Room 15	JNG43 (LHSI) Tank & Loop 4 Annular Area	3828.1	344.48	338.98	248.83	187.76	170.28	168.04
+45ft Room 16	Core Internals Storage Room	2993.6	269.39	265.08	194.59	146.83	133.16	131.41
+45ft Room 17	HVAC	1437.0	129.31	127.24	93.41	70.48	63.92	63.08
+45ft Room 18	JEF10 (RCS) Pressurizer Room	1966.8	176.99	174.16	127.85	96.47	87.49	86.34

Room	Description	Area of Walls (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+45ft Room 19	FAL (FPPS) Valve Room	920.3	82.82	81.49	59.82	45.14	40.94	40.40
+45ft Room 20	FAL (FPPS) Pump Room	924.3	83.17	81.85	60.08	45.33	41.11	40.57
+45ft Room 21	Instrumentation Measuring Table Room	917.3	82.55	81.23	59.63	44.99	40.80	40.27
+45ft Room 22	Instrumentation Measuring Cabinets Room	1240.5	111.63	109.85	80.64	60.85	55.18	54.45
+45ft Room 23	HVAC Duct	648.4	58.35	57.42	42.15	31.80	28.84	28.46
+45ft Room 24	HVAC Duct	648.4	58.35	57.42	42.15	31.80	28.84	28.46
+45ft Room 30	Transfer Tube Compartment	1216.0	109.43	107.68	79.04	59.64	54.09	53.38
+45ft Room 31	Instrumentation Lances Storage Room	1316.7	118.48	116.59	85.58	64.58	58.57	57.80
+45ft Room 32	Reactor Cavity	1913.3	172.18	169.43	124.37	93.84	85.11	83.99
+64ft Room 1	JEA10 (SG) Room	1174.4	105.68	103.99	76.34	57.60	52.24	51.55
+64ft Room 2	JEA20 (SG) Room	1166.7	104.99	103.31	75.84	57.23	51.90	51.22
+64ft Room 3	JEB20 Pump (RCP) Room	1121.5	100.92	99.31	72.90	55.01	49.89	49.23
+64ft Room 4	JEB30 Pump (RCP) Room	1179.4	106.13	104.44	76.66	57.85	52.46	51.77
+64ft Room 5	JEA30 (SG) Room	1166.7	104.99	103.31	75.84	57.23	51.90	51.22
+64ft Room 6	JEA40 (SG) Room	1174.4	105.68	103.99	76.34	57.60	52.24	51.55
+64ft Room 7	North Staircase	1030.9	92.77	91.29	67.01	50.56	45.86	45.25
+64ft Room 8	Elevator	406.2	36.55	35.97	26.40	19.92	18.07	17.83
+64ft Room 9	Setdown Area, Operating floor	15989.0	1438.79	1415.81	1039.30	784.22	711.21	701.85
+64ft Room 10	Annular Area, 240-0 Deg	3698.9	332.85	327.54	240.43	181.42	164.53	162.37
+64ft Room 11	Annular Area, 0-120 Deg	3423.2	308.04	303.12	222.51	167.90	152.27	150.27
+64ft Room 12	Access to Equipment Hatch	2987.3	268.82	264.53	194.18	146.52	132.88	131.13
+64ft Room 13	Access to Operating Floor	1156.4	104.06	102.40	75.17	56.72	51.44	50.76
+64ft Room 14	JEF10 (RCS) Pressurizer Room	1385.4	124.67	122.68	90.05	67.95	61.62	60.81
+64ft Room 15	KLA51/52 Compressor & KLA50 Filter (CBVS) Room	1567.6	141.06	138.81	101.90	76.89	69.73	68.81
+64ft Room 16	Access to Emergency Airlock	1442.1	129.77	127.69	93.74	70.73	64.14	63.30
+64ft Room 17	HVAC Shaft	483.1	43.47	42.78	31.40	23.70	21.49	21.21
+64ft Room 18	HVAC Shaft	483.1	43.47	42.78	31.40	23.70	21.49	21.21
+79ft Room 1	JEA10 (SG) Room	1863.7	167.71	165.03	121.15	91.41	82.90	81.81
+79ft Room 2	JEA20 (SG) Room	1851.6	166.62	163.95	120.35	90.81	82.36	81.28
+79ft Room 3	JEB20 Pump (RCP) Room	1072.1	96.47	94.93	69.69	52.58	47.69	47.06
+79ft Room 4	JEB30 Pump (RCP) Room	1128.1	101.52	99.89	73.33	55.33	50.18	49.52
+79ft Room 5	JEA30 (SG) Room	1851.6	166.62	163.95	120.35	90.81	82.36	81.28
+79ft Room 6	JEA40 (SG) Room	1863.7	167.71	165.03	121.15	91.41	82.90	81.81

Room	Description	Area of Walls (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+79ft Room 7	North Staircase	862.3	77.59	76.35	56.05	42.29	38.35	37.85
+79ft Room 8	Elevator	344.4	30.99	30.49	22.38	16.89	15.32	15.12
+79ft Room 9	Annular Area, 240-0 Deg	10802.6	972.09	956.56	702.18	529.84	480.51	474.19
+79ft Room 10	Annular Area, 0-120 Deg	9391.8	845.14	831.64	610.48	460.65	417.76	412.26
+79ft Room 11	RPV Closure Head Storage Area	1432.1	128.87	126.81	93.09	70.24	63.70	62.86
+79ft Room 12	Pressurizer Head & Safety Relief Valves Room	879.2	79.12	77.85	57.15	43.12	39.11	38.59
+79ft Room 18	HVAC Shaft	348.4	31.35	30.85	22.65	17.09	15.50	15.29
+79ft Room 19	HVAC Shaft	348.4	31.35	30.85	22.65	17.09	15.50	15.29
+79ft Room 20	JEG (RPS) Valve Room	971.0	87.38	85.98	63.12	47.62	43.19	42.62
+94ft Room 2	JEA10 (SG) Room	842.5	75.82	74.60	54.76	41.32	37.48	36.98
+94ft Room 3	JEA20 (SG) Room	837.0	75.32	74.12	54.41	41.05	37.23	36.74
+94ft Room 4	JEA30 (SG) Room	837.0	75.32	74.12	54.41	41.05	37.23	36.74
+94ft Room 5	JEA40 (SG) Room	842.5	75.82	74.60	54.76	41.32	37.48	36.98
+115ft Room 3 (Dome)	Dome	25212.3	2268.77	2232.54	1638.83	1236.60	1121.47	1106.71
Sum		Sum	26231.47	25812.54	18948.16	14297.57	12966.40	12795.80
10% Uncertainty Factor			2623.15	2581.25	1894.82	1429.76	1296.64	1279.58
Total		Total	28854.62	28393.80	20842.98	15727.33	14263.04	14075.38

Table 06.02.02-72-3—Ceiling Condensate Mass per Square Foot

Parameter	During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure
Time (s)	29.18	60.09	600.10	3600.11	12304.73	40122.71
Containment Pressure, (psia)	66.37	63.44	65.15	69.27	61.63	41.97
Surface Tension (lbm/hr ²)	1.403e6	1.412e6	1.407e6	1.393e6	1.419e6	1.502e6
Liquid Density (lbm/ft ³)	57.33	57.42	57.37	57.24	57.49	58.24
Vapor Density (lbm/ft ³)	0.1532	0.1468	0.1505	0.1595	0.1429	0.0996
Maximum Drop Radius (ft)	1.329e-2	1.332e-2	1.330e-2	1.325e-2	1.334e-2	1.363e-2
Volume of One Drop (ft ³)	4.912e-6	4.947e-6	4.928e-6	4.872e-6	4.974e-6	5.307e-6
Number of Drops per Square Foot (1/ft ²)	1416.175	1409.521	1413.204	1423.939	1404.378	1345.126
Volume of Drops per Square Foot (ft ³ /ft ²)	6.957e-3	6.973e-3	6.964e-3	6.938e-3	6.986e-3	7.138e-3

Table 06.02.02-72-4—Mass of Condensate on Ceiling

Room	Description	Ceiling Area (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
-20ft Room 1	Spreading Area	2171.10	865.91	869.31	867.42	862.19	871.96	902.58
-20ft Room 2	IRWST Area	5870.20	2341.23	2350.44	2345.33	2331.18	2357.61	2440.40
-20ft Room 3	KT(NI DVS) Sump Room							
-20ft Room 4	Flooding Device Compartment							
-20ft Room 5	Flooding Device Compartment							
-20ft Room 6	Elevator							
-8ft Room 1	Elevator							
-8ft Room 2	Access Area	1114.23	444.39	446.14	445.17	442.48	447.50	463.22
-8ft Room 3	Area for JND, JNG & JMQ (MHSL, LHSL, SAHRS) Pipe Penetrations	2053.40	818.96	822.18	820.40	815.45	824.69	853.65
-8ft Room 4	Area for JND, JNG & JMQ (MHSL, LHSL, SAHRS) Pipe Penetrations	2090.27	833.67	836.95	835.13	830.09	839.50	868.98
-8ft Room 5	Area for Hot Pipe penetrations from UFA	2089.82	833.49	836.77	834.95	829.91	839.32	868.79
-8ft Room 6	Venting Area for Spreading Compartment							
-8ft Room 7	LCQ (SGBS) HX Room	1057.70	421.85	423.50	422.58	420.03	424.80	439.71
-8ft Room 8	KT (NI DVS) Sump Room	78.23	31.20	31.32	31.26	31.07	31.42	32.52
-8ft Room 9	KT (NI DVS) Floor Drain and Tank Room	634.77	253.17	254.16	253.61	252.08	254.94	263.89
-8ft Room 10	KTA10 (NI DVS) HX Room	117.14	46.72	46.90	46.80	46.52	47.05	48.70
-8ft Room 11	KTA10 (NI DVS) Pumps Room	361.55	144.20	144.77	144.45	143.58	145.21	150.31
-8ft Room 13	KT (RCDT) Tank Room	329.52	131.42	131.94	131.65	130.86	132.34	136.99
-8ft Room 14	KBA12 (CVCS) HX Room	183.74	73.28	73.57	73.41	72.97	73.79	76.39
-8ft Room 15	KBA11 (CVCS) HX Room	176.80	70.51	70.79	70.64	70.21	71.01	73.50
-8ft Room 16	KBA (CVCS) Valve Room	153.98	61.41	61.65	61.52	61.15	61.84	64.01
-8ft Room 17	KBA (CVCS) Valve Room	122.44	48.83	49.03	48.92	48.62	49.17	50.90
-8ft Room 24	Reactor Cavity							
+5ft Room 1	JAA10 (RPV) Room							
+5ft Room 2	JEB10 (RCP) Oil Collection Tank Area							
+5ft Room 3	JEA10 (SG) Supports Area							
+5ft Room 4	JEA20 (SG) Supports Area							

Room	Description	Ceiling Area (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+5ft Room 5	JEB20 (RCP) Oil Collection Tank Area							
+5ft Room 6	JEB30 (RCP) Oil Collection Tank Area							
+5ft Room 7	JEA30 (SG) Supports Area							
+5ft Room 8	JEA40 (SG) Supports Area							
+5ft Room 9	JEB40 (RCP) Oil Collection Tank Area							
+5ft Room 10	South Staircase							
+5ft Room 11	Elevator							
+5ft Room 12	Loop 1 Annular Area 180-270 Deg	1556.37	620.73	623.17	621.82	618.07	625.07	647.02
+5ft Room 13	Loop 2 Annular Area 270-0 Deg	1054.21	420.45	422.11	421.19	418.65	423.40	438.26
+5ft Room 14	Loop 3 Annular Area 0-90 Deg	1191.05	475.03	476.90	475.86	472.99	478.35	495.15
+5ft Room 15	Loop 4 Annular Area 90-180 Deg	1599.12	637.78	640.29	638.90	635.04	642.24	664.80
+5ft Room 16	LCQ50 (SGBS) Tank room	642.06	256.08	257.08	256.52	254.98	257.87	266.92
+5ft Room 17	JEG (PRT) Tank room	472.97	188.64	189.38	188.97	187.83	189.96	196.63
+5ft Room 18	Access to Personnel Airlock	1033.77	412.30	413.92	413.02	410.53	415.19	429.77
+5ft Room 19	FAL (FPPS) Valve Room	123.97	49.44	49.64	49.53	49.23	49.79	51.54
+5ft Room 20	KBA (CVCS) Valve Room	134.68	53.71	53.93	53.81	53.48	54.09	55.99
+5ft Room 21	KBA (CVCS) Valve Room	312.50	124.64	125.13	124.85	124.10	125.51	129.91
+5ft Room 22	KBA10 (CVCS) HX Room	215.73	86.04	86.38	86.19	85.67	86.64	89.68
+5ft Room 23	JND & JNG (MHSI & LHSI) Valve 1 Room	196.06	78.20	78.50	78.33	77.86	78.74	81.51
+5ft Room 24	JND & JNG (MHSI & LHSI) Valve 2 Room	156.98	62.61	62.86	62.72	62.34	63.05	65.26
+5ft Room 25	JND & JNG (MHSI & LHSI) Valve 3 Room	156.98	62.61	62.86	62.72	62.34	63.05	65.26
+5ft Room 26	JND & JNG (MHSI & LHSI) Valve 4 Room	196.06	78.20	78.50	78.33	77.86	78.74	81.51
+5ft Room 27	Access to Loop 1 & 2 Area	88.44	35.27	35.41	35.33	35.12	35.52	36.77
+5ft Room 28	Access to Loop 3 & 4 Area	88.44	35.27	35.41	35.33	35.12	35.52	36.77
+5ft Room 29	Venting Area for Spreading Compartment	80.11	31.95	32.08	32.01	31.81	32.17	33.30
+17ft Room 1	Reactor Cavity							
+17ft Room 2	JEB10 Pump (RCP) Room							

Room	Description	Ceiling Area (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+17ft Room 3	JEA10 (SG) Support Area							
+17ft Room 4	JEA20 (SG) Support Area							
+17ft Room 5	JEB20 Pump (RCP) Room							
+17ft Room 6	JEB30 Pump (RCP) Room							
+17ft Room 7	JEA30 (SG) Support Area							
+17ft Room 8	JEA40 (SG) Support Area							
+17ft Room 9	JEB40 Pump (RCP) Room							
+17ft Room 10	South Staircase							
+17ft Room 11	North Staircase							
+17ft Room 12	Elevator							
+17ft Room 13	JNG13 (LHSI) Tank & Loop 1 Annular Area							
+17ft Room 14	JNG23 (LHSI) Tank & Loop 2 Annular Area							
+17ft Room 15	JNG33 (LHSI) Tank & Loop 3 Annular Area							
+17ft Room 16	JNG43 (LHSI) Tank & Loop 4 Annular Area							
+17ft Room 17	Core Internals Storage Room							
+17ft Room 18	Spray Lines Area	469.25	187.15	187.89	187.48	186.35	188.46	195.08
+17ft Room 19	Surge Line area	544.20	217.05	217.90	217.42	216.11	218.56	226.24
+17ft Room 20	Access to Transfer Tube Compartment	219.51	87.55	87.89	87.70	87.17	88.16	91.26
+17ft Room 21	Transfer Tube Compartment							
+17ft Room 22	Instrumentation Lances Storage Room							
+17ft Room 23	Access to Reactor Cavity	56.38	22.49	22.57	22.53	22.39	22.64	23.44
+17ft Room 24	FAL (FPPS) Room	158.72	63.30	63.55	63.41	63.03	63.75	65.98
+17ft Room 25	HVAC							
+17ft Room 26	HVAC							
+29ft Room 1	Reactor Cavity							
+29ft Room 2	Transfer Tube Compartment							
+29ft Room 3	JEB10 Pump (RCP) Room							
+29ft Room 4	JEA10 (SG) Room							
+29ft Room 5	JEA20 (SG) Room							

Room	Description	Ceiling Area (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+29ft Room 6	JEB20 Pump (RCP) Room							
+29ft Room 7	JEB30 Pump (RCP) Room							
+29ft Room 8	JEA30 (SG) Room							
+29ft Room 9	JEA40 (SG) Room							
+29ft Room 10	JEB40 Pump (RCP) Room							
+29ft Room 11	South Staircase							
+29ft Room 12	North Staircase							
+29ft Room 13	Elevator							
+29ft Room 14	JNG13 (LHSI) Tank & Loop 1 Annular Area							
+29ft Room 15	JNG23 (LHSI) Tank & Loop 2 Annular Area							
+29ft Room 16	JNG33 (LHSI) Tank & Loop 3 Annular Area							
+29ft Room 17	JNG43 (LHSI) Tank & Loop 4 Annular Area							
+29ft Room 18	Spray Lines Area	544.57	217.19	218.05	217.57	216.26	218.71	226.39
+29ft Room 19	Surge Line area	544.57	217.19	218.05	217.57	216.26	218.71	226.39
+29ft Room 20	Corridor	117.37	46.81	47.00	46.89	46.61	47.14	48.79
+29ft Room 21	HVAC							
+29ft Room 22	HVAC							
+29ft Room 28	Instrumentation Lances Storage Room							
+29ft Room 30	Core Internals Storage Room							
+45ft Room 1	JEB10 Pump (RCP) Room	442.63	176.54	177.23	176.84	175.78	177.77	184.01
+45ft Room 2	JEA10 (SG) Room							
+45ft Room 3	JEA20 (SG) Room							
+45ft Room 4	JEB20 Pump (RCP) Room							
+45ft Room 5	JEB30 Pump (RCP) Room							
+45ft Room 6	JEA30 (SG) Room							
+45ft Room 7	JEA40 (SG) Room							
+45ft Room 8	JEB40 Pump (RCP) Room	442.63	176.54	177.23	176.84	175.78	177.77	184.01
+45ft Room 9	South Staircase							
+45ft Room 10	North Staircase							
+45ft Room 11	Elevator							

Room	Description	Ceiling Area (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+45ft Room 12	JNG13 (LHSI) Tank & Loop 1 Annular Area	1504.83	600.18	602.54	597.60	604.37	625.60
+45ft Room 13	JNG23 (LHSI) Tank & Loop 2 Annular Area	1559.64	622.04	624.48	619.36	626.39	648.38
+45ft Room 14	JNG33 (LHSI) Tank & Loop 3 Annular Area	1652.45	659.05	661.64	656.22	663.66	686.97
+45ft Room 15	JNG43 (LHSI) Tank & Loop 4 Annular Area	1633.82	651.62	654.18	648.82	656.18	679.22
+45ft Room 16	Core Internals Storage Room	830.44	331.21	332.51	329.78	333.52	345.24
+45ft Room 17	HVAC	348.96	139.18	139.72	138.58	140.15	145.07
+45ft Room 18	JEF10 (RCS) Pressurizer Room	540.75	215.67	216.52	214.74	217.18	224.80
+45ft Room 19	FAL (FPPS) Valve Room	102.90	41.04	41.20	40.86	41.33	42.78
+45ft Room 20	FAL (FPPS) Pump Room	93.31	37.22	37.36	37.06	37.48	38.79
+45ft Room 21	Instrumentation Measuring Table Room	171.38	68.35	68.62	68.06	68.83	71.25
+45ft Room 22	Instrumentation Measuring Cabinets Room	272.89	108.84	109.27	108.37	109.60	113.45
+45ft Room 23	HVAC Duct	49.23	19.63	19.71	19.55	19.77	20.47
+45ft Room 24	HVAC Duct	49.23	19.63	19.71	19.55	19.77	20.47
+45ft Room 30	Transfer Tube Compartment						
+45ft Room 31	Instrumentation Lances Storage Room						
+45ft Room 32	Reactor Cavity						
+64ft Room 1	JEA10 (SG) Room	767.04	305.92	307.12	304.61	308.06	318.88
+64ft Room 2	JEA20 (SG) Room						
+64ft Room 3	JEB20 Pump (RCP) Room						
+64ft Room 4	JEB30 Pump (RCP) Room						
+64ft Room 5	JEA30 (SG) Room						
+64ft Room 6	JEA40 (SG) Room						
+64ft Room 7	North Staircase						
+64ft Room 8	Elevator						
+64ft Room 9	Setdown Area, Operating floor						
+64ft Room 10	Annular Area, 240-0 Deg	2026.23	808.13	811.31	804.66	813.78	842.36
+64ft Room 11	Annular Area, 0-120 Deg	1152.46	459.64	461.45	457.67	462.85	479.11
+64ft Room 12	Access to Equipment Hatch						

Room	Description	Ceiling Area (ft ²)	Mass at 29 sec (lb)	Mass at 60 sec (lb)	Mass at 600 sec (lb)	Mass at 3600 sec (lb)	Mass at 12304 sec (lb)	Mass at 40122 sec (lb)
+64ft Room 13	Access to Operating Floor	660.18	263.30	264.34	263.76	262.17	265.14	274.45
+64ft Room 14	JEF10 (RCS) Pressurizer Room	539.83	215.30	216.15	215.68	214.38	216.81	224.42
+64ft Room 15	KLA51/52 Compressor & KLA50 Filter (CBVS) Room	627.24	250.16	251.15	250.60	249.09	251.91	260.76
+64ft Room 16	Access to Emergency Airlock	588.00	234.51	235.44	234.92	233.51	236.15	244.45
+64ft Room 17	HVAC Shaft							
+64ft Room 18	HVAC Shaft							
+79ft Room 1	JEA10 (SG) Room							
+79ft Room 2	JEA20 (SG) Room							
+79ft Room 3	JEB20 Pump (RCP) Room							
+79ft Room 4	JEB30 Pump (RCP) Room							
+79ft Room 5	JEA30 (SG) Room							
+79ft Room 6	JEA40 (SG) Room							
+79ft Room 7	North Staircase	194.41	77.54	77.84	77.67	77.20	78.08	80.82
+79ft Room 8	Elevator	60.28	24.04	24.14	24.08	23.94	24.21	25.06
+79ft Room 9	Annular Area, 240-0 Deg							
+79ft Room 10	Annular Area, 0-120 Deg	1596.06	636.56	639.06	637.68	633.83	641.01	663.53
+79ft Room 11	RPV Closure Head Storage Area							
+79ft Room 12	Pressurizer Head & Safety Relief Valves Room	539.83	215.30	216.15	215.68	214.38	216.81	224.42
+79ft Room 18	HVAC Shaft							
+79ft Room 19	HVAC Shaft							
+79ft Room 20	JEG (RPS) Valve Room	223.66	89.20	89.55	89.36	88.82	89.83	92.98
+94ft Room 2	JEA10 (SG) Room							
+94ft Room 3	JEA20 (SG) Room							
+94ft Room 4	JEA30 (SG) Room							
+94ft Room 5	JEA40 (SG) Room							
+115ft Room 3 (Dome)	Dome	16094.20	6418.91	6444.14	6430.14	6391.33	6463.80	6690.79
	Total	Total	26053.19	26155.61	26098.77	25941.28	26235.41	27156.73

Note:

Table cells containing no information represent rooms with no ceilings.

Table 06.02.02-72-5—Water Retained in Steam and Droplet Phase

Parameter	During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure
Initial Pressure (psia)	15.96	15.96	15.96	15.96	15.96	15.96
Initial Temperature °F (°R)	86 (546)	86 (546)	86 (546)	86 (546)	86 (546)	86 (546)
Time (s)	29.18	60.09	600.10	3,600.11	12304.73	40122.71
Containment Pressure, (psia)	66.37	63.44	65.15	69.27	61.63	41.97
Containment Saturation Temp, °F (°R)	257 (716)	259 (719)	275 (735)	279 (739)	269 (729)	232 (692)
Containment Free Volume (ft ³)	2,827,498	2,827,498	2,827,498	2,827,498	2,827,498	2,827,498
Vapor Partial Pressure (psia)	45.44	42.42	43.68	47.67	40.32	21.74
Vapor Density (lbm/ft ³)	0.1073	0.1006	0.1034	0.1122	0.0959	0.0538
Total Steam Mass (lbm)	303,391	284,446	292,363	317,245	271,157	152,119
Total Droplet Mass (lbm)	39,208	2,827	248	81	33	6
Total Steam and Droplet Mass (lbm)	342,599	287,273	292,611	317,326	271,190	152,125

Table 06.02.02-72-6—Depth of Retained Water in Annular Region

Parameter	During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure
Time (s)	29.18212	60.09352	600.1035	3600.11	12304.73	40122.71
Total Condensate Mass (lbm)	13299.86	24538.09	89698.24	217074.94	394108.94	609221.09
Condensation Rate (lbm/s)	448.70	309.49	70.45	33.31	15.81	4.67
Total Condensate Volume (ft ³)	231.99	427.34	1563.50	3792.36	6855.26	10460.53
Condensate Volumetric Flow (ft ³ /s)	7.83	5.39	1.23	0.58	0.27	0.08
Weir Height (ft)	0.333	0.333	0.333	0.333	0.333	0.333
Weir Width (ft)	25.00	25.00	25.00	25.00	25.00	25.00
Calculated Dynamic Head (ft)	0.200	0.157	0.060	0.037	0.022	0.010
Area of Lower Annular Rooms (ft ²)	8407.36	8407.36	8407.36	8407.36	8407.36	8407.36
Depth of Water (ft)	0.533	0.490	0.393	0.370	0.355	0.343

Table 06.02.02-72-7—Retained Water Depth on Heavy Floor

Parameter	During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure
Time (s)	29.18212	60.09352	600.1035	3600.11	12304.73	40122.71
Pressure in Control Volume 10, PR10 (psia)	66.45	63.49	65.22	69.33	61.68	42.02
Liquid Density (lbm/ft ³)	57.33	57.42	57.37	57.24	57.49	58.23
Total Condensate (lbm)	6322.79	11665.47	42642.78	103198.00	187360.43	289625.32
Condensation Rate (lbm/s)	213.31	147.13	33.49	15.83	7.51	2.22
Average Break Effluent Enthalpy, h_{ave} (Btu/lbm)	339.03	256.73	613.27	0.00	0.00	0.00
Evaporation Enthalpy, h_{fg} (Btu/lbm)	910.81	913.04	911.73	908.71	914.44	931.75
Saturated Liquid Enthalpy, h_f (Btu/lbm)	269.25	266.13	267.96	272.18	264.17	239.26
Break Effluent Quality, $X = (h_{ave} - h_f) / h_{fg}$	0.08	-0.01	0.38	0.00	0.00	0.00
Break Mass Flow, M_b (lbm/s)	9312.67	5565.30	254.58	0.00	0.00	0.00
Liquid Break Mass Flow (lbm/s) $= M_b \cdot (1-X)$	8599.17	5565.30	158.16	0.00	0.00	0.00
Safety Injection Mass Flow (lbm/s)	0.00	0.00	0.00	223.95	624.73	627.23
Total Flow onto Heavy Floor (lbm/s)	8812.48	5712.43	191.65	239.79	632.25	629.45
Total Volumetric Flow (ft ³ /s)	153.71	99.49	3.34	4.19	11.00	10.81
Weir Height (ft)	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667
Weir Width (ft)	66.3	66.3	66.3	66.3	66.3	66.3
Dynamic Head Height (ft)	0.6191	0.4854	0.0602	0.0697	0.1290	0.1276
Retained Water Depth (ft)	0.7858	0.6521	0.2269	0.2364	0.2957	0.2943

Table 06.02.02-72-8—Depth of Water behind Doors and Curbs

Room	Floor Area (ft ²)	Depth of Retained Water (ft) at Time					
		29 s	60 s	600 s	3600 s	12304 s	40122 s
-20ft Room 1	2171.10	0.00399	0.00736	0.02692	0.06530	0.11804	0.18012
-20ft Room 3	44.02	0.03300	0.06079	0.22241	0.53947	0.97517	1.48802
-20ft Room 4	103.27	0.08338	0.15360	0.56195	1.36305	2.46391	3.75971
-20ft Room 5	103.27	0.06179	0.11382	0.41644	1.01009	1.82589	2.78615
-20ft Room 6	40.73	0.10002	0.18425	0.67412	1.63511	2.95570	4.51013
-8ft Room 24	318.71	0.01052	0.01937	0.07087	0.17189	0.31072	0.47414
+5ft Room 10	82.80	0.04238	0.07808	0.01614	0.00362	0.00081	0.00007
+5ft Room 20	134.68	0.00897	0.01653	0.06046	0.14666	0.26511	0.40453
+5ft Room 21	312.50	0.00695	0.01279	0.04681	0.11355	0.20525	0.31319
+5ft Room 22	215.73	0.00619	0.01140	0.04169	0.10113	0.18280	0.27894
+17ft Room 11	187.88	0.03160	0.05820	0.04618	0.01037	0.00232	0.00020
+17ft Room 20	219.51	0.02260	0.04163	0.03224	0.00724	0.00162	0.00014
+17ft Room 22	150.46	0.02253	0.04151	0.15187	0.36836	0.66587	1.01606
+64ft Room 17	38.78	0.02407	0.04435	0.16224	0.39353	0.71137	1.08549
+64ft Room 18	38.78	0.02407	0.04435	0.16224	0.39353	0.71137	1.08549
+79ft Room 11	704.54	0.00325	0.00598	0.02189	0.05310	0.09599	0.14647

Table 06.02.02-72-9—Total Mass of Water Retained on Floors

Retained Water on Heavy Floor									
	During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure			
Pressure, PR10 (psia)	66.45	63.49	65.22	69.33	61.68	42.02			
Liquid Density (lbm/ft ³)	57.33	57.42	57.37	57.24	57.49	58.23			
Depth of Water (ft)	0.7858	0.6521	0.2269	0.2364	0.2957	0.2943			
Room Name	Floor Area (ft²)	Mass @ 29s	Mass @ 60s	Mass @ 600s	Mass @ 12,307s	Mass @ 40,122s			
+5ft Room 2	710.62	32,013	26,608	9,250	12,080	12,178			
+5ft Room 3	737.44	33,222	27,613	9,599	12,536	12,638			
+5ft Room 4	737.44	33,222	27,613	9,599	12,536	12,638			
+5ft Room 5	628.53	28,315	23,534	8,182	10,685	10,771			
+5ft Room 6	617.83	27,833	23,134	8,042	10,503	10,588			
+5ft Room 7	737.44	33,222	27,613	9,599	12,536	12,638			
+5ft Room 8	737.44	33,222	27,613	9,599	12,536	12,638			
+5ft Room 9	772.89	34,819	28,940	10,061	13,139	13,245			
+5ft Room 16	642.06	28,925	24,041	8,358	10,915	11,003			
+5ft Room 17	472.97	21,307	17,710	6,157	8,040	8,105			
Subtotal (lbm)	306,099	254,417	88,448	91,942	115,508	116,441			
Retained Water in the Annulus Area									
	During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure			
Liquid Density (lbm/ft ³)	57.33	57.42	57.37	57.24	57.49	58.24			
Depth of Water (ft)	0.533	0.490	0.393	0.370	0.355	0.343			
Room Name	Floor Area (ft²)	Mass @ 29s	Mass @ 60s	Mass @ 3,600s	Mass @ 12,307s	Mass @ 40,122s			
Lower Annular Rooms with Weir									
-8ft Room 2	1114.23	34,067	31,369	25,141	22,759	22,278			
-8ft Room 3	2053.40	62,781	57,809	46,332	41,943	41,055			
-8ft Room 4	2090.27	63,908	58,847	47,164	42,696	41,792			
-8ft Room 5	2089.82	63,894	58,835	47,154	42,687	41,783			
-8ft Room 7	1057.70	32,338	29,777	23,866	21,605	21,147			
Subtotal (lbm)	256,988	236,638	189,657	178,161	171,691	168,056			
Rooms with Assumed Depth of ½ inch									
+5ft Room 18	1033.77	2,489	2,493	2,485	2,496	2,529			
+17ft Room 13	1486.74	3,580	3,585	3,582	3,590	3,637			

Retained Water on Heavy Floor							
		During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure
+17ft Room 14	1550.40	3,733	3,739	3,736	3,727	3,744	3,792
+17ft Room 15	1649.64	3,972	3,978	3,975	3,966	3,983	4,035
+17ft Room 16	1894.47	4,562	4,569	4,565	4,554	4,574	4,634
+17ft Room 18	469.25	1,130	1,132	1,131	1,128	1,133	1,148
+17ft Room 19	544.20	1,310	1,312	1,311	1,308	1,314	1,331
+17ft Room 23	56.38	136	136	136	136	136	138
+29ft Room 18	544.57	1,311	1,313	1,312	1,309	1,315	1,332
+29ft Room 19	544.57	1,311	1,313	1,312	1,309	1,315	1,332
+45ft Room 18	540.75	1,302	1,304	1,303	1,300	1,306	1,323
+45ft Room 19	102.90	248	248	248	247	248	252
+45ft Room 20	93.31	225	225	225	224	225	228
+45ft Room 21	171.38	413	413	413	412	414	419
+45ft Room 22	272.89	657	658	658	656	659	668
+64ft Room 9	4423.85	10,652	10,669	10,659	10,635	10,682	10,821
+64ft Room 10	2026.23	4,879	4,887	4,882	4,871	4,892	4,956
+64ft Room 11	1152.46	2,775	2,779	2,777	2,771	2,783	2,819
+64ft Room 12	3217.73	7,748	7,760	7,753	7,736	7,769	7,871
+64ft Room 13	660.18	1,590	1,592	1,591	1,587	1,594	1,615
+64ft Room 14	539.83	1,300	1,302	1,301	1,298	1,303	1,320
+64ft Room 15	627.24	1,510	1,513	1,511	1,508	1,515	1,534
+64ft Room 16	588.00	1,416	1,418	1,417	1,414	1,420	1,438
+79ft Room 9	964.78	2,323	2,327	2,325	2,319	2,330	2,360
+79ft Room 10	2293.08	5,521	5,530	5,525	5,513	5,537	5,609
+5ft Room 12	1556.37	3,748	3,753	3,750	3,742	3,758	3,807
+5ft Room 13	1054.21	2,538	2,542	2,540	2,534	2,545	2,579
+5ft Room 14	1191.05	2,868	2,872	2,870	2,863	2,876	2,913
+5ft Room 15	1599.12	3,850	3,857	3,853	3,844	3,861	3,912
+5ft Room 19	123.97	298	299	299	298	299	303
+5ft Room 23	196.06	472	473	472	471	473	480
+5ft Room 24	156.98	378	379	378	377	379	384
+5ft Room 25	156.98	378	379	378	377	379	384
+5ft Room 26	196.06	472	473	472	471	473	480
+5ft Room 27	88.44	213	213	213	213	214	216
+5ft Room 28	88.44	213	213	213	213	214	216
+17ft Room 17	508.93	1,225	1,227	1,226	1,224	1,229	1,245

Retained Water on Heavy Floor									
		During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure		
+17ft Room 24	158.72	382	383	382	382	383	388		
+17ft Room 25	121.76	293	294	293	293	294	298		
+17ft Room 26	121.76	293	294	293	293	294	298		
+29ft Room 20	117.37	283	283	283	282	283	287		
+45ft Room 16	348.96	840	842	841	839	843	854		
+45ft Room 17	348.96	840	842	841	839	843	854		
+79ft Room 20	223.66	539	539	539	538	540	547		
Subtotal (lbm)		86,217	86,352	86,277	86,081	86,457	87,585		
Retained Water Behind Doors									
		During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure		
Liquid Density (lbm/ft ³)	Floor Area (ft ²)	Mass @ 29s	Mass @ 60s	Mass @ 600s	Mass @ 3,600s	Mass @ 12,307s	Mass @ 40,122s		
-20ft Room 1	2171.10	497	917	3,353	8,115	14,734	22,776		
-20ft Room 3	44.02	83	154	562	1,359	2,468	3,815		
-20ft Room 4	103.27	494	911	3,329	8,057	14,628	22,612		
-20ft Room 5	103.27	366	675	2,467	5,971	10,840	16,757		
-20ft Room 6	40.73	234	431	1,575	3,812	6,921	10,699		
-8ft Room 24	318.71	192	354	1,296	3,136	5,693	8,801		
+5ft Room 10	82.80	201	371	77	17	4	0		
+5ft Room 20	134.68	69	128	467	1,131	2,053	3,173		
+5ft Room 21	312.50	124	230	839	2,031	3,687	5,700		
+5ft Room 22	215.73	77	141	516	1,249	2,267	3,505		
+17ft Room 11	187.88	340	628	498	112	25	2		
+17ft Room 20	219.51	284	525	406	91	20	2		
+17ft Room 22	150.46	194	359	1,311	3,173	5,760	8,904		
+64ft Room 17	38.78	54	99	361	873	1,586	2,451		
+64ft Room 18	38.78	54	99	361	873	1,586	2,451		
Subtotal (lbm)		3,394	6,263	18,303	42,141	76,160	117,657		
Total Mass on Floors (lbm)		652,699	583,670	382,685	398,326	449,816	489,739		
Total Mass on Floors Including 10% Uncertainty (lbm)		717,968	642,036	420,953	438,159	494,797	538,713		

Table 06.02.02-72-10—Total Mass of Retained Water in RB

	During Blowdown	During Refill/Reflood	During Post Reflood	Time of Peak Cont. Pressure	Time of Peak IRWST Temp	Time of Half Peak Pressure
Time (s)	29	60	600	3,600	12,305	40,123
Steam Phase (lbm)	303,391	284,446	292,363	317,245	271,157	152,119
Droplets (lbm)	39,208	2,827	248	81	33	6
Wall Condensate (lbm)	28,855	28,394	20,843	15,727	14,263	14,075
Ceiling Condensate (lbm)	26,053	26,156	26,099	25,941	26,235	27,157
Retention on RB Floors (lbm)	717,968	642,036	420,953	438,159	494,797	538,713
Retention in Clogged Basket (lbm)	68,064	68,064	68,064	68,064	68,064	68,064
Re-injected into RCS (lbm)	54,958	153,505	363,825	363,825	363,825	363,825
Total Mass of Retained (lbm)	1,238,497	1,205,428	1,192,395	1,229,042	1,238,374	1,163,959

Table 06.02.02-72-11—Water Retention Results and Margins

Large Break LOCA Case						
Time (s)	29	60	600	3,600	12,305	40,123
Total IRWST Water Loss (lbm)	472,310	229,104	216,071	252,718	262,050	187,635
Margin Above Allowable (lbm)	79,726	322,932	335,965	299,318	289,986	364,401
9" Small Break LOCA Case						
Time (s)	61	1,840	3,600	36,000	86,400	
Total IRWST Water Loss (lbm)	253,744	39,471	25,443	222,980	193,796	
Margin Above Allowable (lbm)	1,300,283	871,625	767,699	536,560	516,823	
3" Small Break LOCA Case						
Time (s)	108	5,350	22,413	36,000	86,400	
Total IRWST Water Loss (lbm)	299,134	213,585	621,406	596,324	585,210	
Margin Above Allowable (lbm)	949,477	1,108,187	477,462	485,890	474,628	
3" Small Break in the Pressurizer Lines (Based on 3" Small Break LOCA)						
Time (s)	108	5,350	22,413	36,000	86,400	
Total IRWST Water Loss (lbm)	299,134	213,585	940,008	915,459	905,517	
Margin Above Allowable (lbm)	949,477	1,108,187	158,860	166,755	154,321	

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Table 1.6-1—Reports Referenced
Sheet 2 of 5

Report No. (See Notes 1, 2, and 3)	Title	Date Submitted to NRC	FSAR Section Number(s)
ANP-10287P ANP-10287NP	Incore Trip Setpoint and Transient Methodology for U.S. EPR Topical Report	11/27/07	4.3, 4.4, 7.1, 7.2, 15.0, 15.1, 15.2, 15.3, 15.4, 15.6, 16
ANP-10288P ANP-10288NP Revision 1	U.S. EPR Post-LOCA Boron Precipitation and Boron Dilution Technical Report	01/10	15
ANP-10290 Revision 1	AREVA NP Environmental Report Standard Design Certification	9/11/09	19.2
ANP-10291P ANP-10291NP	Small Break LOCA and Non-LOCA Sensitivity Studies and Methodology Technical Report	5/09	15
ANP-10292 Revision 1	U.S. EPR Conformance with Standard Review Plan (NUREG-0800) Technical Report	5/09	1.9
ANP-10293P, Revision 34	U.S. EPR Design Features to Address GSI-191 Technical Report	311/11	6.3 and 15.6.5.4.3
ANP-10294 Revision 1	U.S. EPR Reactor Coolant Pump Motor Flywheel Structural Analysis Technical Report	3/09	5.4.1.6.6
ANP-10295P ANP-10295NP Revision 3 ANP-10295 Revision 1	U.S. EPR Security Design Features Technical Report	10/09 12/11	13.6
ANP-10296	U.S. EPR Design Features that Enhance Security	12/08	13.6
ANP-10299P Revision 2	Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis, including Supplement 1, August 2011.	12/09	6.2.1 and 6.2.25
ANP-10304 Revision 4	U.S. EPR Diversity and Defense in Depth Assessment Technical Report	6/11	1.9, 7.1, 7.2, 7.3, 7.8, 18.7, 19.1
ANP-10306P	Comprehensive Vibration Assessment Program for U.S. EPR Reactor Internals Technical Report	12/09	3.9.2.1.1, 3.9.2.3, 3.9.2.4, and 3.9.2.7

6.1.3

References

1. ASME Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Plant Power Components," The American Society of Mechanical Engineers, 2004.
2. ASME Boiler and Pressure Vessel Code, Section II, "Materials," The American Society of Mechanical Engineers, 2004.
3. Deleted.
4. EPRI Report 1009801, "Materials Reliability Program: Resistance to Primary Water Stress Corrosion Cracking of Alloys 690, 52, and 152 in Pressurized Water Reactors (MRP-111)," Electric Power Research Institute, March 2004.
5. EPRI Report 1014986, "Pressurized Water Reactor Primary Water Chemistry Guidelines," Revision 6, Electric Power Research Institute, December 2007.
6. ASTM D5144-00, "Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants," American Society for Testing and Materials, 2000.
7. ASME NQA-1-1994, "Quality Assurance Program Requirements for Nuclear Facilities," American society of Mechanical Engineers, 2004.
8. ASTM D3843-00, "Standard Practice for Quality Assurance for Protective Coatings Applied to Nuclear Facilities," American Society for Testing and Materials, 2000.
9. NUREG/CR-4513, "Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems," Revision 1, U.S. Nuclear Regulatory Commission, May 1994.
10. [ANP-10293P, Revision 4, "U.S. EPR Design Features to Address GSI-191, "AREVA NP Inc., November 2011.](#)



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When the lower plenum is refilled to the bottom of the fuel rod heated length, the refill phase ends and the reflood phase begins. The ECCS fluid flowing into the downcomer provides the driving head to move coolant through the core. As the mixture level moves up the core, steam is generated and liquid is entrained. As this entrained liquid is carried into the SGs, it vaporizes because of the higher temperature in the SGs. This causes steam binding, which reduces the core reflooding rate. The fuel rods are cooled and quenched by radiation and convective heat transfer as the quench front moves up the core. Long term recirculation cooling is maintained by the LHSI function of the SIS.

6.3.3.3 NPSH Evaluation

An evaluation of the MHSI and LHSI pumps demonstrates sufficient NPSH is available during postulated DBAs. This evaluation includes the effects of IRWST temperature, sump screen resistance with debris, pump performance, and uncertainties in hydraulic resistances.

IRWST temperatures are calculated using RELAP5/B&W (Reference 16) to determine the mass and energy release, and GOTHIC (Reference 17) to determine the containment and IRWST responses. The IRWST temperatures are calculated conservatively by mixing the condensed liquid in the containment with the IRWST water. The limiting case is the double-ended guillotine (DEG) hot-leg break, Figure 6.3-7—IRWST LOCA Temperature Response. The peak IRWST temperature is calculated to be 246.2~~230~~°F.

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The SIS pump NPSH evaluation for LBLOCA events is performed using the maximum pump flow head-capacity curves, maximum system resistances, debris laden sump screen resistance, and a reduced IRWST level to account for liquid hold up in the containment. The limiting evaluation of NPSH does not credit containment overpressure. It conservatively assumes the IRWST liquid is at the saturation pressure corresponding to the peak calculated IRWST temperature of 246.2~~230~~°F.

Simultaneous operation of both the MHSI and LHSI pumps is considered. The increase in IRWST temperature is taken into account for the LBLOCA analysis in Section 15.6.5. The LBLOCA analysis inherently bounds the SBLOCA analysis.

6.3.4 Tests and Inspections

Refer to Section 14.2 (Test abstract #014, #015, #016, #022, #175, and #177) for initial plant testing. Applicable guidance from RG 1.79 is incorporated in the initial plant testing described in Section 14.2.

Surveillance Requirements 3.5.1, 3.5.2, 3.5.3, and 3.5.4 in Chapter 16 describe the SIS surveillance requirements.

12. BL 88-04, "Potential Safety-Related Pump Loss," U.S. Nuclear Regulatory Commission, May 1988.
13. BL 93-02, "Debris Plugging of Emergency Core Cooling Suction Strainers," U.S. Nuclear Regulatory Commission, May 1993.
14. BL 01-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," U.S. Nuclear Regulatory Commission, August 2001.
15. BL 02-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," U.S. Nuclear Regulatory Commission, March 2002.
16. BAW-10164P-A, Revision 6, "RELAP5/ MOD2-BAW – An Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analyses," AREVA NP Inc., June 2007.
17. BAW-10252(NP)-A, Revision 0, "Analysis of Containment Response to Postulated Pipe Ruptures Using GOTHIC," Framatome ANP, September 2005.
18. GL 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," U.S. Nuclear Regulatory Commission, September 2004.

19. ANP-10293P, Revision ~~34~~, "U.S. EPR Design Features to Address GSI-191," AREVA NP Inc., ~~March~~, November 2011.

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Table 6.3-2—Low Head Safety Injection Pumps Design and Operating Parameters

Parameter	Value			
Number	4			
Type/arrangement	Centrifugal/horizontal			
Type of fluid	primary coolant; post-LOCA downstream fluid			
Maximum strainer head loss during LBLOCA (at 212°F)	2.1 ft			
Design pressure/temperature	1160 psig/360°F			
Normal flowrate (approximate)	2200 gpm			
Normal flow head (approximate)	480 ft			
Minimum flowrate (approximate)	530 gpm			
Flow head at minimum flowrate (approximate)	750 ft			
NPSH required at maximum flowrate (approximate)	8.2 ft			
Nominal motor power (approximate)	340 kW			
LHSI Pump Characteristics				
Pump Flow (gpm)		TDH (ft)	NPSHR (ft)	NPSHA (ft)
0.0		782	2.5	15.9
440		760	2.8	15.2
72	→ 880	718	3.2	14.2
1320		656	3.8	12.9
1760		575	4.4	11.1
2200		475	5.3	9.1
2640		356	6.2	6.7

Pump flow (gpm)	TDH (ft)	NPSHR (ft)
0.0	787.4	N/A
440	771.0	N/A
880	721.8	3.3
1320	656.2	3.9
1760	574.1	4.6
2200	475.7	5.2
2640	360.9	6.2

15.6.6

References

1. ANP-10263P-A, Revision 0, "Codes and Methods Applicability Report for the U.S. EPR," AREVA NP Inc., August 2007.
2. ANP-10287P, Revision 0, "Incore Trip Setpoint and Transient Methodology for U.S. EPR," AREVA NP Inc., November 2007.
3. ANP-10269P, Revision 0, "The ACH-2 CHF Correlation for the U.S. EPR," AREVA NP Inc., November 2006.
4. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, March 2007.
5. ANP-10278P, Revision 1, "U.S. EPR Realistic Large Break Loss of Coolant Accident Topical Report," AREVA NP Inc., January 2010.
6. ANP-10291P, Revision 0, "Small Break LOCA and Non-LOCA Sensitivity Studies and Methodology," October, 2007.
7. ANS-5.1-1973, "Decay Energy Release Rates Following Shutdown of Uranium-Fueled Thermal Reactors," American Nuclear Society, October 1971, revised October 1973.
8. BAW-10227P-A, Revision 1, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," Framatome Cogema Fuels, February 2000.
9. ANP-10288P, Revision 1, "U.S. EPR Post-LOCA Boron Precipitation and Boron Dilution Technical Report," AREVA NP Inc., January 2010.
10. FANP NGTT1/04/en/04, Revision A, "Final Report of the PKL Experimental Program Within the OECD/SETH Project," Framatome ANP, December 2004.
11. ANP-10293P, Revision 04, "U.S. EPR Design Features to Address GSI-191 Technical Report," AREVA NP Inc., ~~February 2008~~ November 2011.

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