HOLTEC INTERNATIONAL

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April 23, 2004

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

Subject: USNRC Docket No. 72-1014, TAC L23657
HI-STORM 100 Certificate of Compliance 1014
HI-STORM License Amendment Request 1014-2, Revision 2, Supplement 3
Clarification of LAR Information

References:
1. Holtec Project 5014
2. Holtec letter, B. Gutherman, to NRC Document Control Desk, "HI-STORM Overpack Lid Concrete Temperature," dated April 19, 2004

Dear Sir:

Enclosed please find the following revised documents comprising Supplement 3 to License Amendment Request (LAR) 1014-2, Revision 2. This supplement provides modified proposed changes to the HI-STORM CoC and FSAR that are required to correct the vacuum drying decay heat limit and bring it line with the previously approved value under CoC Amendment 1. The MPC vacuum drying evaluation for LAR 1014-2 has been re-performed to remove excess conservatism that was unreasonably punitive to the permissible heat load limit. The calculation of the effective thermal conductivity for the composite fuel basket walls during vacuum drying was over-conservative due to a combination of the methodology used and the assumption for the contents of the interstitial spaces (i.e., pure vacuum). A more realistic, but still conservative evaluation that recognizes the presence of low pressure (1 torr) water vapor in the interstitial spaces has been performed. Updated threshold decay heat loads for vacuum drying reported in Section 4.5 have been added to Table 3-1 of Appendix A to the CoC.

This submittal also corrects a typographical error identified in the uranium mass limit specified Appendix A, Table 2.1-3 of the proposed CoC changes for the 8x8B fuel assembly array/class. Modifications to the proposed FSAR changes supporting this LAR are also provided to address the vacuum drying decay heat limit change and the evaluation of elevated local overpack lid concrete temperatures described in Reference 2. The following attachments are provided.

- Instructions for updating the documents in the LAR notebook
- Replacement pages for the FSAR List of Effective Pages
- Replacement pages for the marked-up CoC proposed changes

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- Replacement pages for the revised CoC proposed changes

- Replacement pages for proposed changes to FSAR Chapters 4 and 5 with "Proposed Revision 2D" in the footer.

Please contact the undersigned if you require additional information.

Sincerely,

Brian Gutherman, P.E.
Manager, Licensing and Technical Services

Approval:

for K.P. Singh

K.P. Singh, P.E., Ph.D.
President and CEO

Document ID: 5014518

Attachments: As Stated

cc: Mr. Christopher Regan, USNRC (w/ 7 copies of attachments)
HUG NRC Correspondence Distribution (w/attach.)

INSTRUCTIONS FOR LAR 1014-2, REVISION 2, SUPPLEMENT 3

1. Insert the cover letter and Attachment 1 in the front of the LAR notebook.

2. Remove the following markup CoC pages and replace/insert the enclosed modified markup CoC pages:
    a. Replace Appendix A, Table 3-1
    b. Replace Appendix B, pages 2-51/52

3. Remove the following revised CoC pages and replace/insert the enclosed modified revised CoC pages:
    a. Replace Appendix A, Table 3-1
    b. Replace Appendix B, pages 2-51/52

4. Remove the FSAR List of Effective Pages, Revision 2C in their entirety and replace with FSAR List of Effective Pages, Rev. 2D.

5. Remove FSAR pages 4.2-3 through 4.2-6, Proposed Rev. 2B and replace with enclosed FSAR pages 4.2-3 through 4.2-6, Proposed Rev. 2D.

6. Remove FSAR page 4.4-9/10, Proposed Rev. 2C and replace with enclosed FSAR page 4.4-9/10, Proposed Rev. 2D.

7. Remove FSAR page 4.4-45/46, Proposed Rev. 2C and replace with enclosed FSAR page 4.4-45/46, Proposed Rev. 2D.

8. Replace FSAR Figure 4.4.7, Proposed Rev 2B and replace with enclosed FSAR Figure 4.4.7, Proposed Rev. 2D.

9. Remove FSAR pages 4.5-9 through 4.5-14, Proposed Rev. 2C and replace with enclosed FSAR pages 4.5-9 through 4.5-14, Proposed Rev. 2D.

10. Remove FSAR page 4.5-21/22, Proposed Rev. 2C and replace with enclosed FSAR page 4.5-21/22, Proposed Rev. 2D.

11. Remove FSAR pages 4.7-1 through 4.7-3, Proposed Rev. 2C and replace with enclosed FSAR pages 4.7-1 through 4.7-3, Proposed Rev. 2D.

12. Remove FSAR page 5.3-7/8, Proposed Rev. 2B and replace with enclosed FSAR page 5.3-7/8, Proposed Rev. 2D.

Table 3-1
MPC Cavity Drying Limits

Fuel Burnup (MWD/MTU)	***MPC Heat Load (kW)***	***Method of Moisture Removal (Notes 1 and 2)***
All Assemblies ≤ 45,000	*≤ 26*	*VDS or FHD*
All Assemblies ≤ 45,000	*> 26*	*FHD*
One or more assemblies > 45,000	*≤ 38*	*FHD*

Notes:

1. *VDS means Vacuum Drying System. The acceptance criterion for VDS is MPC cavity pressure shall be ≤ 3 torr for ≥ 30 minutes.*

2. *FHD means Forced Helium Dehydration System. The acceptance criterion for the FHD System is gas temperature exiting the demoisturizer shall be ≤ 21°F for ≥ 30 minutes or gas dew point exiting the MPC shall be ≤ 22.9°F for ≥ 30 minutes .*

Table 2.1-3 (page 1 of 5)
BWR FUEL ASSEMBLY CHARACTERISTICS (Note 1)

Fuel Assembly Array/Class	6x6A	6x6B	6x6C	7x7A	7x7B	8x8A
Clad Material ~~(Note 2)~~	~~Zr~~ *ZR*	~~Zr~~ *ZR*	~~Zr~~ *ZR*	~~Zr~~ *ZR*	~~Zr~~ *ZR*	~~Zr~~ *ZR*
Design Initial U (kg/assy.) (Note 3)	≤ 110	≤ 110	≤ 110	≤ 100	≤ ~~195~~ *198*	≤ 120
Maximum PLANAR-AVERAGE INITIAL ENRICHMENT (wt.% ^{235}U) (Note 14)	≤ 2.7	≤ 2.7 for the UO_2 rods. See Note 4 for MOX rods	≤ 2.7	≤ 2.7	≤ 4.2	≤ 2.7
Initial Maximum Rod Enrichment (wt.% ^{235}U)	≤ 4.0	≤ 4.0	≤ 4.0	≤ 5.5	≤ 5.0	≤ 4.0
No. of Fuel Rod Locations	35 or 36	35 or 36 (up to 9 MOX rods)	36	49	49	63 or 64
Fuel Rod Clad O.D. (in.)	≥ 0.5550	≥ 0.5625	≥ 0.5630	≥ 0.4860	≥ 0.5630	≥ 0.4120
Fuel Rod Clad I.D. (in.)	≤ 0.5105	≤ 0.4945	≤ 0.4990	≤ 0.4204	≤ 0.4990	≤ 0.3620
Fuel Pellet Dia. (in.)	≤ 0.4980	≤ 0.4820	≤ 0.4880	≤ 0.4110	≤ 0.4910	≤ 0.3580
Fuel Rod Pitch (in.)	≤ 0.710	≤ 0.710	≤ 0.740	≤ 0.631	≤ 0.738	≤ 0.523
Active Fuel Length (in.)	≤ 120	≤ 120	≤ 77.5	≤ 80	≤ 150	≤ 120
No. of Water Rods (Note 11)	1 or 0	1 or 0	0	0	0	1 or 0
Water Rod Thickness (in.)	> 0	> 0	N/A	N/A	N/A	≥ 0
Channel Thickness (in.)	≤ 0.060	≤ 0.060	≤ 0.060	≤ 0.060	≤ 0.120	≤ 0.100

Table 2.1-3 (2 of 5)
BWR FUEL ASSEMBLY CHARACTERISTICS (Note 1)

Fuel Assembly Array/Class	**8x8B**	**8x8C**	**8x8D**	**8x8E**	**8x8F**	**9x9A**
Clad Material ~~(Note 2)~~	~~Zr~~ *ZR*	~~Zr~~ *ZR*	~~Zr~~ *ZR*	~~Zr~~ *ZR*	~~Zr~~ *ZR*	~~Zr~~ *ZR*
Design Initial U (kg/assy.) (Note 3)	≤ ~~191~~ *192*	≤ ~~191~~ *190*	≤ ~~191~~ *190*	< ~~191~~ *190*	≤ 191	≤ ~~179~~ *180*
Maximum PLANAR-AVERAGE INITIAL ENRICHMENT (wt.% ^{235}U) (Note 14)	≤ 4.2	≤ 4.2	≤ 4.2	≤ 4.2	≤ 4.0	≤ 4.2
Initial Maximum Rod Enrichment (wt.% ^{235}U)	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0
No. of Fuel Rod Locations	63 or 64	62	60 or 61	59	64	74/66 (Note 5)
Fuel Rod Clad O.D. (in.)	≥ 0.4840	≥ 0.4830	≥ 0.4830	≥ 0.4930	≥ 0.4576	≥ 0.4400
Fuel Rod Clad I.D. (in.)	≤ 0.4295	≤ 0.4250	≤ 0.4230	≤ 0.4250	≤ 0.3996	≤ 0.3840
Fuel Pellet Dia. (in.)	≤ 0.4195	≤ 0.4160	≤ 0.4140	≤ 0.4160	≤ 0.3913	≤ 0.3760
Fuel Rod Pitch (in.)	≤ 0.642	≤ 0.641	≤ 0.640	≤ 0.640	≤ 0.609	≤ 0.566
Design Active Fuel Length (in.)	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150
No. of Water Rods (Note 11)	1 or 0	2	1 - 4 (Note 7)	5	N/A (Note 12)	2
Water Rod Thickness (in.)	≥ 0.034	> 0.00	> 0.00	≥ 0.034	≥ 0.0315	> 0.00
Channel Thickness (in.)	≤ 0.120	≤ 0.120	≤ 0.120	≤ 0.100	≤ 0.055	≤ 0.120

Table 3-1
MPC Cavity Drying Limits

Fuel Burnup (MWD/MTU)	**MPC Heat Load (kW)**	**Method of Moisture Removal (Notes 1 and 2)**
All Assemblies ≤ 45,000	≤ 26	VDS or FHD
All Assemblies ≤ 45,000	> 26	FHD
One or more assemblies > 45,000	≤ 38	FHD

Notes:

1. VDS means Vacuum Drying System. The acceptance criterion for VDS is MPC cavity pressure shall be ≤ 3 torr for ≥ 30 minutes.

2. FHD means Forced Helium Dehydration System. The acceptance criterion for the FHD System is gas temperature exiting the demoisturizer shall be ≤ 21°F for ≥ 30 minutes or gas dew point exiting the MPC shall be ≤ 22.9°F for ≥ 30 minutes .

Table 2.1-3 (page 1 of 5)
BWR FUEL ASSEMBLY CHARACTERISTICS (Note 1)

Fuel Assembly Array/Class	6x6A	6x6B	6x6C	7x7A	7x7B	8x8A
Clad Material	ZR	ZR	ZR	ZR	ZR	ZR
Design Initial U (kg/assy.) (Note 3)	≤ 110	≤ 110	≤ 110	≤ 100	≤ 198	≤ 120
Maximum PLANAR-AVERAGE INITIAL ENRICHMENT (wt.% ^{235}U) (Note 14)	≤ 2.7	≤ 2.7 for the UO_2 rods. See Note 4 for MOX rods	≤ 2.7	≤ 2.7	≤ 4.2	≤ 2.7
Initial Maximum Rod Enrichment (wt.% ^{235}U)	≤ 4.0	≤ 4.0	≤ 4.0	≤ 5.5	≤ 5.0	≤ 4.0
No. of Fuel Rod Locations	35 or 36	35 or 36 (up to 9 MOX rods)	36	49	49	63 or 64
Fuel Rod Clad O.D. (in.)	≥ 0.5550	≥ 0.5625	≥ 0.5630	≥ 0.4860	≥ 0.5630	≥ 0.4120
Fuel Rod Clad I.D. (in.)	≤ 0.5105	≤ 0.4945	≤ 0.4990	≤ 0.4204	≤ 0.4990	≤ 0.3620
Fuel Pellet Dia. (in.)	≤ 0.4980	≤ 0.4820	≤ 0.4880	≤ 0.4110	≤ 0.4910	≤ 0.3580
Fuel Rod Pitch (in.)	≤ 0.710	≤ 0.710	≤ 0.740	≤ 0.631	≤ 0.738	≤ 0.523
Active Fuel Length (in.)	≤ 120	≤ 120	≤ 77.5	≤ 80	≤ 150	≤ 120
No. of Water Rods (Note 11)	1 or 0	1 or 0	0	0	0	1 or 0
Water Rod Thickness (in.)	> 0	> 0	N/A	N/A	N/A	≥ 0
Channel Thickness (in.)	≤ 0.060	≤ 0.060	≤ 0.060	≤ 0.060	≤ 0.120	≤ 0.100

Table 2.1-3 (2 of 5)
BWR FUEL ASSEMBLY CHARACTERISTICS (Note 1)

Fuel Assembly Array/Class	**8x8B**	**8x8C**	**8x8D**	**8x8E**	**8x8F**	**9x9A**
Clad Material	ZR	ZR	ZR	ZR	ZR	ZR
Design Initial U (kg/assy.) (Note 3)	≤ 192	≤ 190	≤ 190	< 190	≤ 191	≤ 180
Maximum PLANAR-AVERAGE INITIAL ENRICHMENT (wt.% ^{235}U) (Note 14)	≤ 4.2	≤ 4.2	≤ 4.2	≤ 4.2	≤ 4.0	≤ 4.2
Initial Maximum Rod Enrichment (wt.% ^{235}U)	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0
No. of Fuel Rod Locations	63 or 64	62	60 or 61	59	64	74/66 (Note 5)
Fuel Rod Clad O.D. (in.)	≥ 0.4840	≥ 0.4830	≥ 0.4830	≥ 0.4930	≥ 0.4576	≥ 0.4400
Fuel Rod Clad I.D. (in.)	≤ 0.4295	≤ 0.4250	≤ 0.4230	≤ 0.4250	≤ 0.3996	≤ 0.3840
Fuel Pellet Dia. (in.)	≤ 0.4195	≤ 0.4160	≤ 0.4140	≤ 0.4160	≤ 0.3913	≤ 0.3760
Fuel Rod Pitch (in.)	≤ 0.642	≤ 0.641	≤ 0.640	≤ 0.640	≤ 0.609	≤ 0.566
Design Active Fuel Length (in.)	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150
No. of Water Rods (Note 11)	1 or 0	2	1 - 4 (Note 7)	5	N/A (Note 12)	2
Water Rod Thickness (in.)	≥ 0.034	> 0.00	> 0.00	≥ 0.034	≥ 0.0315	> 0.00
Channel Thickness (in.)	≤ 0.120	≤ 0.120	≤ 0.120	≤ 0.100	≤ 0.055	≤ 0.120

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2.0-29	2C		2.1-42	2C
2.0-30	2C		2.1-43	2C
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2.2-29	2B		2.3-23	2B
2.2-30	2B		Fig. 2.3.1	0
2.2-31	2B		Fig. 2.3.2	0
2.2-32	2B		Fig. 2.3.3	0
2.2-33	2B		Fig. 2.3.4	0
2.2-34	2B			
2.2-35	2B			

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Page	Revision		Page	Revision
2.4-1	2A			
2.4-2	2A			
2.4-3	2A			
2.5-1	0			
2.6-1	2C			
2.6-2	2C			
2.6-3	2C			
2A-1	1			
2A-2	1			
2A-3	1			
2A-4	1			
2A-5	1			
Fig. 2.A.1	1			
2.B-1	2B			
2.B-2	2B			
2.B-3	2B			
2.B-4	2B			
Fig. 2.B.1	1			
2.C-1	2C			
2.C-2	2C			
Fig. 2.C.1	2C			

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3.0-1	2B	3.1-43	2B
3.0-2	2B	Fig. 3.1.1	1
3.0-3	2B	Fig. 3.1.2	1
3.0-4	2B	Fig. 3.1.3	1
3.0-5	2B	3.2-1	1
3.0-6	2B	3.2-2	1
3.0-7	2B	3.2-3	1
3.0-8	2B	3.2-4	1
3.0-9	2B	3.2-5	1
3.0-10	2B	3.2-6	1
3.1-1	2B	3.2-7	1
3.1-2	2B	3.2-8	1
3.1-3	2B	3.2-9	1
3.1-4	2B	3.2-10	1
3.1-5	2B	3.2-11	1
3.1-6	2B	3.2-12	1
3.1-7	2B	3.3-1	1
3.1-8	2B	3.3-2	1
3.1-9	2B	3.3-3	1
3.1-10	2B	3.3-4	1
3.1-11	2B	3.3-5	1
3.1-12	2B	3.3-6	1
3.1-13	2B	3.3-7	1
3.1-14	2B	3.3-8	1
3.1-15	2B	3.3-9	1
3.1-16	2B	3.3-10	Deleted
3.1-17	2B	3.4-1	2B
3.1-18	2B	3.4-2	2B
3.1-19	2B	3.4-3	2B
3.1-20	2B	3.4-4	2B
3.1-21	2B	3.4-5	2B
3.1-22	2B	3.4-6	2B
3.1-23	2B	3.4-7	2B
3.1-24	2B	3.4-8	2B
3.1-25	2B	3.4-9	2B
3.1-26	2B	3.4-10	2B
3.1-27	2B	3.4-11	2B
3.1-28	2B	3.4-12	2B
3.1-29	2B	3.4-13	2B
3.1-30	2B	3.4-14	2B
3.1-31	2B	3.4-15	2B
3.1-32	2B	3.4-16	2B
3.1-33	2B	3.4-17	2B
3.1-34	2B	3.4-18	2B
3.1-35	2B	3.4-19	2B
3.1-36	2B	3.4-20	2B
3.1-37	2B	3.4-21	2B
3.1-38	2B	3.4-22	2B
3.1-39	2B	3.4-23	2B
3.1-40	2B	3.4-24	2B
3.1-41	2B	3.4-25	2B
3.1-42	2B	3.4-26	2B

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3.4-27	2B		3.4-79	2B
3.4-28	2B		3.4-80	2B
3.4-29	2B		3.4-81	2B
3.4-30	2B		3.4-82	2B
3.4-31	2B		3.4-83	2B
3.4-32	2B		3.4-84	2B
3.4-33	2B		3.4-85	2B
3.4-34	2B		3.4-86	2B
3.4-35	2B		3.4-87	2B
3.4-36	2B		3.4-88	2B
3.4-37	2B		3.4-89	2B
3.4-38	2B		3.4-90	2B
3.4-39	2B		3.4-91	2B
3.4-40	2B		3.4-92	2B
3.4-41	2B		3.4-93	2B
3.4-42	2B		3.4-94	2B
3.4-43	2B		3.4-95	2B
3.4-44	2B		3.4-96	2B
3.4-45	2B		3.4-97	2B
3.4-46	2B		3.4-98	2B
3.4-47	2B		3.4-99	2B
3.4-48	2B		3.4-100	2B
3.4-49	2B		3.4-101	2B
3.4-50	2B		3.4-102	2B
3.4-51	2B		3.4-103	2B
3.4-52	2B		3.4-104	2B
3.4-53	2B		3.4-105	2B
3.4-54	2B		3.4-106	2B
3.4-55	2B		3.4-107	2B
3.4-56	2B		3.4-108	2B
3.4-57	2B		3.4-109	2B
3.4-58	2B		3.4-110	2B
3.4-59	2B		3.4-111	2B
3.4-60	2B		3.4-112	2B
3.4-61	2B		3.4-113	2B
3.4-62	2B		3.4-114	2B
3.4-63	2B		3.4-115	2B
3.4-64	2B		3.4-116	2B
3.4-65	2B		3.4-117	2B
3.4-66	2B		3.4-118	2B
3.4-67	2B		3.4-119	2B
3.4-68	2B		3.4-120	2B
3.4-69	2B		3.4-121	2B
3.4-70	2B		3.4-122	2B
3.4-71	2B		3.4-123	2B
3.4-72	2B		3.4-124	2B
3.4-73	2B		3.4-125	2B
3.4-74	2B		3.4-126	2B
3.4-75	2B		Fig. 3.4.1	0
3.4-76	2B		Fig. 3.4.2	1
3.4-77	2B		Fig. 3.4.3	0
3.4-78	2B			

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Fig. 3.4.4	0	3.5-4	0
Fig. 3.4.5	1	3.5-5	0
Fig. 3.4.6	0	3.5-6	0
Fig. 3.4.7	0	3.5-7	0
Fig. 3.4.8	0	3.5-8	0
Fig. 3.4.9	0	3.5-9	0
Fig. 3.4.10	1	3.5-10	0
Fig. 3.4.11	0	3.5-11	0
Fig. 3.4.12	0	3.5-12	0
Fig. 3.4.13	0	3.5-13	0
Fig. 3.4.14	0	3.5-14	0
Fig. 3.4.15	0	3.5-15	0
Fig. 3.4.16	0	3.5-16	0
Fig. 3.4.16a	0	3.5-17	0
Fig. 3.4.16b	0	3.5-18	0
Fig. 3.4.17	0	3.5-19	0
Fig. 3.4.18	0	Fig. 3.5.1	0
Fig. 3.4.19	0	Fig. 3.5.2	0
Fig. 3.4.20	0	Fig. 3.5.3	0
Fig. 3.4.21	0	Fig. 3.5.4	0
Fig. 3.4.22	0	Fig. 3.5.5	0
Fig. 3.4.23	0	Fig. 3.5.6	0
Fig. 3.4.24	0	Fig. 3.5.7	0
Fig. 3.4.25	0	Fig. 3.5.8	0
Fig. 3.4.26	0	Fig. 3.5.9	0
Fig. 3.4.27	0	3.6-1	2A
Fig. 3.4.28	0	3.6-2	2A
Fig. 3.4.29	0	3.6-3	2A
Fig. 3.4.30	1	3.6-4	2A
Fig. 3.4.31	1	3.6-5	2A
Fig. 3.4.32	1	3.6-6	2A
Fig. 3.4.33	1	3.6-7	2A
Fig. 3.4.34	1	3.6-8	2A
Fig. 3.4.35	1	3.6-9	2A
Fig. 3.4.36	1	3.7-1	2A
Fig. 3.4.37	1	3.7-2	2A
Fig. 3.4.38	1	3.7-3	2A
Fig. 3.4.39	1	3.7-4	2A
Fig. 3.4.40	1	3.7-5	2A
Fig. 3.4.41	1	3.7-6	2A
Fig. 3.4.42	1	3.7-7	2A
Fig. 3.4.43	1	3.7-8	2A
Fig. 3.4.44	1	3.7-9	2A
Fig. 3.4.45	1	3.7-10	2A
Fig. 3.4.46	1	3.8-1	1
Fig. 3.4.47	1	3.8-2	1
Fig. 3.4-48	1	3.A-1	1
Fig. 3.4-49	1	3.A-2	1
3.5-1	0	3.A-3	1
3.5-2	0	3.A-4	1
3.5-3	0	3.A-5	1

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3.A-6	1		3.B-24	Deleted
3.A-7	1		3.B-25	Deleted
3.A-8	1		3.B-26	Deleted
3.A-9	1		3.B-27	Deleted
3.A-10	1		3.B-28	Deleted
3.A-11	1		3.B-29	Deleted
3.A-12	1		3.B-30	Deleted
3.A-13	1		3.B-31	Deleted
3.A-14	1		3.B-32	Deleted
3.A-15	1		3.B-33	Deleted
Fig. 3.A.1	0		3.B-34	Deleted
Fig. 3.A.2	0		3.B-35	Deleted
Fig. 3.A.3	0		3.B-36	Deleted
Fig. 3.A.4	0		3.B-37	Deleted
Fig. 3.A.5	0		3.B-38	Deleted
Fig. 3.A.6	0		3.B-39	Deleted
Fig. 3.A.7	0		3.B-40	Deleted
Fig. 3.A.8	0		3.B-41	Deleted
Fig. 3.A.9	0		3.B-42	Deleted
Fig. 3.A.10	0		3.B-43	Deleted
Fig. 3.A.11	0		3.B-44	Deleted
Fig. 3.A.12	0		3.B-45	Deleted
Fig. 3.A.13	0		3.B-46	Deleted
Fig. 3.A.14	0		3.B-47	Deleted
Fig. 3.A.15	0		3.B-48	Deleted
Fig. 3.A.16	0		3.B-49	Deleted
Fig. 3.A.17	0		3.B-50	Deleted
Fig. 3.A.18	0		3.B-51	Deleted
3.B-1	Deleted		3.B-52	Deleted
3.B-2	Deleted		3.B-53	Deleted
3.B-3	Deleted		3.B-54	Deleted
3.B-4	Deleted		3.B-55	Deleted
3.B-5	Deleted		3.B-56	Deleted
3.B-6	Deleted		3.B-57	Deleted
3.B-7	Deleted		3.B-58	Deleted
3.B-8	Deleted		3.B-59	Deleted
3.B-9	Deleted		3.B-60	Deleted
3.B-10	Deleted		3.B-61	Deleted
3.B-11	Deleted		3.B-62	Deleted
3.B-12	Deleted		3.C-1	Deleted
3.B-13	Deleted		3.C-2	Deleted
3.B-14	Deleted		3.C-3	Deleted
3.B-15	Deleted		3.C-4	Deleted
3.B-16	Deleted		3.C-5	Deleted
3.B-17	Deleted		3.C-6	Deleted
3.B-18	Deleted		3.C-7	Deleted
3.B-19	Deleted		3.C-8	Deleted
3.B-20	Deleted		Fig. 3.C.1	Deleted
3.B-21	Deleted		Fig. 3.C.2	Deleted
3.B-22	Deleted		Fig. 3.C.3	Deleted
3.B-23	Deleted		3.D-1	Deleted
			3.D-2	Deleted

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3.D-3	Deleted	3.G-8	Deleted
3.D-4	Deleted	3.G-9	Deleted
3.D-5	Deleted	3.G-10	Deleted
3.D-6	Deleted	3.G-11	Deleted
3.D-7	Deleted	3.G-12	Deleted
3.D-8	Deleted	3.G-13	Deleted
3.D-9	Deleted	Fig. 3.G.1	Deleted
3.D-10	Deleted	Fig. 3.G.2	Deleted
3.D-11	Deleted	Fig. 3.G.3	Deleted
3.D-12	Deleted	Fig. 3.G.4	Deleted
3.D-13	Deleted	Fig. 3.G.5	Deleted
3.D-14	Deleted	3.H-1	Deleted
3.D-15	Deleted	3.H-2	Deleted
Fig. 3.D.1	Deleted	3.H-3	Deleted
Fig. 3.D.2a	Deleted	3.H-4	Deleted
Fig. 3.D.2b	Deleted	3.H-5	Deleted
Fig. 3.D.2c	Deleted	3.H-6	Deleted
Fig. 3.D.3	Deleted	3.H-7	Deleted
Fig. 3.D.4a	Deleted	Fig. 3.H.1	Deleted
Fig. 3.D.4b	Deleted	3.I-1	Deleted
Fig. 3.D.4c	Deleted	3.I-2	Deleted
Fig. 3.D.5a	Deleted	3.I-3	Deleted
Fig. 3.D.5b	Deleted	3.I-4	Deleted
Fig. 3.D.5c	Deleted	3.I-5	Deleted
3.E-1	Deleted	3.I-6	Deleted
3.E-2	Deleted	3.I-7	Deleted
3.E-3	Deleted	3.I-8	Deleted
3.E-4	Deleted	3.I-9	Deleted
3.E-5	Deleted	3.I-10	Deleted
3.E-6	Deleted	Fig. 3.I.1	Deleted
3.E-7	Deleted	Appendix 3.J	Deleted
3.E-8	Deleted	3.K-1	Deleted
3.E-9	Deleted	3.K-2	Deleted
3.E-10	Deleted	3.K-3	Deleted
Fig. 3.E.1	Deleted	3.K-4	Deleted
Fig. 3.E.2	Deleted	3.K-5	Deleted
Fig. 3.E.3	Deleted	3.K-6	Deleted
3.F-1	Deleted	3.K-7	Deleted
3.F-2	Deleted	3.L-1	Deleted
3.F-3	Deleted	3.L-2	Deleted
3.F-4	Deleted	3.L-3	Deleted
Fig. 3.F.1	Deleted	3.L-4	Deleted
Fig. 3.F.2	Deleted	3.L-5	Deleted
Fig. 3.F.3	Deleted	3.L-6	Deleted
Fig. 3.F.4	Deleted	3.L-7	Deleted
3.G-1	Deleted	3.L-8	Deleted
3.G-2	Deleted	3.L-9	Deleted
3.G-3	Deleted	3.L-10	Deleted
3.G-4	Deleted	3.L-11	Deleted
3.G-5	Deleted	3.L-12	Deleted
3.G-6	Deleted	3.L-13	Deleted
3.G-7	Deleted	3.M-1	Deleted

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3.M-2	Deleted	3.W-6	Deleted
3.M-3	Deleted	3.W-7	Deleted
3.M-4	Deleted	3.W-8	Deleted
3.M-5	Deleted	3.W-9	Deleted
3.M-6	Deleted	3.W-10	Deleted
3.M-7	Deleted	Fig. 3.W.1	Deleted
3.M-8	Deleted	3.X-1	Deleted
3.M-9	Deleted	3.X-2	Deleted
3.M-10	Deleted	3.X-3	Deleted
3.M-11	Deleted	3.X-4	Deleted
3.M-12	Deleted	3.X-5	Deleted
3.M-13	Deleted	3.X-6	Deleted
3.M-14	Deleted	3.X-7	Deleted
3.M-15	Deleted	3.X-8	Deleted
3.M-16	Deleted	3.X-9	Deleted
3.M-17	Deleted	3.X-10	Deleted
3.M-18	Deleted	Fig. 3.X.1	Deleted
3.M-19	Deleted	Fig. 3.X.2	Deleted
Appendix 3.N	Deleted in Rev 1	Fig. 3.X.3	Deleted
Appendix 3.O	Deleted in Rev 1	Fig. 3.X.4	Deleted
Appendix 3.P	Deleted in Rev 1	Fig. 3.X.5	Deleted
Appendix 3.Q	Deleted in Rev 1	3.Y-1	Deleted
Appendix 3.R	Deleted in Rev 1	3.Y-2	Deleted
Appendix 3.S	Deleted in Rev 1	3.Y-3	Deleted
Appendix 3.T	Deleted in Rev 1	3.Y-4	Deleted
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3.U-4	Deleted	3.Y-8	Deleted
3.U-5	Deleted	3.Y-9	Deleted
3.U-6	Deleted	3.Y-10	Deleted
3.U-7	Deleted	3.Y-11	Deleted
3.U-8	Deleted	3.Y-12	Deleted
3.U-9	Deleted	3.Y-13	Deleted
3.U-10	Deleted	3.Y-14	Deleted
Fig. 3.U.1	Deleted	3.Y-15	Deleted
3.V-1	Deleted	3.Y-16	Deleted
3.V-2	Deleted	3.Y-17	Deleted
3.V-3	Deleted	3.Y-18	Deleted
3.V-4	Deleted	3.Y-19	Deleted
3.V-5	Deleted	3.Y-20	Deleted
3.V-6	Deleted	Fig. 3.Y.1	Deleted
3.V-7	Deleted	Fig. 3.Y.2	Deleted
3.V-8	Deleted	3.Z-1	Deleted
3.V-9	Deleted	3.Z-2	Deleted
3.V-10	Deleted	3.Z-3	Deleted
Fig. 3.V.1	Deleted	3.Z-4	Deleted
3.W-1	Deleted	3.Z-5	Deleted
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3.W-3	Deleted	3.Z-7	Deleted
3.W-4	Deleted	3.Z-8	Deleted
3.W-5	Deleted	3.Z-9	Deleted

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3.Z-10	Deleted	3.AD-2	Deleted
3.Z-11	Deleted	3.AD-3	Deleted
3.Z-12	Deleted	3.AD-4	Deleted
Fig. 3.Z.1	Deleted	3.AD-5	Deleted
Fig. 3.Z.2	Deleted	3.AD-6	Deleted
Fig. 3.Z.3	Deleted	3.AD-7	Deleted
Fig. 3.Z.4	Deleted	3.AD-8	Deleted
Fig. 3.Z.5	Deleted	3.AD-9	Deleted
Fig. 3.Z.6	Deleted	3.AD-10	Deleted
3.AA-1	Deleted	3.AD-11	Deleted
3.AA-2	Deleted	3.AD-12	Deleted
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3.AA-4	Deleted	3.AD-14	Deleted
3.AA-5	Deleted	3.AD-15	Deleted
3.AA-6	Deleted	3.AD-16	Deleted
3.AA-7	Deleted	3.AD-17	Deleted
3.AA-8	Deleted	3.AD-18	Deleted
Fig. 3.AA.1	Deleted	3.AD-19	Deleted
Fig. 3.AA.2	Deleted	Fig. 3.AD.1	Deleted
Fig. 3.AA.3	Deleted	Fig. 3.AD.2	Deleted
Fig. 3.AA.4	Deleted	Fig. 3.AD.3	Deleted
Fig. 3.AA.5	Deleted	3.AE-1	Deleted
Fig. 3.AA.6	Deleted	3.AE-2	Deleted
Fig. 3.AA.7	Deleted	3.AE-3	Deleted
Fig. 3.AA.8	Deleted	3.AE-4	Deleted
3.AB-1	Deleted	3.AE-5	Deleted
3.AB-2	Deleted	3.AE-6	Deleted
3.AB-3	Deleted	3.AE-7	Deleted
3.AB-4	Deleted	Fig. 3.AE.1	Deleted
3.AB-5	Deleted	Fig. 3.AE.1b	Deleted in Rev. 1
3.AB-6	Deleted	Fig. 3.AE.1c	Deleted in Rev. 1
3.AB-7	Deleted	Fig. 3.AE.2	Deleted
3.AB-8	Deleted	Fig. 3.AE.3	Deleted
3.AB-9	Deleted	Fig. 3.AE.4	Deleted in Rev. 1
3.AB-10	Deleted	3.AF-1	Deleted
3.AB-11	Deleted	3.AF-2	Deleted
3.AB-12	Deleted	3.AF-3	Deleted
3.AB-13	Deleted	3.AF-4	Deleted
3.AB-14	Deleted	3.AF-5	Deleted
3.AC-1	Deleted	3.AF-6	Deleted
3.AC-2	Deleted	3.AF-7	Deleted
3.AC-3	Deleted	3.AF-8	Deleted
3.AC-4	Deleted	3.AG-1	Deleted
3.AC-5	Deleted	3.AG-2	Deleted
3.AC-6	Deleted	3.AG-3	Deleted
3.AC-7	Deleted	3.AG-4	Deleted
3.AC-8	Deleted	3.AG-5	Deleted
3.AC-9	Deleted	3.AG-6	Deleted
3.AC-10	Deleted	3.AG-7	Deleted
3.AC-11	Deleted	3.AG-8	Deleted
3.AC-12	Deleted	3.AG-9	Deleted
3.AD-1	Deleted	3.AG-10	Deleted

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3.AG-11	Deleted	3.AJ-5	Deleted
3.AG-12	Deleted	3.AJ-6	Deleted
3.AG-13	Deleted	3.AJ-7	Deleted
3.AG-14	Deleted	3.AJ-8	Deleted
3.AG-15	Deleted	3.AJ-9	Deleted
3.AG-16	Deleted	3.AJ-10	Deleted
3.AG-17	Deleted	3.AJ-11	Deleted
3.AG-18	Deleted	3.AJ-12	Deleted
3.AG-19	Deleted	3.AJ-13	Deleted
3.AG-20	Deleted	3.AJ-14	Deleted
3.AG-21	Deleted	3.AJ-15	Deleted
3.AG-22	Deleted	3.AJ-16	Deleted
3.AG-23	Deleted	3.AJ-17	Deleted
3.AG-24	Deleted	3.AJ-18	Deleted
3.AH-1	Deleted	3.AJ-19	Deleted
3.AH-2	Deleted	Fig. 3.AJ.1	Deleted
3.AH-3	Deleted	Fig. 3.AJ.2	Deleted
3.AH-4	Deleted	Fig. 3.AJ.3	Deleted
3.AH-5	Deleted	3.AK-1	Deleted
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3.AH-9	Deleted	3.AK-5	Deleted
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3.AI-15	Deleted	3.AL-2	Deleted
3.AI-16	Deleted	3.AL-3	Deleted
3.AI-17	Deleted	3.AL-4	Deleted
3.AI-18	Deleted	3.AL-5	Deleted
3.AI-19	Deleted	3.AL-6	Deleted
Fig. 3.AI.1	Deleted	3.AL-7	Deleted
Fig. 3.AI.2	Deleted	3.AL-8	Deleted
Fig. 3.AI.3	Deleted	3.AL-9	Deleted
Fig. 3.AI.4	Deleted	3.AL-10	Deleted
Fig. 3.AI.5	Deleted	3.AM-1	Deleted
Fig. 3.AI.6	Deleted	3.AM-2	Deleted
3.AJ-1	Deleted	3.AM-3	Deleted
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3.AJ-3	Deleted	3.AM-5	Deleted
3.AJ-4	Deleted	3.AM-6	Deleted

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3.AM-7	Deleted	Fig. 3.AN.15	Deleted
3.AM-8	Deleted	Fig. 3.AN.16	Deleted
3.AM-9	Deleted	Fig. 3.AN.17	Deleted
3.AM-10	Deleted	Fig. 3.AN.18	Deleted
3.AM-11	Deleted	Fig. 3.AN.19	Deleted
3.AM-12	Deleted	Fig. 3.AN.20	Deleted
3.AM-13	Deleted	Fig. 3.AN.21	Deleted
3.AM-14	Deleted	Fig. 3.AN.22	Deleted
3.AM-15	Deleted	Fig. 3.AN.23	Deleted
3.AM-16	Deleted	Fig. 3.AN.24	Deleted
3.AM-17	Deleted	Fig. 3.AN.25	Deleted
3.AM-18	Deleted	Fig. 3.AN.26	Deleted
3.AM-19	Deleted	Fig. 3.AN.27	Deleted
3.AM-20	Deleted	Fig. 3.AN.28	Deleted
3.AM-21	Deleted	Fig. 3.AN.29	Deleted
3.AM-22	Deleted	Fig. 3.AN.30	Deleted
3.AM-23	Deleted	3.AO-1	Deleted
3.AM-24	Deleted	3.AP-1	Deleted
3.AM-25	Deleted	3.AQ-1	Deleted
3.AM-26	Deleted	3.AQ-2	Deleted
3.AM-27	Deleted	3.AQ-3	Deleted
3.AM-28	Deleted	3.AQ-4	Deleted
3.AM-29	Deleted	3.AQ-5	Deleted
3.AM-30	Deleted	3.AQ-6	Deleted
3.AN-1	Deleted	3.AQ-7	Deleted
3.AN-2	Deleted	3.AQ-8	Deleted
3.AN-3	Deleted	3.AQ-9	Deleted
3.AN-4	Deleted	3.AQ-10	Deleted
3.AN-5	Deleted	3.AR-1	Deleted
3.AN-6	Deleted	3.AR-2	Deleted
3.AN-7	Deleted	3.AR-3	Deleted
3.AN-8	Deleted	3.AR-4	Deleted
3.AN-9	Deleted	3.AR-5	Deleted
3.AN-10	Deleted	3.AR-6	Deleted
3.AN-11	Deleted	3.AR-7	Deleted
3.AN-12	Deleted	3.AR-8	Deleted
3.AN-13	Deleted	3.AR-9	Deleted
3.AN-14	Deleted	3.AR-10	Deleted
Fig. 3.AN.1	Deleted	3.AR-11	Deleted
Fig. 3.AN.2	Deleted	3.AS-1	Deleted
Fig. 3.AN.3	Deleted	3.AS-2	Deleted
Fig. 3.AN.4	Deleted	3.AS-3	Deleted
Fig. 3.AN.5	Deleted	3.AS-4	Deleted
Fig. 3.AN.6	Deleted	3.AS-5	Deleted
Fig. 3.AN.7	Deleted	3.AS-6	Deleted
Fig. 3.AN.8	Deleted	3.AS-7	Deleted
Fig. 3.AN.9	Deleted	3.AS-8	Deleted
Fig. 3.AN.10	Deleted	3.AS-9	Deleted
Fig. 3.AN.11	Deleted	3.AS-10	Deleted
Fig. 3.AN.12	Deleted	3.AS-11	Deleted
Fig. 3.AN.13	Deleted	3.AS-12	Deleted
Fig. 3.AN.14	Deleted	3.AS-13	Deleted

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4.0-3	2C	Fig. 4.3.2	Deleted
4.0-4	2C	Fig. 4.3.3	Deleted
4.0-5	2C	Fig. 4.3.4	Deleted
Fig. 4.0.1	2A	4.4-1	2C
Fig. 4.0.2	2B	4.4-2	2C
Fig. 4.0.3	2B	4.4-3	2C
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4.1-2	2C	4.4-5	2C
4.1-3	2C	4.4-6	2C
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4.2-12	2B	4.4-22	2C
Fig. 4.2.1	Deleted	4.4-23	2C
Fig. 4.2.2	Deleted	4.4-24	2C
Fig. 4.2.3	2B	4.4-25	2C
4.3-1	2C	4.4-26	2C
4.3-2	2C	4.4-27	2C
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4.3-7	Deleted	4.4-32	2C
4.3-8	Deleted	4.4-33	2C
4.3-9	Deleted	4.4-34	2C
4.3-10	Deleted	4.4-35	2C
4.3-11	Deleted	4.4-36	2C
4.3-12	Deleted	4.4-37	2C
4.3-13	Deleted	4.4-38	2C
4.3-14	Deleted	4.4-39	2C
4.3-15	Deleted	4.4-40	2C
4.3-16	Deleted	4.4-41	2C
4.3-17	Deleted	4.4-42	2C
4.3-18	Deleted	4.4-43	2C
4.3-19	Deleted	4.4-44	2C
4.3-20	Deleted	4.4-45	2C
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4.4-49	2C		Fig. 4.4.32	2B
4.4-50	2C		Fig. 4.4.33	2B
4.4-51	Deleted		Fig. 4.4.34	2B
4.4-52	Deleted		Fig. 4.4.35	2B
4.4-53	Deleted		4.5-1	2C
4.4-54	Deleted		4.5-2	2C
4.4-55	Deleted		4.5-3	2C
4.4-56	Deleted		4.5-4	2C
4.4-57	Deleted		4.5-5	2C
4.4-58	Deleted		4.5-6	2C
4.4-59	Deleted		4.5-7	2C
4.4-60	Deleted		4.5-8	2C
4.4-61	Deleted		4.5-9	2D
4.4-62	Deleted		4.5-10	2D
4.4-63	Deleted		4.5-11	2D
4.4-64	Deleted		4.5-12	2D
4.4-65	Deleted		4.5-13	2D
4.4-66	Deleted		4.5-14	2D
4.4-67	Deleted		4.5-15	2C
4.4-68	Deleted		4.5-16	2C
Fig. 4.4.1	0		4.5-17	2C
Fig. 4.4.2	0		4.5-18	2C
Fig. 4.4.3	0		4.5-19	2C
Fig. 4.4.4	0		4.5-20	2C
Fig. 4.4.5	0		4.5-21	2C
Fig. 4.4.6	2A		4.5-22	2D
Fig. 4.4.7	2D		4.5-23	2C
Fig. 4.4.8	Deleted		4.5-24	2C
Fig. 4.4.9	1		4.5-25	Deleted
Fig. 4.4.10	0		4.5-26	Deleted
Fig. 4.4.11	Deleted		Fig. 4.5.1	Deleted
Fig. 4.4.12	Deleted		Fig. 4.5.2	Deleted
Fig. 4.4.13	0		Fig. 4.5.3	Deleted
Fig. 4.4.14	Deleted		Fig. 4.5.4	2B
Fig. 4.4.15	Deleted		4.6-1	2C
Fig. 4.4.16	2B		4.6-2	2C
Fig. 4.4.17	2B		4.7-1	2D
Fig. 4.4.18	Deleted		4.7-2	2D
Fig. 4.4.19	2B		4.7-3	2D
Fig. 4.4.20	2B		4.A-1	Deleted
Fig. 4.4.21	Deleted		4.A-2	Deleted
Fig. 4.4.22	Deleted		4.A-3	Deleted
Fig. 4.4.23	Deleted		4.A-4	Deleted
Fig. 4.4.24	0		4.A-5	Deleted
Fig. 4.4.25	2B		4.A-6	Deleted
Fig. 4.4.26	2B		4.A-7	Deleted
Fig. 4.4.27	2		4.A-8	Deleted
Fig. 4.4.28	2B		4.A-9	Deleted
Fig. 4.4.29	2A		4.A-10	Deleted
Fig. 4.4-30	2B		4.A-11	Deleted

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4.A-16	Deleted			
4.A-17	Deleted			
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4.A-19	Deleted			
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4.A-21	Deleted			
4.A-22	Deleted			
4.A-23	Deleted			
Fig. 4.A.1	Deleted			
Fig. 4.A.2	Deleted			
Fig. 4.A.3	Deleted			
Fig. 4.A.4	Deleted			
Fig. 4.A.5	Deleted			
Fig. 4.A.6	Deleted			
Fig. 4.A.7	Deleted			
Fig. 4.A.8	Deleted			
Fig. 4.A.9	Deleted			
Fig. 4.A.10	Deleted			
Fig. 4.A.11	Deleted			
Fig. 4.A.12	Deleted			
Fig. 4.A.13	Deleted			
4.B-1	2C			
4.B-2	2C			
4.B-3	2C			
4.B-4	2C			
4.B-5	2C			
4.B-6	2C			
4.B-7	2C			
4.B-8	2C			
4.B-9	2C			
4.B-10	2C			
4.B-11	2C			
4.B-12	2C			
4.B-13	2C			
Fig. 4.B.1	1			
Fig. 4.B.2	1			
Fig. 4.B.3	1			
Fig. 4.B.4	1			
Fig. 4.B.5	1			
Fig. 4.B.6	1			
Fig. 4.B.7	1			
Fig. 4.B.8	Deleted			

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5.1-1	2B	5.2-21	2B
5.1-2	2B	5.2-22	2B
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5.1-4	2B	5.2-24	2B
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5.1-7	2B	5.2-27	2B
5.1-8	2B	5.2-28	2B
5.1-9	2B	5.2-29	2B
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5.1-11	2B	5.2-31	2B
5.1-12	2B	5.2-32	2B
5.1-13	2B	5.2-33	2B
5.1-14	2B	5.2-34	2B
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5.1-16	2B	5.2-36	2B
5.1-17	2B	5.2-37	2B
5.1-18	2B	5.2-38	2B
5.1-19	2B	5.2-39	2B
5.1-20	2B	5.2-40	2B
Fig. 5.1.1	1	5.2-41	2B
Fig. 5.1.2	0	5.2-42	2B
Fig. 5.1.3	2B	5.2-43	2B
Fig. 5.1.4	0	5.2-44	2B
Fig. 5.1.5	0	5.2-45	2B
Fig. 5.1.6	0	5.2-46	2B
Fig. 5.1.7	0	5.2-47	2B
Fig. 5.1.8	0	5.2-48	2B
Fig. 5.1.9	0	5.2-49	2B
Fig. 5.1.10	0	5.2-50	2B
Fig. 5.1.11	0	5.2-51	2B
Fig. 5.1.12	1	5.2-52	2B
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5.2-2	2B	5.2-54	2B
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5.2-10	2B	5.3-4	2A
5.2-11	2B	5.3-5	2A
5.2-12	2B	5.3-6	2A
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5.2-14	2B	5.3-8	2D
5.2-15	2B	5.3-9	2A
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5.3-14	2A	5.4-31	2B
Fig. 5.3.1	1	5.4-32	2B
Fig. 5.3.2	0	5.4-33	2B
Fig. 5.3.3	0	5.4-34	2B
Fig. 5.3.4	1	5.4-35	2B
Fig. 5.3.5	0	5.5-1	0
Fig. 5.3.6	0	5.6-1	2B
Fig. 5.3.7	1	5.6-2	2B
Fig. 5.3.8	0	5.6-3	2B
Fig. 5.3.9	0	5.A-1	0
Fig. 5.3.10	1	5.A-2	0
Fig. 5.3.11	1	5.A-3	0
Fig. 5.3.12	0	5.B-1	0
Fig. 5.3.13	0	5.B-2	0
Fig. 5.3.14	1	5.B-3	0
Fig. 5.3.15	1	5.B-4	0
Fig. 5.3.16	1	5.B-5	0
Fig. 5.3.17	1	5.B-6	0
Fig. 5.3.18	1	5.B-7	0
Fig. 5.3.19	1	5.C-1	0
Fig. 5.3-20	1	5.C-2	0
Fig. 5.3-21	1	5.C-3	0
5.4-1	2B	5.C-4	0
5.4-2	2B	5.C-5	0
5.4-3	2B	5.C-6	0
5.4-4	2B	5.C-7	0
5.4-5	2B	5.C-8	0
5.4-6	2B	5.C-9	0
5.4-7	2B	5.C-10	0
5.4-8	2B	5.C-11	0
5.4-9	2B	5.C-12	0
5.4-10	2B	5.C-13	0
5.4-11	2B	5.C-14	0
5.4-12	2B	5.C-15	0
5.4-13	2B	5.C-16	0
5.4-14	2B	5.C-17	0
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5.4-16	2B	5.C-19	0
5.4-17	2B	5.C-20	0
5.4-18	2B	5.C-21	0
5.4-19	2B	5.C-22	0
5.4-20	2B	5.C-23	0
5.4-21	2B	5.C-24	0
5.4-22	2B	5.C-25	0
5.4-23	2B	5.C-26	0
5.4-24	2B	5.C-27	0
5.4-25	2B	5.C-28	0
5.4-26	2B	5.C-29	0
5.4-27	2B	5.C-30	0
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5.C-36	0			
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5.C-38	0			
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5.C-40	0			
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5.C-46	0			
5.C-47	0			
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5.C-61	0			
5.D-1	0			
5.D-2	0			
5.D-3	0			
5.D-4	0			
5.D-5	0			
5.D-6	0			
5.E-1	1			
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6.1-4	2B		6.2-36	2B
6.1-5	2B		6.2-37	2B
6.1-6	2B		6.2-38	2B
6.1-7	2B		6.2-39	2B
6.1-8	2B		6.2-40	2B
6.1-9	2B		6.2-41	2B
6.1-10	2B		6.2-42	2B
6.1-11	2B		6.2-43	2B
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6.2-5	2B		6.2-56	2B
6.2-6	2B		6.2-57	2B
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6.2-9	2B		6.2-60	2B
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6.2-28	2B		6.3-15	2A
6.2-29	2B		6.3-16	2B
6.2-30	2B		6.3-17	2B
6.2-31	2B		6.3-18	2B
6.2-32	2B		Fig. 6.3.1	1

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Fig. 6.3.2	1		Fig. 6.4.11	1
Fig. 6.3.3	0		Fig. 6.4.12	1
Fig. 6.3.4	1		Fig. 6.4.13	1
Fig. 6.3.4A	1		Fig. 6.4.14	1
Fig. 6.3.5	1		Fig. 6.4.15	1
Fig. 6.3.6	0		Fig. 6.4.16	2
Fig. 6.3.7	1		Fig. 6.4.17	2A
6.4-1	2B		6.5-1	0
6.4-2	2B		6.6-1	0
6.4-3	2B		6.7-1	1
6.4-4	2B		6.7-2	1
6.4-5	2B		6.A-1	1
6.4-6	2B		6.A-2	1
6.4-7	2B		6.A-3	1
6.4-8	2B		6.A-4	1
6.4-9	2B		6.A-5	1
6.4-10	2B		6.A-6	1
6.4-11	2B		6.A-7	1
6.4-12	2B		6.A-8	1
6.4-13	2B		6.A-9	1
6.4-14	2B		6.A-10	1
6.4-15	2B		6.A-11	1
6.4-16	2B		6.A-12	1
6.4-17	2B		6.A-13	1
6.4-18	2B		6.A-14	1
6.4-19	2B		6.A-15	1
6.4-20	2B		6.A-16	1
6.4-21	2B		6.A-17	1
6.4-22	2B		6.A-18	1
6.4-23	2B		6.A-19	1
6.4-24	2B		6.A-20	1
6.4-25	2B		Fig. 6.A.1	0
6.4-26	2B		Fig. 6.A.2	0
6.4-27	2B		Fig. 6.A.3	0
6.4-28	2B		Fig. 6.A.4	0
6.4-29	2B		Fig. 6.A.5	0
6.4-30	2B		Fig. 6.A.6	0
6.4-31	2B		6.B-1	0
6.4-32	2B		6.B-2	0
6.4-33	2B		6.C-1	2B
Fig. 6.4.1	Deleted		6.C-2	2B
Fig. 6.4.2	1		6.C-3	2B
Fig. 6.4.3	1		6.C-4	2B
Fig. 6.4.4	1		6.C-5	2B
Fig. 6.4.5	1		6.C-6	2B
Fig. 6.4.6	1		6.C-7	2B
Fig. 6.4.7	1		6.C-8	2B
Fig. 6.4.8	1		6.C-9	2B
Fig. 6.4.9	1		6.C-10	2B

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6.C-17	2B		
6.D-1	1		
6.D-2	1		
6.D-3	1		
6.D-4	1		
6.D-5	1		
6.D-6	1		
6.D-7	1		
6.D-8	1		
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7.1-3	2B	7.A-11	Deleted
7.1-4	2B	7.A-12	Deleted
7.1-5	2B	7.A-13	Deleted
7.1-6	2B	7.A-14	Deleted
7.1-7	2B	7.A-15	Deleted
7.1-8	2B	7.A-16	Deleted
Fig. 7.1.1	0	7.A-17	Deleted
7.2-1	2B	7.A-18	Deleted
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7.2-3	Deleted	7.A-20	Deleted
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7.2-9	Deleted	7.A-26	Deleted
7.2-10	Deleted	7.A-27	Deleted
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7.2-12	Deleted	7.A-29	Deleted
7.3-1	2B	7.A-30	Deleted
7.3-2	Deleted	7.A-31	Deleted
7.3-3	Deleted	7.A-32	Deleted
7.3-4	Deleted	7.A-33	Deleted
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7.3-7	Deleted	7.A-36	Deleted
7.3-8	Deleted	7.A-37	Deleted
7.3-9	Deleted	7.A-38	Deleted
7.3-10	Deleted	7.A-39	Deleted
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7.A-5	Deleted	7.A-57	Deleted
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7.A-66	Deleted			
7.A-67	Deleted			
7.A-68	Deleted			
7.A-69	Deleted			
7.A-70	Deleted			
7.A-71	Deleted			
7.A-72	Deleted			
7.A-73	Deleted			
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7.A-84	Deleted			
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7.A-86	Deleted			
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7.A-91	Deleted			

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8.0-3	2B	Fig. 8.1.2f	0
8.0-4	2B	Fig. 8.1.3	0
8.0-5	2B	Fig. 8.1.4	1
8.0-6	2B	Fig. 8.1.5	0
8.1-1	2C	Fig. 8.1.6	0
8.1-2	2C	Fig. 8.1.7	1
8.1-3	2C	Fig. 8.1.8	0
8.1-4	2C	Fig. 8.1.9	0
8.1-5	2C	Fig. 8.1.10	0
8.1-6	2C	Fig. 8.1.11	0
8.1-7	2C	Fig. 8.1.12	1
8.1-8	2C	Fig. 8.1.13	1
8.1-9	2C	Fig. 8.1.14	0
8.1-10	2C	Fig. 8.1.15	0
8.1-11	2C	Fig. 8.1.16	0
8.1-12	2C	Fig. 8.1.17	0
8.1-13	2C	Fig. 8.1.18	1
8.1-14	2C	Fig. 8.1.19	1
8.1-15	2C	Fig. 8.1.20	1
8.1-16	2C	Fig. 8.1.21	1
8.1-17	2C	Fig. 8.1.22a	1
8.1-18	2C	Fig. 8.1.22b	1
8.1-19	2C	Fig. 8.1.23	1
8.1-20	2C	Fig. 8.1.24	0
8.1-21	2C	Fig. 8.1.25	1
8.1-22	2C	Fig. 8.1.26	1
8.1-23	2C	Fig. 8.1.27	1
8.1-24	2C	Fig. 8.1.28	1
8.1-25	2C	Fig. 8.1.29a	1
8.1-26	2C	Fig. 8.1.29b	1
8.1-27	2C	Fig. 8.1.30	1
8.1-28	2C	Fig. 8.1.31	1
8.1-29	2C	Fig. 8.1.32	0
8.1-30	2C	Fig. 8.1.33	1
8.1-31	2C	Fig. 8.1.34a	1
8.1-32	2C	Fig. 8.1.34b	Deleted
8.1-33	2C	Fig. 8.1.35	0
8.1-34	2C	Fig. 8.1.36	0
8.1-35	2C	Fig. 8.1.37	1
8.1-36	2C	8.2-1	1
8.1-37	2C	8.3-1	2C
8.1-38	2C	8.3-2	2C
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Fig. 8.1.2b	0	8.3-9	2C
Fig. 8.1.2c	1	8.3-10	2C

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8.5-2	2A			
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8.5-4	2A			
8.5-5	2A			
Fig. 8.5-1	0			
8.6-1	0			

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9.1-4	2C			
9.1-5	2C			
9.1-6	2C			
9.1-7	2C			
9.1-8	2C			
9.1-9	2C			
9.1-10	2C			
9.1-11	2C			
9.1-12	2C			
9.1-13	2C			
9.1-14	2C			
9.1-15	2C			
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9.1-18	2B			
9.1-19	2B			
9.1-20	2B			
9.1-21	2B			
9.1-22	2B			
9.1-23	2B			
9.1-24	2B			
9.1-25	2B			
9.1-26	2B			
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9.1-28	2B			
9.1-29	2B			
9.1-30	2B			
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9.2-4	2B			
9.3-1	2B			
9.4-1	0			

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10.1-3	1	Fig. 10.3.1a	1
10.1-4	1	Fig. 10.3.1b	1
10.1-5	1	Fig. 10.3.1c	1
10.1-6	1	Fig. 10.3.1d	1
10.1-7	1	Fig. 10.3.1e	1
10.1-8	1	10.4-1	2B
Fig. 10.1.1	1	10.4-2	2B
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10.3-1	2A	10.4-4	2B
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10.3-5	2B		
10.3-6	2B		
10.3-7	2B		
10.3-8	2B		
10.3-9	2B		
10.3-10	2B		
10.3-11	2B		
10.3-12	2B		
10.3-13	2B		
10.3-14	2B		
10.3-15	2B		
10.3-16	2B		
10.3-17	2B		
10.3-18	2B		
10.3-19	2B		
10.3-20	2B		
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10.3-25	2A		
10.3-26	2A		
10.3-27	2A		
10.3-28	2A		
10.3-29	2A		
10.3-30	2A		
10.3-31	2A		
10.3-32	2A		
10.3-33	2A		
10.3-34	2A		
10.3-35	2A		
10.3-36	2A		
10.3-37	2A		
10.3-38	2A		
10.3-39	2A		
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10.3-41	2A		

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11.1-4	2C	11.2-36	2B
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11.1-6	2C	11.2-38	2B
11.1-7	2C	11.2-39	2B
11.1-8	2C	11.2-40	2B
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11.1-19	2C	11.2-51	2B
11.1-20	2C	Fig. 11.2.1	0
11.2-1	2B	Fig. 11.2.2	Deleted
11.2-2	2B	Fig. 11.2.3	Deleted
11.2-3	2B	Fig. 11.2.4	Deleted
11.2-4	2B	Fig. 11.2.5	Deleted
11.2-5	2B	Fig. 11.2.6	2A
11.2-6	2B	Fig. 11.2.7	Deleted
11.2-7	2B	Fig. 11.2.8	2C
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12.1-3	2C		B 3.2.1-2	Deleted
12.2-1	2C		B 3.2.1-3	Deleted
12.2-2	2C		B 3.2.2-1	2A
12.2-3	2C		B 3.2.2-2	Deleted
12.2-4	2C		B 3.2.2-3	Deleted
12.2-5	2C		B 3.2.3-1	2A
12.2-6	2C		B 3.2.3-2	Deleted
12.2-7	2C		B 3.2.3-3	Deleted
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12.5-1	0		B 3.3.1-5	2A
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B 3.0-2	0			
B 3.0-3	0			
B 3.0-4	0			
B 3.0-5	0			
B 3.0-6	0			
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B 3.0-8	0			
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13.5-1	Deleted			
13.5-2	Deleted			
13.6-1	2A			
Appendix 13.A	Deleted in Rev. 1			
Appendix 13.B	Deleted in Rev. 1			

Hawkins [4.2.9], the product Gr×Pr is expressed as $L^3\Delta TZ$, where L is height of the overpack, ΔT is overpack surface temperature differential and Z is a parameter based on air properties, which are known functions of temperature, evaluated at the average film temperature. The temperature dependence of Z is provided in Table 4.2.7.

Table 4.2.1

SUMMARY OF HI-STORM SYSTEM MATERIALS
THERMAL PROPERTY REFERENCES

Material	Emissivity	Conductivity	Density	Heat Capacity
Helium	N/A	Handbook [4.2.2]	Ideal Gas Law	Handbook [4.2.2]
Air	N/A	Handbook [4.2.2]	Ideal Gas Law	Handbook [4.2.2]
Zircaloy	EPRI [4.2.3]	NUREG [4.2.6], [4.2.7]	Rust [4.2.4]	Rust [4.2.4]
UO_2	Not Used	NUREG [4.2.6], [4.2.7]	Rust [4.2.4]	Rust [4.2.4]
Stainless Steel	Kern [4.2.5]	ASME [4.2.8]	Marks' [4.2.1]	Marks' [4.2.1]
Carbon Steel	Kern [4.2.5]	ASME [4.2.8]	Marks' [4.2.1]	Marks' [4.2.1]
Boral†	Not Used	Test Data	Test Data	Test Data
Holtite-A††	Not Used	Lower Bound Value Used	Not Used	Not Used
Concrete	Not Used	Marks' [4.2.1]	Marks' [4.2.1]	Handbook [4.2.2]
Lead	Not Used	Handbook [4.2.2]	Handbook [4.2.2]	Handbook [4.2.2]
Water	Not Used	ASME [4.2.10]	ASME [4.2.10]	ASME [4.2.10]
~~Aluminum Alloy 1100 (Optional Heat Conduction Elements)~~	~~Handbook [4.2.2]~~	~~ASME [4.2.8]~~	~~ASME [4.2.8]~~	~~ASME [4.2.8]~~
*METAMIC***	*Not Used*	*Test Data*	*Test Data*	*Test Data*
Water Vapor	*Not Used*	*Reid [4.2.11]*	*Not Used*	*Not Used*

† AAR Structures Boral thermophysical test data.

†† ~~From neutron shield manufacturer's data [1.2.11].~~

** *Test data provided by METAMIC Inc.*

Table 4.2.2

SUMMARY OF HI-STORM SYSTEM MATERIALS
THERMAL CONDUCTIVITY DATA

Material	**@ 200°F (Btu/ft-hr-°F)**	**@ 450°F (Btu/ft-hr-°F)**	**@ 700°F (Btu/ft-hr-°F)**
Helium	0.0976	0.1289	0.1575
Air††	0.0173	0.0225	0.0272
Alloy X	8.4	9.8	11.0
Carbon Steel	24.4	23.9	22.4
Concrete‡‡	1.05	1.05	1.05
Lead	19.4	17.9	16.9
Water	0.392	0.368	N/A
Water Vapor at 1 torr	*0.0134*	*0.0209*	*0.0293*

†† At lower temperatures, Air conductivity is between 0.0139 Btu/ft-hr-°F (at 32°F) and 0.0176 Btu/ft-hr-°F at 212°F.

‡‡ Assumed constant for the entire range of temperatures.

Table 4.2.3

SUMMARY OF FUEL ELEMENT COMPONENTS
THERMAL CONDUCTIVITY DATA

Zircaloy Cladding		**Fuel (UO_2)**	
Temperature (°F)	Conductivity (Btu/ft-hr-°F)	Temperature (°F)	Conductivity (Btu/ft-hr-°F)
392	8.28†	100	3.48
572	8.76	448	3.48
752	9.60	570	3.24
932	10.44	793	2.28†

† Lowest values of conductivity used in the thermal analyses for conservatism.

rods and a uniform boundary temperature along the basket cell opening inside periphery. The temperature difference between the peak cladding and boundary temperatures is used to determine an effective conductivity as described in the next step. For this purpose, we consider a two-dimensional cross section of a square shaped block with an edge length of 2L and a uniform volumetric heat source (q_g), cooled at the periphery with a uniform boundary temperature. Under the assumption of constant material thermal conductivity (K), the temperature difference (ΔT) from the center of the cross section to the periphery is analytically given by [4.4.5]:

$$\Delta T = 0.29468 \frac{q_g L^2}{K}$$

This analytical formula is applied to determine the effective material conductivity from a known quantity of heat generation applied in the FLUENT model (smeared as a uniform heat source, q_g) basket opening size and ΔT calculated in the first step.

As discussed earlier, the effective fuel space conductivity must be a function of the temperature coordinate. The above two-step analysis is carried out for a number of reference temperatures. In this manner, the effective conductivity as a function of temperature is established.

Temperature-dependent effective conductivities of PWR and BWR design basis fuel assemblies (most resistive SNF types) are shown in Figure 4.4.5. The finite volume results are also compared to results reported from independent technical sources. From this comparison, it is readily apparent that FLUENT-based fuel assembly conductivities are conservative. The FLUENT computed values (not the published literature data) are used in the MPC thermal analysis presented in this document.

4.4.1.1.3 Effective Thermal Conductivity of Neutron Absorber/Sheathing/Box Wall Sandwich

Each MPC basket cell wall (except the MPC-68 and MPC-32 outer periphery cell walls) is manufactured with a neutron absorbing plate for criticality control. Each neutron absorber plate is sandwiched in a sheathing-to-basket wall pocket. A schematic of the "Box Wall- Neutron absorber-Sheathing" sandwich geometry of an MPC basket is illustrated in Figures 4.4.6 and 4.4.7. During fabrication, a uniform normal pressure is applied to each "Box Wall-Neutron Absorber-Sheathing" sandwich in the assembly fixture during welding of the sheathing periphery on the box wall. This ensures adequate surface-to-surface contact for elimination of any macroscopic gaps. The mean coefficient of linear expansion of the neutron absorber is higher than the thermal expansion coefficients of the basket and sheathing materials. Consequently, basket heat-up from the stored SNF will further ensure a tight fit of the neutron absorber plate in the sheathing-to-box pocket. The presence of small microscopic gaps due to less than perfect surface finish characteristics requires consideration of an interfacial contact resistance between the neutron absorber and box-sheathing surfaces. A conservative contact resistance resulting from a 2 mil neutron absorber to pocket gap is applied in the analysis. In other words, no credit is taken for the interfacial pressure between neutron absorber and stainless plate/sheet stock produced by the fixturing and welding process. Furthermore, no credit is taken for radiative heat exchange across the neutron absorber to sheathing or neutron absorber to box wall gaps.

Heat conduction properties of a composite "Box Wall - Neutron Absorber - Sheathing" sandwich in the two principal basket cross sectional directions as illustrated in Figure 4.4.6 (i.e., lateral "out-of-plane" and longitudinal "in-plane") are unequal. In the lateral direction, heat is transported across layers of sheathing, helium gap, neutron absorber and box wall resistances that are essentially in series (except for the small helium filled end regions shown in Figure 4.4.7). Heat conduction in the longitudinal direction, in contrast, is through an array of essentially parallel resistances comprised of these several layers listed above. Resistance network models applicable to the two directions are illustrated in Figure 4.4.7. It is noted that, in addition to the essentially series and parallel resistances, of the composite wall layers for the "out-of-plane"and "in-plane" directions respectively, the effect of small helium end regions is also included in the resistance network analogy. For the ANSYS based MPC basket thermal model, corresponding non-isotropic effective thermal conductivities in the two orthogonal sandwich directions are determined and applied in the analysis.

4.4.1.1.4 Modeling of Fuel Basket Conductive Heat Transport

The total conduction heat rejection capability of a fuel basket is a combination of planar and axial contributions. These component contributions are calculated independently for each MPC basket design and reported herein .

The planar heat rejection capability of each MPC basket design (i.e., MPC-24, MPC-68, MPC-32 and MPC-24E) is evaluated by developing a thermal model of the combined fuel assemblies and composite basket walls geometry on the ANSYS finite element code. The ANSYS model includes a geometric layout of the basket structure in which the basket "Box Wall - Neutron Absorber - Sheathing" sandwich is replaced by a "homogeneous wall" with an equivalent thermal conductivity. Since the thermal conductivity of the Alloy X material is a weakly varying function of temperature, the equivalent "homogeneous wall" will have a temperature-dependent effective conductivity. Similarly, as illustrated in Figure 4.4.7, the conductivities in the "in-plane" and "out-of-plane" directions of the equivalent "homogeneous wall" are different. Finally, as discussed earlier, the fuel assemblies and the surrounding basket cell openings are modeled as homogeneous heat generating

Table 4.4.31 through 4.4.35

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Table 4.4.36

BOUNDING LONG-TERM NORMAL STORAGE
HI-STORM OVERPACK TEMPERATURES

Component†	Local Section Temperature†† (°F)	Long-Term Temperature Limit (°F)
Inner shell	243	350
Outer shell	183	350
Lid bottom plate	365	450
Lid top plate	197	450
MPC pedestal plate	180	350
Baseplate	108	350
Overpack Body Concrete	193	300
Overpack Lid Concrete	287	300
Overpack Pedestal Concrete	142	300

Note: Local areas of the overpack lid concrete exceed 300°F, with a maximum local value of 365°F. A discussion of the impact of these elevated local temperatures on the shielding performance of the lid concrete is presented in Section 5.3.2. All areas of the overpack body and pedestal concrete are below 300°F.

† See Figure 1.2.8 for a description of HI-STORM components.

†† Section temperature is defined as the through-thickness average temperature.

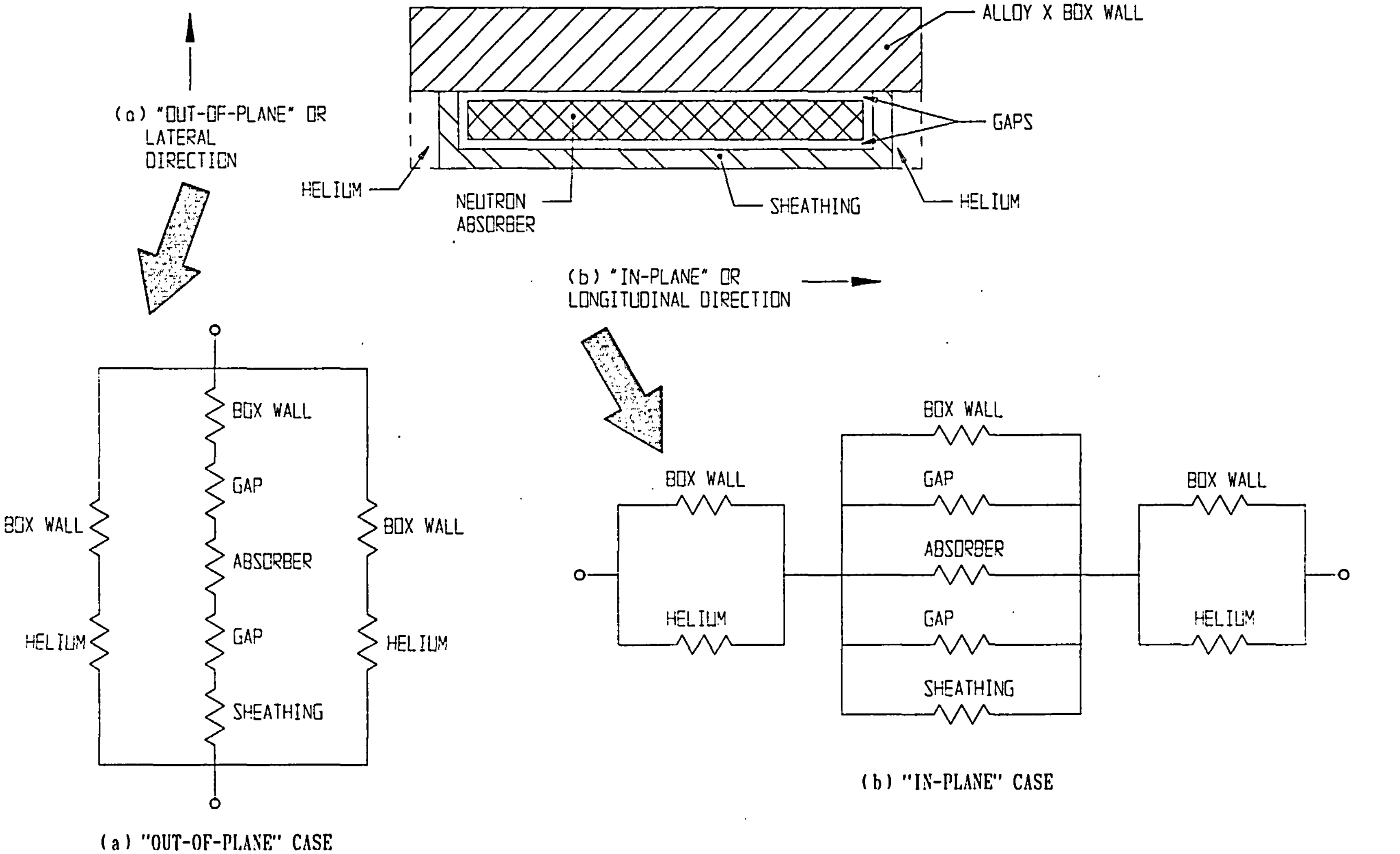

FIGURE 4.4.7; RESISTANCE NETWORK MODEL OF A "BOX WALL-NEUTRON ABSORBER-SHEATHING" SANDWICH

4.5.5 MPC Drying

4.5.5.1 Drying Options

This FSAR provides for two methods for drying Commercial Spent Fuel (CSF) the MPC cavity, namely:

i. Forced Helium Dehydration
ii. Vacuum Drying

The methods are discussed next.

4.5.5.2 Forced Helium Dehydration

To reduce moisture to trace levels in the MPC using a Forced Helium Dehydration (FHD) system, a closed loop dehumidification system consisting of a condenser, a demoisturizer, a compressor, and a pre-heater is utilized to extract moisture from the MPC cavity through repeated displacement of its contained helium, accompanied by vigorous flow turbulation. Appendix 2.B contains detailed discussion of the design criteria and operation of the FHD system.

The FHD system provides concurrent fuel cooling during the moisture removal process through forced convective heat transfer. The attendant forced convection-aided heat transfer occurring during operation of the FHD system ensures that the fuel cladding temperature will remain below the applicable peak cladding temperature limit for normal conditions of storage, which is well below the high burnup cladding temperature limit in Table 4.3.1 for all combinations of SNF type, burnup, decay heat, and cooling time. Because the FHD operation induces a state of forced convection heat transfer in the MPC, (in contrast to the quiescent mode of natural convection in long term storage), it is readily concluded that the peak fuel cladding temperature under the latter condition will be greater than that during the FHD operation phase. In the event that the FHD system malfunctions, the forced convection state will degenerate to natural convection, which corresponds to the conditions of normal storage. As a result, the peak fuel cladding temperatures will approximate the values reached during normal storage as described elsewhere in this chapter.

4.5.5.3 Vacuum Drying

Because the vacuum drying method of demoisturization leads to a considerable rise in the fuel cladding temperature, threshold heat load limits** that are considerably lower than the MPC design basis heat load are computed for the vacuum drying evolution. ~~The threshold heat loads are very low if one or more high burnup fuel (HBF) assemblies are included in the batch of fuel being loaded. If the fuel batch consists of only MBF, and the limitations on the maximum cladding stress described in Subsection 4.5.2 are met, then a higher threshold heat load meeting~~

** See threshold heat load discussion in Subsection 4.5.1

the less restrictive temperature limit is permitted.

(a) Analysis

The vacuum condition effective fuel assembly conductivity is determined by procedures discussed earlier (Subsection 4.4.1.1.2) with recognition of the attenuation of thermosiphon effect with the decrease in the quantity of helium and reduction in the conductivity of helium in a most conservative manner. For this purpose, the thermal conductivity of fluid media is set at a miniscule fraction of the helium conductivity *to the thermal conductivity of water vapor at 1 torr. The use of water vapor is conservative because non-condensable gases (i.e., blowdown gas) are removed at the beginning of vacuum drying, before liquid water has time to vaporize. The use of 1 torr vapor is conservative because the acceptance criterion for vacuum drying in only 3 torr.* A direct result of this assumption is that the cladding temperatures are exaggerated in the thermal solutions and, correspondingly, threshold heat loads understated. The MPC basket cross sectional effective conductivity is determined for vacuum conditions according to the procedure discussed in 4.4.1.1.4. Basket periphery-to-MPC shell heat transfer occurs through conduction and radiation. The heat transported to the MPC shell is dissipated from the external surface of the MPC shell to the annulus. It is recognized that the cladding temperature is directly affected by the temperature of the annulus. To ensure a robust margin in the cladding temperatures, vacuum drying is performed with a water cooled *filled* annulus. Two options are provided for annulus water cooling:

(i) Standing water in the annulus.
(ii) Annulus gap is water flushed.

An axisymmetric FLUENT thermal model of the MPC in a HI-TRAC is constructed, and peak cladding temperatures at threshold heat loads are obtained. The following conditions are applied to this evaluation:

i. The fuel temperatures rise to their asymptotic steady-state values.

ii. The outer surface of the MPC shell is postulated to be at a bounding temperature of 232°F†† (standing water in annulus) or 125°F‡‡ (continuously flushed with water).

iii. The bottom surface of the MPC is insulated.

(b) Results

Table 4.5.11 provides the threshold heat loads at or below which for which vacuum drying is

†† Saturation temperature of water at the bottom of a water filled HI-TRAC annulus.
‡‡ During vacuum operations, water must be circulated at a rate sufficient to ensure maximum annulus temperature is below 125°F. For example given water inlet at 100°F, Q=15 kW and a flush rate of 5 gpm, the maximum temperature (from an adiabatic heat balance for Q = 15 kW) is 120.5°F which is below 125°F.

permitted. For completeness, the threshold heat load under the FHD method of drying is also listed (it is equal to the design heat load). ~~The threshold heat load under the vacuum drying condition is a function of two parameters:~~

~~i. Maximum burnup in the fuel batch stored~~
~~ii. The MPC-HI-TRAC annulus is stagnant or water flushed~~

~~As stated earlier, the permissible temperature for a fuel batch containing only MBF can be as high as *is higher* 570°C *(See Table 4.3.1), the threshold heat loads are also correspondingly greater* if the clad stress criterion in Subsection 4.5.2 is met. The maximum fuel cladding temperature is quite obviously influenced by the thermal state in the annulus: continuous flushing helps reduce the peak cladding temperature. Table 4.5.11 accordingly provides discrete values of the threshold heat loads depending on annulus condition (standing water or annulus flushing) and fuel burnup.~~

4.5.6 On-site Transport in HI-TRAC

4.5.6.1 Analysis

An axisymmetric FLUENT thermal model of an MPC inside a HI-TRAC transfer cask was constructed to evaluate temperature distributions for onsite transport scenarios for two HI-TRAC annulus conditions:

(a) Static column of air
(b) Water cooled annulus

Steady-state analyses of the HI-TRAC transfer cask have been performed for the two annulus conditions under all on-site transport scenarios and threshold heat loads obtained. While the duration of onsite transport may be short enough to preclude the MPC and HI-TRAC from obtaining a steady-state, a steady-state analysis is conservative.

4.5.6.2 Results

As stated earlier, the threshold heat loads depend on the orientation of the HI-TRAC. The threshold heat load for vertical transport are greater than that for horizontal transport. Another variable that affects the computed threshold heat load for the on-site transport condition is the maximum burnup in the batch of fuel loaded in the MPC. Finally, if the actual heat generation rate in the MPC exceeds the threshold heat load permitted for the HI-TRAC orientation and burnup state of the CSF batch loaded then annulus cooling is required. Table 4.5.12 provides the threshold heat loads for all on-site transport scenarios.

For both horizontal and vertical mode of on-site transfer of the loaded MPC in the HI-TRAC transfer cask, threshold heat generation rates to meet the HBF fuel clad temperature limit are well below the design basis heat load for the MPC under the normal condition of storage. These threshold heat loads are provided in Table 4.5.12 for vertical and horizontal mode of on-site

MPC transfer under steady state conditions. If the heat load of a canister exceeds the threshold value listed in Table 4.5.12, then supplemental cooling of the MPC must be provided to maintain the peak fuel cladding temperature below limit set forth in this FSAR.

Because of the narrow annular space between the MPC and HI-TRAC transfer cask and the availability of a threaded coupling connection in the bottom HI-TRAC lid, it is possible to provide augmented heat removal from the MPC by circulating a coolant through the annular space during MPC transfer operations. Calculations show that even when the threshold heat loads are substantially exceeded, a modest flow of water[§§] is all that is needed to extract sufficient amount of heat to ensure that the peak cladding temperature is below the ISG-11 Rev. *3* ~~2~~ limit adopted in this FSAR. For example, the principal variables and results from an evaluation performed for an MPC-32 at its design basis heat load are summarized in Table 4.5.13 to illustrate the concept. As shown in this table, the peak cladding temperature in the cooled MPC is much below the ISG-11 Rev. *3* ~~2~~ limit.

Because the availability of utilities (demineralized water, compressed air, etc.) is plant-specific, it is not possible to design a standard ancillary that can be used at all sites. Nevertheless, the above example serves to demonstrate that the equipment required to effect the necessary heat removal to subcool the MPC during transfer operation for high heat load MPCs will be quite compact and operationally expedient.

It is seen from the above example that even a modest means to cool the external surface of the MPC during on-site transport is sufficient to create a substantial margin in the peak cladding temperature against the permissible limit. This margin may be necessary in certain plants to deal with a short-term handling step during the transfer operation when it may not be practical to maintain auxiliary cooling. Such a situation may occur at certain plants, for example, when the HI-TRAC transfer cask is being positioned over the HI-STORM overpack for the MPC's transfer. In the absence of the auxiliary cooling, if the canister heat load exceeds the Table 4.5.12 threshold heat load, then the fuel cladding temperature will begin to rise. To ensure that the amount of cladding temperature rise is not enough to cause an exceedance of the permissible temperature limit, the MPC must be sufficiently pre-cooled prior to the start of the transfer step when the external cooling becomes unavailable. Calculations show that, with appropriate pre-cooling, a reasonable amount of time to execute an operational step (with the external cooling turned off) can be provided.

To illustrate the MPC heat-up scenario, the water cooled MPC summarized in Table 4.5.13 is analyzed with the HI-TRAC rotated to the horizontal configuration (thermally most adverse configuration) and the auxiliary cooling system turned off. At the beginning of the thermal transient, the MPC is assumed to be in the thermal state condition analyzed above corresponding to the steady state condition with the HI-TRAC vertical and the external cooling operative. The rise in the peak cladding temperature as a function of time is shown in Figure 4.5.4 for this case. This figure shows that 7-1/2 hours are required for the peak cladding temperature to reach 752°F.

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§§ For scenarios that exceed the threshold heat loads by modest amounts, a static column of water in the annulus is adequate.

If a longer period of time were warranted by the operational step, the auxiliary cooling system would be sized to ensure that, prior to initiation of the operation with auxiliary cooling withdrawn, the fuel cladding will be cooled below the applicable clad temperature limit by the required amount. The extent of required pre-cooling, of course, will depend on the MPC heat load, orientation of the HI-TRAC, and the expected duration of the operational step. However, as the above example illustrates, the approach to pre-cool the MPC to maintain the peak cladding temperature below the regulatory limit during a short-time, cooling-unaided operational step is quite feasible.

HI-TRAC cask temperature results are reported for thelimiting sceanario that obtains the highest cladding temperature (Condition 3 and 7, Table 4.5.12). The results are provided in Table 4.5.2 summarizing the maximum calculated temperatures in different parts of the HI-TRAC transfer cask and MPC.

4.5.7 MPC Cooldown and Reflooding for Defueling Operations

NUREG-1536 requires an evaluation of cask cooldown and reflood procedures to support fuel unloading from a dry condition. Past industry experience generally supports cooldown of cask internals and fuel from hot storage conditions by direct water quenching. For high heat load MPCs, the extremely rapid cooldown rates to which the hot MPC internals and the fuel cladding can be subjected during water injection may, however, result in high thermal stresses. Additionally, , water injection may result in large quantities of steam generation. To protect the fuel cladding from high thermal strains under direct water quenching the MPCs are cooled using appropriate means prior to the introduction of water in the MPC cavity space.

Because of the continuous gravity driven circulation of helium in the MPC which results in heated helium gas in sweeping contact with the underside of the top lid and the inner cylindrical surface of the enclosure vessel, utilizing an external cooling means to remove heat from the MPC is quite effective. The external cooling process can be completely non-intrusive such as extracting heat from the outer surface of the enclosure vessel using chilled water. Extraction of heat from the external surfaces of an MPC is very effective largely because of the thermosiphon induced internal transport of heat to the peripheral regions of the MPC. The non-intrusive means of heat removal is preferable to an intrusive process wherein helium is extracted and cooled using a closed loop system such as a Forced Helium Dehydrator (Appendix 2.B), because it eliminates the potential for any radioactive crud to exit the MPC during the cooldown process. Because the optimal method for MPC cooldown is heavily dependent on the location and availability of utilities at a particular nuclear plant, mandating a specific cooldown method cannot be prescribed in this FSAR. Simplified calculations are presented in the following to illustrate the feasibility and efficacy of utilizing an intrusive system such as a recirculating helium cooldown system.

Under a closed-loop forced helium circulation condition, the helium gas is cooled, via an external chiller. The chilled helium is then introduced into the MPC cavity from connections at the top of the MPC lid. The helium gas enters the MPC basket and moves through the fuel basket

cells, removing heat from the fuel assemblies and MPC internals. The heated helium gas exits the MPC from the lid connection to the helium recirculation and cooling system. Because of the turbulation and mixing of the helium contents in the MPC cavity by the forced circulation, the MPC exiting temperature is a reliable measure of the thermal condition inside the MPC cavity. The objective of the cooldown system is to lower the bulk helium temperature in the MPC cavity to below the normal boiling temperature of water (212°F). For this purpose, the rate of helium circulation shall be sufficient to ensure that the helium exit gas temperature is below this threshold limit with a margin.

An example calulation for the required helium circulation rate is provided below to limit the helium temperature to 200°F. The calculation assumes no heat loss from the MPC boundaries and a design maximum heat load*** (1.3×10^5 Btu/hr). Under these assumptions, the MPC helium is heated adiabatically by the MPC decay heat from a given inlet temperature (T1) to a temperature (T2). The required circulation rate to limit T2 to 200°F is computed as follows:

$$m = \frac{Q_d}{C_p(T2 - T1)}$$

where:

Q_d = Design maximum decay heat load (Btu/hr)
m = Minimum helium circulation rate (lb/hr)
Cp = Heat capacity of helium (1.24 Btu/lb-°F (Table 4.2.5))
T1 = Helium supply temperature (assumed 15°F in this example)

Substituting the values for the parameters in the equation above, m is computed as 567 lb/hr.

4.5.8 Minimum Temperatures for On-Site Transport

In Table 2.2.2, the minimum ambient temperature condition required to be considered for the HI-TRAC design is specified as 0°F. If, conservatively, a zero decay heat load (with no solar input) is applied to the stored fuel assemblies then every component of the system at steady state would be at this outside minimum temperature. Provided an antifreeze is added to the water jacket, all HI-TRAC materials will satisfactorily perform their intended functions at this minimum postulated temperature condition.

4.5.9 Evaluation of System Performance for Normal Conditions of Handling and Onsite Transport

The HI-TRAC transfer cask thermal analysis is based on a detailed heat transfer model that conservatively accounts for all modes of heat transfer in various portions of the MPC and HI-TRAC. The thermal model incorporates several conservative features, which are listed below:

*** Table 4.4.39 lists MPC design heat loads. From this Table, the maximum heat load (38 kW) is used in this evaluation.

Tables 4.5.7 through 4.5.10

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Table 4.5.11

THRESHOLD HEAT LOADS FOR FUEL DRYING

Condition No.	Drying Method	Threshold Heat Load (Q_T)	Burnup State	Is Annulus Flush Required?	Cladding Temperature Limit [°F)	Computed Maximum Cladding Temperature [°F]
1	FHD	Q_d‡‡‡	MBF	No	1058	Note 1
2	FHD	Q_d	HBF	No	752	Note 1
3	VD	9 kW	HBF	No	752	729
4	VD	10 kW	HBF	Yes	752	740
53	VD	1726 kW	MBF	No	1058	10421057
6	VD	18 kW	MBF	Yes	1058	1056

Note 1: Under the FHD method for MPC drying, an externally driven circulation of helium ensures drying conditions in the MPC, which are in the neighborhood of the saturation temperature of water at the prevailing pressure (about 350°F). As such the operating clad temperatures are substantially below the cladding temperature limit (752°F) thereby ensuring a hospitable thermal environment for HBF.

Acronyms:
FHD – Forced Helium Dehydration
VD – Vacuum Drying
MBF – Moderate Burnup Fuel
HBF – High Burnup Fuel

‡‡‡ Design heat load (Table 4.4.39).

4.7 REFERENCES

[4.1.1] ANSYS Finite Element Modeling Package, Swanson Analysis Systems, Inc., Houston, PA, 1993.

[4.1.2] FLUENT Computational Fluid Dynamics Software, Fluent, Inc., Centerra Resource Park, 10 Cavendish Court, Lebanon, NH 03766.

[4.1.3] "The TN-24P PWR Spent-Fuel Storage Cask: Testing and Analyses," EPRI NP-5128, (April 1987).

[4.1.4] "Cladding Considerations for the Transportation and Storage of Spent Fuel", Interim Staff Guidance – 11, Revision 3.

[4.1.5] "Topical Report on the HI-STAR/HI-STORM Thermal Model and its Benchmarking with Full-Size Cask Test Data", Holtec Report HI-992252, Rev. 1.

[4.2.1] Baumeister, T., Avallone, E.A. and Baumeister III, T., "Marks' Standard Handbook for Mechanical Engineers," 8th Edition, McGraw Hill Book Company, (1978).

[4.2.2] Rohsenow, W.M. and Hartnett, J.P., "Handbook of Heat Transfer," McGraw Hill Book Company, New York, (1973).

[4.2.3] Creer et al., "The TN-24P Spent Fuel Storage Cask: Testing and Analyses," EPRI NP-5128, PNL-6054, UC-85, (April 1987).

[4.2.4] Rust, J.H., "Nuclear Power Plant Engineering," Haralson Publishing Company, (1979).

[4.2.5] Kern, D.Q., "Process Heat Transfer," McGraw Hill Kogakusha, (1950).

[4.2.6] "A Handbook of Materials Properties for Use in the Analysis of Light Water Reactor Fuel Rod Behavior," NUREG/CR-0497, (August 1981).

[4.2.7] "Safety Analysis Report for the NAC Storable Transport Cask," Docket No. 71-9235.

[4.2.8] ASME Boiler and Pressure Vessel Code, Section II, Part D, (1995).

[4.2.9] Jakob, M. and Hawkins, G.A., "Elements of Heat Transfer," John Wiley & Sons, New York, (1957).

[4.2.10] ASME Steam Tables, 3rd Edition (1977).

[4.2.11] Reid, Prausnitz and Poling, "The Properties of Liquids and Gases," McGraw-Hill International, Fourth Edition, (1988).

[4.3.1] *Deleted* ~~Levy, I.S., et al., "Recommended Temperature Limits for Dry Storage of Spent Light Water Reactor Zircaloy-Clad Fuel Rods in Inert Gas," PNL-6189, (May 1987).~~

[4.3.2] *Deleted* ~~Johnson, Jr., A.B. and Gilbert, E.R., "Technical Basis for Storage of Zircaloy-Clad Spent Fuel in Inert Gases," PNL-4835, (September 1983).~~

[4.3.3] *Deleted* ~~"Spent Fuel Heat Generation in an Independent Spent Fuel Storage Installation," Regulatory Guide 3.54, Revision 1, (January 1999).~~

[4.3.4] *Deleted* ~~Cunningham et. al., "Evaluation of Expected Behavior of LWR Stainless Steel-Clad Fuel in Long-Term Dry Storage," EPRI TR-106440, (April 1996).~~

[4.3.5] *Deleted* ~~Schwartz, M.W., Witte, M.C., Lawrence Livermore National Laboratory, "Spent Fuel Cladding Integrity During Dry Storage," UCID-21181.~~

[4.3.6] *Deleted* ~~"Temperature Limit Determination for the Inert Dry Storage of Spent Nuclear Fuel," EPRI TR-103949, (May 1994).~~

[4.3.7] *Deleted* ~~Schemel, J.H., "ASTM Manual on Zirconium and Hafnium," STP-639, American Society for Testing and Materials, (December 1977).~~

[4.3.8] Lanning, D.D. and Beyer C.F, "Estimated Maximum Cladding Stresses for Bounding PWR Fuel Rods During Short Term Operations for Dry Cask Storage", PNNL white paper, (January 2004).

[4.4.1] Wooton, R.O. and Epstein, H.M., "Heat Transfer from a Parallel Rod Fuel Element in a Shipping Container," Battelle Memorial Institute, (1963).

[4.4.2] Rapp, D., "Solar Energy," Prentice-Hall, Inc., Englewood Cliffs, NJ, (1981).

[4.4.3] Siegel, R. and Howell, J.R., "Thermal Radiation Heat Transfer," 2nd Edition, McGraw Hill (1981).

[4.4.4] *Deleted* ~~Holman, J.P., "Heat Transfer," 6th ed., McGraw-Hill Book Company, (1986).~~

[4.4.5] Sanders et al., "A Method for Determining the Spent-Fuel Contribution to Transport Cask Containment Requirements," Sandia Report SAND90-2406, TTC-1019, UC-820, page II-127, (November 1992).

[4.4.6] *Deleted* ~~Hewitt, G.F., Shires, G.L. and Bott, T.R., "Process Heat Transfer," CRC Press, (1994)~~.

[4.4.7] *Deleted* ~~Hagrman, Reymann and Mason, "MATPRO-Version 11 (Revision 2) A Handbook of Materials Properties for Use in the Analysis of Light Water Reactor Fuel Rod Behavior," NUREG/CR-0497, Tree 1280, Rev. 2, EG&G Idaho, August 1981.~~

[4.4.8] *Deleted* ~~"Effective Thermal Conductivity and Edge Conductance Model for a Spent-Fuel Assembly," R. D. Manteufel & N. E. Todreas, Nuclear Technology, 105, 421-440, (March 1994).~~

[4.4.9] *Deleted* ~~"Spent Nuclear Fuel Effective Thermal Conductivity Report," US DOE Report BBA000000-01717-5705-00010 REV 0, (July 11, 1996).~~

[4.4.10] NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems," USNRC, (January 1997).

[4.4.11] *Deleted* ~~"Fuel Cladding Cladding Temperatures in Transport and Storage Casks Development and Validation of a Computation Method," S. Anton, Ph.D. Thesis (German) RWTH Aachen, Germany, 1997.~~

[4.4.12] *Deleted* ~~"Topical Report on the HI-STAR/HI-STORM Thermal Model and its Benchmarking with Full-Size Cask Test Data", Holtec Report HI-992252, Rev. 1.~~

approximately 6 inches thick located directly below the port opening and attached to the underside of the lid. This design feature is shown on the drawings in Chapter 1. The MCNP model did not explicitly represent this arrangement but, rather, modeled the MPC lid as a solid plate.

5.3.2 Regional Densities

Composition and densities of the various materials used in the HI-STORM 100 System and HI-TRAC shielding analyses are given in Tables 5.3.2 and 5.3.3. All of the materials and their actual geometries are represented in the MCNP model.

The water density inside the MPC corresponds to the maximum allowable water temperature within the MPC. The water density in the water jacket corresponds to the maximum allowable temperature at the maximum allowable pressure. As mentioned, the HI-TRAC transfer cask is equipped with a water jacket providing radial neutron shielding. Demineralized water will be utilized in the water jacket. To ensure operability for low temperature conditions, ethylene glycol (25% in solution) may be added to reduce the freezing point for low temperature operations. Calculations were performed to determine the effect of the ethylene glycol on the shielding effectiveness of the radial neutron shield. Based on these calculations, it was concluded that the addition of ethylene glycol (25% in solution) does not reduce the shielding effectiveness of the radial neutron shield.

Since the HI-STORM 100S and the newer configuration of the HI-STORM 100 do not have the inner shield shell present, the minimum density of the concrete in the body (not the lid or pedestal) of the overpack has been increased slightly to compensate for the change in shielding relative to the HI-STORM 100 overpack with the inner shield shell. Table 5.3.2 shows the concrete composition and densities that were used for the HI-STORM 100 and HI-STORM 100S overpacks. Since the density of concrete is increased by altering the aggregate that is used, the composition of the slightly denser concrete was calculated by keeping the same mass of water as the 2.35 gm/cc composition and increasing all other components by the same ratio.

The MPCs in the HI-STORM 100 System can be manufactured with one of two possible neutron absorbing materials: Boral or Metamic. Both materials are made of aluminum and B_4C powder. The Boral contains an aluminum and B_4C powder mixture sandwiched between two aluminum plates while the Metamic is a single plate. The thickness and minimum ^{10}B areal density are the same for Boral and Metamic. Therefore, the mass of Aluminum and B_4C are essentially equivalent and there is no distinction between the two materials from a shielding perspective. As a result, Table 5.3.2 identifies the composition for Boral and no explicit calculations were performed with Metamic.

Sections 4.4 and 4.5 demonstrate that all materials used in the HI-STORM and HI-TRAC remain below their design temperatures as specified in Table 2.2.3 during all normal conditions. Therefore, the shielding analysis does not address changes in the material density or composition as a result of temperature changes.

Table 4.4.36 indicates that there are localized areas in the concrete in the lid of the overpack which approach 365°F. This increase in temperature above 300°F results in an approximate 0.424% overall density reduction due to the loss of chemically unbound water. This density reduction results in a reduction in the mass fraction of hydrogen from 0.6% to 0.555% in the area affected by the temperature excursion. This is a localized effect with the maximum loss occurring at the bottom center of the lid where the temperature is the hottest and reduced loss occurring as the temperature decreases to 300°F.

Based on these considerations, the presence of localized temperatures in excess of 300°F in the lid concrete has a negligible effect on the shielding effectiveness of the HI-STORM 100 overpack lid.

Chapter 11 discusses the effect of the various accident conditions on the temperatures of the shielding materials and the resultant impact on their shielding effectiveness. As stated in Section 5.1.2, there is only one accident that has any significant impact on the shielding configuration. This accident is the loss of the neutron shield (water) in the HI-TRAC as a result of fire or other damage. The change in the neutron shield was conservatively analyzed by assuming that the entire volume of the liquid neutron shield was replaced by void.