HOLTEC INTERNATIONAL

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BY OVERNIGHT MAIL

February 4, 2000

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

Subject: USNRC Docket No. 72-1008; TAC No. L22019
HI-STAR 100 Storage CoC 1008
License Amendment Request 1008-1, Supplement 1

References:
1. Holtec Project 5014
2. Holtec Letter to NRC dated November 24,1999, LAR 1008-1

Dear Sir:

In accordance with our recent discussions with the NRC, Holtec International is pleased to forward this Supplement 1 to License Amendment Request (LAR) 1008-1 (Ref. 2). This supplement proposes a small number of additional changes to the HI-STAR storage Certificate of Compliance and Topical Safety Analysis Report (TSAR) which have been discussed with NRC project management. These additional changes arose as a result of final fabrication and field dry-run activities associated with the Plant Hatch loading campaign.

These additional proposed changes are described and justified in Attachment 1 to this letter, with revised drawings enclosed. Mark-ups of the proposed CoC and TSAR changes submitted previously are also included to clearly indicate the nature of the changes and to maintain continuity with the proposed changes submitted with our November, 1999 LAR . Please note that the revised drawings enclosed here completely replace the revisions of the those particular drawings submitted previously.

Thank you for your prompt review of this LAR. If you have any questions or require additional information, please contact us.

Sincerely,

Brian Gutherman, P.E.
Licensing Manager

Approval:

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

NMSS01 Public

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cc: Mr. Mark Delligatti, USNRC (w/10 copies of attachment and enclosures)
Ms. Marissa Bailey, USNRC (w/o attach. and encl.)
Mr. Ross Chappell, USNRC (w/o attach. and encl.)
Mr. E. William Brach, USNRC (w/o attach. and encl.)

Document ID: 5014364

Attachment: 1. Summary of Proposed Changes (4 pages)

Enclosures: 1. Revised Drawings (~~11~~ 13 sheets, including cover page)
2. Mark-ups of CoC 1008 and TSAR pages (11 pages, including cover page)

Technical Concurrence:

Mr. Bernard Gilligan (Principal Design Criteria) ____________

Mr. Steve Agace (Operations) ____________

Distribution (w/o attach. and encl.):

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Mr. Ken Phy	New York Power Authority
Mr. J. Nathan Leech	Commonwealth Edison
Dr. Max DeLong	Private Fuel Storage
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Dr. Seymour Raffety	Dairyland Power
Mr. John Sanchez	Consolidated Edison Company
Ms. Kathy Picciott	Niagara Mohawk Power Corporation
Mr. John Donnell	Private Fuel Storage, LLC (SWEC)
Dr. Stanley Turner	Holtec International, Florida Operations Center

SUMMARY OF PROPOSED CHANGES (SUPPLEMENT 1)

SECTION I – PROPOSED CHANGES TO CERTIFICATE OF COMPLIANCE 1008

Proposed Change No. S1

Certificate of Compliance, Appendix B, Item 1.4.6

a. Add "at 28 days" after "4,200 psi" for concrete compressive strength.

b. Replace "Reinforcement Yield Strength: ≤ 60,000 psi" with the following:

"Reinforcing bar shall be 60 ksi yield strength ASTM material"

c. Underneath "Soil effective modulus of elasticity: ≤ 28,000 psi", add the following:

"(measured prior to ISFSI pad installation)"

Reason for Proposed Changes

These changes provide clarification for ISFSI pad designers to ensure full compliance with the certificate of compliance and TSAR when designing and constructing the ISFSI pad.

Justification for Proposed Changes

These changes were requested by our utility clients. They are consistent with the assumptions made in the drop and tip-over analyses and provide needed clarification in procuring reinforcing bar and designing and constructing the ISFSI pad. These changes are consistent with recent identical changes made in the HI-STORM 100 CoC (Docket 72-1014).

SECTION II – PROPOSED CHANGES TO THE TSAR

Proposed Change No. S2

TSAR Tables 2.2.9 and 3.A.1

Revise these two tables and notes to clarify ISFSI pad design requirements and assumed values for the reference pad used in the drop and tipover analyses.

Reason and Justification for Changes

These changes are conforming changes to reflect the changes to the CoC in Change Number S1 above. They are also consistent with the HI-STORM application (Docket 72-1014).

Proposed Change No. S3

TSAR Section 3.4.4.3.1.1

Replace the word "diametral" with the word "radial."

Reason and Justification for Change

To correct an editorial error. The 3/32" gap is the radial gap between the MPC and the overpack, not the diametral gap.

Proposed Change No. S4

TSAR Table 8.1.3

Increase the torque requirement for the closure plate test port plug to 45 ft-lbs (+5/-0).

Reason for Change

To provide sufficient compression for the seals located beneath the port plug heads.

Justification for Change

The seal manufacturer has recommended increasing the port plug torque to ensure sufficient compression of the seal. The depth of the seal groove machined under the heads of the port plugs ensure the seals seat at the higher torque without over-compression.

Proposed Change No. S5

TSAR Section 9.1.2.2, Hydrostatic Testing and Table 9.1.2

Re-name the title of this section to "Pressure Testing" and revise the text to allow pneumatic testing as an option to hydrostatic testing for the overpack only. Delete the text regarding filling the overpack from the drain port. Revise text to allow the closure plate bolts to be torqued to less than or equal to the full torque requirement for the purposes of this test.

Reason for Proposed Change

Shop experience with hydrostatic testing of the HI-STAR overpack has revealed that drying of certain portions of the overpack is not readily achievable after the test. For example, the drain port at the bottom of the overpack collects a small amount of water during hydrostatic testing which is not readily removed in the fabrication facility. During actual fuel loading operations, the overpack cavity will be dried by the vacuum method. Additionally, it was recognized that is not necessary to fill the overpack from the drain port or to fully torque the closure plate bolts prior to hydrostatic testing. Bolts torqued to a lesser value provide a conservative test arrangement.

Justification for Proposed Change

The ASME Code, Section III, Subsection NB, Article NB-6112 allows for the substitution of pneumatic testing for hydrostatic testing when permitted by NB-6112.1(a). Article NB-6112.1(a)(2) states "when components, appurtenances, or systems which are not readily dried are to be used in services where traces of the testing medium cannot be tolerated." While the overpack is designed to be submerged in licensees' spent fuel pools, it is not desirable to ship an overpack from the fabricator to a licensee's site with residual water in the overpack.

The changes related to the use of the drain port and the bolt torquing are lessons learned from fabrication. Specifying the particular port for filling the overpack for this test is unnecessary detail in the TSAR. Allowing torques less than or equal to the required torques for storage provides desired fabricator flexibility.

U. S. Nuclear Regulatory Commission
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Document ID 5014364
Enclosure 1 (~~11~~ 13 pages including this page)

LICENSE AMENDMENT REQUEST 1008-1
SUPPLEMENT 1

REVISED DRAWINGS

BILL OF MATERIALS FOR HI-STAR 100 OVERPACK (BM-1476) (E.I.D. 2851)

14

REF. DWGS. 1397,1398 & 1399.

REV. NO.	PREP. BY & DATE	CHECKED BY DATE	PROJ. MANAGER & DATE	QA. MANAGER & DATE
14	S.GEE 2-1-2000 INCORPORATED ECO-1020-3	[signature] 2/4/00	[signature] 2/4/00	[signature] 2/4/00

ITEM NO.	QTY.	MATERIAL	DESCRIPTION	NOMENCLATURE
1	1	SA-350 LF3	12" X 83 1/4" O.D. BASE PLATE	BOTTOM PLATE
2	1	SA-203-E	2 1/2" THK. X 223 7/8" X 174 1/8" PLATE	INNER SHELL
3	20	SA-515 GRADE 70	1/2" THK. X 172 1/8" X 8" APPROX. PLATE	ENCLOSURE SHELL PANELS
4	20	SA-515 GRADE 70	1/2" THK. X 172 1/8" X 17 1/2" LG. APPROX.	RADIAL CHANNELS
5 (13)	2	SA-705 630 17-4 PH OR SA-564 630 17-4 PH	11" THK. X 12 3/8" WIDE X 14" LG.	POCKET TRUNNION
6	4	SA-193 GRADE B7	5/8" - 11 UNC X 1 1/4" LG. SOCKET SET SCREW	CLOSURE PLATE PLUG
7	2	SB-637-N07718	7 1/4" O.D. X 9 1/4" LG. BAR	LIFTING TRUNNION
8	1	SA-350 LF3	68 3/4" I.D. X 86 1/4" O.D. X 24" LG. FORGING	TOP FLANGE
9	2	SA-203-E OR SA-350-LF3	1 1/2" THK. X 5 5/8" WIDE X 25" LG. BAR	REMOVEABLE SHEAR RING
10	1	SA-350 LF3	6" THK. X 77 3/8" O.D.	CLOSURE PLATE
11	2	SB-637-N07718	1 5/8" - 8 UN X 7 1/8" LG. 12 POINT CAP SCREW W/ 3 1/2" LG. THREAD (W/2.43" DIA. X 1 5/8" TOTAL HIGH HD. PER DET. DWG.1397 SHT.3)	CLOSURE PLATE SHORT BOLT
12	1	SA-516 GRADE 70	1 1/4" THK. X 174 1/8" X 235 5/8" APPROX. PLATE	INTERMEDIATE SHELL #1
13	1	SA-516 GRADE 70	1 1/4" THK. X 174 1/8" X 243 1/2" APPROX. PLATE	INTERMEDIATE SHELL #2
14	1	SA-516 GRADE 70	1 1/4" THK. X 174 1/8" X 251 3/8" APPROX. PLATE	INTERMEDIATE SHELL #3
15	1	SA-516 GRADE 70	1 1/4" THK. X 174 1/8" X 259 3/16" APPROX. PLATE	INTERMEDIATE SHELL #4
16	1	SA-516 GRADE 70	1" THK. X 173 7/8" X 266 1/4" APPROX. PLATE	INTERMEDIATE SHELL #5
17	2	SA-515 GRADE 70	1/2" THK. X 85 3/4" I.D. X 96" O.D. PLATE	ENCLOSURE SHELL RETURN
18	2	SA-193 GRADE B8	7/8" Ø X 4 7/16" LG. BAR (SEE DETAIL ON DWG. 1398 SHT. 3)	PORT PLUG
19	3	ALLOY X750	0.75 O.D. X 0.615 I.D. SPRING ENERGIZED SEAL, PART ASE50033 (AMERICAL SEAL) OR EQUIVALENT	PORT PLUG SEAL
20 (13)	4	SA-193 GRADE B7	1/4 - 20 UNC X 1/2 LG. SOCKET CAP SCREW	TRUNNION LOCKING PAD BOLT
21 (14)	2	SA-516 GRADE 70	1/2" THK. X 6 1/4" O.D PLATE	LIFTING TRUNNION END CAP
22 (13)	4	SA-193 GRADE B7	1/2" - 13 UNC X 1" LG. HEX. BOLTS	TRUNNION END CAP BOLT
23	2	SA-516 GRADE 70	3/8" THK. X 7 3/4" X 9 3/4" PLATE	LIFTING TRUNNION LOCKING PAD
24	AS REQ.	HOLTITE - A	HOLTITE-A WITH 1 WT. % B_4 C	NEUTRON SHIELD
25 (13)	8	SA-193 GRADE B7	3/8" - 16 UNC X 1/2" LG. SOCKET SET SCREW	REMOVEABLE SHEAR RING PLUG
26 (13)	1	COMMERCIAL	3/8" X 71" O.D. SELF ENERGIZED SEAL, INTERNAL PRESSURE OR EQUIVALENT	CLOSURE PLATE INNER SEAL

BILL OF MATERIALS FOR HI-STAR 100 OVERPACK (BM-1476) (E.I.D. 2852)

△16

REF. DWGS. 1397,1398 & 1399.

REV. NO.	PREP. BY & DATE	CHECKED BY DATE	PROJ. MANAGER & DATE	QA. MANAGER & DATE
16	S.GEE 2-1-2000 INCORPORATED ECO-1020-2, -3	[signature] 2/4/00	[signature] 2/4/00	[signature] 2/4/00

	ITEM NO.	QTY.	MATERIAL	DESCRIPTION	NOMENCLATURE
△15	27	1	COMMERCIAL	3/8" X 72.5" O.D. SELF ENERGIZED SEAL, INTERNAL PRESSURE OR EQUIVALENT	CLOSURE PLATE OUTER SEAL
	28	2	SA-350-LF3 OR SA-203-E	1 1/2" THK. X 5 1/2" Ø PLATE	PORT COVER
△15	29	8	SA-193 GRADE B7	3/8 - 16 UNC X 5/8 LG. SOCKET CAP SCREW	PORT COVER BOLT
	30	2	ALLOY X750	2 1/2" O.D. SPRING ENERGIZED C-RING, INTERNAL PRESSURE (AMERICAL SEAL) OR EQUIVALENT	PORT COVER SEAL
△15	31	--	---	DELETED	---
	32	52	SB-637-N07718	1 5/8" - 8 UN X 7 3/8" LG. 12 POINT CAP SCREW W/ 3 3/4" LG. THREAD. (W/2.43" DIA. X 1 5/8" TOTAL HIGH HD. PER DET.DWG.1397. SHT.3)	CLOSURE PLATE LONG BOLT
△15	33	2	COMMERCIAL	RUPTURE DISK (RELIEVE AT 30 PSIG (±5 PSIG)) (1 1/2 IN^2 FLOW AREA)	RUPTURE DISK
△15	34	8	SA-193 GRADE B7	3/8" - 16 UNC X 1 3/8" LG. SOCKET CAP SCREW	REMOVEABLE SHEAR RING BOLT
	35	1	SA-193 GRADE B8	7/8" Ø X 3 13/16" LG. BAR (SEE DETAIL ON DWG. 1398)	DRAIN PORT PLUG
△16	36	AS REQD	SA 515 GR.70	1/2" THK PLATE	POCKET TRUNNION SURROUND
	37	AS REQ.	SILICONE FOAM	TYPE HT-870 (BISCO PRODUCTS) OR EQUIVALENT	THERMAL EXPANSION FOAM
△15	38	--	---	DELETED	---
△15	39	2	SA-516 GRADE 70 OR A569	11 GAGE (1/8" THK.)	RUPTURE DISK PLATE
	40	1	SA 240 304	14 GAGE (0.0751" THK.) X 4" WIDE X 10" LG. SHEET	STORAGE MARKING NAME PLATE
	41	1	SA 240 304	14 GAGE (0.0751" THK.) X 6 1/2" WIDE X 10" LG. SHEET	TRANSPORTATION MARKING NAME PLATE
△15	42	AS REQD	SA515-70	AS REQUIRED	BRIDGE
	43	2	SA 240 304	11 GAGE (1/8" THK.) X 6 1/8" WIDE X 7 11/16" LG. PLATE	POCKET TRUNNION PLUG PLATE
	44	2	SA 240 304	11 GAGE (1/8" THK.) X 1 1/2" WIDE X 9 1/2" LG. PLATE	POCKET TRUNNION PLUG PLATE
	45	2	SA 240 304	11 GAGE (1/8" THK.) X 3 1/2" WIDE X 18 7/8" LG. PLATE	POCKET TRUNNION PLUG PLATE
	46	2	SA 240 304	11 GAGE (1/8" THK.) X 3 3/4" WIDE X 6 1/8" LG. PLATE	POCKET TRUNNION PLUG PLATE
	47	2	SA 240 304	11 GAGE (1/8" THK.) X 6 1/8" WIDE X 7 11/16" LG. PLATE	POCKET TRUNNION PLUG PLATE
△15	48	4	SA-193 GRADE B7	3/8 - 16 UNC X 1/2" LG. SOCKET CAP SCREW	POCKET TRUNNION PLUG SCREW
△15	49	54	S/S	11 GAGE (1/8" THK.) X 1 3/4" ID. X 2 5/8" OD.	CLOSURE BOLT WASHER
	50	40	SA-193-B7	1 3/4"-5UNC X 1 1/8" LG. SOCKET SET SCREW	TOP FLG. LIP HOLE PLUGS
	51	20	SA-193-B7	1"-8UNC X 1 1/4" LG. SOCKET SET SCREW	TOP FLG. SIDE HOLE PLUGS
△15	52	16	SA-193-B7	1 3/4"-8UNC X 2 1/4" LG. SOCKET SET SCREW	BOTTOM PLATE HOLE PLUGS
△16 △15	53	8	SA-193-B7	2 1/2"-4UN X 2 1/2 LG SOCKET SET SCREW	THREADED PLUG
	54	4	SA-193-B7	1/2-13UNC X 5/8" LG SOCKET SET SCREW	THREADED PLUG

NOTES:
1) ALL DIMENSIONS ARE APPROXIMATE.
2) HOLTITE IS A NEUTRON SHIELD MATERIAL WITH 1 WT. % B_4C, 6 WT. % H, AND A DENSITY OF 1.68g/cm^3.
3) ITEMS 12 THRU 16, MATERIAL SA-516-GR 70 IS TO BE NORMALIZED.
△15 4) THICKNESS OF ITEM 16 MAY VARY DEPENDING ON THICKNESSES OF ITEMS 12-15.
5) ITEMS 2,12-17 MAY BE MADE FROM MORE THAN ONE PIECE.

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING
DESCRIPTION HI-STAR 100 MPC-24 CONSTRUCTION	
CLIENT N/A	
COMPANION DRAWINGS 1396	REV. 12
PROJECT No. 5014 P.O. No. N/A	DRAWING No. 1395 SHT 1 OF 4 (E.I.D. 2853)

A

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

REVISION		
HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING	
DESCRIPTION HI-STAR 100 MPC-24 CONSTRUCTION		
CLIENT N/A		
COMPANION DRAWINGS 1395		REV. 11
PROJECT No. 5014	DRAWING No. 1396 SHT 2 OF 6 (E.I.D. 2881)	
P.O. No. N/A		

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING
DESCRIPTION CROSS SECTIONAL VIEW OF HI-STAR 100 OVERPACK	
CLIENT N/A	
COMPANION DRAWINGS 1398, 1399	REV. 17
PROJECT No. 5014 P.O. No. N/A	DRAWING No. 1397 SHT. 1 OF 7 (E.I.D. 2854)

A

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING
DESCRIPTION DETAIL OF TOP FLANGE & BOTTOM PLATE OF HI-STAR 100 OVERPACK	
CLIENT N/A	
COMPANION DRAWINGS 1398, 1399	REV. 12
PROJECT No. 5014 P.O. No. N/A	DRAWING No. 1397 SHT. 2 OF 7 (E.I.D. 2855)

A

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

REVISION

HOLTEC INTERNATIONAL

EQUIPMENT DESIGN
ANALYSIS
CONSULTING

DESCRIPTION
DETAIL OF LIFTING TRUNNION & LOCKING PAD OF HI-STAR 100 OVERPACK

CLIENT N/A

COMPANION DRAWINGS 1398, 1399

REV. 10

PROJECT No. 5014

P.O. No. N/A

DRAWING No. 1397 SHT. 5 OF 7 (E.I.D. 2856)

A

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

REVISION		
HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING	
DESCRIPTION	DETAIL OF SHEAR RING AND CLOSURE PLATE BOLT INSTALLATION OF HI-STAR 100 OVERPACK	
CLIENT N/A		
COMPANION DRAWINGS 1398, 1399		REV. 10
PROJECT No. 5014	DRAWING No. 1397 SHT. 6 OF 7 (E.I.D.2857)	
P.O. No. N/A		

A

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING
DESCRIPTION DETAIL OF TRUNNION POCKET FORGING OF HI-STAR 100 OVERPACK	
CLIENT N/A	
COMPANION DRAWINGS 1397, 1398	REV. 12
PROJECT No. 5014 P.O. No. N/A	DRAWING No. 1399 SHT. 3 OF 3 (E.I.D. 2858)

A

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

BY:	BY:	
REVISION		
HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING	
DESCRIPTION HI-STAR 100 MPC-68 CONSTRUCTION		
CLIENT N/A		
COMPANION DRAWINGS 1402		REV. 13
PROJECT No. 5014 P.O. No. N/A	DRAWING No. 1401 SHT 1 OF 4 (E.I.D. 2859)	

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FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

REVISION	
HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING
DESCRIPTION HI-STAR 100 MPC-68 CONSTRUCTION	
CLIENT N/A	
COMPANION DRAWINGS 1401	REV. 13
PROJECT No. 5014	DRAWING No. 1402 SHT 2 OF 6 (E.I.D. 2882)
P.O. No. N/A	

A

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

REVISION	
HOLTEC INTERNATIONAL	EQUIPMENT DESIGN ANALYSIS CONSULTING
DESCRIPTION HI-STAR 100 MPC-68 CONSTRUCTION	
CLIENT N/A	
COMPANION DRAWINGS 1401	REV. 9
PROJECT No. 5014 P.O. No. N/A	DRAWING No. 1402 SHT 6 OF 6 (E.I.D. 2860)

A

U. S. Nuclear Regulatory Commission
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Document ID 5014364
Enclosure 2 (11 pages including this page)

LICENSE AMENDMENT REQUEST 1008-1
SUPPLEMENT 1

PROPOSED COC CHANGES AND
PROPOSED TSAR CHANGES

2. The allowed temperature extremes, averaged over a three day period, shall be greater than -40°F, and less than 125°F.

3. The horizontal and vertical seismic acceleration levels are bounded by the values listed below in Table 1-4.

Table 1-4

Design-Basis Earthquake Input on the Top Surface of an ISFSI Pad

Horizontal g-level in each of two orthogonal directions	Horizontal g-level Vector Sum	Corresponding Vertical g-level (upward)
0.222 g	0.314 g	1.00 x 0.222 g = 0.222 g
0.235 g	0.332 g	0.75 x 0.235 g = 0.176 g
0.24 g	0.339 g	0.667 x 0.24 g = 0.160 g
0.25 g	0.354 g	0.500 x 0.25 g = 0.125 g

4. The analyzed flood condition of 12 fps water velocity and a height of 656 feet of water (full submergence of the loaded cask) are not exceeded.

5. The potential for fire and explosion shall be addressed, based on site-specific considerations. This includes the condition that the onsite transporter fuel tank will contain no more than 50 gallons of combustible transporter fuel.

6. In addition to the requirement of 10 CFR 72.212(b)(2)(ii), the cask storage pads and foundation shall include the following characteristics as applicable to the drop and tipover analyses:

   a. Concrete thickness: ≤ 36 inches

   b. Concrete compressive strength: ≤ 4,200 psi *at 28 days*

   c. Reinforcement top and bottom (Both Directions):
      Reinforcement area and spacing determined by analysis
      ~~Reinforcement yield strength: ≤ 60,000 psi~~
      Reinforcing bar shall be 60 ksi yield strength ASTM material

   d. Soil effective modulus of elasticity: ≤ 28,000 psi
      (Measured prior to ISFSI pad installation)

2. The allowed temperature extremes, averaged over a three day period, shall be greater than -40°F, and less than 125°F.

3. The horizontal and vertical seismic acceleration levels are bounded by the values listed below in Table 1-4.

Table 1-4

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0.222 g	0.314 g	1.00 x 0.222 g = 0.222 g
0.235 g	0.332 g	0.75 x 0.235 g = 0.176 g
0.24 g	0.339 g	0.667 x 0.24 g = 0.160 g
0.25 g	0.354 g	0.500 x 0.25 g = 0.125 g

4. The analyzed flood condition of 12 fps water velocity and a height of 656 feet of water (full submergence of the loaded cask) are not exceeded.

5. The potential for fire and explosion shall be addressed, based on site-specific considerations. This includes the condition that the onsite transporter fuel tank will contain no more than 50 gallons of combustible transporter fuel.

6. In addition to the requirement of 10 CFR 72.212(b)(2)(ii), the cask storage pads and foundation shall include the following characteristics as applicable to the drop and tipover analyses:

   a. Concrete thickness: ≤ 36 inches

   b. Concrete compressive strength: ≤ 4,200 psi at 28 days

   c. Reinforcement top and bottom (Both Directions):
      Reinforcement area and spacing determined by analysis
      Reinforcing bar shall be 60 ksi yield strength ASTM material

   d. Soil effective modulus of elasticity: ≤ 28,000 psi
      (Measured prior to ISFSI pad installation)

Table 2.2.9

CHARACTERISTICS OF REFERENCE ISFSI PAD†

Concrete thickness	≤ 36 inches
Concrete Compressive Strength	≤ 4,200 psi at 28 days
Reinforcement Top and Bottom (both directions)	~~Specified Yield Strength = 60,000 psi~~ Reinforcing bar shall be 60 ksi Yield Strength ASTM Material
Soil Effective Modulus of Elasticity††	28,000 psi (measured prior to ISFSI pad installation)

† The characteristics of this pad are identical to the pad considered by Lawrence Livermore Laboratory (see Appendix 3.A).

†† An acceptable method of defining the soil effective modulus of elasticity applicable to the drop and tipover analysis is provided in Table 13 of NUREG/CR-6608 with soil classification in accordance with ASTM-D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System USCS) and density determination in accordance with ASTM-D1586 Standard Test Method for Penetration Test and Split/Barrel Sampling of Soils.

overpack's support action, mitigating further increase in the stress. Therefore, to compute primary stresses in the basket and the MPC shell under lateral drop events, the gaps should be assumed to be closed. However, for conservatism, it is assumed that an initial gap of 0.1875" exists, in the direction of the applied deceleration, at all support locations between the basket and the shell and the ~~diametral~~ gap between the shell and the overpack at the support locations is 3/32". All stresses produced by the applied loading on this configuration are compared with primary stress levels, even though the self-limiting stresses should be considered secondary in the strict definition of the Code.

- Description of Individual Loads and Boundary Conditions Applied to the MPCs

The method of applying each individual load to the MPC model is described in this subsection. The individual loads are listed in Table 2.2.14. A free-body diagram of the MPC corresponding to each individual load is given in Figures 3.4.12-3.4.15. In the following discussion, reference to vertical and horizontal orientations are made. Vertical refers to the direction along the cask axis, and horizontal refers to a radial direction.

Quasi-static structural analysis methods are used. The effects of any dynamic load factors (DLFs) are included in the final evaluation of safety margins. All analyses are carried out using the design basis decelerations in Table 3.1.2

The MPC models used for side drop evaluations are shown in Figures 3.4.6 through 3.4.11. In each model, the fuel basket and the enclosure vessel are constrained to move only in the direction that is parallel to the acceleration vector. The overpack inner shell, which is defined by three nodes needed to represent the contact surface, is fixed in all degrees of freedom. The fuel basket, enclosure vessel, and overpack inner shell are all connected at one location by linear springs (see Figure 3.4.6, for example).

(a) Accelerations

During a side impact event, the stored fuel is directly supported by the cell walls in the fuel basket. Depending on the orientation of the drop, 0 or 45 degrees (see Figures 3.4.14 and 3.4.15), either one or two walls support the fuel. The effect of deceleration on the fuel basket and canister metal structure is accounted for by amplifying the gravity field in the appropriate direction. In the finite element model this load is effected by applying a uniformly distributed pressure over the full span of the supporting walls. The magnitude of the pressure is determined by the weight of the fuel assembly (Table 2.1.6), the axial length of the fuel basket support structure, the width of the cell wall, and the impact acceleration. It is assumed that the load is evenly distributed along an axial length of basket equal to the fuel basket support structure. For example, the pressure applied to an impacted cell wall during a 0-degree side drop event is calculated as follows:

$$p = \frac{a_n W}{L \ell}$$

Table 3.A.1: Essential Variables to Characterize the Reference ISFSI Pad

Thickness of concrete	36 inches
Nominal compressive strength of concrete	4,200 psi at 28 days
Concrete mass density	2.097E-04 lb-sec^2/in^4
Concrete shear modulus	1.514E+06 psi
Concrete Poisson's ratio	0.22
Mass density of the engineered fill (soil)	1.498E-04
Effective Modulus of elasticity of the ~~soil~~ subgrade	28,000 psi
Poisson's ratio of the soil	0.3

Note 1. The concrete Young's Modulus is derived from the American Concrete Institute recommended formula $57{,}000\sqrt{f}$ where f is the nominal compressive strength of the concrete (psi).

2. The effective modulus of elasticity of the subgrade soil is to be measured by an appropriate "plate test" before pouring of the concrete ISFSI pad.

3. The pad ~~of~~ thickness of 36", concrete compressive strength of 4200 psi (nom.) at 28 days of curing, and the subgrade soil effective modulus of 28000 psi are the upper bound values to ensure that the deceleration limits under postulated impact events set forth in Table 3.1.2 are satisfied.

Table 8.1.3
HI-STAR 100 SYSTEM TORQUE REQUIREMENTS

Fastener	Torque (ft-lbs)	Pattern
Overpack Closure Plate Bolts†, ††	First Pass – Hand Tight Second Pass – Wrench Tight Third Pass – 860+25/-25 Fourth Pass – 1725+50/-50 Final Pass - 2895+90/-90	Figure 8.1.31
Overpack Vent and Drain Port Cover Plate Bolts††	12+2/-0	X-pattern
Overpack Vent and Drain Port Plugs	~~22+2/-0~~ *45+5/-2*	None
Closure Plate Test Port Plug	~~22+2/-0~~ 45 +5/-2	None
Backfill Tool Test Cover Bolts††	16+2/-0	X-pattern
Shear Ring Segment Bolts	22+2/-0	None
Overpack Bottom Cover Bolts	200+20/-0	None
Pocket Trunnion Plugs	Hand Tight	None
Upper Fuel Spacers	Hand Tight	None
Threaded Inserts (all)	Hand Tight	None

† Detorquing shall be performed by turning the bolts counter-clockwise in 1/3 turn +/- 30 degrees increments per pass according to Figure 8.1.31 for three passes. The bolts may then be removed.

†† Bolts shall be cleaned and inspected for damage or excessive wear (replaced if necessary) and coated with a light layer of Fel-Pro Chemical Products, N-5000, Nuclear Grade Lubricant (or equivalent).

of the operation including the four aforementioned areas.

In order to ensure that the lifting trunnions do not have any hidden material flaws, the trunnions shall be tested at 300% of the maximum design (service) lifting load. The load (750,000 lbs) shall be applied for a minimum of 10 minutes. The accessible parts of the trunnions (areas outside the HI-STAR overpack), and the local HI-STAR 100 cask areas will then be visually examined to verify no deformation, distortion, or cracking has occurred. Any evidence of deformation, distortion or cracking of the trunnion or adjacent HI-STAR 100 cask areas will require replacement of the trunnion and/or repair of the HI-STAR 100 cask. Following any replacements and/or repair, the load testing shall be reperformed and the components re-examined in accordance with the original procedure and acceptance criteria. Testing will be performed in accordance with written and approved procedures. Certified material test reports verifying trunnion material mechanical properties meet ASME Code Section II requirements will provide further verification of the trunnion load capabilities. Test results shall be documented. The documentation shall become part of the final quality documentation package.

The acceptance testing of the trunnions in the manner described above will provide adequate assurance against handling accidents.

9.1.2.2 ~~Hydrostatic~~ Testing

9.1.2.2.1 HI-STAR 100 Helium Retention Boundary

The helium retention boundary of the HI-STAR overpack (e.g., the containment boundary during transportation) will be hydrostatically tested to 150 psig +10,-0 psig, in accordance with the requirements of the ASME Code Section III, Subsection NB, Article NB-6000. The test pressure of 150 psig is 150% of the Maximum Normal Operating Pressure (established per 10CFR71.85(b) requirements). This bounds the ASME Code Section III requirement (NB-6221) for hydrostatic testing to 125% of the design pressure (100 psig). The test shall be performed in accordance with written and approved procedures.

~~The overpack drain port will be used for filling the cavity with water and the vent port for venting the cavity.~~ The approved test procedure shall clearly define the test equipment arrangement.

The overpack ~~hydrostatic~~ test may be performed at any time during fabrication after the containment boundary is complete. Preferably, the ~~hydrotest~~ should be performed after all overpack fabrication is complete, including attachment of the intermediate shells. The HI-STAR overpack shall be assembled for this test with the closure plate mechanical seal (only one required) *or temporary test seal* installed. Closure bolts shall be installed and torqued to the value specified in Chapter 8.

The calibrated test pressure gage installed on the overpack shall have an upper limit of approximately twice that of the test pressure. The hydrostatic test pressure shall be maintained for ten minutes. During this time period, the pressure gage shall not fall below 150 psig. At the end of point) shall be examined. If a leak is discovered, the overpack will be emptied and an evaluation to determine the cause of the leakage will be made. Repairs and retest shall be performed until the hydrostatic test criteria are met.

Note: If failure of the ~~hydrostatic~~ pressure retest occurs after initial repairs are completed, a nonconformance report shall be issued and root cause and corrective action shall be addressed before further repairs and retest are performed.

After completion of the ~~hydrostatic~~ pressure testing, the closure plate will be removed and the internal surfaces shall be visually examined for cracking or deformation. Any evidence of cracking or deformation shall be cause for rejection or repair and retest, as applicable. The overpack shall be required to be ~~hydrotested~~ pressure tested until all examinations are found to be acceptable.

All test results shall be documented and shall become part of the final quality documentation package.

9.1.2.2.2 <u>MPC Confinement Boundary</u>

Hydrostatic testing of the MPC confinement boundary shall be performed in accordance with the requirements of the ASME Code Section III, Subsection NB, Article NB-6000, when field welding of the MPC lid-to-shell weld is completed. The hydrostatic pressure for the test is 125 +5,-0 psig, which is 125% of the design pressure of 100 psig. The MPC vent and drain ports will be used for pressurizing the MPC cavity. The loading procedures in Chapter 8 define the test equipment arrangement. The calibrated test pressure gage installed on the MPC confinement boundary shall have an upper limit of approximately twice that of the test pressure. Following completion of the 10-minute hold period at the hydrostatic test pressure, and while maintaining a minimum test pressure of 125 psig, the surface of the MPC lid-to-shell weld will be visually examined for leakage and then re- examined by dye penetrant examination. Any evidence of cracking or deformation shall be cause for rejection, or repair and retest, as applicable. The performance and sequence of the test and the acceptance criteria are described in Section 8.1 (loading procedures).

If a leak is discovered, the test pressure shall be reduced, the MPC cavity water level lowered, the MPC cavity vented (to the pool or the licensee's off-gas system), and the weld shall be examined to determine the cause of the leakage and/or cracking. Repairs to the weld shall be performed in accordance with approved written procedures prepared in accordance with the ASME Code Section III, Subsection NB, NB-4450.

The MPC confinement boundary hydrostatic test shall be repeated until all visual and dye penetrant examinations are found to be acceptable in accordance with the acceptance criteria. All test results shall be documented and shall be maintained as part of the loaded MPC quality documentation package.

Table 9.1.2 (continued)

HI-STAR OVERPACK
INSPECTION AND TEST ACCEPTANCE CRITERIA

Function	Fabrication	Pre-operation	Maintenance and Operations
Structural	a) Assembly and welding of HI-STAR overpack components will be performed per ASME Code, Subsection NB and NF, as applicable. b) Verification of structural materials will be performed through receipt inspection and review of certified material test reports (CMTRs) obtained in accordance with the item's quality classification category. c) A load test of the lifting trunnions will be performed during fabrication per ANSI N14.6. d) A ~~hydrostatic~~ pressure test of the helium retention boundary in accordance with ASME Code Section III, Subsection NB-6000 will be performed. e) A pneumatic pressure test of the neutron shield enclosure will be performed during fabrication.	a) None.	a) The rupture discs on the neutron shield vessel will be replaced every 5 years.

[9.1.8] U.S. Nuclear Regulatory Commission, "Fracture Toughness Criteria of Base Material for Ferritic Steel Shipping Cask Containment Vessels with a Wall Thickness Greater than 4 Inches (0.1m) But Not Exceeding 12 Inches (0.3m)," Regulatory Guide 7.12, June 1991.

[9.1.9] American National Standards Institute, Institute for Nuclear Materials Management, "American National Standard for Radioactive Materials Leakage Tests on Packages for Shipment", ANSI N14.5~~, January 1987.~~ (1997)

[9.1.10] Holtec International Position Paper DS-213, "Acceptable Flaw Size in MPC Lid-to-Shell Welds", Revision 2.

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SUPPLEMENT 1

PROPOSED COC CHANGES AND
PROPOSED TSAR CHANGES

2. The allowed temperature extremes, averaged over a three day period, shall be greater than -40°F, and less than 125°F.

3. The horizontal and vertical seismic acceleration levels are bounded by the values listed below in Table 1-4.

Table 1-4

Design-Basis Earthquake Input on the Top Surface of an ISFSI Pad

Horizontal g-level in each of two orthogonal directions	Horizontal g-level Vector Sum	Corresponding Vertical g-level (upward)
0.222 g	0.314 g	1.00 x 0.222 g = 0.222 g
0.235 g	0.332 g	0.75 x 0.235 g = 0.176 g
0.24 g	0.339 g	0.667 x 0.24 g = 0.160 g
0.25 g	0.354 g	0.500 x 0.25 g = 0.125 g

4. The analyzed flood condition of 12 fps water velocity and a height of 656 feet of water (full submergence of the loaded cask) are not exceeded.

5. The potential for fire and explosion shall be addressed, based on site-specific considerations. This includes the condition that the onsite transporter fuel tank will contain no more than 50 gallons of combustible transporter fuel.

6. In addition to the requirement of 10 CFR 72.212(b)(2)(ii), the cask storage pads and foundation shall include the following characteristics as applicable to the drop and tipover analyses:

   a. Concrete thickness: ≤ 36 inches

   b. Concrete compressive strength: ≤ 4,200 psi *at 28 days* |

   c. Reinforcement top and bottom (Both Directions):
      Reinforcement area and spacing determined by analysis
      ~~Reinforcement yield strength: ≤ 60,000 psi~~ |
      Reinforcing bar shall be 60 ksi yield strength ASTM material |

   d. Soil effective modulus of elasticity: ≤ 28,000 psi
      (Measured prior to ISFSI pad installation) |

2. The allowed temperature extremes, averaged over a three day period, shall be greater than -40°F, and less than 125°F.

3. The horizontal and vertical seismic acceleration levels are bounded by the values listed below in Table 1-4.

Table 1-4

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4. The analyzed flood condition of 12 fps water velocity and a height of 656 feet of water (full submergence of the loaded cask) are not exceeded.

5. The potential for fire and explosion shall be addressed, based on site-specific considerations. This includes the condition that the onsite transporter fuel tank will contain no more than 50 gallons of combustible transporter fuel.

6. In addition to the requirement of 10 CFR 72.212(b)(2)(ii), the cask storage pads and foundation shall include the following characteristics as applicable to the drop and tipover analyses:

   a. Concrete thickness: $\leq$ 36 inches

   b. Concrete compressive strength: $\leq$ 4,200 psi at 28 days

   c. Reinforcement top and bottom (Both Directions):
      Reinforcement area and spacing determined by analysis
      Reinforcing bar shall be 60 ksi yield strength ASTM material

   d. Soil effective modulus of elasticity: $\leq$ 28,000 psi
      (Measured prior to ISFSI pad installation)

Table 2.2.9

CHARACTERISTICS OF REFERENCE ISFSI PAD[†]

Concrete thickness	≤ 36 inches
Concrete Compressive Strength	≤ 4,200 psi at 28 days
Reinforcement Top and Bottom (both directions)	~~Specified Yield Strength = 60,000 psi~~
Soil Effective Modulus of Elasticity[††]	28,000 psi (measured prior to ISFSI pad installation)

Reinforcing bar shall be 60 ksi Yield Strength ASTM Material

† The characteristics of this pad are identical to the pad considered by Lawrence Livermore Laboratory (see Appendix 3.A).

†† An acceptable method of defining the soil effective modulus of elasticity applicable to the drop and tipover analysis is provided in Table 13 of NUREG/CR-6608 with soil classification in accordance with ASTM-D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System USCS) and density determination in accordance with ASTM-D1586 Standard Test Method for Penetration Test and Split/Barrel Sampling of Soils.

overpack's support action, mitigating further increase in the stress. Therefore, to compute primary stresses in the basket and the MPC shell under lateral drop events, the gaps should be assumed to be closed. However, for conservatism, it is assumed that an initial gap of 0.1875" exists, in the direction of the applied deceleration, at all support locations between the basket and the shell and the ~~diametral~~ gap between the shell and the overpack at the support locations is 3/32". All stresses produced by the applied loading on this configuration are compared with primary stress levels, even though the self-limiting stresses should be considered secondary in the strict definition of the Code. radial

- Description of Individual Loads and Boundary Conditions Applied to the MPCs

The method of applying each individual load to the MPC model is described in this subsection. The individual loads are listed in Table 2.2.14. A free-body diagram of the MPC corresponding to each individual load is given in Figures 3.4.12-3.4.15. In the following discussion, reference to vertical and horizontal orientations are made. Vertical refers to the direction along the cask axis, and horizontal refers to a radial direction.

Quasi-static structural analysis methods are used. The effects of any dynamic load factors (DLFs) are included in the final evaluation of safety margins. All analyses are carried out using the design basis decelerations in Table 3.1.2

The MPC models used for side drop evaluations are shown in Figures 3.4.6 through 3.4.11. In each model, the fuel basket and the enclosure vessel are constrained to move only in the direction that is parallel to the acceleration vector. The overpack inner shell, which is defined by three nodes needed to represent the contact surface, is fixed in all degrees of freedom. The fuel basket, enclosure vessel, and overpack inner shell are all connected at one location by linear springs (see Figure 3.4.6, for example).

(a) Accelerations

During a side impact event, the stored fuel is directly supported by the cell walls in the fuel basket. Depending on the orientation of the drop, 0 or 45 degrees (see Figures 3.4.14 and 3.4.15), either one or two walls support the fuel. The effect of deceleration on the fuel basket and canister metal structure is accounted for by amplifying the gravity field in the appropriate direction. In the finite element model this load is effected by applying a uniformly distributed pressure over the full span of the supporting walls. The magnitude of the pressure is determined by the weight of the fuel assembly (Table 2.1.6), the axial length of the fuel basket support structure, the width of the cell wall, and the impact acceleration. It is assumed that the load is evenly distributed along an axial length of basket equal to the fuel basket support structure. For example, the pressure applied to an impacted cell wall during a 0-degree side drop event is calculated as follows:

$$p = \frac{a_n W}{L \ell}$$

Table 3.A.1: Essential Variables to Characterize the Reference ISFSI Pad

Thickness of concrete	36 inches
Nominal compressive strength of concrete	4,200 psi at 28 days
Concrete mass density	2.097E-04 lb-sec^2/in^4
Concrete shear modulus	1.514E+06 psi
Concrete Poisson's ratio	0.22
Mass density of the engineered fill (soil)	1.498E-04
Effective Modulus of elasticity of the subgrade soil	28,000 psi
Poisson's ratio of the soil	0.3

Note 1. The concrete Young's Modulus is derived from the American Concrete Institute recommended formula $57{,}000\sqrt{f}$ where f is the nominal compressive strength of the concrete (psi).

2. The effective modulus of elasticity of the subgrade soil is to be measured by an appropriate "plate test" before pouring of the concrete ISFSI pad.

3. The pad thickness of 36", concrete compressive strength of 4200 psi (nom.) at 28 days of curing, and the subgrade soil effective modulus of 28000 psi are the upper bound values to ensure that the deceleration limits under postulated impact events set forth in Table 3.1.2 are satisfied.

Table 8.1.3
HI-STAR 100 SYSTEM TORQUE REQUIREMENTS

Fastener	Torque (ft-lbs)	Pattern
Overpack Closure Plate Bolts†, ††	First Pass – Hand Tight Second Pass – Wrench Tight Third Pass – 860+25/-25 Fourth Pass – 1725+50/-50 Final Pass - 2895+90/-90	Figure 8.1.31
Overpack Vent and Drain Port Cover Plate Bolts††	12+2/-0	X-pattern
Overpack Vent and Drain Port Plugs	~~22+2/-0~~ *45+5/-2*	None
Closure Plate Test Port Plug	~~22+2/-0~~ 45 +5/-2	None
Backfill Tool Test Cover Bolts††	16+2/-0	X-pattern
Shear Ring Segment Bolts	22+2/-0	None
Overpack Bottom Cover Bolts	200+20/-0	None
Pocket Trunnion Plugs	Hand Tight	None
Upper Fuel Spacers	Hand Tight	None
Threaded Inserts (all)	Hand Tight	None

† Detorquing shall be performed by turning the bolts counter-clockwise in 1/3 turn +/- 30 degrees increments per pass according to Figure 8.1.31 for three passes. The bolts may then be removed.

†† Bolts shall be cleaned and inspected for damage or excessive wear (replaced if necessary) and coated with a light layer of Fel-Pro Chemical Products, N-5000, Nuclear Grade Lubricant (or equivalent).

of the operation including the four aforementioned areas.

In order to ensure that the lifting trunnions do not have any hidden material flaws, the trunnions shall be tested at 300% of the maximum design (service) lifting load. The load (750,000 lbs) shall be applied for a minimum of 10 minutes. The accessible parts of the trunnions (areas outside the HI-STAR overpack), and the local HI-STAR 100 cask areas will then be visually examined to verify no deformation, distortion, or cracking has occurred. Any evidence of deformation, distortion or cracking of the trunnion or adjacent HI-STAR 100 cask areas will require replacement of the trunnion and/or repair of the HI-STAR 100 cask. Following any replacements and/or repair, the load testing shall be reperformed and the components re-examined in accordance with the original procedure and acceptance criteria. Testing will be performed in accordance with written and approved procedures. Certified material test reports verifying trunnion material mechanical properties meet ASME Code Section II requirements will provide further verification of the trunnion load capabilities. Test results shall be documented. The documentation shall become part of the final quality documentation package.

The acceptance testing of the trunnions in the manner described above will provide adequate assurance against handling accidents.

9.1.2.2 ~~Hydrostatic~~ Pressure Testing

9.1.2.2.1 HI-STAR 100 Helium Retention Boundary

The helium retention boundary of the HI-STAR overpack (e.g., the containment boundary during transportation) will be hydrostatically or pneumatically pressure tested to 150 psig +10,-0 psig, in accordance with the requirements of the ASME Code Section III, Subsection NB, Article NB-6000. The test pressure of 150 psig is 150% of the Maximum Normal Operating Pressure (established per 10CFR71.85(b) requirements). This bounds the ASME Code Section III requirement (NB-6221) for hydrostatic testing to 125% of the design pressure (100 psig). The test shall be performed in accordance with written and approved procedures. The approved test procedure shall clearly define the test equipment arrangement.

~~The overpack drain port will be used for filling the cavity with water and the vent port for venting the cavity.~~

The overpack ~~hydrostatic~~ pressure test may be performed at any time during fabrication after the containment boundary is complete. Preferably, the ~~hydrotest~~ pressure test should be performed after all overpack fabrication is complete, including attachment of the intermediate shells. The HI-STAR overpack shall be assembled for this test with the closure plate mechanical seal (only one required) *or temporary test seal* installed. Closure bolts shall be installed and torqued to an appropriate value less than or equal to the value specified in Chapter 8.

The calibrated test pressure gage installed on the overpack shall have an upper limit of approximately twice that of the test pressure. The hydrostatic test pressure shall be maintained for ten minutes. During this time period, the pressure gage shall not fall below 150 psig. At the end of point) shall be examined. If a leak is discovered, the overpack will be emptied and an evaluation to determine the cause of the leakage will be made. Repairs and retest shall be performed until the hydrostatic test criteria are met.

> Note: If failure of the ~~hydrostatic~~ pressure retest occurs after initial repairs are completed, a nonconformance report shall be issued and root cause and corrective action shall be addressed before further repairs and retest are performed.

After completion of the ~~hydrostatic~~ pressure testing, the closure plate will be removed and the internal surfaces shall be visually examined for cracking or deformation. Any evidence of cracking or deformation shall be cause for rejection or repair and retest, as applicable. The overpack shall be required to be ~~hydrotested~~ pressure tested until all examinations are found to be acceptable.

All test results shall be documented and shall become part of the final quality documentation package.

9.1.2.2.2 MPC Confinement Boundary

Hydrostatic testing of the MPC confinement boundary shall be performed in accordance with the requirements of the ASME Code Section III, Subsection NB, Article NB-6000, when field welding of the MPC lid-to-shell weld is completed. The hydrostatic pressure for the test is 125 +5,-0 psig, which is 125% of the design pressure of 100 psig. The MPC vent and drain ports will be used for pressurizing the MPC cavity. The loading procedures in Chapter 8 define the test equipment arrangement. The calibrated test pressure gage installed on the MPC confinement boundary shall have an upper limit of approximately twice that of the test pressure. Following completion of the 10-minute hold period at the hydrostatic test pressure, and while maintaining a minimum test pressure of 125 psig, the surface of the MPC lid-to-shell weld will be visually examined for leakage and then re- examined by dye penetrant examination. Any evidence of cracking or deformation shall be cause for rejection, or repair and retest, as applicable. The performance and sequence of the test and the acceptance criteria are described in Section 8.1 (loading procedures).

If a leak is discovered, the test pressure shall be reduced, the MPC cavity water level lowered, the MPC cavity vented (to the pool or the licensee's off-gas system), and the weld shall be examined to determine the cause of the leakage and/or cracking. Repairs to the weld shall be performed in accordance with approved written procedures prepared in accordance with the ASME Code Section III, Subsection NB, NB-4450.

The MPC confinement boundary hydrostatic test shall be repeated until all visual and dye penetrant examinations are found to be acceptable in accordance with the acceptance criteria. All test results shall be documented and shall be maintained as part of the loaded MPC quality documentation package.

Table 9.1.2 (continued)

HI-STAR OVERPACK
INSPECTION AND TEST ACCEPTANCE CRITERIA

Function	Fabrication	Pre-operation	Maintenance and Operations
Structural	a) Assembly and welding of HI-STAR overpack components will be performed per ASME Code, Subsection NB and NF, as applicable.	a) None.	a) The rupture discs on the neutron shield vessel will be replaced every 5 years.
	b) Verification of structural materials will be performed through receipt inspection and review of certified material test reports (CMTRs) obtained in accordance with the item's quality classification category.		
	c) A load test of the lifting trunnions will be performed during fabrication per ANSI N14.6.		
	d) A ~~hydrostatic~~ pressure test of the helium retention boundary in accordance with ASME Code Section III, Subsection NB-6000 will be performed.		
	e) A pneumatic pressure test of the neutron shield enclosure will be performed during fabrication.		

[9.1.8] U.S. Nuclear Regulatory Commission, "Fracture Toughness Criteria of Base Material for Ferritic Steel Shipping Cask Containment Vessels with a Wall Thickness Greater than 4 Inches (0.1m) But Not Exceeding 12 Inches (0.3m)," Regulatory Guide 7.12, June 1991.

[9.1.9] American National Standards Institute, Institute for Nuclear Materials Management, "American National Standard for Radioactive Materials Leakage Tests on Packages for Shipment", ANSI N14.5, ~~January 1987.~~ (1997)

[9.1.10] Holtec International Position Paper DS-213, "Acceptable Flaw Size in MPC Lid-to-Shell Welds", Revision 2.