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November 27, 2001

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: USNRC Docket No. 72-1014, TAC L23344
HI-STORM 100 Certificate of Compliance 1014

Reference: NRC letter, T. Kobetz to B. Gutherman, Holtec, dated November 16, 2001

Dear Sir:

We have reviewed the preliminary Certificate of Compliance (CoC) and Safety Evaluation Report (SER) for our HI-STORM 100 System amendment request that was enclosed with the above-referenced letter. The two tables attached to this letter contain our comments on the CoC and SER. Table 1 contains comments on the CoC and its appendices. Table 2 contains comments on the SER.

To address the comment in the last sentence of SER Section 2.1, we enclose a proposed modification to FSAR Appendix 2.A, Section 2.A.3 to better describe those components of the cask anchorage system that are important to safety. Assuming these changes address this SER comment adequately, they will be included in Revision 1 of the FSAR.

Please contact me at (856) 797-0900, extension 668 if you require additional information.

Sincerely,

Brian Gutherman, P.E.
Licensing Manager

Technical Concurrence:

Dr. Alan Soler (Structural Evaluation)

Dr. Indresh Rampall (Thermal Evaluation)

Dr. Everett Redmond II (Shielding Evaluation)

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Technical Concurrence (cont'd):

Dr. Stefan Anton (Criticality Evaluation)

Mr. Kris Cummings (Confinement Evaluation)

Document I.D.: 5014444

Enclosure: Proposed revision to HI-STORM FSAR Appendix 2.A

cc: Mr. Tim Kobetz, USNRC (w/attach. and encl.)
HUG Group N (w/attach. and encl.)
HUG Licensing Committee (w/attach. and encl.)
Holtec Group 1 (w/attach. and encl.)

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Attachment

Table 1
Holtec Comments on Preliminary CoC

ITEM	COC SECTION	COMMENT	BASIS
1	Section 1.b, "Description"	In the third paragraph: a. Move the parenthetical clarification of damaged fuel, currently located at the end of the fifth sentence, to the end of the third sentence, where this term first occurs. b. Move the parenthetical clarification of fuel debris, currently located at the end of the seventh sentence, to the end of the fourth sentence, where this term first occurs. c. Revise the seventh sentence and create a new eighth sentence to read (changes shown in italics) : "The MPC-68F holds up to 68 Dresden Unit 1 or Humboldt Bay BWR fuel assemblies that may be intact or damaged. *Up to four Dresden Unit 1 or Humboldt Bay fuel assemblies in the MPC-68F may be* in the form of fuel debris." d. In the next-to-last sentence, there appears to be an unneeded line break after "stored in."	a. Editorial correction. b. Editorial correction. c. To make this CoC section agree with the Approved Contents section in CoC Appendix B, Table 2.1-1, Section III.B. d. Editorial correction.
2	Section 1.b, "Description"	In the fifth paragraph, second sentence, correct "H-STORM" to read "HI-STORM."	Editorial correction.

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ITEM	COC SECTION	COMMENT	BASIS
3	Section 9, "Special Requirements for First Systems in Place."	In the first sentence: a. Add "(for each thermally unique MPC basket design - MPC-24; MPC-24E or -24EF; MPC-32; and MPC-68, -68F, or -68FF)" after "characteristics of the cask system." b. Delete the existing parenthetical listing of the MPC model numbers. c. Add "by any user" after "placed into service." Delete the last sentence of the third paragraph.	To reflect the intent of this requirement. That is, to have one test, at each heat load threshold, for each MPC basket design that is unique from a thermal performance standpoint.
4	Section 10, "Pre-operational Testing and Training Exercise"	Change the second item 'a' to item 'g'.	Editorial correction.
5	Appendix A, Table of Contents	Section 5.6 is missing from the Table of Contents.	Editorial correction.
6	Appendix A, Section 1.1, "Definitions"	In the last sentence of the definition of TRANSPORT OPERATIONS, correct a typographical error in the word "OPERATIONS"	Editorial correction.
7	Appendix A, Section 5.6, "Fuel Cladding Oxide Thickness Evaluation Program"	In the second paragraph, second sentence, change the second "is" to "if."	Editorial correction.

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ITEM	COC SECTION	COMMENT	BASIS
8	Appendix B, Section 2.0, "Approved Contents", Table 2.1-1, Sections I, IV, and VII.	In Note 1 at the end of these table sections, add a comma after "BPRAS."	Editorial correction.
9	Appendix B, Section 2.0, "Approved Contents", Table 2.1-2, page 3 of 4	In the "Initial Enrichment" row header, add a comma after MPC-24."	Editorial correction.
10	Appendix B, Section 3.2, "Design Features Important for Criticality Control"	In Subsection 3.2.6, add the following after "basket": "when there is water in the MPC."	This CoC section lists design features important for criticality control. This design feature is only important for criticality control when there is water, acting as moderator, in the MPC. The current wording may unnecessarily inhibit changes to the fuel spacer design not related to criticality control. The Holtec QA program and 10 CFR 72.48 provide the appropriate controls for evaluating changes to the fuel spacer design.
11	Appendix B, Section 3.3, "Codes and Standards"	In the second sentence, change "Topical" to "Final."	Editorial correction.

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Table 2
Holtec Comments on Preliminary SER

ITEM	SER SECTION	COMMENT	BASIS
1	1.1.2	a. The first two bullets should be revised to recognize that non-fuel hardware is permitted for storage in the MPC-24E and MPC-24EF. b. In the fourth bullet, add "in" after the second "stored."	a. To be consistent with the "Approved Contents" section in Appendix B to the CoC. b. Editorial correction.
2	1.3	In the first bullet, change "thimble plug assemblies" to "thimble plug devices"	To be consistent with the "Approved Contents" section in Appendix B to the CoC.
3	1.4	Delete the second set of items F1.5 through F1.7.	Information is repeated.
4	2.1	In the second paragraph, delete the last sentence.	This information is provided in proposed revised FSAR text enclosed with this letter.
5	2.2.1	In the first sentence, after "either", add "up to."	To be consistent with the "Approved Contents" section in Appendix B to the CoC.
6	3.1.2	In the second sentence, change the table numbers to "2.0.1, 2.0.2, and 2.0.3."	Editorial correction.
7	3.1.2.1	Delete all text after the first sentence that refers to "alternative acceptance criteria relative to closure weld inspections."	This amendment request did not include alternate acceptance criteria for closure weld inspections. Multi-layer PT examination of the MPC lid-to-shell weld as an alternative to UT examination was included in the original HI-STORM CoC.
8	3.1.2.3	In the fourth paragraph, second sentence, after "subgrade with" delete "an" and insert "a lower."	Editorial correction.

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ITEM	SER SECTION	COMMENT	BASIS
9	4.1.2	In the last sentence of the section, correct a typographical error with the word "publicly."	Editorial correction.
10	4.1.4	In the next-to-last paragraph, the first occurrence of "W" should be a "delta" symbol.	Editorial correction.
11	4.1.5	The paragraph after Table 4-1 appears to be missing some text. Suggest replacing "demoisturized during helium recirculation process" with "forced helium dehydration" and adding "below" after "maintained."	Editorial correction.
12	4.2.2	a. In the first paragraph, fifth sentence, change "MPC" to "cask" and "canister" to "overpack." b. In the third paragraph, the sixth and seventh sentences need to be revised to recognize that the aluminum heat conduction elements (AHCEs) are optional equipment.	a. Editorial correction. b. The ACHEs were left in the thermal model where it was conservative to do so, but no credit for the ACHEs was taken for heat transfer (see paragraph 4 of SER Section 4.4).

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ITEM	SER SECTION	COMMENT	BASIS
13	4.2.2	In the fourth paragraph: a. In the eighth sentence, change "Up to eight (8)" to "Up to four (4)" and add the word "fuel" before the word "debris." b. In the 11th and 12th sentences, revise the text to indicate that fuel assemblies classified as fuel debris are limited to eight in the MPC-68FF regardless of the plant of origin. c. In the tenth sentence, replace "locations" with "plants."	a and b. To be consistent with the "Approved Contents" section in Appendix B to the CoC. c. Editorial correction.
14	4.4	In the last paragraph before Table 4.5, in the second sentence, change "a" to "at."	Editorial correction.
15	4.4	In the fourth paragraph after Table 4.6: a. The examples of non-fuel hardware should be expanded to include wet annular burnable absorbers (WABAs), rod cluster control assemblies (RCCAs), control element assemblies (CEAs), water displacement guide tube plugs, and orifice rod assemblies. b. In the first sentence, revise the MPC listing to include the MPC-24E and the MPC-24EF.	a. To be consistent with the definition of non-fuel hardware in CoC Appendix B, Section 1.0. b. Editorial correction.

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ITEM	SER SECTION	COMMENT	BASIS
	4.4 (cont'd)	c. In the seventh sentence, revise the MPC listing to include the MPC-24EF. d. In the last sentence, add an apostrophe between the "t" and the "s" in "applicants."	c. Editorial correction. d. Editorial correction.
16	4.4	In the seventh paragraph after Table 4.6: a. In the seventh sentence, delete everything after "concluded that..." and insert "no component reaches its short-term temperature limit for the assumed 72-hour event duration." Delete the eighth sentence entirely. The text in the ninth sentence needs to be revised accordingly. b. Ninth sentence, change "MPC closure plate" to "MPC lid." c. 10th sentence, define "HAC" (hypothetical accident conditions)?	a. FSAR Subsection 11.2.13.2 describes the change in acceptance criterion from inner concrete surface temperature to concrete section average temperature. Table 11.2.9 shows no component exceeding its temperature limit for 72 hours. The TS action times have been kept the same as a conservative measure and the Bases in FSAR Appendix 12.A have been revised accordingly. b and c. Editorial corrections.
17	4.6.2	In the first paragraph after Table 4.7, fourth sentence, replace "dew point of the gas in the MPC cavity" with "temperature of the gas exiting the demoisturizer."	To reflect Surveillance Requirement SR 3.1.1.1 in Appendix A to the CoC.
18	4.7	In the second paragraph, item 2 of the first sentence, correct the units of burnup for moderate burnup fuel to be "MWD/MTU."	Editorial correction.

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ITEM	SER SECTION	COMMENT	BASIS
19	F4.7	In the first sentence, change "1-CFR Part 72" to 10 CFR Part 72."	Editorial correction.
20	4.8	Correct reference numbers.	Editorial correction.
21	5.2	In the first paragraph, first sentence, change "allow" to "require" and change "inside" to "outside."	The LCO *requires* contamination surveys. The second change is for consistency with the new LCO note.
22	5.4	a. In the third paragraph, add "DFC" after "TN/D-1." b. In the sixth paragraph, either delete item (d) or clarify that this reason only applies to the TN/D-1 DFC. If clarified, remove reference to the HI-STAR system and a transfer cask.	a. Editorial correction. b. The other DFC changes were not previously approved under the HI-STAR docket and the HI-STAR system does not employ a transfer cask.
23	5.6	In the first paragraph, second sentence, change "emission rates the" to "emission rates to."	Editorial correction.
24	5.7	a. In the second paragraph, first sentence, it is unclear what References 1 and 2 are. They do not appear to be listed in the SER. b. In the third paragraph, fourth sentence, change "hardware devises in" to "hardware devices to."	a. Clarification. b. Editorial correction.
25	5.8	In the first paragraph, in each case where the phrase "design basis BWR fuel" is used, insert the term "6x6" after "basis."	Clarification to distinguish this design basis fuel assembly, unique to Dresden Unit 1 fuel from the generic 7x7 BWR design basis assembly.
26	5.9	In the first paragraph, last sentence, changes "was" to "were."	Editorial correction.

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ITEM	SER SECTION	COMMENT	BASIS
27	5.11	a. In the first table, first column, change "3.4 wt.%" to "3.5 wt.%" and in the third column, change "0.67" to "2.16." b. In the second table, first column, change "5201.89" to 5201.86" and change 3729.61" to "3726.61." c. In the first paragraph after the tables, fourth sentence, change "reducing" to "minimizing." d. In the third paragraph after the tables, add "for the MPC-24" at the end of the first sentence.	a and b. To be consistent with the shielding analysis inputs and results. c. Editorial correction. d. Clarification.
28	5.18	In the last paragraph, add "and" after "analyzed."	Editorial correction.
29	6.4.4 and 6.11	Delete all discussion of Holtec not considering tolerances in Boral panel lengths.	As discussed in FSAR Section 6.3.1, the length of Boral panels was assumed to be the same as the active fuel length (maximum of 150 inches) for all criticality analyses. In every case, the analyzed Boral length is at least 5-7/8 inches less than the nominal panel length (156 inches +/- $1/8^{th}$ inch per the design drawings). This element of the methodology has not changed since original HI-STORM licensing.
30	6.11	In the first paragraph, sixth sentence, add "in" after "drawings."	Editorial correction.

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ITEM	SER SECTION	COMMENT	BASIS
31	7.1, 7.1.1.6, 7.4.1, and F7.3	Correct the name of the storage system to "HI-STORM" (all capitals).	Editorial correction.
32	7.1	In the fourth paragraph, third sentence: a. Change "if" to "is." b. Change "demineralized" to "uncontaminated."	 a. Editorial correction. b. The water in the annulus may not be demineralized water.
33	7.1.1.1	In the third sentence, delete the second "a."	Editorial correction.
34	7.1.1.3	Suggest re-naming Subsection 7.1.1.3 as "Addition of the MPC-24E and MPC-24EF Designs" and re-locating information from Subsection 7.1.1.5, except that the statement "The MPC-24EF is bounded by the MPC-24" should be deleted.	Clarification. The statement proposed for deletion is incorrect.
35	7.1.1.5	Suggest re-naming Subsection 7.1.1.5 as "Addition of the MPC-68FF Design" and adding appropriate discussion.	To be consistent with the previous two sections, MPC-68FF should be included
36	7.1.1.6	In the first paragraph: a. In the third sentence, change "enrichment" to "masses." b. In the fourth sentence, delete "for the design basis fuel assembly."	 a. Editorial correction. b. Clarification. The uranium masses for non-design basis fuel assemblies were increased to the value used in their analysis, which may not have been as high as that used for the design basis fuel assembly.

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ITEM	SER SECTION	COMMENT	BASIS
37	7.4	Delete all text from the fifth sentence on, beginning with "The methods used..." to the end of the paragraph.	10 CFR 72.48 provides sufficient regulatory controls governing whether prior NRC approval is required for changes, test and experiments associated with a cask design, including proposed changes to methods of evaluation. Additional regulatory controls imposed through the SER are unnecessary.
38	Table 7.1	In the first column, change "Failed Fuel" to "Source Term Available for Release."	To use terminology consistent with the FSAR and ISG-15.
39	7.4.1	In the second paragraph, second sentence, delete "$7.5x10^{-6}$ atm-cm^3/sec (reference conditions)."	Editorial correction.
40	Table 7.2	a. In the first PWR column, change "0.624" to "0.642." b. In the first BWR column, change "261" to "216." c. In the second BWR column, change "5.14" to "38.9."	To be consistent with the data in FSAR Tables 7.3.2, 7.3.4, and 7.3.5.
41	F7.6	In the second sentence, change "reasonable" to "reasonably."	Editorial correction.
42	11.1	In the first paragraph, change "Section 11" to Section 11.1" (two places).	Editorial correction.
43	11.2	In the first paragraph, change "Section 11" to Section 11.2" (two places).	Editorial correction.
44	12.0	In the first sentence, delete "of."	Editorial correction.
45	13.0	Change "TN West" to "Holtec International."	Editorial correction.
46	15.2.1	Delete this section entirely.	See item 37.

Enclosure to Holtec Letter 5014444
6 Sheets

APPENDIX 2.A

GENERAL DESIGN AND CONSTRUCTION REQUIREMENTS FOR THE ISFSI PAD FOR HI-STORM 100A

2.A.1 General Comments

As stated in Section 2.0.4, an ISFSI slab that anchors a spent fuel storage cask should be classified as "important to safety." This classification of the slab follows from the provisions of 10CFR72, which require that the cask system retain its capacity to store spent nuclear fuel in a safe configuration subsequent to a seismic or other environmental event. Since the slab for anchored HI-STORM deployment is designated as ITS, the licensee is required to determine whether the reactor site parameters, including earthquake intensity and large missiles, are enveloped by the cask design bases. The intent of the regulatory criteria is to ensure that the slab meets all interface requirements of the cask design and the geotechnical characteristics of the ISFSI site.

This appendix provides general requirements for design and construction of the ISFSI concrete pad as an ITS structure, and also establishes the framework for ensuring that the ISFSI design bases are clearly articulated. The detailed design of the ISFSI pad for anchored HI-STORM deployment shall comply with the technical provisions set forth in this appendix.

2.A.2 General Requirements for ISFSI Pad

1. *Consistent with the provisions of NUREG-1567 [2.0.6], all concrete work shall comply with the requirements of ACI-349-97 [2.0.2].*

2. *All reinforcing steel shall be manufactured from high strength billet steel conforming to ASTM designation A615 Grade 60.*

3. *The ISFSI owner shall develop appropriate mixing, pouring, reinforcing steel placement, curing, testing, and documentation procedures to ensure that all provisions of ACI 349-97 [2.0.2] are met.*

4. *The placement, depth, and design and construction of the slab shall take into account the depth of the frost line at the ISFSI location. The casks transmit a very small amount of heat into the cask pad through conduction. The American Concrete Institute guidelines on reinforced concrete design of ground level slabs to minimize thermal and shrinkage induced cracking shall be followed.*

5. *General Requirements for Steel Embedment: The steel embedment,* excluding *the* pre-tensioned *anchorage* studs, is *required to follow the provisions stipulated in ACI 349-97 [2.0.2], Appendix B "Steel Embedment" and the associated Commentary on Appendix B, as applicable. Later editions of this Code may be used provided a written reconciliation is performed. An example of one acceptable embedment configuration is provided in Figure 2.A.1. Site-specific embedment designs may vary from this example, depending on the geotechnical characteristics of the site-specific foundation. The embedment designer shall consider any current, relevant test data in designing the pad embedment for HI-STORM 100A and HI-STORM 100SA.*

6. *The ISFSI owner shall ensure that pad design analyses, using interface loads provided in this report, demonstrate that all structural requirements of NUREG-1567 and ACI-349-97 are satisfied.*

7. *Unless the load handling device is designed in accordance with ANSI N14.6 and incorporates redundant drop protection features, the ISFSI owner shall ensure that a permissible cask carry height is computed for the site-specific pad/foundation configuration such that the design basis deceleration set forth in this FSAR are not exceeded in the event of a handling accident involving a vertical drop.*

8. *The ISFSI owner shall ensure that the pad/foundation configuration provides sufficient safety margins for overall kinematic stability of the cask/pad/foundation assemblage.*

9. *The ISFSI owner shall ensure that the site--specific seismic inputs, established at the top surface of the ISFSI pad, are bounded by the seismic inputs used as the design basis for the attachment components. If required, the ISFSI owner shall perform additional analyses to ensure that the site-specific seismic event or durations greater than the design basis event duration analyzed in this report, do not produce a system response leading to structural safety factors (defined as allowable stress (load) divided by calculated stress (load)) less than 1.0. Table 2.0.5 and Table 2.2.8 provide the limiting values of ZPAs in the three orthogonal directions that must not be exceeded at an ISFSI site (on the pad top surface) to comply with the general CoC for the HI-STORM 100A (and 100SA) System.*

10. *An ISFSI pad used to support anchored HI-STORM overpacks, unlike the case of free standing overpacks, may experience tensile (vertically upward) anchorage forces in addition to compression loads. The reinforcing steel (pattern and quantity) must be selected to meet the demands of the anchorage forces under seismic and other environmental conditions that involve destabilizing loadings (such as the large tornado missile defined in this FSAR).*

2.A.3 Steel Embedment for Anchored Casks

Figure 2.A.1 shows a typical fastening arrangement for the HI-STORM 100A System. The details of the rebars in the pad (which are influenced by the geotechnical characteristics of the foundation and its connection to the underlying continuum) are not shown in Figure 2.A.1. Representative dimensions of the embedment and anchorage system are provided in Table 2.A.1.

The embedment detail illustrated in Figure 2.A.1 is designed to resist a load equal to the ASME Code, Section III Appendix F Level D load capacity of the cask anchor studs. The figure does not show the additional reinforcement required to ensure that tensile cracking of concrete is inhibited (see Figure B-4 in the Commentary ACI-349R-97) as this depends on the depth chosen for the ITS ISFSI pad concrete. The ACI Code contemplates ductile failure of the embedment steel and requires that the ultimate load capacity of the steel embedment be less than the limit pullout strength of the concrete surrounding the embedment that resists the load transferred from the cask anchor stud. If this criterion cannot be assured, then additional reinforcement must be added to inhibit concrete cracking (per Subsection B.4.4 of Appendix B of ACI-349-97).

The anchor stud receptacle described in Figure 2.A.1 is configured so that the cask anchor studs (which interface with the overpack baseplate as well as the pad embedment per Table 2.0.5 and are designed in accordance with ASME Section III, Subsection NF stress limits), sits flush with the ISFSI top surface while the cask is being positioned. Thus, a translocation device such as an "air pad" (that requires a flat surface) can be used to position the HI-STORM at the designated location. Subsequent to positioning of the cask, the cask anchor stud is raised, the anchor stud nut installed, and the anchor stud preload applied. The transfer of load from the cask anchor stud to the embedment is through the bearing surface of the lower head of the cask anchor stud and the upper part of the anchor stud receptacle shown in the figure. The members of the anchoring system illustrated in Figure 2.A.1, as well as other geometries developed by the ISFSI designer, must meet the following criteria:

i. The weakest structural link in the system shall be in the ductile member. In other words, the tension capacity of the anchor stud/anchor receptacle group (based on the material ultimate strengths) shall be less than the concrete pull-out strength (computed with due recognition of the rebars installed in the pad).

ii. The maximum ratio of embedment plus cask anchor stud effective tensile stiffness to the effective compressive stiffness of the embedment plus concrete shall not exceed 0.25 in order to ensure the effectiveness of the pre-load.

iii. The maximum axial stress in the cask anchor studs under normal and seismic conditions shall be governed by the provisions of ASME Section III Subsection NF (1995).

NEW → *iv. The load-bearing members of the HI-STORM 100A anchorage system shall be*

considered important-to-safety. This includes the following components shown in Figure 2.A.1: anchor stud and nut, top ring, upper collar, anchor receptacle, and anchor ring.

For sites with lower ZPA DBE events, compared to the limiting ZPAs set down in this FSAR, the size of the anchor studs and their number can be appropriately reduced. However, the above three criteria must be satisfied in all cases.

Table 2.A.1 *Typical Embedment and Anchoring Data (Figure 2.A.1)*	
Nominal diameter of the anchor stud, (-inch)	*2*
Thickness of the embedment ring, (inch)	*2*
I.D. of the embedment ring, (inch)	*130*
Anchor receptacle: *Upper Position O.D. and I.D. (inch)* *Lower portion O.D. and I.D. (inch)*	 *O.D.: 2.5 / I.D.: 2.125 (min.)* *O.D.: 4.875 / I.D.: 3.625 (min.)*
Depth of anchor receptacle collar, d, (inch)	*2.5*
Free fall height of the anchor stud, h_e (inch)	*8*
Representative Materials of Construction are as follows:[1]	
Anchor Studs:	*Per Table 2.0.4*
Anchor Receptacle:	*Low carbon steel such as A-36, A-105*
Top Ring, Upper Collar, Anchor Ring:	*Low carbon steel such as A-36, A-516-Gr. 70*

1 The ISFSI designer shall ensure that all permanently affixed embedment parts (such as the anchor receptacle) made from materials vulnerable to deleterious environmental effects (e.g. low carbon steel) are protected through the use of suitably engineered corrosion barrier. Alternatively, the selected material of construction must be innately capable of withstanding the long term environmental conditions at the ISFSI site.

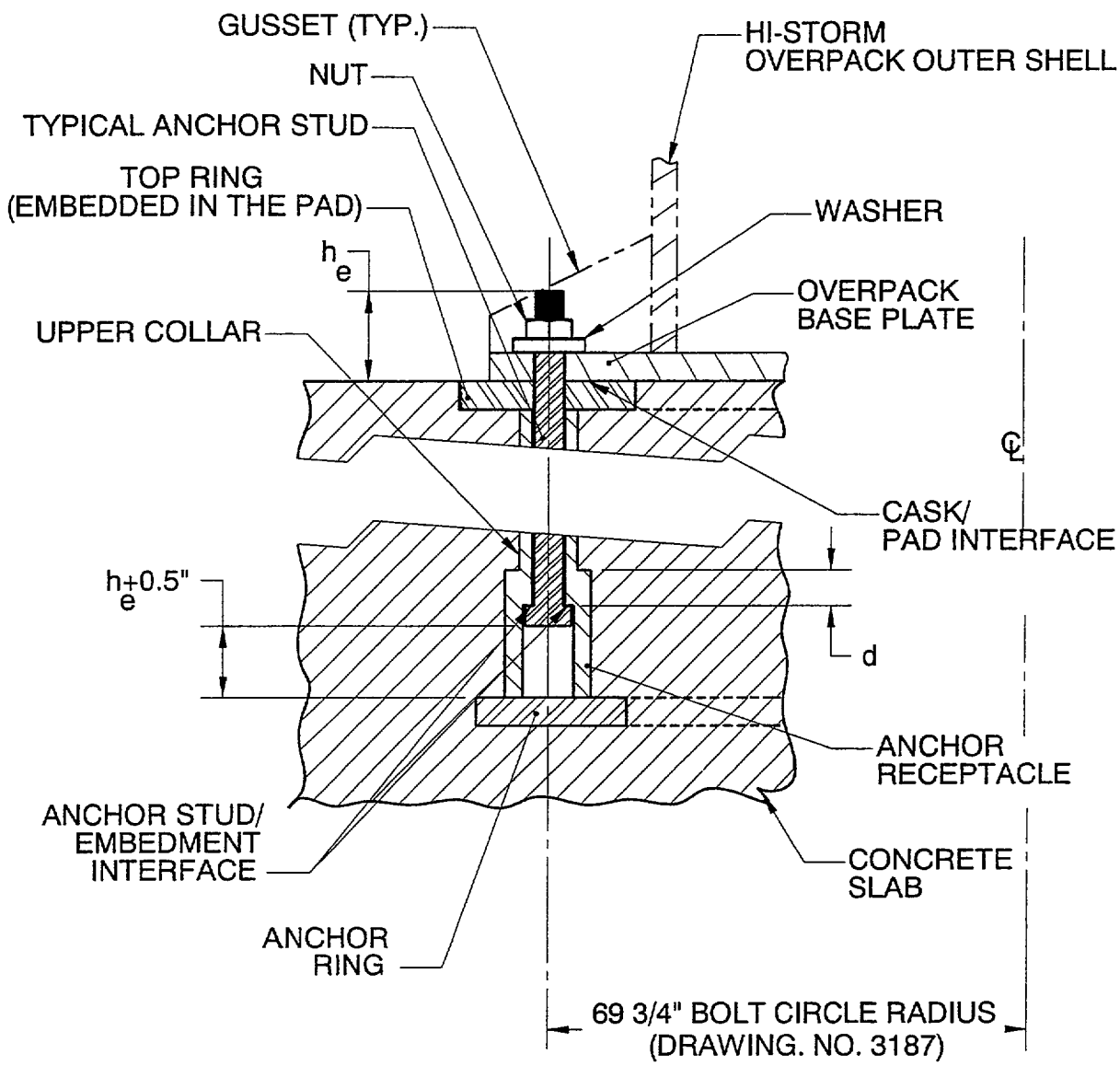

Figure 2.A.1;
Typical HI-STORM/ISFSI pad Fastening Detail

Note: Rebars in the ISFSI pad and sub-surface soil/rock continuum not shown.