

CHAPTER 12†: OPERATING CONTROLS AND LIMITS

12.0 INTRODUCTION

The HI-STORM 100 System provides passive dry storage of spent fuel assemblies in interchangeable MPCs with redundant multi-pass welded closure. The loaded MPC is enclosed in a single-purpose ventilated metal-concrete overpack. This chapter defines the operating controls and limits (i.e., Technical Specifications) including their supporting bases for deployment and storage of a HI-STORM 100 System at an ISFSI. The information provided in this Chapter is in full compliance with NUREG-1536 [12.1.1].

† This chapter has been prepared in the format and section organization set forth in Regulatory Guide 3.61. However, the material content of this chapter also fulfills the requirements of NUREG-1536. Pagination and numbering of sections, figures, and tables are consistent with the convention set down in Chapter 1, Section 1.0, herein. Finally, all terms-of-art used in this chapter are consistent with the terminology of the glossary (Table 1.0.1) and component nomenclature of the Bill-of-Materials (Section 1.5).

12.1 PROPOSED OPERATING CONTROLS AND LIMITS

12.1.1 NUREG-1536 (Standard Review Plan) Acceptance Criteria

12.1.1.1 This portion of the FSAR establishes the commitments regarding the HI-STORM 100 System and its use. Other 10CFR72 [12.1.2] and 10CFR20 [12.1.3] requirements in addition to the Technical Specifications may apply. The conditions for a general license holder found in 10CFR72.212 [12.1.2] shall be met by the licensee prior to loading spent fuel into the HI-STORM 100 System. The general license conditions governed by 10CFR72 [12.1.2] are not repeated with these Technical Specifications. Licensees are required to comply with all commitments and requirements.

12.1.1.2 The Technical Specifications provided in Appendix A to CoC 72-1014 and the authorized contents and design features provided in Appendix B to CoC 72-1014 are primarily established to maintain subcriticality, confinement boundary and intact fuel cladding integrity, shielding and radiological protection, heat removal capability, and structural integrity under normal, off-normal and accident conditions. Table 12.1.1 addresses each of these conditions respectively and identifies the appropriate Technical Specification(s) designed to control the condition. Table 12.1.2 provides the list of Technical Specifications for the HI-STORM 100 System.

Table 12.1.1
HI-STORM 100 SYSTEM CONTROLS

Condition to be Controlled	Applicable Technical Specifications [†]
Criticality Control	Refer to Appendix B to Certificate of Compliance 72-1014 for fuel specifications and design features 3.3.1 Boron Concentration
Confinement Boundary and Intact Fuel Cladding Integrity	3.1.1 Multi-Purpose Canister (MPC) 5.6 Fuel Cladding Oxide Thickness Evaluation Program
Shielding and Radiological Protection	Refer to Appendix B to Certificate of Compliance 72-1014 for fuel specifications and design features 3.1.1 Multi-Purpose Canister (MPC) 3.1.3 Fuel Cool-Down 3.2.1 TRANSFER CASK Average Surface Dose Rates 3.2.2 TRANSFER CASK Surface Contamination 3.2.3 OVERPACK Average Surface Dose Rates
Heat Removal Capability	Refer to Appendix B to Certificate of Compliance 72-1014 for fuel specifications and design features 3.1.1 Multi-Purpose Canister (MPC) 3.1.2 SFSC Heat Removal System
Structural Integrity	3.5 Cask Transfer Facility (CTF) (CoC 72-1014, Appendix B – Design Features) 5.5 Cask Transport Evaluation Program

[†] Technical Specifications are located in Appendix A to CoC 72-1014.

Table 12.1.2
HI-STORM 100 SYSTEM TECHNICAL SPECIFICATIONS

NUMBER	TECHNICAL SPECIFICATION
1.0	USE AND APPLICATION 1.1 Definitions 1.2 Logical Connectors 1.3 Completion Times 1.4 Frequency
2.0	Not Used. Refer to Appendix B to CoC 72-1014 for fuel specifications.
3.0	LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY SURVEILLANCE REQUIREMENT (SR) APPLICABILITY
3.1.1	Multi-Purpose Canister (MPC)
3.1.2	SFSC Heat Removal System
3.1.3	Fuel Cool-Down
3.2.1	TRANSFER CASK Average Surface Dose Rates
3.2.2	TRANSFER CASK Surface Contamination
3.2.3	OVERPACK Average Surface Dose Rates
3.3.1	Boron Concentration
Table 3-1	MPC Model-Dependent Limits
4.0	Not Used. Refer to Appendix B to CoC 72-1014 for design features.
5.0	ADMINISTRATIVE CONTROLS AND PROGRAMS
5.1	Deleted
5.2	Deleted
5.3	Deleted
5.4	Radioactive Effluent Control Program
5.5	Cask Transport Evaluation Program
5.6	Fuel Cladding Oxide Thickness Evaluation Program
Table 5-1	TRANSFER CASK and OVERPACK Lifting Requirements

12.2 DEVELOPMENT OF OPERATING CONTROLS AND LIMITS

This section provides a discussion of the operating controls and limits for the HI-STORM 100 System to assure long-term performance consistent with the conditions analyzed in this FSAR. In addition to the controls and limits provided in the Technical Specifications contained in Appendix A to Certificate of Compliance 72-1014 and the Approved Contents and Design Features in Appendix B to Certificate of Compliance 72-1014, the licensee shall ensure that the following training and dry run activities are performed.

12.2.1 Training Modules

Training modules are to be developed under the licensee's training program to require a comprehensive, site-specific training, assessment, and qualification (including periodic re-qualification) program for the operation and maintenance of the HI-STORM 100 Spent Fuel Storage Cask (SFSC) System and the Independent Spent Fuel Storage Installation (ISFSI). The training modules shall include the following elements, at a minimum:

1. HI-STORM 100 System Design (overview);
2. ISFSI Facility Design (overview);
3. Systems, Structures, and Components Important to Safety (overview)
4. HI-STORM 100 System Final Safety Analysis Report (overview);
5. NRC Safety Evaluation Report (overview);
6. Certificate of Compliance conditions;
7. HI-STORM 100 Technical Specifications, Approved Contents, Design Features and other Conditions for Use;
8. HI-STORM 100 Regulatory Requirements (e.g., 10CFR72.48, 10CFR72, Subpart K, 10CFR20, 10CFR73);
9. Required instrumentation and use;
10. Operating Experience Reviews

11. HI-STORM 100 System and ISFSI Procedures, including

- Procedural overview
- Fuel qualification and loading
- MPC /HI-TRAC/overpack rigging and handling, including safe load pathways
- MPC welding operations
- HI-TRAC/overpack closure
- Auxiliary equipment operation and maintenance (e.g., draining, moisture removal, helium backfilling, and cooldown)
- MPC/HI-TRAC/overpack pre-operational and in-service inspections and tests
- Transfer and securing of the loaded HI-TRAC/overpack onto the transport vehicle.
- Transfer and offloading of the HI-TRAC/overpack
- Preparation of MPC/HI-TRAC/overpack for fuel unloading
- Unloading fuel from the MPC/HI-TRAC/overpack
- Surveillance
- Radiation protection
- Maintenance
- Security
- Off-normal and accident conditions, responses, and corrective actions

12.2.2 Dry Run Training

A dry run training exercise of the loading, closure, handling, and transfer of the HI-STORM 100 System shall be conducted by the licensee prior to the first use of the system to load spent fuel assemblies. The dry run shall include, but is not limited to the following:

1. Receipt inspection of HI-STORM 100 System components.
2. Moving the HI-STORM 100 MPC/HI-TRAC into the spent fuel pool.
3. Preparation of the HI-STORM 100 System for fuel loading.
4. Selection and verification of specific fuel assemblies to ensure type conformance.
5. Locating specific assemblies and placing assemblies into the MPC (using a dummy fuel assembly), including appropriate independent verification.
6. Remote installation of the MPC lid and removal of the MPC/HI-TRAC from the spent fuel pool.

7. Replacing the HI-TRAC pool lid with the transfer lid (HI-TRAC 100 and 125 only).
8. MPC welding, NDE inspections, hydrostatic testing, draining, moisture removal, helium backfilling and leakage testing (for which a mockup may be used).
9. HI-TRAC upending/downending on the horizontal transfer trailer or other transfer device, as applicable to the site's cask handling arrangement.
10. Placement of the HI-STORM 100 System at the ISFSI.
11. HI-STORM 100 System unloading, including cooling fuel assemblies, flooding the MPC cavity, and removing MPC welds (for which a mock-up may be used).

12.2.3 Functional and Operating Limits, Monitoring Instruments, and Limiting Control Settings

The controls and limits apply to operating parameters and conditions which are observable, detectable, and/or measurable. The HI-STORM 100 System is completely passive during storage and requires no monitoring instruments. The user may choose to implement a temperature monitoring system to verify operability of the overpack heat removal system in accordance with Technical Specification Limiting Condition for Operation (LCO) 3.1.2.

12.2.4 Limiting Conditions for Operation

Limiting Conditions for Operation specify the minimum capability or level of performance that is required to assure that the HI-STORM 100 System can fulfill its safety functions.

12.2.5 Equipment

The HI-STORM 100 System and its components have been analyzed for specified normal, off-normal, and accident conditions, including extreme environmental conditions. Analysis has shown in this FSAR that no credible condition or event prevents the HI-STORM 100 System from meeting its safety function. As a result, there is no threat to public health and safety from any postulated accident condition or analyzed event. When all equipment is loaded, tested, and placed into storage in accordance with procedures developed for the ISFSI, no failure of the system to perform its safety function is expected to occur.

12.2.6 Surveillance Requirements

The analyses provided in this FSAR show that the HI-STORM 100 System fulfills its safety functions, provided that the Technical Specifications in Appendix A to CoC 72-1014 and the Authorized Contents and Design Features in Appendix B to CoC 72-1014 are met. Surveillance requirements during loading, unloading, and storage operations are provided in the Technical Specifications.

12.2.7 Design Features

This section describes HI-STORM 100 System design features that are important to safety. These features require design controls and fabrication controls. The design features, detailed in this FSAR and in Appendix B to CoC 72-1014, are established in specifications and drawings which are controlled through the quality assurance program. Fabrication controls and inspections to assure that the HI-STORM 100 System is fabricated in accordance with the design drawings and the requirements of this FSAR are described in Chapter 9.

12.2.8 MPC

- a. Basket material composition, properties, dimensions, and tolerances for criticality control.
- b. Canister material mechanical properties for structural integrity of the confinement boundary.
- c. Canister and basket material thermal properties and dimensions for heat transfer control.
- d. Canister and basket material composition and dimensions for dose rate control.

12.2.9 HI-STORM Overpack

- a. HI-STORM overpack material mechanical properties and dimensions for structural integrity to provide protection of the MPC and shielding of the spent nuclear fuel assemblies during loading, unloading and handling operations.
- b. HI-STORM overpack material thermal properties and dimensions for heat transfer control.
- c. HI-STORM overpack material composition and dimensions for dose rate control.

Technical Specifications for the HI-STORM 100 System are provided in Appendix A to Certificate of Compliance 72-1014. Authorized Contents (i.e., fuel specifications) and Design Features are provided in Appendix B to CoC 72-1014. Bases applicable to the Technical Specifications are provided in FSAR Appendix 12.A. The format and content of the HI-STORM 100 System Technical Specifications and Bases are that of the Improved Standard Technical Specifications for power reactors, to the extent they apply to a dry spent fuel storage cask system. NUMARC Document 93-03, "Writer's Guide for the Restructured Technical Specifications" [12.3.1] was used as a guide in the development of the Technical Specifications and Bases.

12.4 REGULATORY EVALUATION

Table 12.1.2 lists the Technical Specifications for the HI-STORM 100 System. The Technical Specifications are detailed in Appendix A to Certificate of Compliance 72-1014. The Authorized Contents (i.e., fuel specifications) and Design Features are provided in Appendix B to CoC 72-1014.

The conditions for use of the HI-STORM 100 System identify necessary Technical Specifications, limits on authorized contents (i.e., fuel), and cask design features to satisfy 10 CFR Part 72, and the applicable acceptance criteria have been satisfied. Compliance with these Technical specifications and other conditions of the Certificate of Compliance provides reasonable assurance that the HI-STORM 100 System will provide safe storage of spent fuel and is in compliance with 10 CFR Part 72, the regulatory guides, applicable codes and standards, and accepted practices.

12.5 REFERENCES:

- [12.1.1] U.S. Nuclear Regulatory Commission, NUREG-1536, Standard Review Plan for Dry Cask Storage Systems, Final Report, January 1997.
- [12.1.2] U.S. Code of Federal Regulations, Title 10, Energy, Part 72, Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste."
- [12.1.3] U.S. Code of Federal Regulations, Title 10, Energy, Part 20, Standards for Protection Against Radiation."
- [12.3.1] Nuclear Management and Resources Council, Inc. – Writer's Guide for the Restructured Technical Specifications, NUMARC 93-03, February 1993.

HI-STORM 100 SYSTEM FSAR

APPENDIX 12.A

TECHNICAL SPECIFICATION BASES

FOR THE HOLTEC HI-STORM 100 SPENT FUEL STORAGE CASK SYSTEM

(44 PAGES, INCLUDING THIS PAGE)

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B 3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

BASES

LCOs LCO 3.0.1, 3.0.2, 3.0.4, and 3.0.5 establish the general requirements applicable to all Specifications and apply at all times, unless otherwise stated.

LCO 3.0.1 LCO 3.0.1 establishes the Applicability statement within each individual Specification as the requirement for when the LCO is required to be met (i.e., when the facility is in the specified conditions of the Applicability statement of each Specification).

LCO 3.0.2 LCO 3.0.2 establishes that upon discovery of a failure to meet an LCO, the associated ACTIONS shall be met. The Completion Time of each Required Action for an ACTIONS Condition is applicable from the point in time that an ACTIONS Condition is entered. The Required Actions establish those remedial measures that must be taken within specified Completion Times when the requirements of an LCO are not met. This Specification establishes that:

- a. Completion of the Required Actions within the specified Completion Times constitutes compliance with a Specification; and
- b. Completion of the Required Actions is not required when an LCO is met within the specified Completion Time, unless otherwise specified.

There are two basic types of Required Actions. The first type of Required Action specifies a time limit in which the LCO must be met. This time limit is the Completion Time to restore a system or component or to restore variables to within specified limits. Whether stated as a Required Action or not, correction of the entered Condition is an action that may always be considered upon entering ACTIONS. The second type of Required Action specifies the

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BASES

LCO 3.0.2
(continued)

remedial measures that permit continued operation that is not further restricted by the Completion Time. In this case, compliance with the Required Actions provides an acceptable level of safety for continued operation.

Completing the Required Actions is not required when an LCO is met or is no longer applicable, unless otherwise stated in the individual Specifications.

The Completion Times of the Required Actions are also applicable when a system or component is removed from service intentionally. The reasons for intentionally relying on the ACTIONS include, but are not limited to, performance of Surveillances, preventive maintenance, corrective maintenance, or investigation of operational problems. Entering ACTIONS for these reasons must be done in a manner that does not compromise safety. Intentional entry into ACTIONS should not be made for operational convenience.

LCO 3.0.3

This specification is not applicable to a dry storage cask system because it describes conditions under which a power reactor must be shut down when an LCO is not met and an associated ACTION is not met or provided. The placeholder is retained for consistency with the power reactor technical specifications.

LCO 3.0.4

LCO 3.0.4 establishes limitations on changes in specified conditions in the Applicability when an LCO is not met. It precludes placing the HI-STORM 100 System in a specified condition stated in that Applicability (e.g., Applicability desired to be entered) when the following exist:

- a. Facility conditions are such that the requirements of the LCO would not be met in the Applicability desired to be entered; and
- b. Continued noncompliance with the LCO requirements, if the Applicability were entered, would result in being required to

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BASES

LCO 3.0.4
(continued)

exit the Applicability desired to be entered to comply with the Required Actions.

Compliance with Required Actions that permit continuing with dry fuel storage activities for an unlimited period of time in a specified condition provides an acceptable level of safety for continued operation. This is without regard to the status of the dry storage system. Therefore, in such cases, entry into a specified condition in the Applicability may be made in accordance with the provisions of the Required Actions. The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components before entering an associated specified condition in the Applicability.

The provisions of LCO 3.0.4 shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS.

In addition, the provisions of LCO 3.0.4 shall not prevent changes in specified conditions in the Applicability that are related to the unloading of an SFSC.

Exceptions to LCO 3.0.4 are stated in the individual Specifications. Exceptions may apply to all the ACTIONS or to a specific Required Action of a Specification.

LCO 3.0.5

LCO 3.0.5 establishes the allowance for restoring equipment to service under administrative controls when it has been removed from service or determined to not meet the LCO to comply with the ACTIONS. The sole purpose of this Specification is to provide an exception to LCO 3.0.2 (e.g., to not comply with the applicable Required Action(s)) to allow the performance of testing to demonstrate:

- a. The equipment being returned to service meets the LCO; or
- b. Other equipment meets the applicable LCOs.

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BASES

LCO 3.0.5
(continued)

The administrative controls ensure the time the equipment is returned to service in conflict with the requirements of the ACTIONS is limited to the time absolutely necessary to perform the allowed testing. This Specification does not provide time to perform any other preventive or corrective maintenance.

B 3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY

BASES

SRs SR 3.0.1 through SR 3.0.4 establish the general requirements applicable to all Specifications and apply at all times, unless otherwise stated.

SR 3.0.1 SR 3.0.1 establishes the requirement that SRs must be met during the specified conditions in the Applicability for which the requirements of the LCO apply, unless otherwise specified in the individual SRs. This Specification is to ensure that Surveillances are performed to verify that systems and components meet the LCO and variables are within specified limits. Failure to meet a Surveillance within the specified Frequency, in accordance with SR 3.0.2, constitutes a failure to meet an LCO.

Systems and components are assumed to meet the LCO when the associated SRs have been met. Nothing in this Specification, however, is to be construed as implying that systems or components meet the associated LCO when:

- a. The systems or components are known to not meet the LCO, although still meeting the SRs; or
- b. The requirements of the Surveillance(s) are known to be not met between required Surveillance performances.

Surveillances do not have to be performed when the HI-STORM 100 System is in a specified condition for which the requirements of the associated LCO are not applicable, unless otherwise specified.

Surveillances, including Surveillances invoked by Required Actions, do not have to be performed on equipment that has been determined to not meet the LCO because the ACTIONS define the remedial measures that apply. Surveillances have to be met and performed in accordance with SR 3.0.2, prior to returning equipment to service. Upon completion of maintenance, appropriate post-maintenance testing is required. This includes ensuring applicable Surveillances

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BASES

SR 3.0.1
(continued)

are not failed and their most recent performance is in accordance with SR 3.0.2. Post maintenance testing may not be possible in the current specified conditions in the Applicability due to the necessary dry storage cask system parameters not having been established. In these situations, the equipment may be considered to meet the LCO provided testing has been satisfactorily completed to the extent possible and the equipment is not otherwise believed to be incapable of performing its function. This will allow dry fuel storage activities to proceed to a specified condition where other necessary post maintenance tests can be completed.

SR 3.0.2

SR 3.0.2 establishes the requirements for meeting the specified Frequency for Surveillances and any Required Action with a Completion Time that requires the periodic performance of the Required Action on a "once per..." interval.

SR 3.0.2 permits a 25% extension of the interval specified in the Frequency. This extension facilitates Surveillance scheduling and considers facility conditions that may not be suitable for conducting the Surveillance (e.g., transient conditions or other ongoing Surveillance or maintenance activities).

The 25% extension does not significantly degrade the reliability that results from performing the Surveillance at its specified Frequency. This is based on the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the SRs. The exceptions to SR 3.0.2 are those Surveillances for which the 25% extension of the interval specified in the Frequency does not apply. These exceptions are stated in the individual Specifications as a Note in the Frequency stating, "SR 3.0.2 is not applicable."

As stated in SR 3.0.2, the 25% extension also does not apply to the initial portion of a periodic Completion Time that requires performance on a "once per..." basis. The 25% extension applies to each performance after the initial performance. The initial performance of the Required Action, whether it is a particular Surveillance or some other remedial action, is considered a single action with a single Completion Time. One reason for not allowing the 25% extension

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BASES

SR 3.0.2
(continued)

to this Completion Time is that such an action usually verifies that no loss of function has occurred by checking the status of redundant or diverse components or accomplishes the function of the affected equipment in an alternative manner.

The provisions of SR 3.0.2 are not intended to be used repeatedly merely as an operational convenience to extend Surveillance intervals or periodic Completion Time intervals beyond those specified.

SR 3.0.3

SR 3.0.3 establishes the flexibility to defer declaring affected equipment as not meeting the LCO or an affected variable outside the specified limits when a Surveillance has not been completed within the specified Frequency. A delay period of up to 24 hours or up to the limit of the specified Frequency, whichever is less, applies from the point in time that it is discovered that the Surveillance has not been performed in accordance with SR 3.0.2, and not at the time that the specified Frequency was not met.

This delay period provides adequate time to complete Surveillances that have been missed. This delay period permits the completion of a Surveillance before complying with Required Actions or other remedial measures that might preclude completion of the Surveillance.

The basis for this delay period includes consideration of HI-STORM 100 System conditions, adequate planning, availability of personnel, the time required to perform the Surveillance, the safety significance of the delay in completing the required Surveillance, and the recognition that the most probable result of any particular Surveillance being performed is the verification of conformance with the requirements. When a Surveillance with a Frequency based not on time intervals, but upon specified facility conditions, is discovered not to have been performed when specified, SR 3.0.3 allows the full delay period of 24 hours to perform the Surveillance.

SR 3.0.3 also provides a time limit for completion of Surveillances that become applicable as a consequence of changes in the specified conditions in the Applicability imposed by the Required Actions.

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BASES

SR 3.0.3
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Failure to comply with specified Frequencies for SRs is expected to be an infrequent occurrence. Use of the delay period established by SR 3.0.3 is a flexibility which is not intended to be used as an operational convenience to extend Surveillance intervals.

If a Surveillance is not completed within the allowed delay period, then the equipment is considered to not meet the LCO or the variable is considered outside the specified limits and the Completion Times of the Required Actions for the applicable LCO Conditions begin immediately upon expiration of the delay period. If a Surveillance is failed within the delay period, then the equipment does not meet the LCO, or the variable is outside the specified limits and the Completion Times of the Required Actions for the applicable LCO Conditions begin immediately upon the failure of the Surveillance.

Completion of the Surveillance within the delay period allowed by this Specification, or within the Completion Time of the ACTIONS, restores compliance with SR 3.0.1.

SR 3.0.4

SR 3.0.4 establishes the requirement that all applicable SRs must be met before entry into a specified condition in the Applicability.

This Specification ensures that system and component requirements and variable limits are met before entry into specified conditions in the Applicability for which these systems and components ensure safe conduct of dry fuel storage activities.

The provisions of this Specification should not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components before entering an associated specified condition in the Applicability.

However, in certain circumstances, failing to meet an SR will not result in SR 3.0.4 restricting a change in specified condition. When a system, subsystem, division, component, device, or variable is

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BASES

SR 3.0.4
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outside its specified limits, the associated SR(s) are not required to be performed per SR 3.0.1, which states that Surveillances do not have to be performed on equipment that has been determined to not meet the LCO. When equipment does not meet the LCO, SR 3.0.4 does not apply to the associated SR(s) since the requirement for the SR(s) to be performed is removed. Therefore, failing to perform the Surveillance(s) within the specified Frequency does not result in a SR 3.0.4 restriction to changing specified conditions of the Applicability. However, since the LCO is not met in this instance, LCO 3.0.4 will govern any restrictions that may (or may not) apply to specified condition changes.

The provisions of SR 3.0.4 shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS. In addition, the provisions of LCO 3.0.4 shall not prevent changes in specified conditions in the Applicability that are related to the unloading of an SFSC.

The precise requirements for performance of SRs are specified such that exceptions to SR 3.0.4 are not necessary. The specific time frames and conditions necessary for meeting the SRs are specified in the Frequency, in the Surveillance, or both. This allows performance of Surveillances when the prerequisite condition(s) specified in a Surveillance procedure require entry into the specified condition in the Applicability of the associated LCO prior to the performance or completion of a Surveillance. A Surveillance that could not be performed until after entering the LCO Applicability would have its Frequency specified such that it is not "due" until the specific conditions needed are met. Alternately, the Surveillance may be stated in the form of a Note as not required (to be met or performed) until a particular event, condition, or time has been reached. Further discussion of the specific formats of SRs' annotation is found in Section 1.4, Frequency.

B 3.1 SFSC Integrity

B 3.1.1 Multi-Purpose Canister (MPC)

BASES

BACKGROUND A TRANSFER CASK with an empty MPC is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the CoC. A lid is then placed on the MPC. The TRANSFER CASK and MPC are raised to the top of the spent fuel pool surface. The TRANSFER CASK and MPC are then moved into the cask preparation area where dose rates are measured and the MPC lid is welded to the MPC shell and the welds are inspected and tested. The water is drained from the MPC cavity and moisture removal is performed. The MPC cavity is backfilled with helium. Additional dose rates are measured and the MPC vent and drain cover plates and closure ring are installed and welded. Inspections are performed on the welds. TRANSFER CASK bottom pool lid is replaced with the transfer lid to allow eventual transfer of the MPC into the OVERPACK.

MPC cavity moisture removal using vacuum drying or forced helium recirculation is performed to remove residual moisture from the MPC fuel cavity after the MPC has been drained of water. If vacuum drying is used, any water that has not drained from the fuel cavity evaporates from the fuel cavity due to the vacuum. This is aided by the temperature increase due to the decay heat of the fuel and by the heat added to the MPC from the optional warming pad, if used.

If helium recirculation is used, the dry gas introduced to the MPC cavity through the vent or drain port absorbs the residual moisture in the MPC. This humidified gas exits the MPC via the other port and the absorbed water is removed through condensation and/or mechanical drying. The dried helium is then forced back to the MPC until the temperature acceptance limit is met.

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BASES

BACKGROUND

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After the completion of moisture removal, the MPC cavity is backfilled with helium meeting the requirements of the CoC.

Backfilling of the MPC fuel cavity with helium promotes gaseous heat dissipation and the inert atmosphere protects the fuel cladding. Providing a helium pressure in the required range at room temperature (70°F), eliminates air leakage over the life of the MPC because the cavity pressure rises due to heat up of the confined gas by the fuel decay heat during storage. Providing helium in the required density range accomplishes the same function.

In-leakage of air could be harmful to the fuel. Prior to moving the SFSC to the storage pad, the MPC helium leak rate is determined to ensure that the fuel is confined.

APPLICABLE
SAFETY
ANALYSIS

The confinement of radioactivity during the storage of spent fuel in the MPC is ensured by the multiple confinement boundaries and systems. The barriers relied on are the fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the MPC in which the fuel assemblies are stored. Long-term integrity of the fuel and cladding depend on storage in an inert atmosphere. This is accomplished by removing water from the MPC and backfilling the cavity with an inert gas. The thermal analyses of the MPC assume that the MPC cavity is filled with dry helium of a minimum quantity to ensure the assumptions used for convection heat transfer are preserved. Keeping the backfill pressure below the maximum value preserves the initial condition assumptions made in the MPC overpressurization evaluation.

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BASES (continued)

LCO A dry, helium filled and sealed MPC establishes an inert heat removal environment necessary to ensure the integrity of the multiple confinement boundaries. Moreover, it also ensures that there will be no air in-leakage into the MPC cavity that could damage the fuel cladding over the storage period.

APPLICABILITY The dry, sealed and inert atmosphere is required to be in place during TRANSPORT OPERATIONS and STORAGE OPERATIONS to ensure both the confinement barriers and heat removal mechanisms are in place during these operating periods. These conditions are not required during LOADING OPERATIONS or UNLOADING OPERATIONS as these conditions are being established or removed, respectively during these periods in support of other activities being performed with the stored fuel.

ACTIONS A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each MPC. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for each MPC not meeting the LCO. Subsequent MPCs that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the cavity vacuum drying pressure or demoinsturizer exit gas temperature limit has been determined not to be met during TRANSPORT OPERATIONS or STORAGE OPERATIONS, an engineering evaluation is necessary to determine the potential quantity of moisture left within the MPC cavity. Since moisture remaining in the cavity during these modes of operation may represent a long-term degradation concern, immediate action is not necessary. The Completion Time is sufficient to complete the engineering evaluation commensurate with the safety significance of the CONDITION.

(continued)

BASES

ACTIONS
(continued)

A.2

Once the quantity of moisture potentially left in the MPC cavity is determined, a corrective action plan shall be developed and actions initiated to the extent necessary to return the MPC to an analyzed condition. Since the quantity of moisture estimated under Required Action A.1 can range over a broad scale, different recovery strategies may be necessary. Since moisture remaining in the cavity during these modes of operation may represent a long-term degradation concern, immediate action is not necessary. The Completion Time is sufficient to develop and initiate the corrective actions commensurate with the safety significance of the CONDITION.

B.1

If the helium backfill density or pressure limit has been determined not to be met during TRANSPORT OPERATIONS or STORAGE OPERATIONS, an engineering evaluation is necessary to determine the quantity of helium within the MPC cavity. Since too much or too little helium in the MPC during these modes represents a potential overpressure or heat removal degradation concern, an engineering evaluation shall be performed in a timely manner. The Completion Time is sufficient to complete the engineering evaluation commensurate with the safety significance of the CONDITION.

(continued)

BASES

ACTIONS
(continued)

B.2

Once the quantity of helium in the MPC cavity is determined, a corrective action plan shall be developed and initiated to the extent necessary to return the MPC to an analyzed condition. Since the quantity of helium estimated under Required Action B.1 can range over a broad scale, different recovery strategies may be necessary. Since elevated or reduced helium quantities existing in the MPC cavity represent a potential overpressure or heat removal degradation concern, corrective actions should be developed and implemented in a timely manner. The Completion Time is sufficient to develop and initiate the corrective actions commensurate with the safety significance of the CONDITION.

C.1

If the helium leak rate limit has been determined not to be met during TRANSPORT OPERATIONS or STORAGE OPERATIONS, an engineering evaluation is necessary to determine the impact of increased helium leak rate on heat removal and off-site dose. Since the HI-STORM OVERPACK is a ventilated system, any leakage from the MPC is transported directly to the environment. Since an increased helium leak rate represents a potential challenge to MPC heat removal and the off-site doses calculated in the FSAR confinement analyses, reasonably rapid action is warranted. The Completion Time is sufficient to complete the engineering evaluation commensurate with the safety significance of the CONDITION.

(continued)

BASES

ACTIONS
(continued)

C.2

Once the cause and consequences of the elevated leak rate from the MPC are determined, a corrective action plan shall be developed and initiated to the extent necessary to return the MPC to an analyzed condition. Since the recovery mechanisms can range over a broad scale based on the evaluation performed under Required Action C.1, different recovery strategies may be necessary. Since an elevated helium leak rate represents a challenge to heat removal rates and off-site doses, reasonably rapid action is required. The Completion Time is sufficient to develop and initiate the corrective actions commensurate with the safety significance of the CONDITION.

D.1

If the MPC fuel cavity cannot be successfully returned to a safe, analyzed condition, the fuel must be placed in a safe condition in the spent fuel pool. The Completion Time is reasonable based on the time required to replace the transfer lid with the pool lid, perform fuel cooldown operations, re-flood the MPC, cut the MPC lid welds, move the TRANSFER CASK into the spent fuel pool, remove the MPC lid, and remove the spent fuel assemblies in an orderly manner and without challenging personnel.

SURVEILLANCE
REQUIREMENTS

SR 3.1.1.1, SR 3.1.1.2, and SR 3.1.1.3

The long-term integrity of the stored fuel is dependent on storage in a dry, inert environment. For moderate burnup fuel cavity dryness may be demonstrated either by evacuating the cavity to a very low absolute pressure and verifying that the pressure is held over a specified period of time or by recirculating dry helium through the MPC cavity to absorb moisture until the demister exit temperature reaches and remains below the acceptance limit for the specified time period. A low vacuum pressure or a demister exit temperature meeting the acceptance limit is an indication that the cavity is dry. For high burnup fuel, the forced helium

(continued)

BASES

**SURVEILLANCE
REQUIREMENTS**

SR 3.1.1.1, SR 3.1.1.2, and SR 3.1.1.3 (continued)

recirculation method of moisture removal must be used to provide necessary cooling of the fuel during drying operations. Cooling provided by normal operation of the forced helium dehydration system ensures that the fuel cladding temperature remains below the applicable limits since forced recirculation of helium provides more effective heat transfer than that which occurs during normal storage operations.

Having the proper helium backfill density or pressure ensures adequate heat transfer from the fuel to the fuel basket and surrounding structure of the MPC. Meeting the helium leak rate limit ensures there is adequate helium in the MPC for long term storage and the leak rate assumed in the confinement analyses remains bounding for off-site dose.

The leakage rate acceptance limit is specified in units of atm-cc/sec. This is a mass-like leakage rate as specified in ANSI N14.5 (1997). This is defined as the rate of change of the pressure-volume product of the leaking fluid at test conditions. This allows the leakage rate as measured by a mass spectrometer leak detector (MSLD) to be compared directly to the acceptance limit without the need for unit conversion from test conditions to standard, or reference conditions.

All three of these surveillances must be successfully performed once, prior to TRANSPORT OPERATIONS to ensure that the conditions are established for SFSC storage which preserve the analysis basis supporting the cask design.

REFERENCES

1. FSAR Sections 1.2, 4.4, 4.5 7.2, 7.3 and 8.1
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B 3.1 SFSC Integrity

B 3.1.2 SFSC Heat Removal System

BASES

BACKGROUND The SFSC Heat Removal System is a passive, air-cooled, convective heat transfer system which ensures heat from the MPC canister is transferred to the environs by the chimney effect. Relatively cool air is drawn into the annulus between the OVERPACK and the MPC through the four inlet air ducts at the bottom of the OVERPACK. The MPC transfers its heat from the canister surface to the air via natural convection. The buoyancy created by the heating of the air creates a chimney effect and the air is forced back into the environs through the four outlet air ducts at the top of the OVERPACK.

**APPLICABLE
SAFETY
ANALYSIS**

The thermal analyses of the SFSC take credit for the decay heat from the spent fuel assemblies being ultimately transferred to the ambient environment surrounding the OVERPACK. Transfer of heat away from the fuel assemblies ensures that the fuel cladding and other SFSC component temperatures do not exceed applicable limits. Under normal storage conditions, the four inlet and four outlet air ducts are unobstructed and full air flow (i.e., maximum heat transfer for the given ambient temperature) occurs.

Analyses have been performed for the complete obstruction of two, three, and four inlet air ducts. Blockage of two inlet air ducts reduces air flow through the OVERPACK annulus and decreases heat transfer from the MPC. Under this off-normal condition, no SFSC components exceed the short term temperature limits.

Blockage of three inlet air ducts further reduces air flow through the OVERPACK annulus and decreases heat transfer from the MPC. Under this accident condition, no SFSC components exceed the short term temperature limits.

(continued)

BASES

APPLICABLE
SAFETY
ANALYSIS

(continued)

The complete blockage of all four inlet air ducts stops normal air cooling of the MPC. The MPC will continue to radiate heat to the relatively cooler inner shell of the OVERPACK. With the loss of normal air cooling, the SFSC component temperatures will increase toward their respective short-term temperature limits. None of the components reach their temperature limits over the 72-hour duration of the analyzed event. Therefore, the limiting component is assumed to be the fuel cladding.

LCO

The SFSC Heat Removal System must be verified to be operable to preserve the assumptions of the thermal analyses. Operability of the heat removal system ensures that the decay heat generated by the stored fuel assemblies is transferred to the environs at a sufficient rate to maintain fuel cladding and other SFSC component temperatures within design limits.

The intent of this LCO is to address those occurrences of air duct blockage that can be reasonably anticipated to occur from time to time at the ISFSI (i.e., Design Event I and II class events per ANSI/ANS-57.9). These events are of the type where corrective actions can usually be accomplished within one 8-hour operating shift to restore the heat removal system to operable status (e.g., removal of loose debris).

(continued)

BASES

LCO

(continued)

This LCO is not intended to address low frequency, unexpected Design Event III and IV class events such as design basis accidents and extreme environmental phenomena that could potentially block one or more of the air ducts for an extended period of time (i.e., longer than the total Completion Time of the LCO). This class of events is addressed site-specifically as required by Section 3.4.9 of Appendix B to the CoC.

APPLICABILITY

The LCO is applicable during STORAGE OPERATIONS. Once an OVERPACK containing an MPC loaded with spent fuel has been placed in storage, the heat removal system must be operable to ensure adequate heat transfer of the decay heat away from the fuel assemblies.

ACTIONS

A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each SFSC. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for each SFSC not meeting the LCO. Subsequent SFSCs that don't meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the heat removal system has been determined to be inoperable, it must be restored to operable status within eight hours. Eight hours is a reasonable period of time (typically, one operating shift) to take action to remove the obstructions in the air flow path.

(continued)

BASES

ACTIONS
(continued)

B.1

If the heat removal system cannot be restored to operable status within eight hours, the innermost portion of the OVERPACK concrete may experience elevated temperatures. Therefore, Surveillance Requirement (SR) 3.2.3.1 is required to be performed to determine the effectiveness of the radiation shielding provided by the concrete. This SR must be performed immediately and repeated every twelve hours thereafter to provide timely and continued evaluation of whether the concrete is providing adequate shielding. As necessary, the cask user shall provide additional radiation protection measures such as temporary shielding. The Completion Time is reasonable considering the expected slow rate of deterioration, if any, of the concrete under elevated temperatures.

B.2.1

In addition to Required Action B.1, efforts must continue to restore cooling to the SFSC. Efforts must continue to restore the heat removal system to operable status by removing the air flow obstruction(s) unless optional Required Action B.2.2 is being implemented.

This Required Action must be complete in 48 hours. The Completion Time reflects a conservative total time period without any cooling of 80 hours, assuming all of the inlet air ducts become blocked immediately after the last previous successful Surveillance. The results of the thermal analysis of this accident show that the fuel cladding temperature does not reach its short term temperature limit for more than 72 hours. It is also unlikely that an unforeseen event could cause complete blockage of all four air inlet ducts immediately after the last successful Surveillance.

(continued)

BASES

ACTIONS
(continued)

B.2.2

In lieu of implementing Required Action B.2.1, transfer of the MPC into a TRANSFER CASK will place the MPC in an analyzed condition and ensure adequate fuel cooling until actions to correct the heat removal system inoperability can be completed. Transfer of the MPC into a TRANSFER CASK removes the SFSC from the LCO Applicability since STORAGE OPERATIONS does not include times when the MPC resides in the TRANSFER CASK.

An engineering evaluation must be performed to determine if any concrete deterioration has occurred which prevents it from performing its design function. If the evaluation is successful and the air flow obstructions have been cleared, the OVERPACK heat removal system may be considered operable and the MPC transferred back into the OVERPACK. Compliance with LCO 3.1.2 is then restored. If the evaluation is unsuccessful, the user must transfer the MPC into a different, fully qualified OVERPACK to resume STORAGE OPERATIONS and restore compliance with LCO 3.1.2

(continued)

BASES

ACTIONS

B.2.2 (continued)

In lieu of performing the engineering evaluation, the user may opt to proceed directly to transferring the MPC into a different, fully qualified OVERPACK or place the TRANSFER CASK in the spent fuel pool and unload the MPC.

The Completion Time of 48 hours reflects a conservative total time period without any cooling of 80 hours, assuming all of the inlet air ducts become blocked immediately after the last previous successful Surveillance. The results of the thermal analysis of this accident show that the fuel cladding temperature does not reach its short term temperature limit for more than 72 hours. It is also unlikely that an unforeseen event could cause complete blockage of all four air inlet ducts immediately after the last successful Surveillance.

SURVEILLANCE
REQUIREMENTS

SR 3.1.2.1

The long-term integrity of the stored fuel is dependent on the ability of the SFSC to reject heat from the MPC to the environment. There are two options for implementing SR 3.1.2.1, either of which is acceptable for demonstrating that the heat removal system is OPERABLE.

Visual observation that all four inlet and outlet air ducts are unobstructed ensures that air flow past the MPC is occurring and heat transfer is taking place. Complete blockage of any one or more inlet or outlet air ducts renders the heat removal system inoperable and this LCO not met. Partial blockage of one or more inlet or outlet air ducts does not constitute inoperability of the heat removal system. However, corrective actions should be taken promptly to remove the obstruction and restore full flow through the affected duct(s).

(continued)

BASES

**SURVEILLANCE
REQUIREMENTS** SR 3.1.2.1 (continued)

As an alternative, for OVERPACKs with air temperature monitoring instrumentation installed in the outlet air ducts, the temperature rise between ambient and the OVERPACK air outlet may be monitored to verify operability of the heat removal system. Blocked inlet or outlet air ducts will reduce air flow and increase the temperature rise experienced by the air as it removes heat from the MPC. Based on the analyses, provided the air temperature rise is less than the limits stated in the SR, adequate air flow and, therefore, adequate heat transfer is occurring to provide assurance of long term fuel cladding integrity. The reference ambient temperature used to perform this Surveillance shall be measured at the ISFSI facility.

The Frequency of 24 hours is reasonable based on the time necessary for SFSC components to heat up to unacceptable temperatures assuming design basis heat loads, and allowing for corrective actions to take place upon discovery of blockage of air ducts.

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- REFERENCES**
1. FSAR Chapter 4
 2. FSAR Sections 11.2.13 and 11.2.14
 3. ANSI/ANS 57.9-1992
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B 3.1 SFSC INTEGRITY

B 3.1.3 Fuel Cool-Down

BASES

BACKGROUND In the event that an MPC must be unloaded, the TRANSFER CASK with its enclosed MPC is returned to the cask preparation area to begin the process of fuel unloading. The MPC closure ring, and vent and drain port cover plates are removed. The MPC gas is sampled to determine the integrity of the spent fuel cladding. The MPC is attached to the Cool-Down System. The Cool-Down System is a closed-loop forced ventilation gas cooling system that cools the fuel assemblies by cooling the surrounding helium gas.

Following fuel cool-down, the MPC is then re-flooded with water and the MPC lid weld is removed leaving the MPC lid in place. The transfer cask and MPC are placed in the spent fuel pool and the MPC lid is removed. The fuel assemblies are removed from the MPC and the MPC and transfer cask are removed from the spent fuel pool and decontaminated.

Reducing the fuel cladding temperatures significantly reduces the temperature gradients across the cladding thus minimizing thermally-induced stresses on the cladding during MPC re-flooding. Reducing the MPC internal temperatures eliminates the risk of high MPC pressure due to sudden generation of steam during re-flooding.

**APPLICABLE
SAFETY
ANALYSIS**

The confinement of radioactivity during the storage of spent fuel in the MPC is ensured by the multiple confinement boundaries and systems. The barriers relied on are the fuel pellet matrix, the metallic fuel cladding tubes in which the fuel pellets are contained, and the MPC in which the fuel assemblies are stored. Long-term integrity of the fuel and cladding depend on minimizing thermally-induced stresses to the cladding.

(continued)

BASES

APPLICABLE SAFETY ANALYSIS (continued) This is accomplished during the unloading operations by lowering the MPC internal temperatures prior to MPC re-flooding. The Integrity of the MPC depends on maintaining the internal cavity pressures within design limits. This is accomplished by reducing the MPC internal temperatures such that there is no sudden formation of steam during MPC re-flooding. (Ref. 1).

LCO Monitoring the circulating MPC gas exit temperature ensures that there will be no large thermal gradient across the fuel assembly cladding during re-flooding which could be potentially harmful to the cladding. The temperature limit specified in the LCO was selected to ensure that the MPC gas exit temperature will closely match the desired fuel cladding temperature prior to re-flooding the MPC. The temperature was selected to be lower than the boiling temperature of water with an additional margin.

APPLICABILITY The MPC helium gas exit temperature is measured during UNLOADING OPERATIONS after the transfer cask and integral MPC are back in the FUEL BUILDING and are no longer suspended from, or secured in, the transporter. Therefore, the Fuel Cool-Down LCO does not apply during TRANSPORT OPERATIONS and STORAGE OPERATIONS.

A note has been added to the APPLICABILITY for LCO 3.1.3 which states that the Applicability is only applicable during wet UNLOADING OPERATIONS. This is acceptable since the intent of the LCO is to avoid uncontrolled MPC pressurization due to water flashing during re-flooding operations. This is not a concern for dry UNLOADING OPERATIONS.

ACTIONS A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each MPC. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for each MPC not

(continued)

BASES

ACTIONS
(continued)

meeting the LCO. Subsequent MPCs that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the MPC helium gas exit temperature limit is not met, actions must be taken to restore the parameters to within the limits before re-flooding the MPC. Failure to successfully complete fuel cool-down could have several causes, such as failure of the cool down system, inadequate cool down, or clogging of the piping lines. The Completion Time is sufficient to determine and correct most failure mechanisms and proceeding with activities to flood the MPC cavity with water are prohibited.

A.2

If the LCO is not met, in addition to performing Required Action A.1 to restore the gas temperature to within the limit, the user must ensure that the proper conditions exist for the transfer of heat from the MPC to the surrounding environs to ensure the fuel cladding remains below the short term temperature limit. If the TRANSFER CASK is located in a relatively open area such as a typical refuel floor, no additional actions are necessary. However, if the TRANSFER CASK is located in a structure such as a decontamination pit or fuel vault, additional actions may be necessary depending on the heat load of the stored fuel.

Three acceptable options for ensuring adequate heat transfer for a TRANSFER CASK located in a pit or vault are provided below, based on an MPC loaded with fuel assemblies with design basis heat load in every storage location. Users may develop other alternatives on a site-specific basis, considering actual fuel loading and decay heat generation.

(continued)

BASES

ACTIONS

A.2 (continued)

1. Ensure the annulus between the MPC and the TRANSFER CASK is filled with water. This places the system in a heat removal configuration which is bounded by the FSAR thermal evaluation of the system considering a vacuum in the MPC. The system is open to the ambient environment which limits the temperature of the ultimate heat sink (the water in the annulus) and, therefore, the MPC shell to 212° F.
2. Remove the TRANSFER CASK from the pit or vault and place it in an open area such as the refuel floor with a reasonable amount of clearance around the cask and not near a significant source of heat.
3. Supply nominally 1000 SCFM of ambient (or cooler) air to the space inside the vault at the bottom of the TRANSFER CASK to aid the convection heat transfer process. This quantity of air is sufficient to limit the temperature rise of the air in the cask-to-vault annulus to approximately 60° F at design basis maximum heat load while providing enhanced cooling of the cask by the forced flow.

Twenty- two (22) hours is an acceptable time frame to allow for completion of Required Action A.2 based on a thermal evaluation of a TRANSFER CASK located in a pit or vault. In such a configuration, passive cooling mechanisms will be largely diminished. Eliminating 90% of the passive cooling mechanisms with the cask emplaced in the vault, the thermal inertia of the cask (approximately 20,000 Btu/° F) will limit the rate of temperature rise with design basis maximum heat load to approximately 4.5 degrees F per hour. Thus, the fuel cladding temperature rise in 22 hours will be less than 100° F. Large short term temperature margins exist to preclude any cladding integrity concerns under this temperature rise.

(continued)

BASES

SURVEILLANCE SR 3.1.3.1
REQUIREMENTS

The long-term integrity of the stored fuel is dependent on the material condition of the fuel assembly cladding. By minimizing thermally-induced stresses across the cladding the integrity of the fuel assembly cladding is maintained. The integrity of the MPC is dependent on controlling the internal MPC pressure. By controlling the MPC internal temperature prior to re-flooding the MPC there is no formation of steam during MPC re-flooding.

The MPC helium exit gas temperature limit ensures that there will be no large thermal gradients across the fuel assembly cladding during MPC re-flooding and no formation of steam which could potentially overpressurize the MPC.

Fuel cool down must be performed successfully on each SFSC before the initiation of MPC re-flooding operations to ensure the design and analysis basis are preserved.

REFERENCES 1. FSAR, Sections 4.4.1, 4.5.1.1.4, and 8.3.2.

TRANSFER CASK Average Surface Dose Rates
B 3.2.1

B 3.2 SFSC Radiation Protection

B 3.2.1 TRANSFER CASK Average Surface Dose Rates

BASES

BACKGROUND The regulations governing the operation of an ISFSI set limits on the control of occupational radiation exposure and radiation doses to the general public (Ref. 1). Occupational radiation exposure should be kept as low as reasonably achievable (ALARA) and within the limits of 10CFR Part 20. Radiation doses to the public are limited for both normal and accident conditions.

APPLICABLE SAFETY ANALYSIS The TRANSFER CASK average surface dose rates are not an assumption in any accident analysis, but are used to ensure compliance with regulatory limits on occupational dose and dose to the public.

LCO The limits on TRANSFER CASK average surface dose rates are based on the shielding analysis of the HI-STORM 100 System (Ref. 2). The limits were selected to minimize radiation exposure to the general public and maintain occupational dose ALARA to personnel working in the vicinity of the TRANSFER CASKs. The LCO requires specific locations for taking dose rate measurements to ensure the dose rates measured are indicative of the neutron shielding material's effectiveness and not the steel channel members.

APPLICABILITY The average TRANSFER CASK surface dose rates apply during TRANSPORT OPERATIONS. These limits ensure that the transfer cask average surface dose rates during TRANSPORT OPERATIONS, AND UNLOADING OPERATIONS are within the estimates contained in the HI-STORM 100 Final Safety Analysis Report. Radiation doses during STORAGE OPERATIONS are verified for the OVERPACK under LCO 3.2.3 and monitored thereafter by the SFSC user in accordance with the plant-specific radiation protection program required by 10CFR72.212(b)(6).
(continued)

BASES (continued)

ACTIONS

A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each TRANSFER CASK. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for each TRANSFER CASK not meeting the LCO. Subsequent TRANSFER CASKs that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the TRANSFER CASK average surface dose rates are not within limits, it could be an indication that a fuel assembly was inadvertently loaded into the MPC that did not meet the requirements of the Authorized Contents section of Appendix B to the CoC. Administrative verification of the MPC fuel loading, by means such as review of video recordings and records of the loaded fuel assembly serial numbers, can establish whether a mis-loaded fuel assembly is the cause of the out of limit condition. The Completion Time is based on the time required to perform such a verification.

A.2

If the TRANSFER CASK average surface dose rates are not within limits, and it is determined that the MPC was loaded with the correct fuel assemblies, an analysis may be performed. This analysis will determine if the OVERPACK, once located at the ISFSI, would result in the ISFSI offsite or occupational doses exceeding regulatory limits in 10 CFR Part 20 or 10 CFR Part 72. If it is determined that the out of limit average surface dose rates do not result in the regulatory limits being exceeded, TRANSPORT OPERATIONS may proceed.

(continued)

BASES

ACTIONS
(continued)

B.1

If it is verified that unauthorized fuel was loaded or that the ISFSI offsite radiation protection requirements of 10 CFR Part 20 or 10 CFR Part 72 will not be met with the transfer cask average surface dose rates above the LCO limit, the fuel assemblies must be placed in a safe condition in the spent fuel pool. The Completion Time is reasonable based on the time required to replace the transfer lid with the pool lid, perform fuel cooldown operations, re-flood the MPC, cut the MPC lid welds, move the TRANSFER CASK into the spent fuel pool, remove the MPC lid, and remove the spent fuel assemblies in an orderly manner and without challenging personnel.

SURVEILLANCE
REQUIREMENTS

SR 3.2.1.1

This SR ensures that the TRANSFER CASK average surface dose rates are within the LCO limits prior to TRANSPORT OPERATIONS. The surface dose rates are measured on the sides and the top of the TRANSFER CASK at locations described in the SR following standard industry practices for determining average dose rates for large containers. The SR requires specific locations for taking dose rate measurements to ensure the dose rates measured are indicative of the average value around the cask.

REFERENCES

1. 10 CFR Parts 20 and 72.
 2. FSAR Sections 5.1 and 8.1.6.
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B 3.2 SFSC Radiation Protection

B 3.2.2 TRANSFER CASK Surface Contamination

BASES

BACKGROUND A TRANSFER CASK is immersed in the spent fuel pool in order to load the spent fuel assemblies. As a result, the surface of the TRANSFER CASK may become contaminated with the radioactive material in the spent fuel pool water. This contamination is removed prior to moving the TRANSFER CASK to the ISFSI, or prior to transferring the MPC into the OVERPACK, whichever occurs first, in order to minimize the radioactive contamination to personnel or the environment. This allows dry fuel storage activities to proceed without additional radiological controls to prevent the spread of contamination and reduces personnel dose due to the spread of loose contamination or airborne contamination. This is consistent with ALARA practices.

APPLICABLE SAFETY ANALYSIS The radiation protection measures implemented during MPC transfer and transportation using the TRANSFER CASK are based on the assumption that the exterior surfaces of the TRANSFER CASKs have been decontaminated. Failure to decontaminate the surfaces of the TRANSFER CASKs could lead to higher-than-projected occupational doses.

LCO Removable surface contamination on the TRANSFER CASK exterior surfaces and accessible surfaces of the MPC is limited to 1000 dpm/100 cm² from beta and gamma sources and 20 dpm/100 cm² from alpha sources. These limits are taken from the guidance in IE Circular 81-07 (Ref. 2) and are based on the minimum level of activity that can be routinely detected under a surface contamination control program using direct survey methods. Only loose contamination is controlled, as fixed contamination will not result from the TRANSFER CASK loading process.

(continued)

BASES

LCO
(continued)

Experience has shown that these limits are low enough to prevent the spread of contamination to clean areas and are significantly less than the levels which would cause significant personnel skin dose. LCO 3.2.2 requires removable contamination to be within the specified limits for the exterior surfaces of the TRANSFER CASK and accessible portions of the MPC. The location and number of surface swipes used to determine compliance with this LCO are determined based on standard industry practice and the user's plant-specific contamination measurement program for objects of this size. Accessible portions of the MPC means the upper portion of the MPC external shell wall accessible after the inflatable annulus seal is removed and before the annulus shield ring is installed. The user shall determine a reasonable number and location of swipes for the accessible portion of the MPC. The objective is to determine a removable contamination value representative of the entire upper circumference of the MPC, while implementing sound ALARA practices.

APPLICABILITY

The applicability is modified by a note that states that the LCO is not applicable to the TRANSFER CASK if MPC transfer operations occur inside the FUEL BUILDING. This is consistent with the intent of this LCO, which is to ensure loose contamination on the loaded TRANSFER CASK and MPC outside the FUEL BUILDING is within limits. If the MPC transfer is performed inside the FUEL BUILDING the empty TRANSFER CASK remains behind and is treated like any other contaminated hardware under the user's Part 50 contamination control program.

Verification that the surface contamination is less than the LCO limit is performed during LOADING OPERATIONS. This occurs before TRANSPORT OPERATIONS, when the LCO is applicable. Measurement of surface contamination is unnecessary during UNLOADING OPERATIONS as surface contamination would have been measured prior to moving the subject TRANSFER CASK to the ISFSI.

(continued)

BASES (continued)

ACTIONS

A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each TRANSFER CASK. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for each TRANSFER CASK not meeting the LCO. Subsequent TRANSFER CASKs that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the removable surface contamination of a TRANSFER CASK or MPC, as applicable, that has been loaded with spent fuel is not within the LCO limits, action must be initiated to decontaminate the TRANSFER CASK or MPC and bring the removable surface contamination within limits. The Completion Time of 7 days is appropriate given that sufficient time is needed to prepare for, and complete the decontamination once the LCO is determined not to be met.

**SURVEILLANCE
REQUIREMENTS**

SR 3.2.2.1

This SR verifies that the removable surface contamination on the TRANSFER CASK and/or accessible portions of the MPC is less than the limits in the LCO. The Surveillance is performed using smear surveys to detect removable surface contamination. The Frequency requires performing the verification during LOADING OPERATIONS in order to confirm that the TRANSFER CASK or OVERPACK can be moved to the ISFSI without spreading loose contamination.

REFERENCES

1. FSAR Sections 8.1.5 and 8.1.6.
 2. NRC IE Circular 81-07.
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B 3.2 SFSC Radiation Protection

B 3.2.3 OVERPACK Average Surface Dose Rates

BASES

BACKGROUND The regulations governing the operation of an ISFSI set limits on the control of occupational radiation exposure and radiation doses to the general public (Ref. 1). Occupational radiation exposure should be kept as low as reasonably achievable (ALARA) and within the limits of 10CFR Part 20. Radiation doses to the public are limited for both normal and accident conditions.

APPLICABLE SAFETY ANALYSIS The OVERPACK average surface dose rates are not an assumption in any accident analysis, but are used to ensure compliance with regulatory limits on occupational dose and dose to the public.

LCO The limits on OVERPACK average surface dose rates are based on the shielding analysis of the HI-STORM 100 System (Ref. 2). The limits were selected to minimize radiation exposure to the general public and maintain occupational dose ALARA to personnel working in the vicinity of the SFSCs.

APPLICABILITY The average OVERPACK surface dose rates apply during TRANSPORT OPERATIONS and STORAGE OPERATIONS. These limits ensure that the OVERPACK average surface dose rates are within the estimates contained in the HI-STORM 100 Final Safety Analysis Report. Radiation doses during STORAGE OPERATIONS are monitored for the OVERPACK by the SFSC user in accordance with the plant-specific radiation protection program required by 10CFR72.212(b)(6).

(continued)

BASES (continued)

ACTIONS

A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each SFSC. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for each SFSC not meeting the LCO. Subsequent SFSCs that don't meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1

If the OVERPACK average surface dose rates are not within limits, it could be an indication that a fuel assembly was inadvertently loaded into the MPC that did not meet the requirements of the Authorized Contents section of Appendix B to the CoC.. Administrative verification of the MPC fuel loading, by means such as review of video recordings and records of the loaded fuel assembly serial numbers, can establish whether a mis-loaded fuel assembly is the cause of the out of limit condition. The Completion Time is based on the time required to perform such a verification.

A.2

If the OVERPACK average surface dose rates are not within limits, and it is determined that the MPC was loaded with the correct fuel assemblies, an analysis may be performed. This analysis will determine if the OVERPACK, once located at the ISFSI, would result in the ISFSI offsite or occupational doses exceeding regulatory limits in 10 CFR Part 20 or 10 CFR Part 72. If it is determined that the out of limit average surface dose rates do not result in the regulatory limits being exceeded, STORAGE OPERATIONS may proceed.

B.1

If it is verified that the correct fuel was not loaded or that the ISFSI offsite radiation protection requirements of 10 CFR Part 20 or 10 CFR Part 72 will not be met with the OVERPACK average surface dose rates above the LCO limit, the fuel

(continued)

BASES

ACTIONS
(continued)

assemblies must be placed in a safe condition in the spent fuel pool. The Completion Time is reasonable based on the time required to transfer the MPC back into the TRANSFER CASK, replace the transfer lid with the pool lid, perform fuel cooldown operations, re-flood the MPC, cut the MPC lid welds, move the SFSC into the spent fuel pool, remove the MPC lid, and remove the spent fuel assemblies in an orderly manner and without challenging personnel.

SURVEILLANCE SR 3.2.3.1
REQUIREMENTS

This SR ensures that the OVERPACK average surface dose rates are within the LCO limits within 24 hours of placing the OVERPACK in its designated storage location on the ISFSI. Surface dose rates are measured at the locations described in the SR following standard industry practices for determining average dose rates for large containers.

- REFERENCES**
1. 10 CFR Parts 20 and 72.
 2. FSAR Sections 5.1 and 8.1.6.
-

B 3.3 SFSC Criticality Control

B 3.3.1 Boron Concentration

BASES

BACKGROUND A TRANSFER CASK with an empty MPC is placed in the spent fuel pool and loaded with fuel assemblies meeting the requirements of the Certificate of Compliance. A lid is then placed on the MPC. The TRANSFER CASK and MPC are raised to the top of the spent fuel pool surface. The TRANSFER CASK and MPC are then moved into the cask preparation area where dose rates are measured and the MPC lid is welded to the MPC shell and the welds are inspected and tested. The water is drained from the MPC cavity and vacuum drying is performed. The MPC cavity is backfilled with helium. Additional dose rates are measured and the MPC vent and drain cover plates and closure ring are installed and welded. Inspections are performed on the welds. The TRANSFER CASK bottom pool lid is replaced with the transfer lid to allow eventual transfer of the MPC into the OVERPACK.

For those MPCs containing PWR fuel assemblies of relatively high initial enrichment, credit is taken in the criticality analyses for boron in the water within the MPC. To preserve the analysis basis, users must verify that the boron concentration of the water in the MPC meets specified limits when there is fuel and water in the MPC. This may occur during LOADING OPERATIONS and UNLOADING OPERATIONS.

**APPLICABLE
SAFETY
ANALYSIS**

The spent nuclear fuel stored in the SFSC is required to remain subcritical ($k_{\text{eff}} < 0.95$) under all conditions of storage. The HI-STORM 100 SFSC is analyzed to stored a wide variety of spent nuclear fuel assembly types with differing initial enrichments. For all PWR fuel loaded in the MPC-32, and for relatively high enrichment PWR fuel loaded in the MPC-24, -24E, and -24EF, credit was taken in the criticality analyses for neutron poison in the form of soluble boron in the water within the MPC. Compliance with this LCO preserves the assumptions made in the criticality analyses regarding credit for soluble boron.

(continued)

BASES (continued)

LCO

Compliance with this LCO ensures that the stored fuel will remain subcritical with a $k_{\text{eff}} \leq 0.95$ while water is in the MPC. LCOs 3.3.1.a and 3.3.1.b provide the minimum concentration of soluble boron required in the MPC water for the MPC-24, and MPC-24E/24EF, respectively. The limits are applicable to the respective MPCs if one or more fuel assemblies to be loaded in the MPC had an initial enrichment of U-235 greater than the value in Table 2.1-2 for loading with no soluble boron credit.

LCO 3.3.1.c provides the minimum boron concentration required in the MPC water for the MPC-32 if one or more to fuel assemblies to be loaded had an initial enrichment less than or equal to 4.1 wt.% U-235. LCO 3.3.1.d provides the minimum boron concentration required in the MPC water for the MPC-32 if one or more to fuel assemblies to be loaded had an initial enrichment greater than 4.1 wt.% U-235.

All fuel assemblies loaded into the MPC-24, MPC-24E, MPC-24EF, and MPC-32 are limited by analysis to maximum enrichments of 5.0 wt.% U-235.

APPLICABILITY

The boron concentration LCO is applicable whenever an MPC-24, -24E, -24EF, or -32 has at least one PWR fuel assembly in a storage location and water in the MPC. For the MPC-24 and MPC-24E/24EF, when all fuel assemblies to be loaded have initial enrichments less than the limit for no soluble boron credit as provided in CoC Appendix B, Table 2.1-2, the boron concentration requirement is implicitly understood to be zero.

During **LOADING OPERATIONS**, the LCO is applicable immediately upon the loading of the first fuel assembly in the MPC. It remains applicable until the MPC is drained of water

(continued)

BASES

LCO

(continued)

During UNLOADING OPERATIONS, the LCO is applicable when the MPC is re-flooded with water after helium cooldown operations. Note that compliance with SR 3.0.4 assures that the water to be used to flood the MPC is of the correct boron concentration to ensure the LCO is upon entering the Applicability.

ACTIONS

A note has been added to the ACTIONS which states that, for this LCO, separate Condition entry is allowed for each MPC. This is acceptable since the Required Actions for each Condition provide appropriate compensatory measures for each MPC not meeting the LCO. Subsequent MPCs that do not meet the LCO are governed by subsequent Condition entry and application of associated Required Actions.

A.1 and A.2

Continuation of LOADING OPERATIONS, UNLOADING OPERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the SFSC in compliance with the LCO. If the boron concentration of water in the MPC is less than its limit, all activities LOADING OPERATIONS, UNLOADING OPERATIONS or positive reactivity additions must be suspended immediately.

A.3

In addition to immediately suspending LOADING OPERATIONS, UNLOADING OPERATIONS and positive reactivity additions, action to restore the concentration to within the limit specified in the LCO must be initiated immediately.

(continued)

BASES

ACTIONS
(continued)

A.3 (cont'd)

One means of complying with this action is to initiate boration of the affected MPC. In determining the required combination of boration flow rate and concentration, there is no unique design basis event that must be satisfied; only that boration be initiated without delay. In order to raise the boron concentration as quickly as possible, the operator should begin boration with the best source available for existing plant conditions.

Once boration is initiated, it must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.3.1.1

The boron concentration in the MPC water must be verified to be within the applicable limit within four hours of entering the Applicability of the LCO. For LOADING OPERATIONS, this means within four hours of loading the first fuel assembly into the cask.

For UNLOADING OPERATIONS, this means verifying the source of borated water to be used to re-flood the MPC within four hours of commencing re-flooding operations. This ensures that when the LCO is applicable (upon introducing water into the MPC), the LCO will be met.

Surveillance Requirement 3.3.1.1 is modified by a note which states that SR 3.3.1.1 is only required to be performed if the MPC is submerged in water or if water is to be added to, or recirculated through the MPC. This reflects the underlying premise of this SR which is to ensure, once the correct boron concentration is established, it need only be verified thereafter if the MPC is in a state where the concentration could be changed.

There is no need to re-verify the boron concentration of the water in the MPC after it is removed from the spent fuel pool unless water is to be added to, or recirculated through the MPC., because these are the only credible activities that could potentially change the boron concentration during this time. This note also prevents the interference of unnecessary sampling activities while lid closure welding and other MPC storage preparation activities are taking place in an elevated radiation area atop the MPC. Plant procedures should ensure that any water to be added to, or recirculated through the MPC is at a boron concentration greater than or equal to the minimum boron concentration specified in the LCO

REFERENCES

1. FSAR Chapter 6.
-

HI-STORM 100 SYSTEM FSAR
APPENDIX 12.B
COMMENT RESOLUTION LETTERS
(22 Pages Including this Page)



Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

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Telephone (609) 797-0900

Fax (609) 797-0909

BY FAX AND OVERNIGHT MAIL

June 7, 1999

Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Subject: USNRC Docket No. 72-1014
HI-STORM 100 Topical Safety Analysis Report, TAC No. L22221
Comment Resolution Letter A

Reference: Holtec Project No. 5014

Dear Sir:

In accordance with our commitment made in a telephone conference with the SFPO staff on Friday, June 4, 1999, we provide the following description of the commitment and our response.

Commitment A.1

The staff has requested the hoop stresses applicable to the peak fuel cladding temperature limits in HI-STORM Topical Safety Analysis Report (TSAR) Table 4.3.7, Revision 6 be provided. In addition, the SAR text should be revised as necessary to clarify the assumptions used to calculate the hoop stresses.

Response

The requested information is contained in TSAR Section 4.3 provided herein as draft Revision 8 in Attachment 1 to this letter. These changes will be included in the final revision (Revision 8) of the TSAR, presently scheduled for submittal no later than June 28, 1999 to support the SFPO staff's completion of the draft certificate of compliance and preliminary safety evaluation report by July 9, 1999.

If you have any questions or comments, please contact us.

Sincerely,

Bernard Gilligan
Project Manager
HI-STAR/HI-STORM Licensing Project



Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900

Fax (609) 797-0909

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Document I.D.: 5014318

Attachment: Draft Revision 8 TSAR Section 4.3

Cc: Marissa Bailey, USNRC (w/attach.)

Approvals

Brian Gutherman
Licensing Manager

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

Technical Concurrence:

Dr. Indresh Rampall (Thermal Evaluation - author)

Mr. Evan Rosenbaum (Thermal Evaluation - reviewer)

Distribution (w/o attach.) :

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Vermont Yankee Corporation
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GPUN - Oyster Creek Nuclear Power Station
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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900

Fax (609) 797-0909

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June 9, 1999

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

Subject: USNRC Docket No. 72-1014
HI-STORM 100 Topical Safety Analysis Report, TAC No. L22221
Comment Resolution Letter B

Reference: Holtec Project No. 5014

Dear Sir:

The purpose of this letter is to document questions posed by the SFPO staff in recent phone conversations and provide responses or commitments for providing responses. The identification scheme used to document the items below uses a three-part identifier. The first part is the Comment Resolution Letter identifier (in this case, "B"). The second part is the affected HI-STORM Topical Safety Analysis Report (TSAR) Chapter number. The third part is the sequential commitment number. Information provided in any draft Revision 8 TSAR pages will be included in the final TSAR revision (Revision 8) to be submitted by June 28, 1999.

Item B.2.1: The discussion in RAI responses 2-2 and 2-3 regarding cost benefit analyses to be performed by the users in deciding whether to upgrade their existing crane to use the 125-Ton HI-TRAC transfer cask should be added to the TSAR.

Commitment

TSAR Chapters 2 and 10 will be revised to add the above-referenced discussion. This new text will be included in TSAR Revision 8.

Item B.4.1: The NRC has been informed that new information will be published shortly which discounts the diffusion-controlled cavity growth (DCCG) method as a dominant fuel cladding failure mode. The DCCG method of determining peak fuel cladding temperature limits will no longer be acceptable to the staff. Holtec should recalculate the fuel peak fuel cladding temperature limits using the appropriate guidance from Pacific Nuclear Laboratories (PNL) publications.



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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900

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Page 2 of 5

Commitment

We will re-calculate the peak fuel cladding temperature limits using the requested PNL (CSFM) methodology, using internal rod gas pressures calculated from conservatively determined fill gas temperatures. Appropriate justification will be provided for the internal rod gas temperature used to calculate the internal rod pressures. A written summary of the key inputs, assumptions, and results of the revised peak fuel cladding temperature limits calculation will be provided by the opening of business, Friday, June 11, 1999.

In addition, the estimated peak fuel cladding temperature during normal conditions of storage will be re-calculated assuming no fuel rod failure and assuming ambient temperature air entering the overpack inlet ducts. These temperatures will be compared to the new peak fuel cladding temperature limits calculated above to assure the calculated temperatures are less than the temperature limits. If necessary to prevent exceeding the new peak fuel cladding temperature limits, the design basis decay heat loads will be reduced from their current levels. A written summary of the key inputs, assumptions, and results of the revised peak fuel cladding temperature calculation will be provided by the close of business, Monday, June 14, 1999.

Chapter 4 of the TSAR will be revised accordingly and all appropriate changes will be included in TSAR Revision 8.

Item B.5.1: In TSAR subsection 5.1.2, the reference to 20 days to reach the 5 Rem limit for the hypothetical accident event where all water is lost from the HI-TRAC water jacket is not consistent with the typical 30-day duration of an accident event.

Commitment

We have evaluated the 10 mrem/hr dose rate estimation used to calculate the 20-day duration and found it to be overly conservative. Draft Revision 8 of TSAR subsection 5.1.2, included as Attachment 1 to this letter, provides a revised, more appropriate dose rate estimate. Using the new dose rate estimate, the time to reach the 5 Rem dose limit has increased by more than an order of magnitude.

Item B.8.1: With regard to TSAR Section 8.5, please provide controls for a cask user to verify that the MPC is not contaminated if received in a HI-STAR transportation package for transfer into a HI-STORM overpack.





Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900
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Page 3 of 5

Commitment

We will revise TSAR Section 8.5 to require users to verify (through records review) that the MPC and HI-STAR transportation package met the required contamination limits prior to transportation. These changes will be included in TSAR Revision 8.

Item B.10.1: With regard to RAI Response 10-4, explain why the published data previously used to determine personnel requirements and time durations in Chapter 10 is now obsolete.

Response

After further review, we have determined that the reference to published data is erroneous. Holtec International provides a wide array of field construction services on a regular basis, the large majority of which take place in radiation controlled areas of nuclear power plants. Both the previous and the revised methodology used to determine personnel exposures in TSAR Chapter 10 relied on a combination of the actual field experience of our field services department personnel working in radiation areas and prior experience of our corporate personnel in loading casks. In the revised methodology, the broadly defined overall tasks were broken down into smaller, better defined tasks performed at specific locations near the cask or in a remote, low radiation area.

Item B.10.2: The time frames stated in TSAR Table 10.1.3b for accomplishing contamination smears and bolt removal and torquing appear optimistic. What is the basis for these time frames?

Response

The basis for the time durations is the experience of our corporate personnel who participated in the loading of casks at the Calvert Cliffs nuclear plant. Multiple contamination smears of a large object with unimpeded access, such as the HI-TRAC transfer cask, are typically performed in a rapid fashion by swiping the smear in a "figure S" pattern to obtain a representative sample for 100 cm². This can be performed in a "rapid fire" sequence to easily perform one smear each six seconds.

Installing and removing flange bolts is a commonly performed task at any industrial facility. No new skills will be required to perform this task for the HI-TRAC transfer cask. Bolting of the HI-TRAC top and bottom lid bolts will be performed in locations which are easily accessible by



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the worker (via standard scaffolding, as necessary). With adequate pre-job planning (including dry run training) and a sufficient number of nuts in a container at his or her side, each nut can be hand-started and torqued in succession, moving continuously around the periphery of the cask. Based on our experience, the assumptions on bolt removal and torquing are reasonable for an adequately trained mechanic under these work conditions.

Item B.10.3: Which temporary shielding was assumed to be in place in determining the dose rates used in calculating the exposures in Chapter 10?

Commitment



Only the temporary shield ring (TSAR Figure 8.1.18) was assumed to be in place for the shielding calculations which support Chapter 10. The TSAR text in Chapter 10 will be revised to clarify this point. These changes will be included in TSAR Revision 8.

Item B.11.1: The response to RAI 11-2 refers to some water remaining in the water jacket after a design basis fire. Previously in the TSAR, it was assumed that all of the water would drain from the water jacket and, therefore, this would be the worst-case scenario for recovery, from a dose perspective. Provide justification that no event will cause the water jacket to drain, or provide a dose estimate for recovery of a HI-TRAC transfer cask with no water in the water jacket.

Commitment

We had erroneously interpreted RAI 11-2 to be concerned with strictly the fire accident, and not a representative worst-case event. We will provide a dose estimate for recovery of the HI-TRAC with no water in the water jacket. Draft Revision 8 TSAR pages will be provided by the close of business Monday, June 14, 1999.

If you have any questions or comments, please contact us.

Sincerely,

Bernard Gilligan
Project Manager

HI-STAR/HI-STORM Licensing Project





Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900

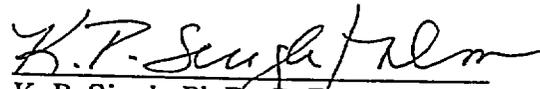
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Document I.D.: 5014319
Attachment: Draft Revision 8 TSAR page 5.1-8
Cc: Marissa Bailey, USNRC (w/attach.)

Approvals


Brian Gutherman
Licensing Manager

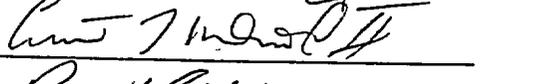
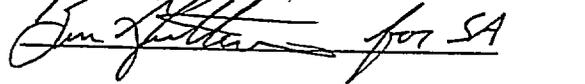

K. P. Singh, Ph.D., P. E.
President and CEO

Technical Concurrence:

Dr. Indresh Rampall (Thermal Evaluation)

Dr. Everett Redmond II (Shielding Evaluation)

Mr. Steve Agace (Operations)



 for SA

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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900
Fax (609) 797-0909

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June 10, 1999

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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: USNRC Docket No. 72-1014
HI-STORM 100 Topical Safety Analysis Report, TAC No. L22221
Comment Resolution Letter C

- References:
1. Holtec Project No. 5014
 2. Holtec Letter, B. Gilligan, to NRC dated June 9, 1999.

Dear Sir:

In accordance with our commitment documented the Reference 2 letter, we herewith provide as Attachment 1 to this letter a summary of the calculation performed to determine the fuel cladding temperature limits applicable to fuel authorized for loading in the HI-STORM 100 System. The calculation was performed using the agreed-upon Pacific Nuclear Laboratories (PNL) methodology and other inputs and assumptions discussed in yesterday's conference calls. In addition, one new commitment was made during a phone conversation held this morning with members of the SFPO staff. That item is described below.

NEW ITEM

Item C.4.1: Provide additional clarifying discussion to TSAR subsection 4.5.2.1 which supports the completion time for required action A.2 of LCO 3.1.5.

Commitment

The requested changes will be made to TSAR subsection 4.5.2.1. Draft TSAR Revision 8 pages will be provided by the close of business Tuesday, June 15, 1999

If you have any questions or comments, please contact us.

Sincerely

Bernard Gilligan
Project Manager
HI-STAR/HI-STORM Licensing Project





Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900
Fax (609) 797-0909

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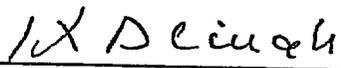
Attachment 1: Fuel Cladding Temperature Limit Calculation Summary

Cc: Marissa Bailey, USNRC (w/attach.)

Approvals



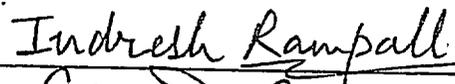
Brian Gutherman
Licensing Manager

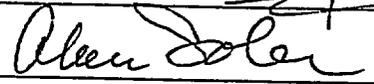


K. P. Singh, Ph.D., P. E.
President and CEO

Technical Concurrence:

Dr. Indresh Rampall (Thermal Evaluation)





Dr. Alan Soler (Reviewer)

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- Vermont Yankee Corporation
- Southern California Edison
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- IES Utilities
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Telephone (609) 797-0900

Fax (609) 797-0909

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June 14, 1999

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Subject: USNRC Docket No. 72-1014
HI-STORM 100 Topical Safety Analysis Report, TAC No. L22221
Comment Resolution Letter D

- References:
1. Holtec Project No. 5014
 2. Holtec Letter, B. Gilligan, to NRC dated June 9, 1999 (Comment Resolution Letter B).
 3. Holtec Letter, B. Gilligan, to NRC dated June 10, 1999 (Comment Resolution Letter C).

Dear Sir:

In accordance with commitments documented the Reference 2 and 3 letters, we herewith provide the following requested information.

Item B.4.1

Attachment 1 to this letter contains a summary of the calculation performed to determine the design basis heat loads for the MPC-24 and MPC-68, based upon the permissible fuel cladding temperatures provided in the Reference 3 letter. Section 2.0 in Attachment 2 provides the assumptions upon which the calculation is based. The text contained in TSAR Revision 8 will be appropriately revised to incorporate the changes governed by this commitment.

Item C.4.1

Attachment 2 to this letter contains additional text to be inserted into TSAR subsection 4.5.2.1. This additional text provides clarification of the basis for Technical Specification LCO 3.1.5, Required Action A.2 to assure adequate MPC cooling if the helium cooldown system is unable to reduce MPC cavity helium temperature to less than 200° F.

Item B.11.1

Attachment 3 to this letter contains draft Revision 8 TSAR pages describing the estimated exposure for recovery of a HI-TRAC transfer cask with no water in the water jacket.



Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

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Fax (609) 797-0909

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If you have any questions or comments, please contact us.

Sincerely,

Bernard Gilligan
Project Manager
HI-STAR/HI-STORM Licensing Project

Document I.D.: 5014321

- Attachments:
1. Cask Design Basis Heat Load Calculation Summary
 2. Draft TSAR Revision 8 insert text for subsection 4.5.2.1
 3. Draft TSAR Revision 8 pages for subsection 11.2.1.3

Cc: Marissa Bailey, USNRC (w/attach.)

Approvals

Brian Gutherman
Licensing Manager

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

Technical Concurrence:

Dr. Indresh Rampall (Thermal Evaluation)

Distribution (w/o attach.):

Recipient

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Telephone (609) 797-0900
Fax (609) 797-0909

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Mr. Stan Miller
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Mr. Joe Andrescavage
Mr. Ron Bowker
Mr. William Swantz

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Maine Yankee Atomic Power Company
Vermont Yankee Corporation
Southern California Edison
Entergy Operations – Arkansas Nuclear One
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IES Utilities
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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900

Fax (609) 797-0909

BY FAX AND OVERNIGHT MAIL

June 16, 1999

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

Subject: USNRC Docket No. 72-1014
HI-STORM 100 Topical Safety Analysis Report, TAC No. L22221
Comment Resolution Letter E

References: 1. Holtec Project No. 5014
2. Meeting Between Holtec and SFPO Staff held June 15, 1999

Dear Sir:

The purpose of this letter is to document commitments resulting from discussions held between Holtec International and the Spent Fuel Project Office staff regarding the ongoing review of the HI-STORM 100 dry spent fuel storage system. All draft revised TSAR information will be included in TSAR Revision 8 to be submitted no later than June 28, 1999.

Item E.2.1: Provide draft revised Topical Safety Analysis Report text and technical specification requirements which incorporate the agreements made in discussions with the SFPO staff regarding design requirements for the Cask Transfer Facility (CTF).

Commitment

The requested draft TSAR Revision 8 text and technical specification changes will be provided by the close of business, Friday, June 18, 1999.

Item E.4.1: In a TSAR table, provide a matrix of thermal analyses performed for the various handling and storage configurations of HI-STORM and HI-TRAC. List in the table the ultimate heat sink, principal input parameters, and TSAR section numbers where maximum component temperatures are listed.

Commitment

Attachment 1 to this letter contains draft Revision 8 TSAR tables which provide the requested information. Chapter 4 text referring to these tables will be included in TSAR Revision 8.



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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

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Page 2 of 3

Item E.12.1: Add a dose rate limit for the overpack inlet and outlet ventilation ducts to LCO 3.2.3 in the Technical Specifications.

Commitment

Draft Revision 8 Technical Specification changes reflecting this request will be submitted by the close of business Friday, June 18, 1999.

If you have any questions or comments, please contact us.

Sincerely,



Bernard Gilligan
Project Manager
HI-STAR/HI-STORM Licensing Project

Document I.D.: 5014322

Attachments: 1. Draft Revision 8 TSAR Tables 4.4.22 and 4.5.8

Cc: Marissa Bailey, USNRC (w/attach.)

Approvals

Brian Gutherman
Licensing Manager

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

Technical Concurrence:

Dr. Indresh Rampall (Thermal Evaluation)

Indresh Rampall





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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900

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Telephone (609) 797-0900

Fax (609) 797-0909

BY OVERNIGHT MAIL

June 18, 1999

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

Subject: USNRC Docket No. 72-1014
HI-STORM 100 Topical Safety Analysis Report, TAC No. L22221
Comment Resolution Letter F

References: 1. Holtec Project No. 5014
2. Holtec Letter, B. Gilligan, to NRC dated June 16, 1999

Dear Sir:

The purpose of this letter is to provide information in accordance with commitments documented in the Reference 2 letter. In addition, this letter documents commitments resulting from discussions held yesterday between Holtec International and the Spent Fuel Project Office staff regarding the ongoing review of the HI-STORM 100 dry spent fuel storage system. All draft revised TSAR information will be included in TSAR Revision 8 to be submitted no later than June 28, 1999.

Commitment E.2.1

Attachment 1 to this letter contains draft Revision 8 TSAR and technical specification pages which include proposed changes to address requirements for the design of a Cask Transfer Facility on the general licensee's site.

Commitment E.12.1

Attachment 2 to this letter contains draft Revision 8 technical specification changes to LCO 3.2.3 which include a limit on average dose rate at the inlet and outlet ventilation ducts.

NEW ITEMS

Item F.4.1: Discussions with the SFPO staff revealed that a lower fuel plenum volume is appropriate for use in determining the permissible fuel cladding temperatures for PWR fuel. The impact of using the lower value needs to be evaluated and the result of that evaluation submitted for review.



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Commitment

Attachment 3 to this letter contains the requested evaluation and results.

Item F.5.1: The NRC staff requested that data be provided to compare dose rates for the MPC-24 assuming varying cobalt impurity levels, burnups, and cooling times.

Commitment

Attachment 4 to this letter contains the requested information.

Item F.7.1: The NRC staff questioned the normal and off-normal doses from the confinement analyses being exactly a factor of ten different, based on the differing fuel rod failure assumptions (1% for normal vs. 10% for off-normal). The dose contribution from Cobalt-60 (crud), which is on the outside surface of the fuel assemblies, is not affected by the amount of fuel failure assumed.

Commitment

We have evaluated the staff's comment and found that the dose contribution due to Cobalt-60 for normal and off-normal conditions is slightly underestimated for the assumptions currently used. The dose analyses have been revised using more appropriate assumptions regarding fuel failure and release fraction, based on current regulatory guidance. Attachment 5 to this letter contains draft Revision 8 TSAR pages showing the results of these changes.

If you have any questions or comments, please contact us.

Sincerely,

Bernard Gilligan
Project Manager
HI-STAR/HI-STORM Licensing Project



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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900
Fax (609) 797-0909

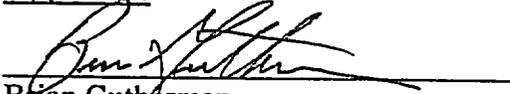
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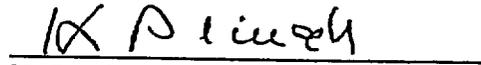
- Attachments:
1. Draft Revision 8 TSAR Subsection 2.3.3.1, Table 2.3.2, Figures 2.3.1 through 2.3.4, LCO 3.1.3, LCO 3.1.4, and Design Features Section 4.5.
 2. Draft Revision 8 technical specification LCO 3.2.3
 3. Thermal Evaluation
 4. Shielding Data
 5. Draft Revision 8 TSAR pages 7.3-8 through 7.3-15 and Appendix 7A



Cc: Marissa Bailey, USNRC (w/attach.)

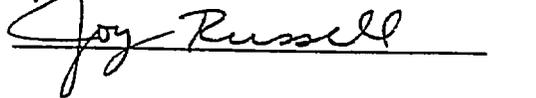
Approvals


 Brian Gutherman
 Licensing Manager


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

Technical Concurrence:

- Dr. Indresh Rampall (Thermal Evaluation)
- Dr. Everett Redmond II (Shielding Evaluation)
- Ms. Joy Russell (Confinement Evaluation)


 FOR E. Redmond






HOLTEC
INTERNATIONAL

Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900

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Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900

Fax (609) 797-0909

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June 23, 1999

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

Subject: USNRC Docket No. 72-1014
HI-STORM 100 Topical Safety Analysis Report, TAC No. L22221
Comment Resolution Letter G

References: 1. Holtec Project No. 5014
2. Holtec Letter, B. Gilligan, to NRC dated June 9, 1999

Dear Sir:

The purpose of this letter is to provide information in accordance with Commitment B.2.1 documented in the Reference 2 letter. Attachment 1 to this letter contains draft Revision 8 TSAR pages with proposed text discussing the use of ALARA-based cost-benefit analyses by cask users in determining whether to employ the 100-Ton or 125-Ton HI-TRAC transfer cask.

If you have any questions or comments, please contact us.

Sincerely,

Bernard Gilligan
Project Manager
HI-STAR/HI-STORM Licensing Project

Document I.D.: 5014325

Attachments: 1. Draft Revision 8 TSAR pages 2.0-9, 2.3-20, 2.3-21

Cc: Marissa Bailey, USNRC (w/attach.)

Approvals

Brian Gutherman
Licensing Manager

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



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INTERNATIONAL

Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053

Telephone (609) 797-0900
Fax (609) 797-0909

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CHAPTER 13[†]: QUALITY ASSURANCE

13.0 INTRODUCTION

This chapter provides a summary of the quality assurance program implemented for activities related to the design, qualification analyses, material procurement, fabrication, assembly, testing and use of structures, systems, and components of the HI-STORM 100 System and HI-TRAC transfer cask designated as important to safety.

Table 2.2.6 identifies the structures, systems and components (SSCs) of the HI-STORM 100 System and HI-TRAC transfer cask that are considered important to safety. Table 8.1.6 identifies the ancillary equipment needed for handling and loading operations that has been designated as important to safety.

[†] This chapter has been prepared in the format and section organization set forth in Regulatory Guide 3.61. However, the material content of this chapter also fulfills the requirements of NUREG-1536. Pagination and numbering of sections, figures, and tables are consistent with the convention set down in Chapter 1, Section 1.0, herein. Finally, all terms-of-art used in this chapter are consistent with the terminology of the glossary (Table 1.0.1) and component nomenclature of the Bill-of-Materials (Section 1.5)

13.1 GRADED APPROACH TO QUALITY ASSURANCE

For the HI-STORM 100 System and HI-TRAC transfer cask, a graded approach to quality is used by Holtec. This graded approach is controlled by Holtec Quality Assurance (QA) program documents.

NUREG/CR-6407 [13.1.1] provides descriptions of quality categories A, B and C. These descriptions are provided below.

Category A: Category A items include structures, systems, and components whose failure could directly result in a condition adversely affecting public health and safety. The failure of a single item could cause loss of primary containment leading to release of radioactive material, loss of shielding, or unsafe geometry compromising criticality control.

Category B: Category B items include structures, systems, and components whose failure or malfunction could indirectly result in a condition adversely affecting public health and safety. The failure of a Category B item, in conjunction with the failure of an additional item, could result in an unsafe condition.

Category C: Category C items include structures, systems, and components whose failure or malfunction would not significantly reduce the packaging effectiveness and would not be likely to create a situation adversely affecting public health and safety.

Using these descriptions along with the quality category assignments from NUREG/CR-6407 [13.1.1], Holtec International has assigned a quality category to each individual component of the HI-STORM 100 System and HI-TRAC transfer cask. The categories are identified in Table 2.2.6.

Activities affecting quality are defined by the purchaser's procurement contract for use of the HI-STORM 100 System on a site-specific independent spent fuel storage installation (ISFSI) under the general license provisions of 10CFR72, Subpart K. They may include any or all of the following: design, procurement, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair and monitoring of HI-STORM 100 structures, systems, and components which are important to safety. Regardless of the provisions of the procurement contract, the quality requirements set forth in this document constitute the minimum set of acceptable bases. Activities performed in the course of the previous and ongoing work effort on HI-STORM 100 comply with Holtec International's quality assurance program. Holtec International's QA program was developed to meet Nuclear Regulatory Commission (NRC) requirements delineated in 10CFR50, Appendix B, and has been expanded to include provisions of 10CFR71, Subpart H and 10CFR72, Subpart G, for structures, systems, and components designated as important to safety. A topical report [13.1.2] on the Holtec International QA program has been previously submitted to the NRC. Quality Assurance Program Approval for Radioactive Packages No. 0784 was issued by the NRC. This quality assurance program also applies to the design, material procurement, fabrication, inspection, testing, handling, and repair of the HI-STORM 100 System, including the HI-TRAC transfer cask.

The quality assurance program described in this chapter fully complies with the requirements of 10CFR72 Subpart G, and NUREG-1536 [13.1.3].

The HI-STORM 100 System project has been established under Holtec International's project identification number 5014. This project has been designated as important to safety (ITS), which automatically mandates a rigorously formulated and carefully articulated project management system in accordance with the Holtec Quality Assurance Manual (HQAM). The first requirement of the HQAM is to identify a project team, and to prepare and approve a Project Plan. The HQAM mandates that all activities of an important to safety project be carried out in accordance with the Project Plan. Section 13.3 herein presents the essential elements of the HI-STORM 100 project programmatic quality requirements.

The HI-STORM 100 project team consists of a project manager, the licensing manager, the QA manager, and a team of technical specialists. A description of Holtec's organizational structure, functions, lines of responsibility, and levels of authority can be found in Holtec Quality Assurance documents.

13.3 QUALITY ASSURANCE PROGRAM

13.3.1 Overview

Important to safety (ITS) work on the HI-STORM 100 project is performed by Holtec International in accordance with Holtec International's quality assurance program which is designed to satisfy the requirements imposed within 10CFR50 Appendix B, 10CFR71, Subpart H, and 10CFR72, Subpart G. The following provides a summary of Holtec International's quality assurance program implementation to comply with the applicable regulatory requirements.

13.3.2 Quality Assurance Program Documents

Holtec International's quality assurance program has three levels of controlling documents. The highest level, and overall controlling document, is the Holtec International Quality Assurance Manual (HQAM) which provides the requirements and commitments that Holtec International must follow during the course of any nuclear safety-related or important to safety project. The manual is organized into 18 sections that correspond to the eighteen QA program criteria cited in the above-referenced regulations.

The second level of quality assurance program controlling documents is the Holtec International Quality Procedures (HQP). These procedures provide specific details on how Holtec International implements the requirements and commitments in the quality assurance manual.

Standard and project specific procedures comprise the third level of quality assurance program controlling documents. These procedures are used to control specific project activities and requirements which are not addressed within the Holtec International quality procedures. Examples of this would be a visual weld examination procedure, liquid penetrant examination procedure, or an in-process inspection procedure. These procedures are considered quality assurance records and are controlled in accordance with Holtec International's quality assurance program.

13.3.3 Quality Assurance Program Content

The requirements and commitments of Holtec International's quality assurance program as specified in the Holtec International quality assurance manual and corresponding quality procedures and project specific procedures (hereafter called quality assurance program documents) are summarized below. Each criterion is summarized separately.

1. Organization

Holtec International's quality assurance program documents define the quality assurance program related responsibilities of Holtec International personnel, as well as the breakdown of the organizational responsibilities within Holtec International. The Holtec International organization is detailed in the HQAM and HQP 1.0.

Holtec International's quality assurance program requires that the President of Holtec International review the status of the quality program on an annual basis. Furthermore, as part of Holtec International upper management's commitment to Holtec International's quality assurance program, a statement of policy authored by the President of Holtec International is contained in the quality assurance manual. This policy defines Holtec International's commitment to meeting the requirements of 10CFR50, Appendix B; 10CFR71, Subpart H; and 10CFR72, Subpart G, as applicable, on safety-related and important to safety projects and also delegates overall responsibility of quality program maintenance to the Quality Assurance Manager. The listing of Structures, Systems, and Components (SSC), defined as important to safety for the HI-STORM 100 System, is provided in Table 2.2.6 of this FSAR.

The Quality Assurance Manager is the person responsible for establishing and maintaining the QA Program. He reports to the Executive Vice President of Holtec International on all quality matters and has the authority and organizational freedom to enforce QA requirements, identify problem areas, recommend or provide solutions to QA problems, and verify the effectiveness of those solutions. As necessary, the Quality Assurance Manager can communicate directly to the President of Holtec International on quality-related issues. The minimum qualification requirements for the position of Quality Assurance Manager are contained in the Holtec QA program procedures. Regardless of the education and experience requirements, the QA manager shall be knowledgeable of the applicable codes and standards.

The Quality Assurance Manager has the following typical responsibilities:

- a. Monitor quality issues and keep Management informed of significant conditions adverse to quality.
- b. Initiate, recommend, or provide solutions and verify implementation of corrective actions to nonconforming conditions.

- c. Control or stop further processing, delivery, or installation of a nonconforming item, deficiency, or unsatisfactory condition until proper dispositioning has occurred.
- d. Maintain and control the HQAM, HQPs, and standard and project procedures.
- e. Review contractual documents to assure inclusion of applicable quality assurance requirements.
- f. Interface with clients and regulators during audits.
- g. Schedule, perform, and/or oversee audits/surveillances of suppliers of quality-related items and services to verify proper implementation of the quality assurance program.
- h. Schedule, perform, and/or oversee audits of internal activities to verify compliance with the HQAM.
- i. Approve Quality Procedures and Project Plans.
- j. Perform periodic reviews of nonconformance reports to identify adverse quality trends for management review and assessment.
- k. Coordinate activities to assess the adequacy and effectiveness of the QA program.
- l. Schedule and conduct training and indoctrination of personnel performing activities affecting quality.
- m. Maintain current qualifications/certifications for personnel performing quality-related activities, as appropriate.
- n. Maintain a current Approved Vendors List for vendors approved to provide quality-related items/services.
- o. Maintain a current list of approved computer programs.

Some of the above listed activities may be performed by personnel designated by the Quality Assurance Manager, although the Quality Assurance Manager retains overall responsibility for assuring proper implementation of the Quality Assurance Program.

Holtec International may contract with another organization to perform work on important to safety activities. The other organization could be a design agent, manufacturer, supplier, or subcontractor. Any organization performing functions affecting quality of important to safety work must have a QA position with the required authority and organizational freedom, as well as, direct access to upper

levels of management. Holtec International shall retain overall responsibility for the QA Program.

2. Quality Assurance Program

The Holtec International quality assurance program requires that activities important to safety involving design, procurement, fabrication, inspection and testing are performed in accordance with written procedures. Additional project specific procedures are written as needed when specific project requirements are not covered by quality procedures. These additional project specific quality procedures are considered quality assurance records which are controlled in accordance with Holtec International's quality assurance program. QA manuals and procedures, as well as project specific procedures, are controlled and distributed in accordance with the quality assurance program.

Holtec International personnel performing important to safety activities must be indoctrinated in the Holtec International quality assurance program prior to performing important to safety work in order assure requirements of the QA program are understood. Additionally, a training session is held each year for Holtec International personnel in order to review specific quality assurance requirements. The effectiveness of the quality program is assessed by upper management through annual audits, in-process assessments, and other means.

Holtec International personnel performing inspection, testing or auditing activities are qualified in accordance with written procedures using guidelines established by the American Society for Nondestructive Testing, American Society of Mechanical Engineers, American National Standards Institute, or other recognized authority, as applicable. These procedures define education, training, experience, and examination requirements for qualifying personnel to perform inspection, testing or auditing. Qualification records are maintained by the quality assurance manager, or designee, and include certification records, bases for qualification, qualification time period, experience and training records, and examination scores, as applicable. Proficiency of qualified personnel shall be maintained as required through retraining, re-examination, and/or re-certification.

Contractors used by Holtec International to perform important to safety work may have their own quality assurance program which meets or exceeds Holtec International's, or shall perform the work under Holtec International's quality assurance program.

QA programs of contractors performing important to safety work are reviewed by Holtec's quality assurance organization through audits, assessments, and surveillances to assure applicable QA criteria will be met.

A project plan is generated for each important to safety project. The project plan contains the necessary information to enable the project team to execute the project in a well-coordinated manner.

Disputes involving quality which arise from the difference of opinion between personnel from other departments shall be resolved by the QA Manager.

3. Design Control

Holtec International's quality assurance program documents establish measures necessary to assure the control of the design process, from input through verification. A design basis is defined in a design specification so that appropriate codes, standards and other relevant documents are used during the course of the design process. Design parameters, as well as miscellaneous design requirements, such as maintenance, repair and storage, are also defined within the Holtec design specification.

Drawings, procedures and design reports are the three main documents produced by Holtec International through its design process. Holtec International quality program requirements for procedures and drawings are defined in criterion 5 of the HQAM. Measures are established to assure applicable requirements from design bases documents are translated into drawings, procedures, and reports.

Quality assurance program documents are established to identify and control the authority and responsibilities of all individuals or groups responsible for design reviews and verification activities.

Holtec International's quality assurance program documents require that all design reports include, as applicable, a defined purpose, assumptions, references, inputs, outputs and results. Design reports are signed by the author and are reviewed by the Project Manager. Additionally, the design report is verified by an individual or group of individuals other than the author of the report. Verification may be made either by qualification testing, design review or alternate calculations. A design verification checklist is used as part of the review process. When qualification testing is used, the prototype shall be subjected to the most adverse design conditions. Surveillances are performed by members of Holtec's Quality Assurance Department to verify that design reports comply with the requirements of Holtec's QA program.

Measures are established to assure that design verification shall be performed by qualified personnel who did not perform the design analysis. The verifier shall not have influenced inputs or approaches utilized in the analysis. The analyst's supervisor may perform the verification pursuant to the requirements of NQA-1 [13.3.1].

Holtec International quality assurance program documents require that design verification, if other than by prototype or lead production quality testing, must be satisfactorily completed prior to

release for fabrication unless the timing cannot be met. In this case, written justification must be provided to the Quality Assurance Manager or designee and unverified portions of the design must be identified and controlled.

Changes to a Holtec International design report and specification are subject to the same design controls and must be reviewed and approved in a similar manner to the original.

Errors in design shall be addressed in accordance with Criteria 15 and 16.

When applicable, use of commercial items in an important to safety system, structure, or component shall be reviewed for suitability to their intended function.

Measures are established for the review and disposition of vendor documents including procedures and drawings.

Measures are established in the QA program to assure valid industry standards and specifications are used in the selection of design inputs (including suitable materials and processes).

4. Procurement Document Control

Holtec International's quality assurance program establishes measures to control the preparation, review, approval and issuance of all important to safety purchase orders. Only suppliers approved in accordance with Criterion 7 shall be qualified to supply important to safety items.

Measures are established within Holtec International's quality assurance program to ensure that purchase orders contain the following information, codes, standards, and specifications, as applicable:

- a. a statement of the scope of work to be performed by the vendor;
- b. the design basis technical requirements including codes, standards, specifications, etc., to which the item must be designed or manufactured;
- c. quality assurance requirements including as applicable, but not limited to, compliance by the vendor with the requirements of 10CFR21 [13.3.2], 10CFR50, Appendix B, 10CFR71, Subpart H, or 10CFR72, Subpart G; and direct reference to the vendor's quality assurance program.
- d. permission to gain access to the supplier's or subtier supplier's plant facilities and records;
- e. identification of documentation required to be supplied by the vendor for approval by Holtec;

- f. requirements for reporting and approving disposition of nonconformances;
- g. required procedures, tests, and inspections; and
- h. record retainage and control requirements.

All safety significant purchase orders shall be subject to at least one independent review and concurrence. The QA Department shall conduct required surveillances to ensure that safety significant purchase orders are being issued in accordance with the QA program.

Changes and revisions to purchase orders shall be subjected to the same or equivalent review and approval requirements as the original document.

5. Instructions, Procedures and Drawings

Holtec International quality assurance program documents require that activities that are important to safety must be prescribed and accomplished in accordance with written instructions, procedures or drawings. Methods for complying with the 18 criteria set forth within 10CFR50 Appendix B, 10CFR71, Subpart H, and 10CFR72, Subpart G, are also required to be described within defined procedures.

Instructions, procedures and drawings are required by the Holtec International quality assurance program to include qualitative and quantitative acceptance criteria in order to verify that activities important to safety have been satisfactorily accomplished.

Measures are established through the Holtec International quality assurance program to prepare, review, approve, and control these instructions, procedures and drawings. The review of these documents is required to be performed by a cognizant verifier other than the author. Revisions to instructions, procedures and drawings are required to be reviewed and approved in a similar manner to the original revision.

6. Document Control

Holtec International's quality assurance program documents establish methods to control the review, approval, and issuance of documents and changes thereto, before release, to ensure that the documents are adequate and applicable quality requirements have been incorporated. Documents that must be controlled shall include, but not be limited to: design specifications; design reports; design and fabrication drawings; procurement documents; QA manuals; design criteria documents; and procedures and instructions (i.e., fabrication, inspection, and testing).

Measures are established in quality assurance program documents to define individuals or organizations responsible for the review, approval, and control of the documents identified above. Document revisions are required to be reviewed, approved, and controlled in a similar manner to the original document. Review of documents is required to be performed by qualified personnel.

Quality assurance program documents require that documents required to perform a specific activity shall be available at the location where the activity is being performed. Quality assurance program documents also require that obsolete or superseded documents are controlled in order to prevent their inadvertent use.

An index of project documents is maintained in order to allow identification of the latest revision of applicable documents. This list includes, but is not limited to, design reports, specifications, procedures, and drawings.

7. Control of Purchased Material, Equipment and Services

Holtec International quality assurance program documents define measures to ensure that important to safety materials, equipment and services conform to procurement documents. Procedures are established to define requirements for procurement document control, supplier evaluation and selection, vendor surveillance, and receipt inspection in order to assure purchased items are properly controlled from the procurement phase through item receipt.

Holtec International quality assurance program documents require that Holtec International qualified personnel evaluate Holtec International subcontractors supplying important to safety items and services prior to contract award. A vendor shall be evaluated to determine its technical capability as well as its production capability. Those vendors found to have satisfactory technical and production capabilities are submitted to the quality assurance department for a quality assurance evaluation. The quality assurance evaluation, which shall be documented, shall assess past performance and also determine the capabilities of the vendor to comply with required codes and QA criteria through audit, surveillance, or other source evaluation, as applicable. Unacceptable conditions discovered by Holtec International quality assurance are addressed through nonconformances and audit findings, as applicable. Holtec International shall impose its own quality assurance program on vendors which are determined not to have an adequate quality assurance program; or shall require changes in the supplier's quality assurance program to make it acceptable to Holtec International; or shall perform dedication of the items through surveillance, inspections, and tests in accordance with Holtec International's QA program, as applicable. Qualified suppliers of important to safety items, equipment, and services must be placed on Holtec International's Approved Vendors List. Specific requirements for placing vendors on the Approved Vendor List are defined within Holtec International quality assurance program documents. As applicable, this includes an audit, surveillance, or other source evaluation of the vendor to verify QA program conformance to applicable codes and implementation of the QA program. Measures for performing audits, surveillances, and other source evaluations are defined in quality assurance program

documents. As applicable, the QA program requires triennial audits, surveillances, or other source evaluations in order to verify continued implementation of their QA program and maintenance on the Approved Vendors List.

Measures for performing supplier surveillances are defined within Holtec International quality assurance program documents. Source surveillance is used to determine that in-process work is being performed by the supplier in accordance with purchase order requirements. The Project Manager, in conjunction with the Quality Assurance Manager, must determine the extent of source surveillance required for a particular job or supplier based on the important to safety classification, complexity of the item, and quantity. Holtec International quality assurance program documents define types of surveillance activities that may be performed including hold point verification. Project-specific procedures and procurement documents define, when applicable, necessary inspection points to be performed by Holtec, and inspection and test acceptance criteria.

Measures for performing receipt inspection activities are defined within Holtec International quality assurance program documents. Receipt inspection is performed in order to verify received items meet the requirements of the purchase order. The extent of receipt inspection to be performed on vendor-furnished items in order to assure items are properly identified and conform to purchase order requirements is established through Holtec International quality and project procedures, or vendor procedures approved by Holtec. Inspection records, material test reports, and/or certificates of conformance attesting to the acceptance of the item are reviewed, as applicable, for acceptability as part of the receipt inspection process. When item acceptance is contingent on post-installation testing or inspection, the acceptance criteria shall be defined with vendors through procurement documents prior to item use. Items and materials that have completed receipt inspection and are released for fabrication or further use are controlled in accordance with quality assurance program documents.

Measures have been established through Holtec International quality assurance program documents to control items discovered during receipt inspection, to have a nonconforming condition. These measures include segregation and identification of items, evaluation of the nonconforming items, and disposition with justification, as required.

Holtec International quality assurance program documents establish measures to assure that a supplier provides the documentation for a received part as required by the purchase order. These documents include, but are not limited to, material test reports, inspection and test reports, certificates of conformance and nonconformance reports, as applicable. Review of these documents for conformance to procurement documents is required.

8. Identification and Control of Materials, Parts and Components

Holtec International quality assurance program documents establish measures to ensure that materials, parts and components, including partially fabricated assemblies, are adequately identified

and controlled in order to preclude the use of incorrect or nonconforming items. Measures are established by Holtec International through its quality documents to ensure that limited life items are controlled in order to preclude their use once the shelf life of these items has expired.

Measures are established by Holtec International through quality assurance program documents in order to provide the means for material, part or component identification so that items maintain traceability to appropriate documentation such as drawings and test reports throughout fabrication, installation and use, and to preclude use of incorrect or defective items. Markings are required to be made such that they are not detrimental to the item. Any specific identification or marking requirements are identified through drawings, procedures, or specifications.

9. Control of Special Processes

Holtec International quality assurance program documents establish measures to ensure that special processes such as welding, lead pouring, neutron shield material installation, and NDE examinations are controlled. Specific special processes are typically identified in fabrication specifications. Procedures, equipment, and personnel used to perform special processes are required to be qualified in accordance with applicable codes, standards and specifications. Special process operations shall be performed by appropriately qualified personnel using written and approved procedures, as applicable. Special process operations are required to be documented and verified. Special process records including procedure, equipment and personnel qualifications, as well as special process operation results are required to be maintained as quality records.

10. Licensee Inspection

Inspections are required to be performed in accordance with written procedures in order to verify conformance of quality affecting activities. Drawings and specifications are used in conjunction with the procedures to define specific acceptance criteria. Inspection procedures include, as applicable, identification of characteristics and activities to be inspected, acceptance and/or rejection criteria, methods of inspection, identification of the individuals or groups responsible for performing the inspection operation, recording of inspection results, identification of hold and witness points, approval requirements for inspection data and inspection prerequisites such as personnel qualifications. Inspection results are documented and signed by the applicable inspector. Inspections through sampling shall use known standards as applicable for the basis of acceptance.

Measures are established within Holtec International quality assurance program documents to ensure that structures, systems, and components important to safety are, upon receipt, inspected to verify that the item meets purchase order requirements. Control of materials, both before and after receipt inspection, are defined for both accepted and nonconforming material within Holtec International quality assurance program documents.

Measures for in-process control are established through project-specific procedures for situations

when direct inspection would be impractical. In-process controls when required, may include, but are not limited to, monitoring of processing methods, equipment and personnel, as well as review of in-process documentation.

Measures are established within the quality assurance program documents to assure that reworked or repaired items are inspected to the original requirements, or approved deviation and new requirements.

Holtec International quality assurance program documents establish measures to ensure that nonconformances identified during the course of fabrication are resolved prior to, or during final inspection; that items which are inspected must be identifiable and traceable to specific records; and that inspection records must be reviewed by the Holtec International QA Manager, or designee, to verify the inspection requirements have been satisfied.

Holtec International quality assurance program documents require that inspectors shall be qualified in accordance with applicable codes and standards and shall be properly trained. Inspector qualification records are maintained within the quality assurance files and are required to be kept current. Measures are defined within Holtec International quality assurance program documents to ensure that inspection personnel are independent from personnel performing the activity being inspected.

11. Test Control

Holtec International quality assurance program documents establish measures to ensure that applicable test programs (i.e., load tests, leak tests, hydrostatic tests, production tests, etc.) are performed in accordance with written procedures, as applicable. Test procedures include, as applicable: test equipment and calibration requirements; material requirements; personnel qualifications; prerequisites (including environmental conditions); detailed performance instructions; hold points; acceptance and rejection criteria; instructions for documenting and evaluating results; and documentation approval requirements.

The acceptance test program is defined in Chapter 9 of the FSAR for the HI-STORM 100 System and shall be implemented for each system to verify that SSCs conform to the specified requirements and will perform satisfactorily in service.

Only qualified personnel shall evaluate test results for acceptability.

12. Control of Measuring and Test Equipment

Holtec International quality assurance program documents establish measures to ensure that measurement and test equipment shall be calibrated, adjusted and maintained at prescribed intervals or prior to use. Calibrations are required to be performed in accordance with written procedures or

standards. Measuring and test equipment is required to be controlled such that the next calibration date and traceability back to calibration records is maintained.

Measures are established within Holtec International quality assurance program documents to ensure that calibrations of measuring and test equipment are performed using calibration standards that are both traceable and have known valid relationships to nationally recognized standards. When no known recognized standard exists, the basis for the calibration is required to be defined and documented.

Measures are established within Holtec International quality assurance program documents to control measuring and test equipment which is found to be out of calibration. These controls include validation of all previous inspection and test results from the time the item was found to be out of calibration back to the time of the previous acceptable calibration of the same item. Measuring or test equipment found to be out of calibration is required by Holtec International quality assurance program documents to be repaired and recalibrated prior to next use, or replaced.

A master list of calibrated tools and equipment is required to be kept in order to maintain a complete calibration status of each item.

13. Handling, Storage and Shipping

Holtec International quality assurance program documents establish measures to ensure that cleaning, handling, storage and shipping of items are accomplished in accordance with design requirements to preclude damage, loss, or deterioration by environmental conditions. These activities are performed in accordance with written instructions or procedures as necessary. Measures for establishing provisions for the use of special handling, lifting or storage equipment in order to adequately identify and preserve items, components or assemblies are provided within Holtec International quality assurance program documents.

Measures are established within Holtec International quality assurance program documents to ensure that a review of packaging be performed prior to item shipment in order to assure packaging meets approved drawings, specifications and codes. Additionally, verification of completion of documentation, including procedures, manuals and inspection and test results is required to be performed prior to shipment. Physical identification of the item shall be verified prior to shipment.

14. Inspection, Test and Operating Status

Holtec International quality assurance program documents establish measures to ensure the inspection, test and operating status of items is known by organizations responsible for quality activities.

Measures are established by Holtec International through its quality assurance program documents to control the application and removal of status indicators such as markers and tags. Additionally, Holtec International quality assurance program documents establish measures to ensure that if required operations such as tests or inspections are bypassed, such action is taken through controlled procedures and under cognizance of the quality assurance department.

Controls on nonconforming items are summarized in Criterion 15.

15. Nonconforming Materials, Parts or Components

Holtec International quality assurance program documents establish measures to ensure control of nonconforming important to safety items, services, and activities. This includes provisions for the identification, documentation, tracking, segregation, review, disposition of nonconforming items, and notification of the affected organizations, as appropriate.

Holtec International quality assurance program documents establish measures to ensure that nonconforming items, services or activities shall be reviewed and dispositioned. Provisions are included to ensure that nonconforming services or activities, including those of suppliers, for which the recommended disposition is "accept-as-is" or "repair", shall be submitted to the client for approval, if required

Measures are established within Holtec International quality assurance program documents to require nonconformances to be identified through deviation reports and corresponding corrective actions (which may include repair, rework, and inspection requirements). Individuals responsible for review and disposition of nonconforming items are identified within Holtec International quality assurance program documents.

Measures are established within Holtec International quality assurance program documents to control further processing, delivering, or installation of nonconforming or defective items pending a decision on its disposition. Measures are established through Holtec International quality assurance program documents to ensure that nonconforming items are segregated and controlled until proper disposition is completed.

Holtec International quality assurance program documents establish measures to ensure that the acceptability of nonconforming items is verified by inspecting or testing the nonconforming item against original requirements after designated repair or rework. Final disposition of nonconforming items shall be defined and documented.

Measures are established within Holtec International quality assurance program documents to permit anyone who discovers a nonconformance to report it in accordance with quality assurance program documents. Provisions are established to ensure that nonconformances are evaluated for the purpose of determining if reporting pursuant to 10CFR21 [13.3.2] is required.

Holtec International quality assurance program documents require that nonconformances be assessed by the Quality Assurance Manager on a defined basis to determine any quality trends. Any trends or significant results shall be evaluated by appropriate management personnel for development of correction actions.

Nonconformance reports are considered part of the quality records package. As-built conditions are required to be documented as applicable.

16. Corrective Action

Holtec International quality assurance program documents establish measures to ensure that causes of conditions adverse to quality are promptly identified and reported to upper management through deviation reports and corrective action reports. Measures are also established to ensure that corrective actions are performed on identified nonconforming conditions or items, and that follow-ups are performed and documented as applicable to verify implementation and effectiveness of the corrective action.

Measures are established within Holtec International quality assurance program documents to ensure that follow-up activities are performed to verify that corrective actions have been correctly implemented so as to minimize the possibility of recurrence of the nonconforming condition. Individuals responsible for verifying and documenting corrective action are identified within Holtec International quality assurance program documents.

Measures are established within Holtec International quality assurance program documents to document and evaluate significant conditions adverse to quality through root cause evaluations. These evaluations are performed by qualified individuals and reviewed by cognizant levels of management.

17. Quality Assurance Records

Holtec International quality assurance program documents require that evidence of activities affecting quality shall be documented and shall provide sufficient information to permit identification of the record with the items or activities to which it applies. Quality assurance records include, but are not limited to, design, procurement, manufacturing and installation records; audits (internal and external); nonconformance reports; inspection and test results; drawings (including as-built) and specifications; analysis reports (i.e., failure, seismic, etc.); personnel qualifications and training (including retraining) records; procedures (i.e., inspection, testing, calibration, etc.); calibration records; equipment qualification; corrective action reports; operating logs and completed travelers; material test reports; and design review documents.

Holtec International quality assurance program documents require that inspection and test records shall, as applicable, contain observations, evidence of inspection or test performance, results of inspections or tests, names of inspectors, date of tests, test personnel and data recorders, equipment identification, and evidence of acceptability. Any nonconforming conditions shall be addressed in accordance with Criterion 15.

Holtec International quality assurance program documents establish measures to ensure that documents defined as quality assurance records are legible and that they reflect the total of work performed.

Quality assurance records are defined as either "lifetime" or "nonpermanent", as appropriate. Holtec International quality assurance program documents define which quality assurance records are "lifetime" and which are "nonpermanent". "Lifetime" records are those records that pertain to the design, fabrication and installation of a particular item such that the records can demonstrate the capability of the item and provide evidence of activities supporting the acceptability of the item. These records demonstrate the capability for safe operation; provide evidence of repair, rework, replacement or modification; aid in determining the cause for an accident or malfunction of an item; or provide a baseline for inservice inspection. Examples of "lifetime" records include design reports, drawings, procedures and inspection reports. "Nonpermanent" records are those records that show evidence of an activity being performed but do not meet the criteria for "lifetime" records. Examples of "nonpermanent" records include document transmittal forms and surveillance reports. "Nonpermanent" record retention times are defined within Holtec International quality assurance program documents.

Holtec International quality assurance program documents establish measures to ensure quality assurance records are properly controlled from receipt through long term storage. Responsibilities for receipt, storage, retrieval and disposal of quality assurance records are provided within Holtec International quality assurance program documents. Records are required to be indexed so that they are readily retrievable.

Holtec International quality assurance program documents define storage requirements in order to assure quality assurance records are not damaged or destroyed. Quality assurance records are required to be stored in boxes, cabinets or shelves, or on the electronic network, and shall be protected from such conditions as water, fire, etc. Measures are established through Holtec International quality assurance documents to ensure records requiring special storage requirements are stored properly. Quality assurance record storage areas are required by Holtec International quality assurance program documents to have controlled access. In the case where a quality assurance record is damaged or lost, it is required to be replaced immediately in a controlled manner by responsible personnel.

18. Audits

Holtec International quality assurance program documents define a comprehensive audit program including independence of the auditors from the area being audited, audit schedule requirements, identification of auditors and their required qualifications, access provisions for audit personnel, documentation requirements, methods for reporting audit findings, and methods for corrective actions and follow-ups.

Holtec International quality assurance program documents require that schedules be defined for internal and external audits. Audit plans are required to be written for each audit and shall define the key activities or areas to be audited.

Audits are performed in accordance with written procedures and/or checklists. Audits are performed in order to provide a comprehensive independent verification and evaluation of procedures and activities affecting quality, and to verify and evaluate a supplier's QA program, procedures, and activities. As appropriate, audit teams may contain members who are technical experts in the areas being audited. Holtec International internal audits are required to be performed annually and shall review all aspects of Holtec International's quality assurance program in order to determine the effectiveness of the program. External audits are performed per Criterion 7, as necessary, and shall evaluate all applicable and Holtec International relevant portions of the vendor's quality assurance program.

Holtec International quality assurance program documents establish qualification requirements for auditors including lead auditors. Additionally, responsibilities of audit personnel regarding the performance of the audit as well as the follow-up documentation (i.e., audit report, findings etc.) are defined within the same documents.

The Holtec International quality assurance program documents establish requirements for the performance of pre- and post- audit conferences. The pre-audit conference is used to define the scope of the audit as well as the specific areas to be audited, and define a schedule and agenda for the audit. The post-audit conference is used to discuss the results of the audit with the audited party.

Holtec International quality assurance program documents establish measures for writing of audit reports and provide instructions for the processing of findings and their corresponding corrective actions. Corrective action responses are required to clearly state the corrective action taken to correct the nonconforming condition and date of implementation. Audit reports shall be transmitted to responsible personnel at the audited organization for review and implementation of corrective actions, when required. Reports of internal audits shall be transmitted to the president of Holtec International.

Holtec International quality assurance program documents require that the audit team verify that corrective action responses are made in a timely manner, that the corrective action responses are adequate, and that corrective actions have been properly implemented.

13.4 PROJECT PLAN

Section deleted.

The structure of the Holtec International organization and the assignment of responsibilities for each activity ensures that the designated responsible parties will perform the necessary work to achieve and maintain the quality requirements specified in the HQAM. Conformance to established requirements will be verified by individuals and groups not directly responsible for the performance of the work. The QA Manager, who directly reports to the Executive Vice President of Holtec International, has been designated as the party responsible for verifying quality, and he has the required authority and organizational freedom, including independence from influence of cost and schedule, to effectively complete his responsibilities. The QA Manager can also communicate directly to the President of Holtec International regarding quality assurance activities.

The Holtec International Quality Assurance Program is documented in the HQAM, HQPs and project specific procedures, and provides adequate control over activities affecting quality, as well as structures, systems, and components that are important to safety, to the extent consistent with their relative importance to safety. The QA program describes a management system and controls, that when properly implemented, will comply with the requirements of Subpart G to 10CFR Part 72 and 10CFR Part 21 [13.3.2].

Design analyses and engineering documentation for the thermal, structural, confinement, criticality, shielding, and operational capabilities of the HI-STORM 100 System for normal, off-normal and postulated accident conditions are carried out in accordance with the 18 criteria in the HQAM. In addition, those activities and items designated as important to safety and related to the material specification and procurement for the HI-STORM overpack and MPC canister, as well as the HI-STORM 100 lifting equipment, are subject to Holtec QA program procedures. Governing procedures include those for procurement document control, control of purchased items and services, material handling, and instructions and drawings which control material requirements.

Further, the fabrication, testing and inspection of the HI-STORM 100 System by Holtec International and its subcontractors will be conducted in accordance with all QA program requirements, including those activities and project procedures addressed by the 18 criteria, especially those covering design control, identification, and control of materials, parts and components, test control, inspection procedures, control of special processes, control of measuring and test equipment, and inspection and test status documentation.

The operation, maintenance, repair and modification of the HI-STORM 100 System will be governed by the licensee's (e.g., utility) QA program with support and record maintenance as required by Holtec's QA program and regulatory requirements. These activities will be verified and audited on a periodic basis with respect to control of nonconforming materials, parts or components, corrective action, quality assurance records, audits, and reviews of ongoing inspections, surveillances, and operating status.

In conclusion, the Holtec International QA Program complies with the applicable NRC regulations and industry standards, and will be implemented for the HI-STORM 100 dry cask storage system.

13.6 REFERENCES

- [13.1.1] NUREG/CR-6407, "Classification of Transportation Packaging and Dry Spent Fuel Storage System Components According to Importance to Safety," February 1996.
- [13.1.2] Holtec International Quality Assurance Program Topical Report for 10CFR71, Subpart H and 10CFR72, Subpart G, Holtec International Report HI-941152, Rev. 2 (8/4/94).
- [13.1.3] NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems," January 1997.
- [13.3.1] NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities"
- [13.3.2] U.S. Code of Federal Regulations, Title 10, "Energy", Part 21, "Reporting of Defects and Noncompliance."

HI-STORM FSAR

APPENDIX 13.A

Intentionally Deleted

APPENDIX 13.B
INTENTIONALLY DELETED