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DESIGN CRITERIA DOCUMENT FOR THE DIABLO CANYON CASK TRANSFER FACILITY

FOR

PG&E

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☐ Technical Report (Per HQP 3.2) (Such as a Licensing Report)

☒ Design Criterion Document (Per HQP 3.4)

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SUMMARY OF REVISIONS

Rev. 0		Initial Issue
Rev. 1	•	Incorporated significant PG&E comments
Rev. 2		Incorporated PG&E Comments
Rev. 3		Incorporated PG&E Comments

1. INTRODUCTION

1.1 Overview:

a. This specification covers the functional requirements for the Cask Transfer Facility for use with the HI-STAR and HI-STORM Systems at the Diablo Canyon Power Plant (DCPP). The Cask Transfer Facility is primarily intended to lower a HI-STORM 100 Overpack into a recessed pit whereas a transfer cask containing a loaded canister (MPC) containing spent nuclear fuel assemblies may be placed atop of the HI-STORM 100 to effectuate MPC transfer. To qualify the Cask Transfer Facility as acceptable for cask lifting, the cask lifting device of the Cask Transfer Facility must have rigorous structural safety margins.

1.2 The cask lifting functions required of the Cask Transfer Facility are:

a. Raising and lowering a HI-STORM 100 Overpack for mating with the HI-TRAC transfer cask.

b. Raising and lowering a HI-STAR 100 Overpack for mating with the HI-TRAC transfer cask.

1.3 The Cask Transfer Facility functions that support cask preparation are:

a. Areas to position cask lids and other support equipment and components.

b. Areas to position mobile lifting equipment for lifting and positioning of cask lids and other support equipment and components.

c. Areas for upending and downending the transfer cask.

d. Features to support positioning and alignment of the cask transporter over the lowered HI-STORM or HI-STAR Overpack.

e. Areas to support upending and downending of the HI-TRAC transfer cask.

f. Temporary storage location for cask components and support equipment.

g. Access paths to the underground components of the cask transfer facility for inspection and repair of components.

1.4 Important to Safety Designation

a. [

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1.5 System Description

a. Diablo Canyon Cask Transfer Facility (CTF) is used in conjunction with the Diablo Canyon transporter to effectuate MPC transfers between the HI-TRAC transfer cask, HI-STORM 100 Overpack and HI-STAR 100 Overpack. [

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2. REFERENCES

Note:

The applicable versions of the following references shall be current revision unless otherwise indicated.

2.1 Holtec References:

a. DCPP ISFSI Safety Analysis Report

b. "License Amendment Request No. 1014-1", Holtec International, Rev. 2, July, 2001.
c. "Final Safety Analysis Report for the HI-STORM 100 System", Holtec International Report No. HI-2002444, Rev. 0, July 2000.
d. Holtec Certificate of Compliance (COC) 72-1014, HI-STORM 100 Cask System, Docket No. 72-1014.

2.2 Regulatory References:

a. Nuclear Regulatory Commission (NUREG-1567 "Standard Review Plan for Spent Fuel Dry Storage Facilities", March 2000.

b. NUREG/CR-6407, Classification of Transportation Packaging and Dry Spent Fuel Storage System Components According to Importance to Safety.

c. U.S. Nuclear Regulatory Commission, "Standard Review Plan for Dry Cask Storage Systems", NUREG-1536.

d. *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."".

e. Nuclear Regulatory Commission NUREG-0612 "Control of Heavy Loads at Nuclear Power Plants.

2.3 Industry References:

a. American Concrete Institute (ACI 318), "Building Code Requirements for Structural Concrete".

b. ACI 349, Code Requirements for Nuclear Safety Related Concrete Structures," American Concrete Institute (ACI 349R).

c. ACI 349 Draft, Appendix B, Dated 10/01/2000 Draft Code Requirements for Nuclear Safety Related Concrete Structures.,"

d. Draft Regulatory Guide DG-1098, "Safety Related Concrete Structures for Nuclear Power Plants (Other than Reactor Vessel and Containment)". U.S. Nuclear Regulatory Commission, August 2000.

e. American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section III, Subsection NF, "Component Supports", 1995 Edition through 1997 Addenda.

f. Crane Manufacturers Association of America, Inc. Specifications for Electric Overhead Traveling Cranes, CMAA-70.

g. American Society of Mechanical Engineers , American National Standard, Safety Standards, "Jacks", ASME B30.1.

h. Deleted.

i. American Welding Society, "Specification for Welding of Industrial and Mill Cranes and Other Material Handling Equipment," AWS D14.1.

j. California Code of Regulations Title 8, "General Industry Safety Orders".

k. National Fire Protection Association (NFPA), NFPA 70, "National Electric Code".

3. OPERATIONAL DESCRIPTION

3.1 The loading operations for transferring the MPC from a HI-TRAC into a HI-STORM[1] are summarized as follows. This section is provided for the aide of understanding the operations of the CTF. Actual operations may vary from those described herein. A detailed description of the operations with accompanying pictures is in Reference2.1a. An empty HI-STORM 100 Overpack is placed in the CTF using the DCPP cask transporter. Radial positioning plates, located on the top surface of the platform, act as key ways to help locate the HI-STORM in the CTF. The CTF is lowered to the full down position leaving the top of the HI-STORM 100 Overpack body *[* *.]* The HI-STORM lid is removed and a mating adapter is attached to the HI-STORM 100 Overpack top. A set of lateral restraints are installed between the HI-STORM 100 Overpack and the CTF inside wall. The lateral restraints act somewhat like boat bumpers to limit the radial movement of the HI-STORM during a seismic event. A mating device is secured to the HI-STORM top surface. The mating device provides the connection between the transfer cask and the HI-STORM 100 Overpack.

The HI-TRAC transfer cask, containing a loaded and sealed MPC, is upended, raised and placed into the mating adapter using the cask transporter. Seismic restraints secure the HI-TRAC transfer cask to the secured cask transporter or directly to the CTF pad to prevent sliding during a seismic event (i.e., HI-TRAC may be restrained directly to the CTF pad or to the CTF pad via the cask transporter). The pool lid of the HI-TRAC transfer cask fits into the recess of the mating device while the bolting flange supports the HI-TRAC body. *[*

] The HI-TRAC bottom lid is removed using the mating device. Once the pool lid is removed, the MPC is lowered into the HI-STORM 100 Overpack using the sling and pulley system. The cask transporter lift links are reconnected and attached to the HI-TRAC lifting trunnions and the seismic restraints are disconnected. The empty HI-TRAC transfer cask is removed from on top of the HI-STORM 100 Overpack. The MPC lifting attachments and slings are disconnected and the mating

[1] The CTF may also be used for transferring a loaded MPC into a HI-STAR 100 Overpack for off-site shipment The procedures are similar for both (HI-STAR and HI-STORM) overpacks For simplicity, the discussion is limited to the HI-STORM 100 Overpack.

device is removed. The HI-STORM 100 Overpack lid is installed. HI-STORM is raised to the full up position by the cask transfer facility. The transporter, now equipped with lifting brackets attaches to HI-STORM and raises it completely out of the cask transfer facility and places it on the ISFSI pad for storage.

3.2 The cask transfer facility is simply described as a level pad with a cylindrical hole containing a lifting platform onto which a HI-STORM 100 Overpack sits (See Figures 3.2.1 through 3.2.4). The top surface of the pad has provisions for securing the cask transporter and HI-TRAC during a seismic event. [

] The CTF consists of the following subsystems:

a. Main Shell – [

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b. Lifting jacks – *[*

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c. Drive and Control System – *[*

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d. Lifting Platform – *[*

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e. Apron pad – *[*

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4. DESIGN AND CONSTRUCTION

4.1 Load Combinations

a. The load combinations for the jacks, shell, and platform shall include the fully loaded and assembled HI-STORM 100 Overpack dead weight (assumed to be180 tons) plus the weight of the lifted platform *[*

.] The jacks shall be designed to safely raise and lower a fully loaded HI-STORM 100 Overpack. The components of the jacks in tension shall meet the guidelines of Reference 2.2e. Additional load combinations, as they apply to specific CTF components, are discussed in the following sections.

b. Load combinations will be those of Reference 2.1c Section 2.3.3 as amended by site-specific values specified in PG&E Specification 10012-N-NPG as applicable.

4.2 Apron Pads

a. The apron pad shall be designed to support the cask transporter carrying the loaded HI-STORM 100 Overpack. The location for transfer cask upending shall be designed to support the load of the rotating corner of the transfer cask transport frame. Restraint shall be designed to prevent sliding of the cask transporter on the pad during a seismic event. The restraints may take several forms including hard stops, gusset-type attachments and/or removable links. The shell, in conjunction with the backfill shall be designed to prevent the HI-STORM 100 Overpack from overturning during a seismic event. Lateral restraints shall be positioned such that they do not interfere with cask transporter movement.

b. The apron pad shall be designed to support the weight of the cask transporter carrying the HI-STORM 100 Overpack near the shell of the CTF.

c. Other areas of the pad (equipment lay down areas) shall be designed for the specific loads.

4.3 Structural Steel

a. The load-bearing structural steel members shall be designed and fabricated in accordance with Reference 2.3e.

5. STRUCTURAL CRITERIA

5.1 Design Loads

a. The design for the cask lifting platform shall be based on a dead load of the loaded HI-STORM 100 Overpack, plus the weight of the cask lifting platform itself (See Section 4.1.a).

b. Jacks shall be rated for a minimum load of 150 tons each.

6. FUNCTIONAL/TECHNICAL REQUIREMENTS

6.1 General

a. The CTF shall meet the requirements of Holtec FSAR Section 2.3.3 as applicable.

b. The cask transfer facility and its components shall be designed to operate in conjunction with the cask transporter.

c. No interferences shall exist that impede the operation of the cask transporter or other equipment needed to perform the cask loading operations.

d. All components requiring maintenance (e.g., mechanical, electrical, control components drain lines, grease fittings, oil fill and drain ports) shall be accessible. Access to the areas below the platform shall be accessible when the HI-STORM 100 Overpack is removed from the CTF.

6.2 Main Shell

a. The embedded main shell shall be flush with (or close to) the finished surface of the surrounding concrete pad.

b. The cask lifting platform shall be a horizontal steel weldment that is raised inside the bounds of the main shell.

c. The main shell shall be equipped with a sump, drains or other means to remove water from the cask transfer facility hole.

d. [

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e. If multiple segments are to be assembled on site, the assembly shall minimize welding.

f. [

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g. The shell, in conjunction with the platform and the surrounding fill, shall be designed to withstand loads imparted through the lifting platform from wind, earthquake, lightning, tornado missile loads, operational and handling loads.

h. The main shell shall maintain sufficient rigidity during installation and construction (i.e., concrete pouring) to prevent permanent deformation.

i. [

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j. The concrete floor shall be designed for the placement of three identical evenly-placed support pedestals. The support pedestals shall be designed to transfer the weight of the empty HI-STORM 100 Overpack, HI-TRAC transfer cask, loaded MPC, mating device and meet the material and stress requirements of Reference 2.3b and 2.3c.

k. The shell shall have provisions for securing the shell in place during concrete pouring.

6.3 Lifting Platform

a. Radial stability of the lifting platform shall be provided by the main shell. This shall include wind, earthquake, lightning, tornado missile loads, operational and handling loads.

b. Vertical guides or runners shall be provided to prevent damage of the main shell or lifting platform at the interface locations. These shall be wheeled or low friction pads.

c. [

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d. [

.]

e. Parking of the platform shall accommodate jack screw protective boots.

f. The lifting platform shall bottom out against the main shell in the down position (i.e., the jacks shall not have to support the combined weight of the stacked casks).

g. [

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h. Personnel access provisions shall be provided for access, inspection and repair of cask transfer facility components. Access to the underside of the platform may be via ladder through removable access ports. Access is not allowed if the platform is loaded.

i. The top of the platform shall be equipped with provisions for locating the HI-STORM 100 Overpack and transmitting lateral loads to the platform. Methods for location shall not inhibit the use of the HI-STAR 100 Overpack in the CTF.

6.4 Jacks

a. Jacks shall have design safety factors consistent with Section 5.1.6 of Reference 2.2e.

b. Even loading of the platform shall be afforded by the simultaneous operation of the lifting jacks.

c. [

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d. [

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e. Jacks shall be capable of performing the lift in one continuous motion. The jacks shall not require an interim cooling period during the lift.

f. Jacks, in conjunction with their drive system, shall not be capable of unwinding during a loss of power or seismic event.

6.5 Drive and Control System

a. The cask lifting platform shall be operated from a fixed position control station or a pendent. The control station may be located above or below grade as long as reasonable access is provided.

b. Cask lifting platform drive system shall ensure coordination of the lifting jacks.

c. Jacks, gearboxes, couplers, motors, wires and other jack drive and control appurtenances shall be below grade in concrete-lined shallow trenches. A removable steel cover plate shall cover all trenches.

d. The trench cover plates shall be equipped with provisions for removal of the cover plates.

e. Subsurface cavities (for motors and gear boxes, etc.) shall have provisions for water drainage.

f. Cover plates shall be situated slightly below the level of the finished surface to prevent direct bearing of the cask transporter on the cover plates. The cask transporter tracks may bridge the cover plates but shall not place direct load on the plates. Plates shall be a minimum of 1 inch thick.

g. Power to the CTF motors, electrical control wires between the control station shall be run underground and suitably protected from damage and the elements in accordance with applicable industry standards for such utilities.

h. Motors shall be 460 volt, three phase and meet applicable NEMA, National Electrical Code and IEEE requirements for the location (i.e., outside, underground, wet environment), environment and type of service to be employed in the CTF. Motor heaters are not required.

i. At the user's discretion, motors shall be equipped with brakes or the jack drive system shall be demonstrated to require a significant positive driving force to move the platform in the downward direction.

6.6 Apron pad

a. *[*

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b. Lateral restraints shall be provided to restrain the cask transporter and or the transfer cask during MPC downloading. Restraints shall resist lateral movement during a seismic event. See Section 4.2a.

c. Personnel safety preventing falling into the cask transfer facility opening shall be provided by removable handrails or other form of protection (cover plate, strong mesh cover, inserted platform).

d. The apron pad shall be capable of being equipped with removable personnel hand rails that conform with applicable personnel safety regulations. Appurtenances for the attachment of the hand rails shall not interfere with the operation of the cask transporter.

e. Jacks, gearboxes, couplers, motors, wires and other jack drive and control appurtenances shall be below grade in concrete-lined shallow trenches. A removable steel cover plate shall cover all trenches.

f. Cover plates shall be situated slightly below the level of the finished surface to prevent direct bearing of the cask transporter on the cover plates. The cask transporter tracks may straddle the cover plates but shall not bear directly on them.

6.7 Facility Power

a. Power for the facility shall be electric. Power lines shall be sufficiently protected from interaction with the cask transporter and other operations.

b. Electrical components shall meet appropriate NEMA, NFPA and/or IEEE standards.

7. DESIGN LIFE

a. The Cask Transfer Facility shall be constructed to have a minimum design life of 40 years.

8. ENVIRONMENTAL REQUIREMENTS

8.1 Environmental Conditions:

a. The CTF shall be designed to the Reference 2.1c Section 2.3.3.1 environmental conditions as amended by site-specific values specified in PG&E Specification 10012-N-NPG as applicable.

b. Rain and Snow

c. 0 °F to 100 °F at 100% humidity

9. TESTING REQUIREMENTS

9.1 Load and Functional Testing

a. All testing described herein shall be performed in accordance with Holtec-approved procedures. Procedures shall include pre-test and post-test measurements, test requirements, inspections, and acceptance criteria.

b. A functional test shall be performed on the unloaded Cask Transfer Facility to ensure that the equipment and controls function in accordance with this specification. As a minimum, the test shall confirm the proper performance of all control panel instrumentation, indicator devices, controls and safety features. The platform shall be raised and lowered to ensure that it moves freely along its entire range of travel and can be moved to designated positions and stopped for cask lifting operations.

c. *[*

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d. All welds on Important to Safety components shall be visually inspected following load testing to determine that welds are not damaged (i.e., cracked). Any welds found to be unacceptable after load testing will require repair, followed by re-performance of load testing and reexamination of the welds. Components shall be visually examined to verify load testing did not cause any deformation or cracking of the base material.

10. SHIPPING REQUIREMENTS

10.1 Mode of shipping for the components shall be designated on the Purchase Order.

11. GENERAL QUALITY ASSURANCE REQUIREMENTS

11.1 Components considered Not Important to Safety may be designed, procured, and fabricated as commercial grade.

11.2 Additional fabrication and material quality control requirements are listed on the Purchasing Documentation.

12. DOCUMENTATION REQUIREMENTS

12.1 Three (3) hard copies and one electronic copy of a documentation package shall be provided and, at a minimum, shall comprise of the following:

a. A Certificate of Compliance (CoC) on stating that furnished components meet all requirements of the latest revision to this specification.

b. Functional/Load Testing Certification, documenting all data and observations recorded during the tests conducted in accordance with Section 9.1.

12.2 Operations and Maintenance Manual

a. Maintenance Drawings

b. Maintenance Procedures

c. Preventive Maintenance Schedules

d. Operating Procedures

e. Troubleshooting Guidelines

f. Recommended Spare Parts List (including prices)

g. Precautionary information to avert performance malfunctions

FIGURE 3.2.1: CTF GENERAL LAYOUT

FIGURE 3.2.2: GENERAL CONFIGURATION OF THE CTF UNDERGROUND COMPONENTS

FIGURE 3.2.3: CTF PLATFORM GENERAL CONFIGURATION

FIGURE 3.2.4: JACK AND PLATFORM GENERAL ARRANGEMENT (SHELL NOT SHOWN)