CHAPTER 10: RADIATION PROTECTION[†]

This chapter discusses the design considerations and operational features that are incorporated in the HI-STORM 100 Storage System design to protect plant personnel and the public from exposure to radioactive contamination and ionizing radiation during canister loading, closure, transfer, and on-site dry storage. Occupational exposure estimates for typical canister loading, closure, transfer operations, and ISFSI inspections are provided. An off-site dose assessment for a typical ISFSI is also discussed. Since the determination of off-site doses is necessarily site-specific, similar dose assessments are to be prepared by the licensee, as part of implementing the HI-STORM 100 Storage System in accordance with 10CFR72.212 [10.0.1]. The information provided in this chapter meets all requirements of NUREG-1536.

10.1 <u>ENSURING THAT OCCUPATIONAL RADIATION EXPOSURES ARE AS-LOW-AS-</u> REASONABLY-ACHIEVABLE (ALARA)

10.1.1 <u>Policy Considerations</u>

The HI-STORM 100 has been designed in accordance with 10CFR72 [10.0.1] and maintains radiation exposures ALARA consistent with 10CFR20 [10.1.1] and the guidance provided in Regulatory Guides 8.8 [10.1.2] and 8.10 [10.1.3]. Licensees using the HI-STORM 100 System will utilize and apply their existing site ALARA policies, procedures and practices for ISFSI activities to ensure that personnel exposure requirements of 10CFR20 [10.1.1] are met. Personnel performing ISFSI operations shall be trained on the operation of the HI-STORM 100 System, and be familiarized with the expected dose rates around the MPC, HI-STORM and HI-TRAC during all phases of loading, storage, and unloading operations. Chapter 12 provides dose rate limits at the HI-TRAC and HI-STORM surfaces to ensure that the HI-STORM 100 System is operated within design basis conditions and that ALARA goals will be met. Pre-job ALARA briefings should be held with workers and radiological protection personnel prior to work on or around the system. Worker dose rate monitoring, in conjunction with trained personnel and well-planned activities, will significantly reduce the overall dose received by the workers. When preparing or making changes to site-specific procedures for ISFSI activities, users shall ensure that ALARA practices are implemented and the 10CFR20 [10.1.1] standards for radiation protection are met in accordance with the site's written commitments. Users can further reduce dose rates around the HI-STORM 100 System by preferentially loading longer-cooled and lowerburnup spent fuel assemblies in the periphery fuel storage cells of the MPC, and loading assemblies with shorter cooling times and higher burnups in the inner MPC fuel storage cell locations. Users can also further reduce the dose rates around the HI-TRAC by the use of temporary shielding. In some cases, users may opt to upgrade their existing crane to take advantage of the increased shielding capabilities of the 125-Ton HI-TRAC transfer cask (versus

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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).

the 100-Ton HI-TRAC transfer cask). This decision should be based on a cost-benefit analysis. Temporary shielding and use of special tools to reduce dose is discussed in Section 10.1.4.

10.1.2 Design Considerations

Consistent with the design criteria defined in Section 2.3.5, the radiological protection criteria that limit exposure to radioactive effluents and direct radiation from an ISFSI using the HI-STORM 100 Storage System are as follows:

1. 10CFR72.104 [10.0.1] requires that for normal operation and anticipated occurrences, the annual dose equivalent to any real individual located beyond the owner-controlled area boundary must not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other critical organ. This dose would be a result of planned discharges, direct radiation from the ISFSI, and any other radiation from uranium fuel cycle operations in the area. The licensee is responsible for demonstrating site-specific compliance with these requirements.

2. 10CFR72.106 [10.0.1] requires that any individual located on or beyond the nearest owner-controlled area boundary may not receive from any design basis accident the more limiting of a total effective dose equivalent of 5 rem, or the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue (other than the lens of the eye) of 50 rem. The lens dose equivalent shall not exceed 15 rem and the shallow dose equivalent to skin or to any extremity shall not exceed 50 rem. The licensee is responsible for demonstrating site-specific compliance with this requirement.

3. 10CFR20 [10.1.1], Subparts C and D, limit occupational exposure and exposure to individual members of the public. The licensee is responsible for demonstrating site-specific compliance with this requirement.

4. Regulatory Position 2 of Regulatory Guide 8.8 [10.1.2] provides guidance regarding facility and equipment design features. This guidance has been followed in the design of the HI-STORM 100 Storage System as described below:

- Regulatory Position 2a, regarding access control, is met by locating the ISFSI in a Protected Area in accordance with 10CFR72.212(b)(5)(ii) [10.0.1]. Depending on the site-specific ISFSI design, other equivalent measures may be used. Unauthorized access is prevented once a loaded HI-STORM 100 Storage cask is placed in an ISFSI. Due to the nature of the system, only limited monitoring is required, thus reducing occupational exposure and supporting ALARA considerations. The licensee is responsible for site-specific compliance with these criteria.
 - Regulatory Position 2b, regarding radiation shielding, is met by the storage cask and transfer cask biological shielding that minimizes personnel exposure, as described in Chapter 5 or later in this chapter. Fundamental design considerations that most directly influence occupational exposures with dry storage systems in general and which have been incorporated into the HI-STORM 100 System design include:

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- system designs that reduce or minimize the number of handling and transfer operations for each spent fuel assembly;
- system designs that reduce or minimize the number of handling and transfer operations for each MPC loading;

system designs that maximize fuel capacity, thereby taking advantage of the self-shielding characteristics of the fuel and the reduction in the number of MPCs that must be loaded and handled;

system designs that minimize planned maintenance requirements;

system designs that minimize decontamination requirements at ISFSI decommissioning;

system designs that optimize the placement of shielding with respect to anticipated worker locations and fuel placement;

thick walled overpack that provides gamma and neutron shielding;

thick MPC lid which provides effective shielding for operators during MPC loading and unloading operations;

multiple welded barriers to confine radionuclides;

smooth surfaces to reduce decontamination time;

minimization of potential crud traps on the handling equipment to reduce decontamination requirements;

capability of maintaining water in the MPC during welding to reduce dose rates;

capability of maintaining water in the transfer cask annulus space and water jacket to reduce dose rates during closure operations;

MPC penetrations located and configured to reduce streaming paths;

HI-STORM and HI-TRAC designed to reduce streaming paths;

MPC vent and drain ports with resealable caps to prevent the release of radionuclides during loading and unloading operations and facilitate draining, drying, and backfill operations;

use of a pool lid, annulus seal, and Annulus Overpressure System to prevent contamination of the MPC shell outer surfaces during in-pool activities;

temporary and auxiliary shielding to reduce dose rates around the HI-TRAC; and

low-maintenance design to reduce doses during storage operation.

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- Regulatory Position 2c, regarding process instrumentation and controls, is met since there are no radioactive systems at an ISFSI.
- Regulatory Position 2d, regarding control of airborne contaminants, is met since the HI-STORM 100 Storage System is designed to withstand all design basis conditions without loss of confinement function, as described in Chapter 7 of this FSAR, and no gaseous releases are anticipated. No significant surface contamination is expected since the exterior of the MPC is kept clean by using clean water in the HI-TRAC transfer cask-MPC annulus and by using an inflatable annulus seal.
 - Regulatory Position 2e, regarding crud control, is not applicable to a HI-STORM 100 Storage System ISFSI since there are no radioactive systems at an ISFSI that could transport crud.
 - Regulatory Position 2f, regarding decontamination, is met since the exterior of the loaded transfer cask is decontaminated prior to being removed from the plant's fuel building. The exterior surface of the HI-TRAC transfer cask is designed for ease of decontamination. In addition, an inflatable annulus seal is used to prevent fuel pool water from contacting and contaminating the exterior surface of the MPC.
 - Regulatory Position 2g, regarding monitoring of airborne radioactivity, is met since the MPC provides confinement for all design basis conditions. There is no need for monitoring since no airborne radioactivity is anticipated to be released from the casks at an ISFSI.
- Regulatory Position 2h, regarding resin treatment systems, is not applicable to an ISFSI since there are no treatment systems containing radioactive resins.
 - Regulatory Position 2i, regarding other miscellaneous ALARA items, is met since stainless steel is used in the MPC shell, the primary confinement boundary. This material is resistant to the damaging effects of radiation and is well proven in the SNF cask service. Use of this material quantitatively reduces or eliminates the need to perform maintenance (or replacement) on the primary confinement system.

10.1.3 Operational Considerations

Operational considerations that most directly influence occupational exposures with dry storage systems in general and that have been incorporated into the design of the HI-STORM 100 System include:

• totally-passive design requiring minimal maintenance and monitoring (other than security monitoring) during storage;

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- remotely operated welding system, lift yoke, transfer slide or mating device and moisture removal systems to reduce time operators spend in the vicinity of the loaded MPC;
- maintaining water in the MPC and the annulus region during MPC closure activities to reduce dose rates;
- low fuel assembly lift-over height of the HI-TRAC maximizes water coverage over assemblies during fuel assembly loading;
- a water-filled neutron shield jacket allows filling after removal of the HI-TRAC from the spent fuel pool. This maximizes the shielding on the HI-TRAC without exceeding the crane capacity;
- descriptive operating procedures that provide guidance to reduce equipment contamination, obtain survey information, minimize dose and alert workers to possible changing radiological conditions;
- preparation and inspection of the HI-STORM and HI-TRAC in low-dose areas;
- MPC lid fit tests and inspections prior to actual loading to ensure smooth operation during loading;
- gas sampling of the MPC and HI-STAR 100 annulus (receiving from transport) to assess the condition of the cladding and MPC confinement boundary;
- HI-STORM vent temperature elements (See Chapter 12) allow remote monitoring of the vent operability surveillance;
- wetting of component surfaces prior to placement in the spent fuel pool to reduce the need for decontamination;
- decontamination practices which consider the effects of weeping during HI-TRAC transfer cask heat up and surveying of HI-TRAC prior to removal from the fuel handling building;
- a sequence of operations based on ALARA considerations; and
- use of mock-ups and dry run training to prepare personnel for actual work situations.

10.1.4 Auxiliary/Temporary Shielding

To minimize occupational dose during loading and unloading operations, a specially-designed set of auxiliary shielding is available. The HI-STORM 100 auxiliary shielding consists of the Automated Welding System Baseplate, the HI-TRAC Temporary Shield Ring, the annulus shield, HI-STORM vent shield insert, the HI-TRAC transfer step or mating device, and the shield panel trim plates. Additional supplemental shielding such as lead blankets and bricks or other such shielding may also be used to help reduce dose rates. Each auxiliary shield is described in Table 10.1.1, shown on Figure 10.1.1 and the procedures for utilization are provided in Chapter 8. Other embodiments of the temporary shielding may also be used. Table 10.1.2

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HI-STORM FSAR REPORT HI-2002444 provides the minimum requirements for use of the temporary shielding indicating optional and required shielding. Users shall evaluate the need for auxiliary and temporary shielding and use of special tooling to reduce the overall exposure based on an ALARA review of cask loading operations and the MPC contents.

Temporary Shield	Description	Utilization
Automated Welding System Baseplate	Thick gamma and neutron shield circular plate that sits on the MPC lid. Plate is set directly on the MPC. Threaded lift holes are provided to assist in rigging.	Used during MPC closure and unloading operations in the cask preparation area to reduce the dose rates around the MPC lid. The design of the closure ring allows the baseplate shield to remain in place during the entire closure operation.
HI-TRAC Temporary Shield Ring	A water-filled tank that is placed atop of the HI-STAR or HI-TRAC neutron shield.	Used during MPC and HI-TRAC closure operations and MPC transfers into HI-STAR to reduce dose rates to the operators around the top flange of the HI-TRAC.
Annulus Shield	A shield that is seated between the MPC shell and the HI-TRAC.	Used during MPC closure operations to reduce streaming from the annulus.
HI-TRAC Transfer Step	A stepped block used to position the pool lid and transfer lid at the same elevation. The transfer step creates a tight seam between the two lids to eliminate streaming during bottom lid replacement.	Used during HI-TRAC 100 or 125 bottom lid replacement.
HI-TRAC Mating Device	Device used to remove HI-TRAC pool lid and to provide shielding during MPC transfer to HI-STORM	Used during MPC transfer to the HI-STORM when used with HI-TRAC 100D or 125D
Shield Panel Trim Plates	Four steel plates approximately 0.25 inch by 3 inch by 80 inch that are placed at the ends of the transfer lid top and bottom plate and secured by clamps or other method deemed suitable by the user.	Used during MPC transfer to and from HI-TRAC to shield the small gap above and below the sliding doors on the transfer lid.
HI-STORM Vent Shield Inserts	Devices shaped to fit into the HI- STORM exit vents.	Used during MPC transfer to and from HI-STORM to eliminate the streaming path from the exit vents during MPC transfer operations.

Table 10.1.1HI-STORM 100 AUXILIARY AND TEMPORARY SHIELDS

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Ta	able 10.1.2
HI-STORM 100 AUXILIARY AND	TEMPORARY SHIELD REQUIREMENTS

Auxiliary Shielding	Required for the 100-Ton HI-TRAC and HI-TRAC 100D	Required for the 125-ton HI-TRAC and HI-TRAC 125D			
Temporary Shield Ring	Note 1	Note 1			
Automated Welding System Baseplate Shield	No	No			
Annulus Shield	Note 1	Note 1			
Vent Duct Shield Inserts	Note 2	Note 2			
Transfer Step	Yes (Note 3)	Yes (Note 3)			
Trim Plates	No	No			
Mating Device	Yes (Note 4)	Yes (Note 4)			

Notes:

- 1. Users shall determine the need for this temporary shielding based on the specific operations and the MPC contents.
- 2. Not required for the HI-STORM 100S Overpack.
- 3. Not used with the HI-TRAC 100D or 125D.
- 4. Used only with HI-TRAC 100D or 125D



Figure 10.1.1; HI-STORM 100 System Auxiliary/Temporary Shielding

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10.2 <u>RADIATION PROTECTION DESIGN FEATURES</u>

The development of the HI-STORM 100 System has focused on design provisions to address the considerations summarized in Sections 10.1.2 and 10.1.3. The intent has been to improve on past concrete-based dry storage system designs by developing HI-STORM 100 as a hybrid of current metal and concrete storage system technologies. The design is, therefore, an evolution in storage systems, which incorporates preferred features from concrete storage, canister-based systems while retaining several of the advantages of metal casks as well. This approach results in a reduction in the need for maintenance, in overall radiation levels, and in the time spent on maintenance, when compared with current concrete-based dry storage systems. The following specific design features ensure a high degree of confinement integrity and radiation protection:

- HI-STORM 100 has been designed to meet storage condition dose rates required by 10CFR72 [10.0.1] for three-year cooled fuel;
- HI-STORM 100 has been designed to accommodate a maximum number of PWR or BWR fuel assemblies to minimize the number of cask systems that must be handled and stored at the storage facility and later transported off-site;
 - HI-STORM 100 overpack structure is virtually maintenance free, especially over the years following its initial loading, because of the outer metal shell. The metal shell and its protective coating provide a high level of resistance to corrosion and other forms of degradation (e.g., erosion);
 - HI-STORM 100 has been designed for redundant, multi-pass welded closures on the MPC; consequently, no monitoring of the confinement boundary is necessary and no gaseous or particulate releases occur for normal, off-normal or credible accident conditions;
- HI-TRAC transfer cask utilizes a mating device or transfer step and other auxiliary shielding devices which reduce streaming paths and simplify operations;
- The pool lid maximizes available fuel assembly water coverage in the spent fuel pool.
 - The transfer lid and mating device are designed for quick alignment with HI-STORM; and
 - HI-STORM 100 has been designed to allow close positioning (pitch) on the ISFSI storage pad, thereby increasing the ISFSI self-shielding by decreasing the view factors and reducing exposures to on-site and off-site personnel.

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10.3 ESTIMATED ON-SITE COLLECTIVE DOSE ASSESSMENT

This section provides the estimates of the cumulative exposure to personnel performing loading, unloading and transfer operations using the HI-STORM system. This section uses the shielding analysis provided in Chapter 5 and the operations procedures provided in Chapter 8 to develop a dose assessment. The dose assessment is provided in Tables 10.3.1, 10.3.2, and 10.3.3.

The dose rates from the HI-STORM 100 overpack, MPC lid, HI-TRAC transfer cask, and HI-STAR 100 overpack are calculated to determine the dose to personnel during the various loading and unloading operations. The dose rates are also calculated for the various conditions of the cask that may affect the dose rates to the operators (e.g., MPC water level, HI-TRAC annulus water level, neutron shield water level, presence of temporary shielding). The dose rates around the 100-Ton HI-TRAC transfer cask are based on 24 PWR fuel assemblies with a burnup of 60,000 MWD/MTU and cooling of 3 years including BPRAs. The dose rates around the 125-Ton HI-TRAC transfer cask are based on 24 PWR fuel assemblies with a burnup of 75,000 MWD/MTU and cooling of 5 years including BPRAs. The dose rates around the HI-STORM 100 overpack are based on 24 PWR fuel assemblies with a burnup of 60,000 MWD/MTU and cooling of 3 years. The selection of these fuel assembly types in all fuel cell locations bound all possible PWR and BWR loading scenarios for the HI-STORM System from a dose-rate perspective. The HI-STORM dose rates used in this chapter were calculated for the HI-STORM 100 S Version B. No assessment is made with respect to background radiation since background radiation can vary significantly by site. In addition, exposures are based on work being performed with the temporary shielding described in Table 10.1.2.

The choice of burnup and cooling times used in this chapter is extremely conservative. The bounding burnup and cooling time that resulted in the highest dose rates around the 100-ton, 125-ton HI-TRACs, and HI-STORM 100S Version B were used. In addition, including the source term from BPRAs increases the level of conservatism. The maximum dose rate due to BPRAs was used in this analysis. As stated in Chapter 5, using the maximum source for the BPRAs in conjunction with the bounding burnup and cooling times of the BPRAs and fuel assemblies would be such that they are both at the maximum design basis values. This combined with the already conservative dose rates for the HI-TRACs and HI-STORMs results in an upper bound estimate of the occupational exposure. Users' radiation protection programs will assure appropriate temporary shielding is used based on actual fuel to be loaded and resulting dose rates in the field.

For each step in Tables 10.3.1 through 10.3.3, the operator work location is identified. These correspond to the locations identified in Figure 10.3.1. The relative locations refer to all HI-STORM Overpacks. The dose rate location points around the transfer cask and overpack were selected to model actual worker locations and cask conditions during the operation. Cask operators typically work at an arms-reach distance from the cask. To account for this, an 18-inch

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distance was used to estimate the dose rate for the worker. This assessment addresses only the operators that perform work on or immediately adjacent to the cask.

Justification for the duration of operations along with the corresponding procedure Sections from Chapter 8 are also provided in the tables. The assumptions used in developing time durations are based on mockups of the MPC, review of design drawings, walk-downs using other equipment to represent the HI-TRAC transfer cask and HI-STORM 100 overpack the HI-STAR 100 overpack and MPC-68 prototype, consultation with UST&D (weld examination) and consultation with cask operations personnel from Calvert Cliffs Nuclear Power Plant (for items such as lid installation and decontamination). In addition, for the shielding calculations, only the Temporary Shield Ring was assumed to be in place for applicable portions of the operations.

Tables 10.3.1a, 10.3.1b, and 10.3.1c provide a summary of the dose assessment for a HI-STORM 100 System loading operation using the 125-ton HI-TRAC, the 100-ton HI-TRAC, and the HI-TRAC 125D respectively. Tables 10.3.2a, 2b, and 2c provide a summary of the dose assessment for HI-STORM 100 System unloading operations using the 125-ton HI-TRAC, the 100-ton HI-TRAC, and HI-TRAC 125D respectively. Tables 10.3.3a, 3b, and 3c provide a summary of the dose assessment for transferring the MPC to a HI-STAR 100 overpack as described in Section 8.5 of the operating procedures using the 125-ton HI-TRAC, the 100-ton HI-TRAC, and 125-ton HI-TRAC 125D, respectively. The HI-TRAC 100D was not specifically analyzed since, as stated in Section 5.4, the dose rates from the HI-TRAC 100 and 100D are similar at 1 meter from the overpack. In addition, the results for the HI-TRAC 125 and 125D indicate that there is only a small difference in the occupational exposure from using a mating device (HI-TRAC 100D does not result in occupational exposures significantly different than those presented for the 100-ton HI-TRAC.

10.3.1 Estimated Exposures for Loading and Unloading Operations

The assumptions used to estimate personnel exposures are conservative by design. The main factors attributed to actual personnel exposures are the age and burnup of the spent fuel assemblies and good ALARA practices. To estimate the dose received by a single worker, it should be understood that a canister-based system requires a diverse range of disciplines to perform all the necessary functions. The high visibility and often critical path nature of fuel movement activities have prompted utilities to load canister systems in a round-the-clock mode in most cases. This results in the exposure being spread out over several shifts of operators and technicians with no single shift receiving a majority of the exposure.

The total person-rem exposure from operation of the HI-STORM 100 System is proportional to the number of systems loaded. A typical utility will load approximately four MPCs per reactor cycle to maintain the current available spent fuel pool capacity. Utilities requiring dry storage of spent fuel assemblies typically have a large inventory of spent fuel assemblies that date back to the reactor's first cycle. The older fuel assemblies will have a significantly lower dose rate than the design basis fuel assemblies due to the extended cooling time (i.e., much greater than the values used to compute the dose rates). Users shall assess the cask loading for their particular fuel types (burnup, cooling time) to satisfy the requirements of 10CFR20 [10.1.1].

For licensees using the 100-Ton HI-TRAC transfer cask, design basis dose rates will be higher (than a corresponding 125-Ton HI-TRAC) due to the decreased mass of shielding. Due to the higher expected dose rates from the 100-Ton HI-TRAC, users may need to use the auxiliary shielding (See Table 10.1.2), and should consider preferential loading, and increased precautions (e.g., additional temporary or auxiliary shielding, remotely operated equipment, additional contamination prevention measures). Actual use of optional dose reduction measures must be decided by each user based on the fuel to be loaded.

10.3.2 Estimated Exposures for Surveillance and Maintenance

Table 10.3.4 provides an estimate of the occupational exposure required for security surveillance and maintenance of an ISFSI. Security surveillance time is based on a daily security patrol around the perimeter of the ISFSI security fence. Users may opt to utilize electronic temperature monitoring of the HI-STORM modules or remote viewing methods instead of performing direct visual observation of the modules. Since security surveillances can be performed from outside the ISFSI, and since the ISFSI fence is typically positioned such that the area outside the fence is not a radiation area, a dose rate of 3 mrem/hour is estimated. Although the HI-STORM 100 System requires only minimal maintenance during storage (e.g. touch-up paint), maintenance will be required around the ISFSI for items such as security equipment maintenance, grass cutting, snow removal, vent system surveillance, drainage system maintenance, and lighting, telephone, and intercom repair. Since most of the maintenance is expected to occur outside the actual cask array, a dose rate of 10 mrem/hour is estimated

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Table 10.3.1a									
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
Section 8.1.4									
LOAD PRE-SELECTED FUEL ASSEMBLIES INTO MPC	1020	1	2	4	17.0	34.0	15 MINUTES PER ASSEMBLY/68 ASSY		
PERFORM POST-LOADING VISUAL VERIFICATION OF ASSEMBLY IDENTIFICATION	68	1	2	1	1.1	2.3	1 MINUTES PER ASSY/68 ASSY		
			Section	n 8.1.5					
INSTALL MPC LID AND ATTACH LIFT YOKE	45	2	2	2.0	1.5	3.0	CONSULTATION WITH CALVERT CLIFFS		
RAISE HI-TRAC TO SURFACE OF SPENT FUEL POOL	20	2	2	2.0	0.7	1.3	40 FEET @ 2 FT/MINUTE (CRANE SPEED)		
SURVEY MPC LID FOR HOT PARTICLES	3	3A	1	31.1	1.6	1.6	TELESCOPING DETECTOR USED		
VERIFY MPC LID IS SEATED	0.5	3A	. 1	31.1	0.3	0.3	VISUAL VERIFICATION FROM 3 METERS		
INSTALL LID RETENTION SYSTEM BOLTS	6	3B	2	46.4	4.6	9.3	24 BOLTS @ 2/PERSON-MINUTE		
REMOVE HI-TRAC FROM SPENT FUEL POOL	8.5	3C	1	117.8	16.7	16.7	17 FEET @ 2 FT/MIN (CRANE SPEED)		
DECONTAMINATE HI-TRAC BOTTOM	10	3D	1	142.0	23.7	23.7	LONG HANDLED TOOLS, PRELIMINARY DECON		
TAKE SMEARS OF HI-TRAC EXTERIOR SURFACES	5	5B	1	185.3	15.4	15.4	50 SMEARS @ 10 SMEARS/MINUTE		
DISCONNECT ANNULUS OVERPRESSURE SYSTEM	0.5	5C	1	82.7	0.7	0.7	QUICK DISCONNECT COUPLING		
SET HI-TRAC IN CASK PREPARATION AREA	10	4A	1	46.4	7.7	7.7	100 FT @ 10 FT/MIN (CRANE SPEED)		
REMOVE NEUTRON SHIELD JACKET FILL PLUG	2	4A	I	46.4	1.5	1.5	SINGLE PLUG, NO SPECIAL TOOLS		
INSTALL NEUTRON SHIELD JACKET FILL PLUG	2	5B	1	185.3	6.2	6.2	SINGLE PLUG, NO SPECIAL TOOLS		
DISCONNECT LID RETENTION SYSTEM	6	5A	2	37.3	3.7	7.5	24 BOLTS @ 2 BOLT/PERSON MINUTES		
MEASURE DOSE RATES AT MPC LID	3	5A	1	37.3	1.9	1.9	TELESCOPING DETECTOR USED		

[†] See notes at bottom of Table 10.3.4.

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Table 10.3.1a									
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
DECONTAMINATE AND SURVEY HI- TRAC	103	5B	. 1	185.3	318.1	318.1	490 SQ-FT@5 SQ-FT/PRERSON- MINUTE+50 SMEARS@10 SMEARS/MINUTE		
INSTALL TEMPORARY SHIELD	16	6A	2	18.7	5.0	10.0	8 SEGMENTS @ 1 SEGMENT/PERSON MIN		
FILL TEMPORARY SHIELD RING	25	6A	1	18.7	7.8	7.8	230 GAL @10GPM, LONG HANDLED SPRAY WAND		
ATTACH DRAIN LINE TO HI-TRAC DRAIN PORT	0.5	5C	1	82.7	0.7	0.7	QUICK DISCONNECT COUPLING		
INSTALL RVOAs	2	6A	1	18.7	0.6	0.6	SINGLE THREADED CONNECTION X 2 RVOAs		
ATTACH WATER PUMP TO DRAIN PORT	2	6A	1	18.7	0.6	0.6	POSITION PUMP SELF PRIMING		
DISCONNECT WATER PUMP	5	6A	1	18.7	1.6	1.6	DRAIN HOSES MOVE PUMP		
DECONTAMINATE MPC LID TOP SURFACE AND SHELL AREA ABOVE INFLATABLE ANNULUS SEAL	6	6A	1	18.7	1.9	1.9	30 SQ-FT @5 SQ-FT/MINUTE+10 SMEARS@10 SMEARS/MINUTE		
REMOVE INFLATABLE ANNULUS SEAL	3	6A	1	18.7	0.9	0.9	SEAL PULLS OUT DIRECTLY		
SURVEY MPC LID TOP SURFACES AND ACCESSIBLE AREAS OF TOP THREE INCHES OF MPC SHELL	1	6A	1	18.7	0.3	0.3	10 SMEARS@10 SMEARS/MINUTE		
INSTALL ANNULUS SHIELD	2	6A	1	18.7	0.6	0.6	SHIELD PLACED BY HAND		
CENTER LID IN MPC SHELL	20	6A	3	18.7	6.2	18.7	CONSULTATION WITH CALVERT CLIFFS		
INSTALL MPC LID SHIMS	12	6A		18.7	3.7	7.5	MEASURED DURING WELD MOCKUP TESTING		
POSITION AWS BASEPLATE SHIELD ON MPC LID	20	7A	2	18.7	6.2	12.5	ALIGN AND REMOVE 4 SHACKLES		
INSTALL AUTOMATED WELDING SYSTEM ROBOT	8	7A	2	18.7	2.5	5.0	ALIGN AND REMOVE 4 SHACKLES/4 QUICK CONNECTS@1/MIN		
PERFORM NDE ON LID WELD	230	7A	1	18.7	71.7	71.7	MEASURED DURING WELD MOCKUP TESTING		
ATTACH DRAIN LINE TO VENT PORT	$\mathbf{I}^{(1)} = \mathbf{I}^{(1)} + \mathbf{I}^{(1)}$	7A	1	18.7	0.3	0.3	1" THREADED FITTING NO TOOLS		
VISUALLY EXAMINE MPC LID-TO- SHELL WELD FOR LEAKAGE OF WATER	10	7A	1	18.7	3.1	3.1	10 MIN TEST DURATION		
DISCONNECT WATER FILL LINE AND DRAIN LINE	2	7A	1	18.7	0.6	0.6	1" THREADED FITTING NO TOOLS X 2		

Table 10.3.1a										
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK										
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)										
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS			
REPEAT LIQUID PENETRANT EXAMINATION ON MPC LID FINAL PASS	45	7A	1	18.7	14.0	14.0	5 MIN TO APPLY, 7 MIN TO WIPE, 5 APPLY DEV, INSP (24 IN/MIN)			
ATTACH GAS SUPPLY TO VENT PORT	1	7A	1	18.7	0.3	0.3	1" THREADED FITTING NO TOOLS			
ATTACH DRAIN LINE TO DRAIN PORT	1	7A	1	18.7	0.3	0.3	1" THREADED FITTING NO TOOLS			
Deletted										
Deleted							SIMPLE ATTACHMENT NO TOOLS			
ATTACH DRAIN LINE TO VENT PORT	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS			
ATTACH WATER FILL LINE TO DRAIN PORT	1	8A	1	37.9	0.6	0.6	I" THREADED FITTING NO TOOLS			
DISCONNECT WATER FILL DRAIN LINES FROM MPC	2	8A	1	37.9	1.3	1.3	1" THREADED FITTING NO TOOLS X 2			
ATTACH HELIUM SUPPLY TO VENT PORT	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS			
ATTACH DRAIN LINE TO DRAIN PORT	1	8A	1	37.9	0.6	0.6	I" THREADED FITTING NO TOOLS			
DISCONNECT GAS SUPPLY LINE FROM MPC	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS			
DISCONNECT DRAIN LINE FROM MPC	1	8A	- 1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS			
ATTACH MOISTURE REMOVAL SYSTEM TO VENT AND DRAIN PORT RVOAs	2	8A	1	37.9	1.3	1.3	1" THREADED FITTING NO TOOLS			
DISCONNECT MOISTURE REMOVAL SYSTEM FROM MPC	2	8A	1	37.9	1.3	1.3	1" THREADED FITTING NO TOOLS X			
CLOSE DRAIN PORT RVOA CAP AND REMOVE DRAIN PORT RVOA	1.5	8A	. 1.	37.9	0.9	0.9	SINGLE THREADED CONNECTION (1 RVOA)			
ATTACH HELIUM BACKFILL SYSTEM TO VENT PORT	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS			
DISCONNECT HBS FROM MPC	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS			
CLOSE VENT PORT RVOA AND DISCONNECT VENT PORT RVOA	1.5	8A	1	37.9	0.9	0.9	SINGLE THREADED CONNECTION (1 RVOA)			
WIPE INSIDE AREA OF VENT AND DRAIN PORT RECESSES	2	8A	1	37.9	1.3	1.3	2 PORTS, 1 MIN/PORT			
PLACE COVER PLATE OVER VENT PORT RECESS	1	8A	1	37.9	0.6	0.6	INSTALLED BY HAND NO TOOLS (2/MIN)			
PERFORM NDE ON VENT AND DRAIN COVER PLATE WELD	100	8A	1	37.9	63.2	63.2	MEASURED DURING WELD MOCKUP TESTING			

Table 10.3.1a									
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
FLUSH CAVITY WITH HELIUM AND INSTALL SET SCREWS	2	8A	1	37.9	1.3	1.3	4 SET SCREWS @2/MINUTE		
PLUG WELD OVER SET SCREWS	8	8A	1	37.9	5.1	5.1	FOUR SINGLE SPOT WELDS @ 1 PER 2 MINTES		
INSTALL MSLD OVER VENT PORT COVER PLATE	2	8A	1	37.9	1.3	1.3	INSTALLED BY HAND, NO TOOLS		
INSTALL MSLD OVER DRAIN PORT COVER PLATE	2	8A	1	37.9	1.3	1.3	INSTALLED BY HAND, NO TOOLS		
INSTALL AND ALIGN CLOSURE RING	5	8A	1	37.9	3.2	3.2	INSTALLED BY HAND NO TOOLS		
PERFORM NDE ON CLOSURE RING WELDS	185	8A	1	37.9	116.9	116.9	MEASURED DURING WELD MOCKUP TESTING		
RIG AWS TO CRANE	12	8A	1	37.9	7.6	7.6	10 MIN TO DISCONNECT LINES, 4 SHACKLES@2/MIN		
Section 8.1.6									
REMOVE ANNULUS SHIELD	1	8A	1	37.9	0.6	0.6	SHIELD PLACED BY HAND		
ATTACH DRAIN LINE TO HI-TRAC	1	9D	1	354.2	5.9	5.9	1" THREADED FITTING NO TOOLS		
POSITION HI-TRAC TOP LID	10	98	2	37.9	6.3	12.6	VERTICAL FLANGED CONNECTION		
TORQUE TOP LID BOLTS	12	9B	1	37,9	7.6	7.6	24 BOLIS AT 2/MIN (INSTALL AND TORQUE,1 PASS)		
INSTALL MPC LIFT CLEATS AND MPC SLINGS	25	9A	2	158.5	66.0	132.1	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS		
REMOVE TEMPORARY SHIELD RING DRAIN PLUGS	1	9B	1	37.9	0.6	0.6	8 PLUGS @ 8/MIN		
REMOVE TEMPORARY SHIELD RING SEGMENTS	4	9A	1	158.5	10.6	10.6	REMOVED BY HAND NO TOOLS (8 SEGS@2/MIN)		
ATTACH MPC SLINGS TO LIFT YOKE	4	9A	2	158.5	10.6	21.1	INSTALLED BY HAND NO TOOLS		
POSITION HI-TRAC ABOVE TRANSFER STEP	15	9C	1	117.8	29.5	29.5	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN		
REMOVE BOTTOM LID BOLTS	6	10A	1	354.2	35.4	35.4	36 BOLTS@6 BOLTS/MIN IMPACT TOOLS USED		
INSTALL TRANSFER LID BOLTS	18	11B	1	354.2	106.3	106.3	36 BOLTS @ 2/MIN IMPACT TOOLS USED 1 PASS		
DISCONNECT MPC SLINGS	4	9A	2	158.5	10.6	21.1	INSTALLED BY HAND NO TOOLS		
			Section	ı 8.1.7		and the second			
POSITION HI-TRAC ON TRANSPORT DEVICE	20	11A	2	117.8	39.3	78.5	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE		
TRANSPORT HI-TRAC TO OUTSIDE TRANSFER LOCATION	90	12A	3	26.4	39.6	118.8	DRIVER AND 2 SPOTTERS		

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Table 10.3.1a										
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK										
ESTIMATED OF	ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS			
ATTACH OUTSIDE LIFTING DEVICE LIFT LINKS	2	12A	2	26.4	0.9	1.8	2 LINKS@1/MIN			
MATE OVERPACKS	10	13B	2	118.5	19.8	39.5	ALIGNMENT GUIDES USED			
ATTACH MPC SLINGS TO MPC LIFT CLEATS	10	13A	2	158.5	26.4	52.8	2 SLINGS@5MIN/SLING NO TOOLS			
REMOVE TRANSFER LID DOOR LOCKING PINS AND OPEN DOORS	4	13B	2	118.5	7.9	15.8	2 PINS@2MIN/PIN			
INSTALL TRIM PLATES	4	13B	2	118.5	7.9	15.8	INSTALLED BY HAND			
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	10	13A	2	158.5	26.4	52.8	2 SLINGS@5MIN/SLING			
REMOVE MPC LIFT CLEATS AND MPC SLINGS	10	14A	1	487.4	81.2	81.2	4 BOLTS,NO TORQUING			
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING			
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1 .	43.9	1.5	1.5	4 SHACKLES@2/MIN			
REMOVE ALIGNMENT DEVICE	4	15A	1	43.9	2.9	2.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)			
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	25	16A	2	11.7	4.9	9.8	INSTALL LID AND HYDRO TORQUE 4 BOLTS			
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	4	16B	1	205.5	13.7	13.7	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS			
INSTALL TEMPERATURE ELEMENTS	20	16B	.1	205.5	68.5	68.5	4@5MIN/TEMPERATURE ELEMENT			
INSTALL EXIT VENT SCREENS	20	16B	1	205.5	68.5	68.5	4 SCREENS@5MIN/SCREEN			
REMOVE HI-STORM LID LIFTING DEVICE	2	16A	1	11.7	0.4	0.4	4 SHACKLES@2/MIN			
INSTALL HOLE PLUGS IN EMPTY HOLES	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING			
PERFORM SHIELDING EFFECTIVENESS TESTING	16	16D	2	122.7	32.7	65.4	16 POINTS@1 MIN			
SECURE HI-STORM TO TRANSPORT DEVICE	10	16A	2	11.7	2.0	3.9	ASSUMES AIR PAD			
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	40	16C	1	69.7	46.5	46.5	200 FEET @ 4FT/MIN			
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN			
REMOVE AIR PAD	- 5	16D	2	122.7	10.2	20.5	1 PAD MOVED BY HAND			
REMOVE HI-STORM LIFTING JACKS	4	16D	<u>1 1 1</u>	122.7	8.2	8.2	4 JACKS@1/MIN			
INSTALL INLET VENT SCREENS/CROSS PLATES	20	16D	1	122.7	40.9	40.9	4 SCREENS@5MIN/SCREEN			

Table 10.3.1a									
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)									
ACTION DURATION (MINUTES) OPERATOR (FIGURE 10.3.1) OPERATORS (FIGURE 10.3.1) OPERATORS (MIREM) OPERATORS (MINUTES) OPERATORS (MIREM) OPERATORS (MINUTES) (MINUTES) OPERATORS (MINUTES) (MI									
PERFORM AIR TEMPERATURE RISE TEST	8	16B	1	205.5	27.4	27.4	8 MEASUREMENTS@1/MIN		
TOTAL 2063.1 PERSON-MREM									

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Table 10.3.1b									
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (60,000 MWD/MTU, 3-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
Section 8.1.4									
LOAD PRE-SELECTED FUEL ASSEMBLIES INTO MPC	1020	1	2	3	51.0	102.0	15 MINUTES PER ASSEMBLY/68 ASSY		
PERFORM POST-LOADING VISUAL VERIFICATION OF ASSEMBLY IDENTIFICATION	68	1	2	3	3.4	6.8	1 MINUTES PER ASSY/68 ASSY		
			Sectio	n 8.1.5	·				
INSTALL MPC LID AND ATTACH LIFT YOKE	45	2	2	3	2.3	4.5	CONSULTATION WITH CALVERT CLIFFS		
RAISE HI-TRAC TO SURFACE OF SPENT FUEL POOL	20	2	2	3	1.0	2.0	40 FEET @ 2 FT/MINUTE (CRANE SPEED)		
SURVEY MPC LID FOR HOT PARTICLES	3	3Å	1	37.6	1.9	1.9	TELESCOPING DETECTOR USED		
VERIFY MPC LID IS SEATED	0.5	3A	1	37.6	0.3	0.3	VISUAL VERIFICATION FROM 3 METERS		
INSTALL LID RETENTION SYSTEM BOLTS	6	3B	2	90.3	9.0	18.1	24 BOLTS @ 2/PERSON-MINUTE		
REMOVE HI-TRAC FROM SPENT FUEL POOL	8.5	3C	1	837.0	118.6	118.6	17 FEET @ 2 FT/MIN (CRANE SPEED)		
DECONTAMINATE HI-TRAC BOTTOM	10	3D	1	554.8	92.5	92.5	LONG HANDLED TOOLS, PRELIMINARY DECON		
TAKE SMEARS OF HI-TRAC EXTERIOR SURFACES	5	5B	1	1091.9	91.0	91.0	50 SMEARS @ 10 SMEARS/MINUTE		
DISCONNECT ANNULUS OVERPRESSURE SYSTEM	0.5	5C	1	282.1	2.4	2.4	QUICK DISCONNECT COUPLING		
SET HI-TRAC IN CASK PREPARATION AREA	10	4A	1	90.3	15.1	15.1	100 FT @ 10 FT/MIN (CRANE SPEED)		
REMOVE NEUTRON SHIELD JACKET FILL PLUG	2	4A	1	90.3	3.0	3.0	SINGLE PLUG, NO SPECIAL TOOLS		
INSTALL NEUTRON SHIELD JACKET FILL PLUG	2	5B	1	1091.9	36.4	36.4	SINGLE PLUG, NO SPECIAL TOOLS		
DISCONNECT LID RETENTION SYSTEM	6	5A	2	69.8	7.0	14.0	24 BOLTS @ 2 BOLT/PERSON MINUTES		

See notes at bottom of Table 10.3.4.

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Table 10.3.1b										
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK										
ESTIMATED OPERATIONAL EXPOSURES' (60,000 MWD/MTU, 3-YEAR COOLED PWR FUEL)										
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS			
MEASURE DOSE RATES AT MPC LID	3	5A	1	69.8	3.5	3.5	TELESCOPING DETECTOR USED			
DECONTAMINATE AND SURVEY HI-TRAC	103	5B	1	1091.9	1874.4	1874.4	490 SQ-FT@5 SQ-FT/PRERSON- MINUTE+50 SMEARS@10 SMEARS/MINUTE			
INSTALL TEMPORARY SHIELD	16	бA	2	34.2	9.1	18.2	8 SEGMENTS @ 1 SEGMENT/PERSON MIN			
FILL TEMPORARY SHIELD RING	25	6A	1	34.2	14.3	14.3	230 GAL @10GPM, LONG HANDLED SPRAY WAND			
ATTACH DRAIN LINE TO HI-TRAC DRAIN PORT	0.5	5C	1	282.1	2.4	2.4	QUICK DISCONNECT COUPLING			
INSTALL RVOAs	2	6A	1	34.2	1.1	1.1	SINGLE THREADED CONNECTION X 2 RVOAs			
ATTACH WATER PUMP TO DRAIN PORT	2	6A	1	34.2	1.1	1.1	POSITION PUMP SELF PRIMING			
DISCONNECT WATER PUMP	5	6A	1	34.2	2.9	2.9	DRAIN HOSES MOVE PUMP			
DECONTAMINATE MPC LID TOP SURFACE AND SHELL AREA ABOVE INFLATABLE ANNULUS SEAL	6	6A	1	34.2	3.4	3.4	30 SQ-FT @5 SQ-FT/MINUTE+10 SMEARS@10 SMEARS/MINUTE			
REMOVE INFLATABLE ANNULUS SEAL	3	6A	1	34.2	1.7	1.7	SEAL PULLS OUT DIRECTLY			
SURVEY MPC LID TOP SURFACES AND ACCESSIBLE AREAS OF TOP THREE INCHES OF MPC SHELL	1	6A	I	34.2	0.6	0.6	10 SMEARS@10 SMEARS/MINUTE			
INSTALL ANNULUS SHIELD	2	6A	1	34.2	1.1	1.1	SHIELD PLACED BY HAND			
CENTER LID IN MPC SHELL	20	6A	3	34.2	11.4	34.2	CONSULTATION WITH CALVERT CLIFFS			
INSTALL MPC LID SHIMS	12	6A	2	34.2	6.8	13.7	MEASURED DURING WELD MOCKUP TESTING			
POSITION AWS BASEPLATE SHIELD ON MPC LID	20	7A	2	34.2	11.4	22.8	ALIGN AND REMOVE 4 SHACKLES			
INSTALL AUTOMATED WELDING SYSTEM ROBOT	8	7A	2	34.2	4.6	9.1	ALIGN AND REMOVE 4 SHACKLES/4 QUICK CONNECTS@1/MIN			
PERFORM NDE ON LID WELD	230	7A	1	34.2	131.1	131.1	MEASURED DURING WELD MOCKUP TESTING			

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Table 10.3.1b									
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK									
ESTIMATED O	PERATION	VAL EXPO	SURES [†] (60	,000 MWD	/MTU, 3-YE	AR COOL	LED PWR FUEL)		
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
ATTACH DRAIN LINE TO VENT PORT	1	7A	1	34.2	0.6	0.6	1" THREADED FITTING NO TOOLS		
VISUALLY EXAMINE MPC LID-TO- SHELL WELD FOR LEAKAGE OF WATER	10	7A	1	34.2	5.7	5.7	10 MIN TEST DURATION		
DISCONNECT WATER FILL LINE AND DRAIN LINE	2	7A	1	34,2	1.1	1.1	1" THREADED FITTING NO TOOLS X 2		
REPEAT LIQUID PENETRANT EXAMINATION ON MPC LID FINAL PASS	45	7A	1	34.2	25.7	25.7	5 MIN TO APPLY, 7 MIN TO WIPE, 5 APPLY DEV, INSP (24 IN/MIN)		
ATTACH GAS SUPPLY TO VENT PORT	n de la constante de la consta	7A	1	34.2	0.6	0.6	1" THREADED FITTING NO TOOLS		
ATTACH DRAIN LINE TO DRAIN PORT	1	7A	1	34.2	0.6	0.6	1" THREADED FITTING NO TOOLS		
Deleted									
Deleted					-		· .		
ATTACH DRAIN LINE TO VENT PORT	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS		
ATTACH WATER FILL LINE TO DRAIN PORT	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS		
DISCONNECT WATER FILL DRAIN LINES FROM MPC	2	8A	1	79.5	2.7	2.7	1" THREADED FITTING NO TOOLS X 2		
ATTACH HELIUM SUPPLY TO VENT PORT	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS		
ATTACH DRAIN LINE TO DRAIN PORT	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS		
DISCONNECT GAS SUPPLY LINE FROM MPC	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS		
DISCONNECT DRAIN LINE FROM MPC	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS		
ATTACH MOISTURE REMOVAL SYSTEM () TO VENT AND DRAIN PORT RVOAs	2	8A	1	79.5	2.7	2.7	1" THREADED FITTING NO TOOLS		
DISCONNECT MOISTURE REMOVAL SYSTEM FROM MPC	2	8A	1	79.5	2.7	2.7	1" THREADED FITTING NO TOOLS X 2		
CLOSE DRAIN PORT RVOA CAP AND REMOVE DRAIN PORT RVOA	1.5	8A	1	79.5	2.0	2.0	SINGLE THREADED CONNECTION (1 RVOA)		

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Table 10.3.1b												
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK												
ESTIMATED O	PERATION	IAL EXPO	SURES [†] (60	.000 MWD	/MTU. 3-YE	AR COOI	ED PWR FUEL)					
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
ATTACH HELIUM BACKFILL SYSTEM TO VENT PORT	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS					
DISCONNECT HBS FROM MPC	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS					
CLOSE VENT PORT RVOA AND DISCONNECT VENT PORT RVOA	1.5	8A	1	79.5	2.0	2.0	SINGLE THREADED CONNECTION (1 RVOA)					
WIPE INSIDE AREA OF VENT AND DRAIN PORT RECESSES	2	8A	1	79.5	2.7	2.7	2 PORTS, 1 MIN/PORT					
PLACE COVER PLATE OVER VENT PORT RECESS	1	8A	1	79.5	1.3	1.3	INSTALLED BY HAND NO TOOLS (2/MIN)					
PERFORM NDE VENT AND DRAIN COVER PLATE WELD	100	8A	· . I	79.5	132.5	132.5	MEASURED DURING WELD MOCKUP TESTING					
FLUSH CAVITY WITH HELIUM AND INSTALL SET SCREWS	2	8A	1	79.5	2.7	2.7	4 SET SCREWS @2/MINUTE					
PLUG WELD OVER ET SCREWS	8	8A	1	79.5	10.6	10.6	FOUR SINGLE SPOT WELDS @ 1 PER 2 MINTES					
INSTALL MSLD OVER VENT PORT COVER PLATE	2	8A	1				INSTALLED BY HAND, NO TOOLS					
INSTALL MSLD OVER DRAIN PORT COVER PLATE	2	8A	1				INSTALLED BY HAND, NO TOOLS					
INSTALL AND ALIGN CLOSURE RING	5	8A	1	79.5	6.6	6.6	INSTALLED BY HAND NO TOOLS					
PERFORM NDE ON CLOSURE RING WELDS	185	8A	1	79.5	245.1	245.1	MEASURED DURING WELD MOCKUP TESTING					
RIG AWS TO CRANE	12	8A	1	79.5	15.9	15.9	10 MIN TO DISCONNECT LINES, 4 SHACKLES@2/MIN					
		an taga sa	Section	n 8.1.6								
REMOVE ANNULUS SHIELD	1	8A	1	79.5	1.3	1.3	SHIELD PLACED BY HAND					
ATTACH DRAIN LINE TO HI-TRAC	1 .	9D	1	2190.1	36.5	36.5	1" THREADED FITTING NO TOOLS					
POSITION HI-TRAC TOP LID	10	9B	2	79.5	13.3	26.5	VERTICAL FLANGED CONNECTION					
TORQUE TOP LID BOLTS	12	9B	1	79.5	15.9	15.9	24 BOLTS AT 2/MIN (INSTALL AND TORQUE,1 PASS)					
INSTALL MPC LIFT CLEATS AND MPC SLINGS	25	9A	2	363.8	151.6	303.2	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS					
REMOVE TEMPORARY SHIELD RING DRAIN PLUGS	1	9B	1	79.5	1.3	1.3	8 PLUGS @ 8/MIN					
REMOVE TEMPORARY SHIELD RING SEGMENTS	4	9A	1	363.8	24.3	24.3	REMOVED BY HAND NO TOOLS (8 SEGS@2/MIN)					

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Table 10.3.1b												
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK												
ESTIMATED OPERATIONAL EXPOSURES [†] (60,000 MWD/MTU, 3-YEAR COOLED PWR FUEL)												
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
ATTACH MPC SLINGS TO LIFT YOKE	4	9A	2	363.8	24.3	48.5	INSTALLED BY HAND NO TOOLS					
POSITION HI-TRAC ABOVE TRANSFER STEP	15	9C	1	900.9	225.2	225.2	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN					
REMOVE BOTTOM LID BOLTS	6	10A	1	2190.1	219.0	219.0	36 BOLTS@6 BOLTS/MIN IMPACT TOOLS USED					
INSTALL TRANSFER LID BOLTS	18	11B	1	2190.1	657.0	657.0	36 BOLTS @ 2/MIN IMPACT TOOLS USED 1 PASS					
DISCONNECT MPC SLINGS	4	9A	2	363.8	24.3	48.5	INSTALLED BY HAND NO TOOLS					
		<u> </u>	Section	n 8.1.7								
POSITION HI-TRAC ON TRANSPORT DEVICE	20	11A	2	900.9	300.3	600.6	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE					
TRANSPORT HI-TRAC TO OUTSIDE TRANSFER LOCATION	90	12A	3	35.2	52.8	158.4	DRIVER AND 2 SPOTTERS					
ATTACH OUTSIDE LIFTING DEVICE LIFT LINKS	2	12A	2	35.2	1.2	2.3	2 LINKS@1/MIN					
MATE OVERPACKS	10	13B	2	692.0	115.3	230.7	ALIGNMENT GUIDES USED					
ATTACH MPC SLINGS TO MPC LIFT CLEATS	10	13A	2	363.8	60.6	121.3	2 SLINGS@5MIN/SLING NO TOOLS					
REMOVE TRANSFER LID DOOR LOCKING PINS AND OPEN DOORS	4	13B	2	692.0	46.1	92.3	2 PINS@2MIN/PIN					
INSTALL TRIM PLATES	4, L*	13B	2	692.0	46.1	92.3	INSTALLED BY HAND					
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	10	13A	2	363.8	60.6	121.3	2 SLINGS@5MIN/SLING					
REMOVE MPC LIFT CLEATS AND MPC SLINGS	10	14A	1	487.4	81.2	81.2	4 BOLTS,NO TORQUING					
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING					
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1	43.9	1.5	1.5	4 SHACKLES@2/MIN					
REMOVE ALIGNMENT DEVICE	4	15A	1	43.9	2.9	2.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)					
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	25	16A	2	11.7	4.9	9.8	INSTALL LID AND HYDRO TORQUE 4 BOLTS					
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	4	16B	1	205.5	13.7	13.7	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS					

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Table 10.3.1b												
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK												
ESTIMATED OPERATIONAL EXPOSURES [†] (60,000 MWD/MTU, 3-YEAR COOLED PWR FUEL)												
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
INSTALL TEMPERATURE ELEMENTS	20	16B	1	205.5	68.5	68.5	4@5MIN/TEMPERATURE ELEMENT					
INSTALL EXIT VENT SCREENS	20	16B	1	205.5	68.5	68.5	4 SCREENS@5MIN/SCREEN					
REMOVE HI-STORM LID LIFTING DEVICE	2	16A	1	11.7	0.4	0.4	4 SHACKLES@2/MIN					
INSTALL HOLE PLUGS IN EMPTY HOLES	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING					
PERFORM SHIELDING EFFECTIVENESS TESTING	16	16D	2	122.7	32.7	65.4	16 POINTS@1 MIN					
SECURE HI-STORM TO TRANSPORT DEVICE	10	16A	2	11.7	2.0	3.9	ASSUMES AIR PAD					
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	40	16C	1	69.7	46.5	46.5	200 FEET @ 4FT/MIN					
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN					
REMOVE AIR PAD	5	16D	2	122.7	10.2	20.5	1 PAD MOVED BY HAND					
REMOVE HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN					
INSTALL INLET VENT SCREENS/CROSS PLATES	20	16D	. 1	122.7	40.9	40.9	4 SCREENS@5MIN/SCREEN					
PERFORM AIR TEMPERATURE RISE TEST	8	16B	1	205.5	27.4	27.4	8 MEASUREMENTS@1/MIN					
		TOTAL					6628.4 PERSON-MREM					

Table 10.3.1c HLSTORM 100 SVSTEM LOADING OPERATIONS USING THE 125 TON HI TRAC 125D TRANSFER CASE												
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)												
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
Section 8.1.4												
LOAD PRE-SELECTED FUEL ASSEMBLIES INTO MPC	1020	1	2	1.0	17.0	34.0	15 MINUTES PER ASSEMBLY/68 ASSY					
PERFORM POST-LOADING VISUAL VERIFICATION OF ASSEMBLY IDENTIFICATION	68	I	2	1.0	1.1	2.3	I MINUTES PER ASSY/68 ASSY					
				Section 8.1.5		5						
INSTALL MPC LID AND ATTACH LIFT YOKE	45	2	2	2.0	1.5	3.0	CONSULTATION WITH CALVERT CLIFFS					
RAISE HI-TRAC TO SURFACE OF SPENT FUEL POOL	20	2	2	2.0	0.7	1.3	40 FEET @ 2 FT/MINUTE (CRANE SPEED)					
SURVEY MPC LID FOR HOT PARTICLES	3	3A	1	31.1	1.6	1.6	TELESCOPING DETECTOR USED					
VERIFY MPC LID IS SEATED	0.5	3A	1	31.1	0.3	0.3	VISUAL VERIFICATION FROM 3 METERS					
INSTALL LID RETENTION SYSTEM BOLTS	6	3B	2	46.4	4.6	9.3	24 BOLTS @ 2/PERSON-MINUTE					
REMOVE HI-TRAC FROM SPENT FUEL POOL	8.5	3C	1	117.8	16.7	16.7	17 FEET @ 2 FT/MIN (CRANE SPEED)					
DECONTAMINATE HI-TRAC BOTTOM	10	3D	1	142.0	23.7	23.7	LONG HANDLED TOOLS, PRELIMINARY DECON					
TAKE SMEARS OF HI-TRAC EXTERIOR SURFACES	5	5B	1	185.3	15.4	15.4	50 SMEARS @ 10 SMEARS/MINUTE					
DISCONNECT ANNULUS OVERPRESSURE SYSTEM	0.5	5C	1	82.7	0.7	0.7	QUICK DISCONNECT COUPLING					
SET HI-TRAC IN CASK PREPARATION AREA	10	4A	1	46.4	7.7	7.7	100 FT @ 10 FT/MIN (CRANE SPEED)					
REMOVE NEUTRON SHIELD JACKET FILL PLUG	2	4A	1	46.4	1.5	1.5	SINGLE PLUG, NO SPECIAL TOOLS					
INSTALL NEUTRON SHIELD JACKET FILL PLUG	2	5B	1	185.3	6.2	6.2	SINGLE PLUG, NO SPECIAL TOOLS					
DISCONNECT LID RETENTION SYSTEM	6	5A	2	37.3	3.7	7.5	24 BOLTS @ 2 BOLT/PERSON MINUTES					

[†] See notes at bottom of Table 10.3.4.

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Table 10.3.1c												
HI-STORM 100 S	YSTEM LO	DADING (OPERATIO	ONS USINC	G THE 125	-TON HI-T	RAC 125D TRANSFER CASK					
ESTIMATE	D OPERA	FIONAL I	EXPOSUR	ES' (75,000	MWD/M1	TU, 5-YEAI	R COOLED PWR FUEL)					
ACTION	DURATION (MINUTES)	LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
MEASURE DOSE RATES AT MPC LID	3	5A	1	37.3	1.9	1.9	TELESCOPING DETECTOR USED					
DECONTAMINATE AND SURVEY HI-TRAC	103	5B	1	185.3	318.1	318.1	490 SQ-FT@5 SQ-FT/PRERSON-MINUTE+50 SMEARS@10 SMEARS/MINUTE					
INSTALL TEMPORARY SHIELD	16	6A	2	18.7	5.0	10.0	8 SEGMENTS @ 1 SEGMENT/PERSON MIN					
FILL TEMPORARY SHIELD RING	25	6A	. 1	18.7	7.8	7.8	230 GAL @10GPM, LONG HANDLED SPRAY WAND					
ATTACH DRAIN LINE TO HI-TRAC DRAIN PORT	0.5	5C	1	82.7	0.7	0.7	QUICK DISCONNECT COUPLING					
INSTALL RVOAs	2	6A	1	18.7	0.6	0.6	SINGLE THREADED CONNECTION X 2 RVOAs					
ATTACH WATER PUMP TO DRAIN PORT	2	6A	1	18.7	0.6	0.6	POSITION PUMP SELF PRIMING					
DISCONNECT WATER PUMP	5	6A	1	18.7	1.6	1.6	DRAIN HOSES MOVE PUMP					
DECONTAMINATE MPC LID TOP SURFACE AND SHELL AREA ABOVE INFLATABLE ANNULUS SEAL	6	6A	ľ	18.7	1.9	1.9	30 SQ-FT @5 SQ-FT/MINUTE+10 SMEARS@10 SMEARS/MINUTE					
REMOVE INFLATABLE ANNULUS SEAL	3	6A	1.	18.7	0.9	0.9	SEAL PULLS OUT DIRECTLY					
SURVEY MPC LID TOP SURFACES AND ACCESSIBLE AREAS OF TOP THREE INCHES OF MPC SHELL		6A		18.7	0.3	0.3	10 SMEARS@10 SMEARS/MINUTE					
INSTALL ANNULUS SHIELD	2	6A	1	18.7	0.6	0.6	SHIELD PLACED BY HAND					
CENTER LID IN MPC SHELL	20	6A	3	18.7	6.2	18.7	CONSULTATION WITH CALVERT CLIFFS					
INSTALL MPC LID SHIMS	12	6A	2	18.7	3.7	7,5	MEASURED DURING WELD MOCKUP TESTING					
POSITION AWS BASEPLATE SHIELD ON MPC LID	20	7A	2	18.7	6.2	12.5	ALIGN AND REMOVE 4 SHACKLES					
INSTALL AUTOMATED WELDING SYSTEM ROBOT	8	7A	2	18.7	2.5	5.0	ALIGN AND REMOVE 4 SHACKLES/4 QUICK CONNECTS@1/MIN					
PERFORM NDE OF LID WELD	230	7A	1	18.7	71.7	71.7	MEASURED DURING WELD MOCKUP TESTING					
ATTACH DRAIN LINE TO VENT PORT	1	7A	1	18.7	0.3	0.3	I" THREADED FITTING NO TOOLS					

	Table 10.3.1c												
HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC 125D TRANSFER CASK													
ESTIMATE	D OPERA	TIONAL E	EXPOSUR	ES [†] (75,000	MWD/MT	U, 5-YEAF	R COOLED PWR FUEL)						
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS						
VISUALLY EXAMINE MPC LID-TO- SHELL WELD FOR LEAKAGE OF WATER	10	7A	l	18.7	3.1	3.1	10 MIN TEST DURATION						
DISCONNECT WATER FILL LINE AND DRAIN LINE	2	7A	1	18.7	0.6	0.6	1" THREADED FITTING NO TOOLS X 2						
REPEAT LIQUID PENETRANT EXAMINATION ON MPC LID FINAL PASS	45	7A	1	18.7	14.0	14.0	5 MIN TO APPLY, 7 MIN TO WIPE, 5 APPLY DEV, INSP (24 IN/MIN)						
ATTACH GAS SUPPLY TO VENT PORT	1	7A	1	18.7	0.3	0.3	I" THREADED FITTING NO TOOLS						
ATTACH DRAIN LINE TO DRAIN PORT	1	7A	1	18.7	0.3	0.3	I" THREADED FITTING NO TOOLS						
Deleted													
Deleted													
ATTACH DRAIN LINE TO VENT PORT	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS						
ATTACH WATER FILL LINE TO DRAIN PORT	1	8A	1	37.9	0.6	0.6	I" THREADED FITTING NO TOOLS						
DISCONNECT WATER FILL DRAIN LINES FROM MPC	2	8A	1	37.9	1.3	1.3	I" THREADED FITTING NO TOOLS X 2						
ATTACH HELIUM SUPPLY TO VENT PORT	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS						
ATTACH DRAIN LINE TO DRAIN PORT	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS						
DISCONNECT GAS SUPPLY LINE FROM MPC	1	8A	1	37.9	0.6	0.6	I" THREADED FITTING NO TOOLS						
DISCONNECT DRAIN LINE FROM MPC	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS						
ATTACH MOISTURE REMOVAL SYSTEM TO VENT AND DRAIN PORT RVOAs	2	8A	1	37.9	1.3	1.3	I" THREADED FITTING NO TOOLS						
DISCONNECT MOISTURE REMOVAL SYSTEM FROM MPC	2	8A	. 1	37.9	1.3	1.3	1" THREADED FITTING NO TOOLS X 2						

Table 10.3.1c												
HI-STORM 100 SY	YSTEM LO	DADING (PERATI	ONS USINC	G THE 125	-TON HI-T	RAC 125D TRANSFER CASK					
ESTIMATE	D OPERA	FIONAL F	EXPOSUR	ES [†] (75,000	MWD/MT	<u>'U, 5-YEAF</u>	R COOLED PWR FUEL)					
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
CLOSE DRAIN PORT RVOA CAP AND REMOVE DRAIN PORT RVOA	1.5	8A	1	37.9	0.9	0.9	SINGLE THREADED CONNECTION (1 RVOA)					
ATTACH HELIUM BACKFILL SYSTEM TO VENT PORT	1 1 1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS					
DISCONNECT HBS FROM MPC	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS					
CLOSE VENT PORT RVOA AND DISCONNECT VENT PORT RVOA	1.5	8A	ľ	37.9	0.9	0.9	SINGLE THREADED CONNECTION (1 RVOA)					
WIPE INSIDE AREA OF VENT AND DRAIN PORT RECESSES	2	8A	1	37.9	1.3	1.3	2 PORTS, 1 MIN/PORT					
PLACE COVER PLATE OVER VENT PORT RECESS	1	8A	1	37.9	0.6	0.6	INSTALLED BY HAND NO TOOLS (2/MIN)					
PERFORM NDE ON VENT AND DRAIN COVER PLATE WELD	100	8A	1	37.9	63.2	63.2	MEASURED DURING WELD MOCKUP TESTING					
INSTALL SET SCREWS	2	8A	1	37.9	1.3	1.3	4 SET SCREWS @2/MINUTE					
PLUG WELD OVER SET SCREWS	8	8A	1	37.9	5.1	5.1	FOUR SINGLE SPOT WELDS @ 1 PER 2 MINTES					
Deleted												
Deleted						_						
INSTALL AND ALIGN CLOSURE RING	5	8A	1	37.9	3.2	3.2	INSTALLED BY HAND NO TOOLS					
PERFORM A NDE ON CLOSURE RING WELDS	185	8A	1	37.9	116.9	116.9	MEASURED DURING WELD MOCKUP TESTING					
RIG AWS TO CRANE	12	8A	1	37.9	7.6	7.6	10 MIN TO DISCONNECT LINES, 4 SHACKLES@2/MIN					
				Section 8.1.6	· .							
REMOVE ANNULUS SHIELD	1	8A	1	37.9	0.6	0.6	SHIELD PLACED BY HAND					
ATTACH DRAIN LINE TO HI-TRAC	1	9D	1	354.2	5.9	5.9	I" THREADED FITTING NO TOOLS					
POSITION HI-TRAC TOP LID	10	9B	2	37.9	6.3	12.6	VERTICAL FLANGED CONNECTION					
TORQUE TOP LID BOLTS	12	9B	1	37.9	7.6	7.6	24 BOLTS AT 2/MIN (INSTALL AND TORQUE, I PASS)					

Table 10.3.1c													
HI-STORM 100 S	HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC 125D TRANSFER CASK ESTIMATED OPERATIONAL EXPOSUDES ¹ (75 000 MM/D/MTH 5 MEAD COOLED DWD EVIEL)												
ESTIMATE	D OPERA	LOPERATOR	EXPOSUR	ES' (75,000	MWD/M1	<u>'U, 5-YEAF</u>	R COOLED PWR FUEL)						
ACTION	DURATION (MINUTES)	LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS						
INSTALL MPC LIFT CLEATS AND MPC SLINGS	25	9A	2	158.5	66.0	132.1	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS						
REMOVE TEMPORARY SHIELD RING DRAIN PLUGS	1 - 1	9B	1	37.9	0.6	0.6	8 PLUGS @ 8/MIN						
REMOVE TEMPORARY SHIELD RING SEGMENTS	4	9A	1	158.5	10.6	10.6	REMOVED BY HAND NO TOOLS (8 SEGS@2/MIN)						
ATTACH MPC SLINGS TO LIFT YOKE	4	9A	·	158.5	10.6	21.1	INSTALLED BY HAND, NO TOOLS						
Section 8.1.7													
POSITION HI-TRAC ON TRANSPORT DEVICE	20	11A	2	117.8	39.3	78.5	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE						
TRANSPORT HI-TRAC TO OUTSIDE TRANSFER LOCATION	90	12A	3	26.4	39.6	118.8	DRIVER AND 2 SPOTTERS						
ATTACH OUTSIDE LIFTING DEVICE LIFT LINKS	2	12A	2	26.4	0.9	1.8	2 LINKS@1/MIN						
MATE OVERPACKS	10	13B	2	118.5	19.8	39.5	ALIGNMENT GUIDES USED						
ATTACH MPC LIFT SLINGS TO MPC LIFT CLEATS	10	13A	2	158.5	26.4	52.8	2 SLINGS@5MIN/SLING NO TOOLS						
REMOVE MATING DEVICE LOCKING PINS AND OPEN DRAWER	40	13B	2	118.5	79.0	158.0	2 PINS@2MIN/PIN						
INSTALL TRIM PLATES	4	13B	2	118.5	7.9	15.8	INSTALLED BY HAND						
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	10	13A	2	158.5	26.4	52.8	2 SLINGS@5MIN/SLING						
REMOVE MPC LIFT CLEATS AND MPC LIFT SLINGS	10	14A	1	487.4	81.2	81.2	4 BOLTS,NO TORQUING						
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	2	14A	1.	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING						
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1	43.9	1.5	1.5	4 SHACKLES@2/MIN						
REMOVE MATING DEVICE	10	15A	1	43.9	7.3	7.3	3 BOLTS @ 2 MINUTES PER BOLT						
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	25	16A	2	11.7	4.9	9.8	INSTALL LID AND HYDRO TORQUE 4 BOLTS						

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	Table 10.3.1c													
HI-STORM 100 SY	HI-STORM 100 SYSTEM LOADING OPERATIONS USING THE 125-TON HI-TRAC 125D TRANSFER CASK													
ESTIMATE	ESTIMATED OPERATIONAL EXPOSURES ⁺ (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)													
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS							
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	4	16B	1	205.5	13.7	13.7	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS							
INSTALL TEMPERATURE ELEMENTS	20	16B	1	205.5	68.5	68.5	4@5MIN/TEMPERATURE ELEMENT							
INSTALL EXIT VENT SCREENS	20	16B	T I	205.5	68.5	68.5	4 SCREENS@5MIN/SCREEN							
REMOVE HI-STORM LID LIFTING DEVICE	2	16A	1	11.7	0.4	0.4	4 SHACKLES@2/MIN							
INSTALL HOLE PLUGS IN EMPTY HOLES	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING							
PERFORM SHIELDING EFFECTIVENESS TESTING	16	16D	2	122.7	32.7	65.4	16 POINTS@1 MIN							
SECURE HI-STORM TO TRANSPORT DEVICE	10	16A	2	11.7	2.0	3.9	ASSUMES AIR PAD							
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	40	16C	1	69.7	46.5	46.5	200 FEET @ 4FT/MIN							
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN							
REMOVE AIR PAD	5	16D	2	122.7	10.2	20.5	I PAD MOVED BY HAND							
REMOVE HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN							
INSTALL INLET VENT SCREENS/CROSS PLATES	20	16D	1	122.7	40.9	40.9	4 SCREENS@5MIN/SCREEN							
PERFORM AIR TEMPERATURE RISE TEST	8	16B	1	205.5	27.4	27.4	8 MEASUREMENTS@1/MIN							
			2017.4 PERSON-MREM											

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Table 10.3.2a													
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK													
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)													
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS						
Section 8.3.2 (Step Sequence Varies By Site and Mode of Transport) REMOVE INLET VENT SCREENS 20 16D 1 122.7 40.0 40.0 4.00 4.00 4.00 1 1.00 1.0													
REMOVE INLET VENT SCREENS 20 16D 1 122.7 40.9 40.9 4 SCREENS@5MIN/SCREEN													
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN						
INSERT AIR PAD	5	16D	2	122.7	10.2	20.5	1 PAD MOVED BY HAND						
REMOVE HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN						
TRANSFER HI-STORM TO MPC TRANSFER LOCATION	40	16C	1	69.7	46.5	46.5	200 FEET @ 4FT/MIN						
REMOVE HI-STORM LID STUDS/NUTS	10	16A	1	11.7	2.0	2.0	4 BOLTS NO TORQUE						
REMOVE HI-STORM LID LIFTING HOLE PLUGS AND INSTALL LID LIFTING SLING	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING						
REMOVE GAMMA SHIELD CROSS PLATES	4	16B	1	205.5	13.7	13.7	4 PLATES@1/MIN						
REMOVE TEMPERATURE ELEMENTS	8	16B	1	205.5	27.4	27.4	4 TEMP. ELEMENTS @ 2MIN/TEMP. ELEMENT NO TORQUE						
REMOVE HI-STORM LID	2	16A	1	11.7	0.4	0.4	4 SHACKLES@2/MIN						
INSTALL HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1	43.9	1.5	1.5	4 SHACKLES@2/MIN						
INSTALL ALIGNMENT DEVICE	4	15A	1	43.9	2.9	2.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)						
REMOVE MPC LIFT CLEAT HOLE PLUGS	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING						
INSTALL MPC LIFT CLEATS AND MPC SLINGS	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING						
ALIGN HI-TRAC OVER HI-STORM AND MATE OVERPACKS	10	13B	2	118.5	19.8	39.5	ALIGNMENT GUIDES USED						
PULL MPC SLINGS THROUGH TOP LID HOLE	10	13A	2	158.5	26.4	52.8	2 SLINGS@5MIN/SLING						
INSTALL TRIM PLATES	4	13B	2	118.5	7.9	15.8	INSTALLED BY HAND NO FASTENERS						

See notes at bottom of Table 10.3.4.

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Table 10.3.2a													
HI-STORM 100 SYS	HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK												
ESTIMATED O	PERATION	AL EXPO	SURES [†] (75	,000 MWD	MTU, 5-YE	AR COOL	ED PWR FUEL)						
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS						
ATTACH MPC SLING TO LIFTING DEVICE	10	13A	1	158.5	26.4	26.4	2 SLINGS@5MIN/SLING NO BOLTING						
CLOSE HI-TRAC DOORS AND INSTALL DOOR LOCKING PINS	4	13B	2	118.5	7.9	15.8	2 PINS@2MIN/PIN						
DISCONNECT SLINGS FROM MPC LIFT CLEATS	10	13A	2	158.5	26.4	52.8	2 SLINGS@5MIN/SLING						
DOWNEND HI-TRAC ON TRANSPORT FRAME	20	12A	2	26.4	8.8	17.6	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE						
TRANSPORT HI-TRAC TO FUEL BUILDING	90	12A	1	26.4	39.6	39.6	DRIVER RECEIVES MOST DOSE						
UPEND HI-TRAC	20	12A	2	26.4	8.8	17.6	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE						
Section 8.3.3													
MOVE HI-TRAC TO TRANSFER SLIDE	20	11A	2	117.8	39.3	78.5	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE						
ATTACH MPC SLINGS	4	9A	2	158.5	10.6	21.1	INSTALLED BY HAND NO TOOLS						
REMOVE TRANSFER LID BOLTS	6	11B	1	354.2	35.4	35.4	36 BOLTS@6 BOLTS/MIN IMPACT TOOLS USED						
INSTALL POOL LID BOLTS	18	10A	1	354.2	106.3	106.3	36 BOLTS @ 2/MIN IMPACT TOOLS USED 1 PASS						
DISCONNECT MPC SLINGS AND LIFT CLEATS	10	9A	1	158.5	26.4	26.4	4 BOLTS,NO TORQUING						
PLACE HI-TRAC IN PREPARATION AREA	15	9C	1	117.8	29.5	29.5	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN						
REMOVE TOP LID BOLTS	6	9B	1	37.9	3.8	3.8	24 BOLTS AT 4/MIN (NO TORQUE IMPACT TOOLS)						
REMOVE HI-TRAC TOP LID	2	6A	1	18.7	0.6	0.6	4 SHACKLES@2/MIN						
ATTACH WATER FILL LINE TO HI- TRAC DRAIN PORT	0.5	9D	1	354.2	3.0	3.0	QUICK DISCONNECT NO TOOLS						
INSTALL BOLT PLUGS OR WATERPROOF TAPE FROM HI- TRAC TOP BOLT HOLES	9	8A	1	37.9	5.7	5.7	18 HOLES@2/MIN						
CORE DRILL CLOSURE RING AND VENT AND DRAIN PORT COVER PLATES	40	7A	2	18.7	12.5	24.9	20 MINUTES TO INSTALL/ALIGN +10 MIN/COVER						

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Table 10.3.2a												
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK												
ESTIMATED O	PERATION	IAL EXPO	\mathbf{SURES}^{\dagger} (75	,000 MWD	/MTU, 5-YE	AR COOL	ED PWR FUEL)					
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
REMOVE CLOSURE RING SECTION AND VENT AND DRAIN PORT COVER PLATES	1	8A	1	37.9	0.6	0.6	2 COVERS@2/MIN NO TOOLS					
ATTACH RVOAS	2	8A	1	37.9	1.3	1.3	SINGLE THREADED CONNECTION (1 RVOA)					
ATTACH A SAMPLE BOTTLE TO VENT PORT RVOA	0.5	8A	1	37.9	0.3	0.3	1" THREADED FITTING NO TOOLS					
GATHER A GAS SAMPLE FROM MPC	0.5	8A	1	37.9	0.3	0.3	SMALL BALL VALVE					
CLOSE VENT PORT CAP AND DISCONNECT SAMPLE BOTTLE	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS					
ATTACH RE-FLOOD SYSTEM TO RVOAs	2	8A	1	37.9	1.3	1.3	1" THREADED FITTING NO TOOLS X 2					
DISCONNECT RE-FLOOD LINES TO VENT AND DRAIN PORT RVOAs	1	8A	1	37.9	0.6	0.6	1" THREADED FITTING NO TOOLS					
VACUUM TOP SURFACES OF MPC AND HI-TRAC	10	6A	1	18.7	3.1	3.1	SHOP VACUUM WITH WAND + HAND WIPE					
REMOVE ANNULUS SHIELD	1	8A	- 1	37.9	0.6	0.6	SHIELD PLACED BY HAND					
MANUALLY INSTALL INFLATABLE SEAL	10	6A	2	18.7	3.1	6.2	CONSULTATION WITH CALVERT CLIFFS					
OPEN NEUTRON SHIELD JACKET DRAIN VALVE	2	5C	1	82.7	2.8	2.8	SINGLE THREADED CONNECTION					
CLOSE NEUTRON SHIELD JACKET DRAIN VALVE	2	5C	1	82.7	2.8	2.8	SINGLE THREADED CONNECTION					
REMOVE MPC LID LIFTING HOLE PLUGS	2	5A	1	37.3	1.2	1.2	4 PLUGS AT 2/MIN NO TORQUING					
ATTACH LID RETENTION SYSTEM	12	5A	1	37.3	7.5	7.5	24 BOLTS @ 2 MINUTES/BOLT					
ATTACH ANNULUS OVERPRESSURE SYSTEM	0.5	5C	. 1	82.7	0.7	0.7	QUICK DISCONNECT NO TOOLS					
POSITION HI-TRAC OVER CASK LOADING AREA	10	5C	1	82.7	13.8	13.8	100 FT @ 10 FT/MIN (CRANE SPEED)					
LOWER HI-TRAC INTO SPENT FUEL POOL	8.5	3C	1	117.8	16.7	16.7	17 FEET @ 2 FT/MIN (CRANE SPEED)					
REMOVE LID RETENTION BOLTS	12	3B	1	46.4	9.3	9.3	24 BOLTS @ 2/MINUTE					
PLACE HI-TRAC ON FLOOR	20	2	2	2.0	0.7	1.3	40 FEET @ 2 FT/MINUTE (CRANE SPEED)					

	Table 10.3.2a											
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC TRANSFER CASK												
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)												
ACTION	DURATION (MINUTES)OPERATOR LOCATION (FIGURE 10.3.1)NUMBER OF OPERATORSDOSE RATE AT OPERATOR DOSE TO IDOSE TO INDIVIDUAL DOSE TO INDIVIDUAL (MREM)						TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS				
REMOVE MPC LID		20	2	2	2.0	0.7	1.3	CONSULTATION WITH CALVERT CLIFFS				
			2	Sectio	n 8.3.4							
REMOVE SPENT FUEL ASSEMBLIES FROM MPC		1020	1	2	1.0	17.0	34.0	15 MINUTES PER ASSEMBLY/68 ASSY				
			TOTAL		1997 - 19			924.4 PERSON-MREM				

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Table 10.3.2b											
HI-STORM 100 SYS	TEM UNLO	DADING O	PERATION	IS USING T	ТНЕ 100-ТО	N HI-TRA	C TRANSFER CASK				
ESTIMATED O	PERATION	NAL EXPO	SURES [†] (60	,000 MWD	'MTU, 3-YE	AR COOI	ED PWR FUEL)				
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS				
		Section 8.3.2 (St	ep Sequence Vari	es By Site and M	ode of Transport	<u></u>					
REMOVE INLET VENT SCREENS	20	16D	1	122.7	40.9	40.9	4 SCREENS@5MIN/SCREEN				
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN				
INSERT AIR PAD	5	16D	2	122.7	10.2	20.5	1 PAD MOVED BY HAND				
REMOVE HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN				
TRANSFER HI-STORM TO MPC TRANSFER LOCATION	40	16C	1 :	69.7	46.5	46.5	200 FEET @ 4FT/MIN				
REMOVE HI-STORM LID STUDS/NUTS	10	16A	1	11.7	2.0	2.0	4 BOLTS NO TORQUE				
REMOVE HI-STORM LID LIFTING HOLE PLUGS AND INSTALL LID LIFTING SLING	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING				
REMOVE GAMMA SHIELD CROSS PLATES	4	16B	1	205.5	13.7	13.7	4 PLATES@1/MIN				
REMOVE TEMPERATURE ELEMENTS	8	16B	. 1	205,5	27.4	27.4	4 TEMP. ELEMENTS @ 2MIN/TEMP. ELEMENT NO TORQUE				
REMOVE HI-STORM LID	2	16A	1 .	11.7	0.4	0.4	4 SHACKLES@2/MIN				
INSTALL HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1	43.9	1.5	1.5	4 SHACKLES@2/MIN				
INSTALL ALIGNMENT DEVICE	4	15A	1	43.9	2.9	2.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)				
REMOVE MPC LIFT CLEAT HOLE PLUGS	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING				
INSTALL MPC LIFT CLEATS AND MPC SLINGS	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING				
ALIGN HI-TRAC OVER HI-STORM AND MATE OVERPACKS	10	13B	2	692.0	115.3	230.7	ALIGNMENT GUIDES USED				
PULL MPC SLINGS THROUGH TOP LID HOLE	10	13A	2	363.8	60.6	121.3	2 SLINGS@5MIN/SLING				
INSTALL TRIM PLATES	4	13B	2	692.0	46.1	92.3	INSTALLED BY HAND NO FASTENERS				

See notes at bottom of Table 10.3.4.

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Table 10.3.2b												
HI-STORM 100 SYS	FEM UNLO	DADING O	PERATION	IS USING 1	ТНЕ 100-ТО	N HI-TRA	C TRANSFER CASK					
ESTIMATED O	PERATION	NAL EXPO	SURES[†] (60	,000 MWD	/MTU, 3-YE	AR COOL	ED PWR FUEL)					
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
ATTACH MPC SLING TO LIFTING DEVICE	10	13A	1	363.8	60.6	60.6	2 SLINGS@5MIN/SLING NO BOLTING					
CLOSE HI-TRAC DOORS AND INSTALL DOOR LOCKING PINS	4	13B	2	692.0	46.1	92.3	2 PINS@2MIN/PIN					
DISCONNECT SLINGS FROM MPC LIFT CLEATS	10	13A	2	363.8	60.6	121.3	2 SLINGS@5MIN/SLING					
DOWNEND HI-TRAC ON TRANSPORT FRAME	20	12A	2	35.2	11.7	23.5	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE					
TRANSPORT HI-TRAC TO FUEL BUILDING	90	12A	1	35.2	52.8	52.8	DRIVER RECEIVES MOST DOSE					
UPEND HI-TRAC	20	12A	2	35.2	11.7	23.5	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE					
Section 8.3.3												
MOVE HI-TRAC TO TRANSFER SLIDE	20	11A	2	900.9	300.3	600.6	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE					
ATTACH MPC SLINGS	4	9A	2	363.8	24.3	48.5	INSTALLED BY HAND NO TOOLS					
REMOVE TRANSFER LID BOLTS	6	11B		2190.1	219.0	219.0	36 BOLTS@6 BOLTS/MIN IMPACT TOOLS USED					
INSTALL POOL LID BOLTS	18	10A	1	2190.1	657.0	657.0	36 BOLTS @ 2/MIN IMPACT TOOLS USED 1 PASS					
DISCONNECT MPC SLINGS AND LIFT CLEATS	10	9A	1	363.8	60.6	60.6	4 BOLTS,NO TORQUING					
PLACE HI-TRAC IN PREPARATION AREA	15	9C	1	900.9	225.2	225.2	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN					
REMOVE TOP LID BOLTS	6	9B	1	79.5	8.0	8.0	24 BOLTS AT 4/MIN (NO TORQUE IMPACT TOOLS)					
REMOVE HI-TRAC TOP LID	2	6A	1	34.2	1.1	1.1	4 SHACKLES@2/MIN					
ATTACH WATER FILL LINE TO HI- TRAC DRAIN PORT	0.5	9D	1	2190.1	18.3	18.3	QUICK DISCONNECT NO TOOLS					
INSTALL BOLT PLUGS OR WATERPROOF TAPE FROM HI- TRAC TOP BOLT HOLES	9	8A	1	79.5	11.9	11.9	18 HOLES@2/MIN					
CORE DRILL CLOSURE RING AND VENT AND DRAIN PORT COVER PLATES	40	7A	2	34.2	22.8	45.6	20 MINUTES TO INSTALL/ALIGN +10 MIN/COVER					

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	Table 10.3.2b												
HI-STORM 100 SYS'	TEM UNLO	DADING O	PERATION	IS USING T	ГНЕ 100-ТО	N HI-TRA	C TRANSFER CASK						
ESTIMATED O	PERATION	IAL EXPO	SURES[†] (60	,000 MWD	/MTU, 3-YE	AR COOL	LED PWR FUEL)						
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS						
REMOVE CLOSURE RING SECTION AND VENT AND DRAIN PORT COVER PLATES	1	8A	1	79.5	1.3	1.3	2 COVERS@2/MIN NO TOOLS						
ATTACH RVOAS	2	8A	1	79.5	2.7	2.7	SINGLE THREADED CONNECTION (1 RVOA)						
ATTACH A SAMPLE BOTTLE TO VENT PORT RVOA	0.5	8A	. 1	79.5	0.7	0.7	1" THREADED FITTING NO TOOLS						
GATHER A GAS SAMPLE FROM MPC	0.5	8A	1	79.5	0.7	0.7	SMALL BALL VALVE						
CLOSE VENT PORT CAP AND DISCONNECT SAMPLE BOTTLE	1	8A	. 1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS						
ATTACH RE-FLOOD SYSTEM TO RVOAs	2	8A	1	79.5	2.7	2.7	1" THREADED FITTING NO TOOLS X 2						
DISCONNECT RE-FLOOD LINES TO VENT AND DRAIN PORT RVOAs	1	8A	1	79.5	1.3	1.3	1" THREADED FITTING NO TOOLS						
VACUUM TOP SURFACES OF MPC AND HI-TRAC	10	6A	1	34.2	5.7	5.7	SHOP VACUUM WITH WAND + HAND WIPE						
REMOVE ANNULUS SHIELD	1	8A	· 1	79.5	1.3	1.3	SHIELD PLACED BY HAND						
MANUALLY INSTALL INFLATABLE SEAL	10	6A	2	34.2	5.7	11.4	CONSULTATION WITH CALVERT CLIFFS						
OPEN NEUTRON SHIELD JACKET DRAIN VALVE	2	5C	1	282.1	9.4	9.4	SINGLE THREADED CONNECTION						
CLOSE NEUTRON SHIELD JACKET DRAIN VALVE	2	5C	1	282.1	9.4	9.4	SINGLE THREADED CONNECTION						
REMOVE MPC LID LIFTING HOLE PLUGS	2	5A	1 1 1	69.8	2.3	2.3	4 PLUGS AT 2/MIN NO TORQUING						
ATTACH LID RETENTION SYSTEM	12	5A	1	69.8	14.0	14.0	24 BOLTS @ 2 MINUTES/BOLT						
ATTACH ANNULUS OVERPRESSURE SYSTEM	0.5	5C	1	282.1	2.4	2.4	QUICK DISCONNECT NO TOOLS						
POSITION HI-TRAC OVER CASK LOADING AREA	10	5C	1	282.1	47.0	47.0	100 FT @ 10 FT/MIN (CRANE SPEED)						
LOWER HI-TRAC INTO SPENT FUEL POOL	8.5	3C	1	837.0	118.6	118.6	17 FEET @ 2 FT/MIN (CRANE SPEED)						
REMOVE LID RETENTION BOLTS	12	3B	1	90.3	18.1	18.1	24 BOLTS @ 2/MINUTE						
PLACE HI-TRAC ON FLOOR	20	2	2	3	1.0	2.0	40 FEET @ 2 FT/MINUTE (CRANE SPEED)						

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	Table 10.3.2b											
HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 100-TON HI-TRAC TRANSFER CASK												
ESTIMATED OPERATIONAL EXPOSURES ^T (60,000 MWD/MTU, 3-YEAR COOLED PWR FUEL)												
ACTION DURATION (MINUTES) OPERATOR (FIGURE 10.3.1) OPERATORS OPERATORS OPERATORS (FIGURE 10.3.1) OPERATORS (MREM) (MREM) (MREM) MREM) TOTAL DOSE TO DOSE TO DOSE (PERSON- (MREM/HR) (MREM) (MREM)												
REMOVE MPC LID		20	2	2	3.	1.0	2.0	CONSULTATION WITH CALVERT CLIFFS				
		de la compañía de la		Section	n 8.3.4							
REMOVE SPENT FUEL ASSEMBLIES FROM MPC		1020	1	2	3	51.0	102.0	15 MINUTES PER ASSEMBLY/68 ASSY				
			TOTAL					3275.0 PERSON-MREM				

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Table 10.3.2c												
HI-STORM 100 SYS	STEM UNI	LOADING	OPERAT	IONS USIN	IG THE 12	5-TON HI	-TRAC 125D TRANSFER CASK					
ESTIMATE	D OPERA	TIONAL I	EXPOSURI	ES† (75,000	MWD/MT	'U, 5-YEA	R COOLED PWR FUEL)					
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS					
		Section	8.3.2 (Step Sequ	ence Varies By S	ite and Mode of	Transport)						
REMOVE INLET VENT SCREENS	20	16D	1	122.7	40.9	40.9	4 SCREENS@5MIN/SCREEN					
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN					
INSERT AIR PAD	5	16D	. 2 .	122.7	10.2	20.5	I PAD MOVED BY HAND					
REMOVE HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN					
TRANSFER HI-STORM TO MPC TRANSFER LOCATION	40	16C	1	69.7	46.5	46.5	200 FEET @ 4FT/MIN					
REMOVE HI-STORM LID STUDS/NUTS	10	16A	1	11.7	2.0	2.0	4 BOLTS NO TORQUE					
REMOVE HI-STORM LID LIFTING HOLE PLUGS AND INSTALL LID LIFTING SLING	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING					
REMOVE GAMMA SHIELD CROSS PLATES	4	16B	1	205.5	13.7	13.7	4 PLATES@1/MIN					
REMOVE TEMPERATURE ELEMENTS	8	16B	1	205.5	27.4	27.4	4 TEMP. ELEMENTS @ 2MIN/TEMP. ELEMENT NO TORQUE					
REMOVE HI-STORM LID	2	16A	1	11.7	0.4	0.4	4 SHACKLES@2/MIN					
INSTALL HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1	43.9	1.5	1.5	4 SHACKLES@2/MIN					
INSTALL MATING DEVICE WITH POOL LID	10	15A	1	43.9	7.3	7.3	3 BOLTS AT 2 MINUTES PER BOLT					
REMOVE MPC LIFT CLEAT HOLE PLUGS	2	14A	. 1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING					
INSTALL MPC LIFT CLEATS AND MPC SLINGS	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING					
ALIGN HI-TRAC OVER HI- STORM AND MATE OVERPACKS	. 10	13B	2	118.5	19.8	39.5	ALIGNMENT GUIDES USED					

See notes at bottom of Table 10.3.4.

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				Table 10.3.	2c		
HI-STORM 100 SYS	STEM UN	LOADING	OPERAT	IONS USIN	IG THE 12	5-TON HI	-TRAC 125D TRANSFER CASK
ESTIMATE	D OPERA	TIONAL I	EXPOSURI	<u>ES† (75,000</u>	MWD/MT	'U, 5-YEA	R COOLED PWR FUEL)
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS
PULL MPC SLINGS THROUGH TOP LID HOLE	10	13A	2	158.5	26.4	52.8	2 SLINGS@5MIN/SLING
INSTALL TRIM PLATES	4	13B	2	118.5	7.9	15.8	INSTALLED BY HAND NO FASTENERS
ATTACH MPC SLING TO LIFTING DEVICE	10	13A	1	158.5	26.4	26.4	2 SLINGS@5MIN/SLING NO BOLTING
CLOSE MATING DEVICE DRAWER AND BOLT-UP POOL LID	36	13B	2	118.5	71.1	142.2	2 PINS@2MIN/PIN, 16 BOLTS @ 2MIN/BOLT
DISCONNECT SLINGS FROM MPC LIFT CLEATS	10	13A	2	158.5	26.4	52.8	2 SLINGS@5MIN/SLING
DOWNEND HI-TRAC ON TRANSPORT FRAME	20	12A	2	26.4	8.8	17.6	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
TRANSPORT HI-TRAC TO FUEL BUILDING	90	12A	1	26.4	39.6	39.6	DRIVER RECEIVES MOST DOSE
UPEND HI-TRAC	20	12A	2	26.4	8.8	17.6	ALIGN TRUNNIONS, DISCONNECT LIFT YOKE
			<i>n</i>	Section 8.3.3			
PLACE HI-TRAC IN PREPARATION AREA	15	9C	1	117.8	29.5	29.5	100 FT @ 10 FT/MIN (CRANE SPEED)+ 5MIN TO ALIGN
REMOVE TOP LID BOLTS	6	9B	1	37.9	3.8	3.8	24 BOLTS AT 4/MIN (NO TORQUE IMPACT TOOLS)
REMOVE HI-TRAC TOP LID	2	6A	1	18.7	0.6	0.6	4 SHACKLES@2/MIN
ATTACH WATER FILL LINE TO HI-TRAC DRAIN PORT	0.5	9D	1	354.2	3.0	3.0	QUICK DISCONNECT NO TOOLS
INSTALL BOLT PLUGS OR WATERPROOF TAPE FROM HI- TRAC TOP BOLT HOLES	9	8A	1	37.9	5.7	5.7	18 HOLES@2/MIN
CORE DRILL CLOSURE RING AND VENT AND DRAIN PORT COVER PLATES	40	7A	2	18.7	12.5	24.9	20 MINUTES TO INSTALL/ALIGN +10 MIN/COVER
REMOVE CLOSURE RING SECTION AND VENT AND DRAIN PORT COVER PLATES	1	8A	1	37.9	0.6	0.6	2 COVERS@2/MIN NO TOOLS
ATTACH RVOAS	2	8A	1	37.9	1.3	1.3	SINGLE THREADED CONNECTION (1 RVOA)

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				Table 10.3	.2c		
HI-STORM 100 SYS	STEM UN	LOADING	OPERAT	IONS USIN	IG THE 12	5-TON HI	-TRAC 125D TRANSFER CASK
ESTIMATE	D OPERA I	HONAL I	CAPOSURI	ES" (75,000 DOSE RATE	MWD/M1	<u>U, 5-YEA</u>	R COOLED PWR FUEL)
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS
ATTACH A SAMPLE BOTTLE TO VENT PORT RVOA	0.5	8A	1	37.9	0.3	0.3	1" THREADED FITTING NO TOOLS
GATHER A GAS SAMPLE FROM MPC	0.5	8A	1	37.9	0.3	0.3	SMALL BALL VALVE
CLOSE VENT PORT CAP AND DISCONNECT SAMPLE BOTTLE	1	8A	1	37.9	0.6	0.6	I" THREADED FITTING NO TOOLS
ATTACH RE-FLOOD SYSTEM TO RVOAs	2	8A	1	37.9	1.3	1.3	1" THREADED FITTING NO TOOLS X 2
DISCONNECT RE-FLOOD LINES TO VENT AND DRAIN PORT RVOAs	1	8A	1	37.9	0.6	0.6	I" THREADED FITTING NO TOOLS
VACUUM TOP SURFACES OF MPC AND HI-TRAC	10	6A	1	18.7	3.1	3.1	SHOP VACUUM WITH WAND + HAND WIPE
REMOVE ANNULUS SHIELD	1	8A	1	37.9	0.6	0.6	SHIELD PLACED BY HAND
MANUALLY INSTALL INFLATABLE SEAL	10	6A	2	18.7	3.1	6.2	CONSULTATION WITH CALVERT CLIFFS
OPEN NEUTRON SHIELD JACKET DRAIN VALVE	2	5C	1	82.7	2.8	2.8	SINGLE THREADED CONNECTION
CLOSE NEUTRON SHIELD JACKET DRAIN VALVE	2	5C	1	82.7	2.8	2.8	SINGLE THREADED CONNECTION
REMOVE MPC LID LIFTING HOLE PLUGS	2	5A	1.	37.3	1.2	1.2	4 PLUGS AT 2/MIN NO TORQUING
ATTACH LID RETENTION SYSTEM	12	5A	1	37.3	7.5	7.5	24 BOLTS @ 2 MINUTES/BOLT
ATTACH ANNULUS OVERPRESSURE SYSTEM	0.5	5C	1	82.7	0.7	0.7	QUICK DISCONNECT NO TOOLS
POSITION HI-TRAC OVER CASK LOADING AREA	10	5C	1	82.7	13.8	13.8	100 FT @ 10 FT/MIN (CRANE SPEED)
LOWER HI-TRAC INTO SPENT FUEL POOL	8.5	3C	1	117.8	16.7	16.7	17 FEET @ 2 FT/MIN (CRANE SPEED)
REMOVE LID RETENTION BOLTS	12	3B	1	46.4	9.3	9.3	24 BOLTS @ 2/MINUTE
PLACE HI-TRAC ON FLOOR	20	2	2	2.0	0.7	1.3	40 FEET @ 2 FT/MINUTE (CRANE SPEED)
REMOVE MPC LID	20	2	2	2.0	0.7	1.3	CONSULTATION WITH CALVERT CLIFFS

Table 10.3.2c HI-STORM 100 SYSTEM UNLOADING OPERATIONS USING THE 125-TON HI-TRAC 125D TRANSFER CASK ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)										
ACTION DURATION (MINUTES) OPERATOR (MINUTES) OPERATOR 10.3.1) OPERATOR (FIGURE 10.3.1) OPERATORS (FIGURE 10.3.1) OPERATORS (MREM/HR) OPERATOR (MREM/HR) OPERATOR (MREM/HR) OPERATOR (MREM/HR) OPERATOR (MREM/HR) OPERATOR (MREM/HR) OPERATOR (MREM/HR) OPERATOR										
Section 8.3.4										
REMOVE SPENT FUEL1020121.017.034.0ASSEMBLIES FROM MPC1020121.017.034.0	15 MINUTES PER ASSEMBLY/68 ASSY									
TOTAL 787.5 PERSON-MREM										

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Table 10.3.3a													
MPC TRANSFI	ER INTO T	HE HI-STO)RM 100 SY	'STEM DIF	RECTLY FF	ROM TRAN	SPORT USING						
		THE 125-T	ON HI-TR	AC TRANS	FER CASK								
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)													
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS						
Section 8.5.2													
MEASURE HI-STAR DOSE RATES 16 17A 2 14.1 3.8 7.5 16 POINTS@1 POINT/MIN													
REMOVE PERSONNEL BARRIER	10	17C	2	21.5	3.6	7.2	ATTACH SLING REMOVE 8 LOCKS						
PERFORM REMOVABLE CONTAMINATION SURVEYS	1	17C	1	21.5	0.4	0.4	10 SMEARS@10 SMEARS/MINUTE						
REMOVE IMPACT LIMITERS	16	17A	2	14.1	3.8	7.5	ATTACH FRAME REMOVE 22 BOLTS IMPACT TOOLS						
REMOVE TIE-DOWN	6	17A	2	14.1	1.4	2.8	ATTACH 2-LEGGED SLING REMOVE 4 BOLTS						
PERFORM A VISUAL INSPECTION OF OVERPACK	10	17B	l	9.0	1.5	1.5	CHECKSHEET USED						
REMOVE REMOVABLE SHEAR RING SEGMENTS	4	17A	1	14.1	0.9	0.9	4 BOLTS EACH @2/MIN X 2 SEGMENTS						
UPEND HI-STAR OVERPACK	20	17B	2	9.0	3.0	6.0	DISCONNECT LIFT YOKE						
INSTALL TEMPORARY SHIELD RING SEGMENTS	16	18A	1	7.1	1.9	1.9	8 SEGMENTS @ 2 MIN/SEGMENT						
FILL TEMPORARY SHIELD RING SEGMENTS	25	18A	1	7.1	3.0	3.0	230 GAL @10GPM, LONG HANDLED SPRAYER						
REMOVE OVERPACK VENT PORT COVER PLATE	2	18A	1	7.1	0.2	0.2	4 BOLTS @2/MIN						
ATTACH BACKFILL TOOL	2	18A	1	7.1	0.2	0.2	4 BOLTS @2/MIN						
OPEN/CLOSE VENT PORT PLUG	0.5	18A	1	7.1	0.1	0.1	SINGLE TURN BY HAND NO TOOLS						
REMOVE CLOSURE PLATE BOLTS	39	18A	2	7.1	4.6	9.2	52 BOLTS@4/MIN X 3 PASSES						
REMOVE OVERPACK CLOSURE PLATE	2	18A	1	7.1	0.2	0.2	4 SHACKLES@2/MIN						
INSTALL HI-STAR SEAL SURFACE PROTECTOR	2	19B	1	7.1	0.2	0.2	PLACED BY HAND NO TOOLS						
INSTALL TRANSFER COLLAR ON HI-STAR	10	19B	2	7.1	1.2	2.4	ALIGN AND POSITION REMOVE 4 SHACKLES						
REMOVE MPC LIFT CLEAT HOLE PLUGS	2	19A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING						

[†] See notes at bottom of Table 10.3.4.

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Table 10.3.3a													
MPC TRANSFI	MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING												
		THE 125-T	ON HI-TRA	AC TRANS	FER CASK								
ESTIMATED O	PERATION	AL EXPO	SURES' (75	,000 MWD/	<u>'MTU, 5-YE</u>	AR COOL	LED PWR FUEL)						
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS						
INSTALL MPC LIFT CLEATS AND LIFT SLING	25	19A	2	487.4	203.1	406.2	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS						
MATE OVERPACKS	10	20B	2	118.5	19.8	39.5	ALIGNMENT GUIDES USED						
REMOVE DOOR LOCKING PINS AND OPEN DOORS	4	20B	2	118.5	7.9	15.8	2 PINS@2/MIN						
INSTALL TRIM PLATES	4	20B	2	118.5	7.9	15.8	INSTALLED BY HAND NO FASTENERS						
Section 8.5.3													
REMOVE TRIM PLATES	4	20B	2	118.5	7.9	15.8	INSTALLED BY HAND NO FASTENERS						
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	10	20A	2	158.5	26.4	52.8	2 SLINGS@5/MIN						
INSTALL TRIM PLATES	4	13B	2	118.5	7.9	15.8	INSTALLED BY HAND NO FASTENERS						
REMOVE MPC LIFT CLEATS AND MPC LIFT SLINGS	10	14A	1	487.4	81.2	81.2	4 BOLTS,NO TORQUING						
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING						
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1	43.9	1.5	1.5	4 SHACKLES@2/MIN						
REMOVE ALIGNMENT DEVICE	4	15A	1	43.9	2.9	2.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)						
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	25	16A	2	11.7	4.9	9.8	INSTALL LID AND HYDRO TORQUE 4 BOLTS						
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	4	16B	1	205.5	13.7	13.7	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS						
INSTALL TEMPERATURE ELEMENTS	20	16B	1	205.5	68.5	68.5	4@5MIN/TEMPERATURE ELEMENT						
INSTALL EXIT VENT SCREENS	20	16B	1	205.5	68.5	68.5	4 SCREENS@5MIN/SCREEN						
REMOVE HI-STORM LID LIFTING DEVICE	2	16A	1	11.7	0.4	0.4	4 SHACKLES@2/MIN						
INSTALL HOLE PLUGS IN EMPTY HOLES	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING						
PERFORM SHIELDING EFFECTIVENESS TESTING	16	16D	1.	122.7	32.7	32.7	16POINTS@1 MIN						

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	Table 10.3.3a											
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING												
THE 125-TON HI-TRAC TRANSFER CASK												
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)												
ACTION DURATION (MINUTES) OPERATOR (FIGURE 10.3.1) OPERATORS DOSE RATE (DOSE RATE DOSE TO INDIVIDUAL DOSE TO INDIVIDUAL (PERSON- (MREM/HR)) (MREM) (MREM) (MREM)												
SECURE HI-STORM TO TRANSPORT DEVICE	10	16A	1	11.7	2.0	2.0	ASSUMES AIR PAD					
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	40	16C	: <u>.</u> · 1	69.7	46.5	46.5	200 FEET @ 4FT/MIN					
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN					
REMOVE AIR PAD	5	16D	1	122.7	10.2	10.2	1 PAD MOVED BY HAND					
REMOVE HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8,2	4 JACKS@1/MIN					
INSTALL INLET VENT SCREENS	20	16D		122.7	40.9	40.9	4 SCREENS@5MIN/SCREEN					
PERFORM AIR TEMPERATURE RISE TEST	8	16B	1	205.5	27.4	27.4	8 MEASMT@1/MIN					
	and the second second	TOTAL					1068.3 PERSON-MREM					

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Table 10.3.3b									
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING									
THE 100-TON HI-TRAC TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (60,000 MWD/MTU, 3-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
			Section	n 8.5.2					
MEASURE HI-STAR DOSE RATES	16	17A	2	14.1	3.8	7.5	16 POINTS@1 POINT/MIN		
REMOVE PERSONNEL BARRIER	10	17C	2	21.5	3.6	7.2	ATTACH SLING REMOVE 8 LOCKS		
PERFORM REMOVABLE CONTAMINATION SURVEYS	1	17C	1	21.5	0.4	0.4	10 SMEARS@10 SMEARS/MINUTE		
REMOVE IMPACT LIMITERS	16	17A	2	14.1	3.8	7.5	ATTACH FRAME REMOVE 22 BOLTS IMPACT TOOLS		
REMOVE TIE-DOWN	6	17A	2	14.1	1.4	2.8	ATTACH 2-LEGGED SLING REMOVE 4 BOLTS		
PERFORM A VISUAL INSPECTION OF OVERPACK	10	17B	1	9.0	1.5	1.5	CHECKSHEET USED		
REMOVE REMOVABLE SHEAR RING SEGMENTS	4	17A	1	14.1	0.9	0.9	4 BOLTS EACH @2/MIN X 2 SEGMENTS		
UPEND HI-STAR OVERPACK	20	17B	2	9.0	3.0	6.0	DISCONNECT LIFT YOKE		
INSTALL TEMPORARY SHIELD RING SEGMENTS	16	18A	Ι	6.9	1.8	1.8	8 SEGMENTS @ 2 MIN/SEGMENT		
FILL TEMPORARY SHIELD RING SEGMENTS	25	18A	1	6.9	2.9	2.9	230 GAL @10GPM, LONG HANDLED SPRAYER		
REMOVE OVERPACK VENT PORT COVER PLATE	2	18A	1	6.9	0.2	0.2	4 BOLTS @2/MIN		
ATTACH BACKFILL TOOL	2	18A	1	6.9	0.2	0.2	4 BOLTS @2/MIN		
OPEN/CLOSE VENT PORT PLUG	0.5	18A	1	6.9	0.1	0.1	SINGLE TURN BY HAND NO TOOLS		
REMOVE CLOSURE PLATE BOLTS	39	18A	2	6.9	4.5	9.0	52 BOLTS@4/MIN X 3 PASSES		
REMOVE OVERPACK CLOSURE PLATE	2	18A	1	6.9	0.2	0.2	4 SHACKLES@2/MIN		
INSTALL HI-STAR SEAL SURFACE PROTECTOR	2	19B	1	6.9	0.2	0.2	PLACED BY HAND NO TOOLS		
INSTALL TRANSFER COLLAR ON HI-STAR	10	19B	2	6.9	1.2	2.3	ALIGN AND POSITION REMOVE 4 SHACKLES		
REMOVE MPC LIFT CLEAT HOLE PLUGS	2	19A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING		

[†] See notes at bottom of Table 10.3.4.

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Table 10.3.3b									
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING									
THE 100-TON HI-TRAC TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES' (60,000 MWD/MTU, 3-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
INSTALL MPC LIFT CLEATS AND LIFT SLING	25	19A	2	487.4	203.1	406.2	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS		
MATE OVERPACKS	10	20B	2	692.0	115.3	230.7	ALIGNMENT GUIDES USED		
REMOVE DOOR LOCKING PINS AND OPEN DOORS	4	20B	2	692.0	46.1	92.3	2 PINS@2/MIN		
INSTALL TRIM PLATES	4	20B	2	692.0	46.1	92.3	INSTALLED BY HAND NO FASTENERS		
Section 8.5.3									
REMOVE TRIM PLATES	4	20B	2	692.0	46.1	92.3	INSTALLED BY HAND NO FASTENERS		
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	10	20A	2	363.8	60.6	121.3	2 SLINGS@5/MIN		
REMOVE TRIM PLATES	4	13B	2	692.0	46.1	92.3	INSTALLED BY HAND NO FASTENERS		
REMOVE MPC LIFT CLEATS AND MPC LIFT SLINGS	10	14A	1	487.4	81.2	81.2	4 BOLTS,NO TORQUING		
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING		
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1	43.9	1.5	1.5	4 SHACKLES@2/MIN		
REMOVE ALIGNMENT DEVICE	4	15A	1	43.9	2.9	2.9	REMOVED BY HAND NO TOOLS (4 PCS@1/MIN)		
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	25	16A	2	11.7	4.9	9.8	INSTALL LID AND HYDRO TORQUE 4 BOLTS		
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	4	16B	1	205.5	13.7	13.7	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS		
INSTALL TEMPERATURE ELEMENTS	20	16B	1	205.5	68.5	68.5	4@5MIN/TEMPERATURE ELEMENT		
INSTALL EXIT VENT SCREENS	20	16B	1	205.5	68.5	68.5	4 SCREENS@5MIN/SCREEN		
REMOVE HI-STORM LID LIFTING DEVICE	2	16A	1	11.7	0.4	0.4	4 SHACKLES@2/MIN		
INSTALL HOLE PLUGS IN EMPTY HOLES	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING		
PERFORM SHIELDING EFFECTIVENESS TESTING	16	16D	1	122.7	32.7	32.7	16POINTS@1 MIN		

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Table 10.3.3b									
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING									
THE 100-TON HI-TRAC TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (60,000 MWD/MTU, 3-YEAR COOLED PWR FUEL)									
ACTION OPERATOR DURATION (MINUTES) OPERATOR (MINUTES) OPERATOR 10.3.1) OPERATOR 10.3.1) OPERATOR DOSE RATE AT OPERATOR DOSE TO INDIVIDUAL (MREM) (MREM) MREM) DOSE TO INDIVIDUAL (MREM) MREM)									
SECURE HI-STORM TO TRANSPORT DEVICE	10	16A	1	11.7	2.0	2.0	ASSUMES AIR PAD		
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	40	16C	1	69.7	46.5	46.5	200 FEET @ 4FT/MIN		
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN		
REMOVE AIR PAD	5	16D	1	122.7	10.2	10.2	1 PAD MOVED BY HAND		
REMOVE HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS@1/MIN		
INSTALL INLET VENT SCREENS	20	16D	1 + 1	122.7	40.9	40.9	4 SCREENS@5MIN/SCREEN		
PERFORM AIR TEMPERATURE RISE TEST	8	16B	1	205.5	27.4	27.4	8 MEASMT@1/MIN		
· · · · · · · · · · · · · · · · · · ·		TOTAL					1633.3 PERSON-MREM		

	Table 10.3.3c								
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING									
THE 125-TON HI-TRAC 125D TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES' (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
			- · ·	Section 8.5.2					
MEASURE HI-STAR DOSE RATES	16	17A	2	14.1	3.8	7.5	16 POINTS@1 POINT/MIN		
REMOVE PERSONNEL BARRIER	10	17C	2	21.5	3.6	7.2	ATTACH SLING REMOVE 8 LOCKS		
PERFORM REMOVABLE CONTAMINATION SURVEYS		17C	1	21.5	0.4	0.4	10 SMEARS@10 SMEARS/MINUTE		
REMOVE IMPACT LIMITERS	16	17A	2	14.1	3.8	7.5	ATTACH FRAME REMOVE 22 BOLTS IMPACT TOOLS		
REMOVE TIE-DOWN	6	17A	2	14.1	1.4	2.8	ATTACH 2-LEGGED SLING REMOVE 4 BOLTS		
PERFORM A VISUAL INSPECTION OF OVERPACK	10	17B	$(1,1)^{2}$, $(1,1)^{2}$,	9.0	1.5	1.5	CHECKSHEET USED		
REMOVE REMOVABLE SHEAR RING SEGMENTS	4	17A	1	14.1	0.9	0.9	4 BOLTS EACH @2/MIN X 2 SEGMENTS		
UPEND HI-STAR OVERPACK	20	17B	2	9.0	3.0	6.0	DISCONNECT LIFT YOKE		
INSTALL TEMPORARY SHIELD RING SEGMENTS	16	18A	1	7.1	1.9	1.9	8 SEGMENTS @ 2 MIN/SEGMENT		
FILL TEMPORARY SHIELD RING SEGMENTS	25	18A	1	7.1	3.0	3.0	230 GAL @10GPM, LONG HANDLED SPRAYER		
REMOVE OVERPACK VENT PORT COVER PLATE	2	18A	1	7.1	0.2	0.2	4 BOLTS @2/MIN		
ATTACH BACKFILL TOOL	2	18A	1	7.1	0.2	0.2	4 BOLTS @2/MIN		
OPEN/CLOSE VENT PORT PLUG	0.5	18A	1.	7.1	0.1	0.1	SINGLE TURN BY HAND NO TOOLS		
REMOVE CLOSURE PLATE BOLTS	39	18A	2	7.1	4.6	9.2	52 BOLTS@4/MIN X 3 PASSES		
REMOVE OVERPACK CLOSURE PLATE	2	18A	1	6.7	0.2	0.2	4 SHACKLES@2/MIN		

See notes at bottom of Table 10.3.4.

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	Table 10.3.3c								
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING									
THE 125-TON HI-TRAC 125D TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
INSTALL HI-STAR SEAL SURFACE PROTECTOR	2	19B	1	7.1	0.2	0.2	PLACED BY HAND NO TOOLS		
INSTALL MATING DEVICE ON HI-STAR	20	19B	2	7.1	2.4	4.7	ALIGN AND BOLT INTO PLACE		
REMOVE MPC LIFT CLEAT HOLE PLUGS	2	19A	1	487.4	16.2	16,2	4 PLUGS AT 2/MIN NO TORQUING		
INSTALL MPC LIFT CLEATS AND LIFT SLING	25	19A	2	487.4	203.1	406.2	INSTALL CLEATS AND HYDRO TORQUE 4 BOLTS		
MATE OVERPACKS	10	20B	2	118.5	19.8	39.5	ALIGNMENT GUIDES USED		
REMOVE LOCKING PINS AND OPEN DRAWER	4	20B	2	118.5	7.9	15.8	2 PINS@2/MIN		
INSTALL TRIM PLATES	4	20B	2	118.5	7.9	15,8	INSTALLED BY HAND NO FASTENERS		
				Section 8.5.3					
REMOVE TRIM PLATES	4	20B	2	118.5	7.9	15.8	INSTALLED BY HAND NO FASTENERS		
RAISE THE POOL LID AND BOLT INTO PLACE ON HI-TRAC	32	20B	2	118.5	63.2	126.4	2 MINS/BOLT, 16 BOLTS		
DISCONNECT SLINGS FROM MPC LIFTING DEVICE	10	20A	2	158.5	26.4	52.8	2 SLINGS@5/MIN		
INSTALL TRIM PLATES	4	13B	2	118.5	7.9	15.8	INSTALLED BY HAND NO FASTENERS		
REMOVE MPC LIFT CLEATS AND MPC LIFT SLINGS	10	14A	1	487.4	81.2	81.2	4 BOLTS,NO TORQUING		
INSTALL HOLE PLUGS IN EMPTY MPC BOLT HOLES	2	14A	1	487.4	16.2	16.2	4 PLUGS AT 2/MIN NO TORQUING		
REMOVE HI-STORM VENT DUCT SHIELD INSERTS	2	15A	1	43.9	1.5	1.5	4 SHACKLES@2/MIN		
REMOVE THE MATINGE DEVICE	6	15A	1	43.9	4.4	4.4	3 BOLTS AT 2 MINUTES PER BOLTS		
INSTALL HI-STORM LID AND INSTALL LID STUDS/NUTS	25	16A		11.7	4.9	9.8	INSTALL LID AND HYDRO TORQUE 4 BOLTS		

Table 10.3.3c									
MPC TRANSFER INTO THE HI-STORM 100 SYSTEM DIRECTLY FROM TRANSPORT USING									
THE 125-TON HI-TRAC 125D TRANSFER CASK									
ESTIMATED OPERATIONAL EXPOSURES [†] (75,000 MWD/MTU, 5-YEAR COOLED PWR FUEL)									
ACTION	DURATION (MINUTES)	OPERATOR LOCATION (FIGURE 10.3.1)	NUMBER OF OPERATORS	DOSE RATE AT OPERATOR LOCATION (MREM/HR)	DOSE TO INDIVIDUAL (MREM)	TOTAL DOSE (PERSON- MREM)	ASSUMPTIONS		
INSTALL HI-STORM EXIT VENT GAMMA SHIELD CROSS PLATES	4	16B	··· · · · · · · ·	205.5	13.7	13.7	4 PCS @ 1/MIN INSTALL BY HAND NO TOOLS		
INSTALL TEMPERATURE ELEMENTS	20	16B	1	205.5	68.5	68.5	4@5MIN/TEMPERATURE ELEMENT		
INSTALL EXIT VENT SCREENS	20	16B	1	205.5	68.5	68.5	4 SCREENS@5MIN/SCREEN		
REMOVE HI-STORM LID LIFTING DEVICE	2	16A		11.7	0.4	0.4	4 SHACKLES@2/MIN		
INSTALL HOLE PLUGS IN EMPTY HOLES	2	16A	1	11.7	0.4	0.4	4 PLUGS AT 2/MIN NO TORQUING		
PERFORM SHIELDING EFFECTIVENESS TESTING	16	16D	1	122.7	32.7	32.7	16POINTS@1 MIN		
SECURE HI-STORM TO TRANSPORT DEVICE	10	16A	1	11.7	2.0	2.0	ASSUMES AIR PAD		
TRANSFER HI-STORM TO ITS DESIGNATED STORAGE LOCATION	40	16C	1	69.7	46.5	46.5	200 FEET @ 4FT/MIN		
INSERT HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS @1/MIN		
REMOVE AIR PAD	5	16D	1	122.7	10.2	10.2	1 PAD MOVED BY HAND		
REMOVE HI-STORM LIFTING JACKS	4	16D	1	122.7	8.2	8.2	4 JACKS @1/MIN		
INSTALL INLET VENT SCREENS	20	16D	1	122.7	40.9	40.9	4 SCREENS@5MIN/SCREEN		
PERFORM AIR TEMPERATURE RISE TEST	8	16B	1	205.5	27.4	27.4	8 MEASMT@1/MIN		
		1198.6 PERSON-MREM							

Table 10.3.4 ESTIMATED EXPOSURES FOR HI-STORM 100 SURVEILLANCE AND MAINTENANCE

ACTIVITY	ESTIMATED PERSONNEL	ESTIMATED HOURS PER YEAR	ESTIMATED DOSE RATE (MREM/HR)	OCCUPATIONAL DOSE TO INDIVIDUAL (PERSON- MREM)
SECURITY SURVEILLANCE	1	30	3	90
ANNUAL MAINTENANCE	2	15	10	300

Notes for Tables 10.3.1a, 10.3.1b, 10.3.1c, 10.3.2a, 10.3.2b, 10.3.2c, 10.3.3a, 10.3.3b, 10.3.3c and 10.3.4:

- 1.
- Refer to Chapter 8 for detailed description of activities. Number of operators may be set to 1 to simplify calculations where the duration is indirectly proportional to the number of operators. The total dose is 2 equivalent in both respects.
- HI-STAR 100 Operations assume that the cooling time is at least 10 years. 3

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Figure 10.3.1a; Operator Work Locations Used for Estimating Personnel Exposure

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Figure 10.3.1b; Operator Work Locations Used for Estimating Personnel Exposure

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Figure 10.3.1c; Operator Work Locations Used for Estimating Personnel Exposure

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Figure 10.3.1d; Operator Work Locations Used for Estimating Personnel Exposure

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Figure 10.3.1e; Operator Work Locations Used for Estimating Personnel Exposure

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10.4 ESTIMATED COLLECTIVE DOSE ASSESSMENT

10.4.1 <u>Controlled Area Boundary Dose for Normal Operations</u>

10CFR72.104 [10.0.1] limits the annual dose equivalent to any real individual at the controlled area boundary to a maximum of 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem for any other critical organ. This includes contributions from all uranium fuel cycle operations in the region.

It is not feasible to predict bounding controlled area boundary dose rates on a generic basis since radiation from plant and other sources; the location and the layout of an ISFSI; and the number and configuration of casks are necessarily site-specific. In order to compare the performance of the HI-STORM 100 System with the regulatory requirements, sample ISFSI arrays were analyzed in Chapter 5. These represent a full array of design basis fuel assemblies. Users are required to perform a site specific dose analysis for their particular situation in accordance with 10CFR72.212 [10.0.1]. The analysis must account for the ISFSI (size, configuration, fuel assembly specifics) and any other radiation from uranium fuel cycle operations within the region.

Table 5.1.9 presents dose rates at various distances from sample ISFSI arrays for the design basis burnup and cooling time which results in the highest off-site dose for the combination of maximum burnup and minimum cooling times analyzed in Chapter 5. 10CFR72.106 [10.0.1] specifies that the minimum distance from the ISFSI to the controlled area boundary is 100 meters. Therefore this was the minimum distance analyzed in Chapter 5. As a summary of Chapter 5, Table 10.4.1 presents the annual dose results for a single overpack at 100 and 350 meters and a 2x5 array of HI-STORM 100 systems at 550 meters. These annual doses are based on a full array of design basis fuel with a burnup of 60,000 MWD/MTU and 3-year cooling. This burnup and cooling time combination conservatively bounds the allowable burnup and cooling times listed in Section 2.1.9. In addition, 100% occupancy (8760 hours) is conservatively assumed. In the calculation of the annual dose, the casks were positioned on an infinite slab of soil to account for earth-shine effects. These results indicate that the calculated annual dose is less than the regulatory limit of 25 mrem/year at a distance of 350 meters for a single cask and at 550 meters for a 2x5 array of HI-STORM 100 Systems containing design basis fuel. These results are presented only as an illustration to demonstrate that the HI-STORM 100 System is in compliance with 10CFR72.104[10.0.1]. Neither the distances nor the array configurations become part of the Technical Specifications. Rather, users are required to perform a site specific analyses to demonstrate compliance with 10CFR72.104[10.0.1] contributors and 10CFR20[10.1.1].

An additional contributor to the controlled area boundary dose is the loaded HI-TRAC transfer cask, if the HI-TRAC is to be used at the ISFSI outside of the fuel building. Table 10.4.2 provides dose rates at 100, 200, and 300 meters for a 100-ton HI-TRAC transfer cask loaded with design basis fuel. The 100-ton HI-TRAC dose rates bound the 125-ton HI-TRAC by large margins. Based on the short duration that the loaded HI-TRAC is used outside at the ISFSI, the HI-STORM 100 System is in compliance with

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10CFR72.104[10.0.1] when worst-case design basis fuel is loaded in all fuel cell locations. However, users are required to perform a site specific analysis to demonstrate compliance with 10CFR72.104[10.0.1] and 10CFR20[10.1.1] taking into account the actual site boundary distance and fuel characteristics.

Section 7.1 provides a discussion as to how the Holtec MPC design, welding, testing, and inspection requirements meet the guidance of ISG-18 such that leakage from the confinement boundary may be considered non-credible. Therefore, there is no additional dose contribution due to leakage from the welded MPC. The site licensee is required to perform a site-specific dose evaluation of all dose contributors as part of the ISFSI design. This evaluation will account for the location of the controlled area boundary, the total number of casks on the ISFSI and the effects of the radiation from uranium fuel cycle operations within the region.

10.4.2 Controlled Area Boundary Dose for Off-Normal Conditions

As demonstrated in Section 11.1, the postulated off-normal conditions (off-normal pressure, off-normal environmental temperatures, leakage of one MPC weld, partial blockage of air inlets, and off-normal handling of HI-TRAC) do not result in the degradation of the HI-STORM 100 System shielding effectiveness. Therefore, the dose at the controlled area boundary from direct radiation for off-normal conditions is equal to that of normal conditions.

10.4.3 Controlled Area Boundary Dose for Accident Conditions

10CFR72.106 [10.0.1] specifies the maximum doses allowed to any individual at the controlled area boundary from any design basis accident (See Subsection 10.1.2). In addition, it is specified that the minimum distance from the ISFSI to the controlled area boundary be at least 100 meters.

Chapter 11 presents the results of the evaluations performed to demonstrate that the HI-STORM 100 System can withstand the effects of all accident conditions and natural phenomena without the corresponding radiation doses exceeding the requirements of 10CFR72.106 [10.0.1]. The accident events addressed in Chapter 11 include: handling accidents, tip-over, fire, tornado, flood, earthquake, 100 percent fuel rod rupture, confinement boundary leakage, explosion, lightning, burial under debris, extreme environmental temperature, partial blockage of MPC basket air inlets, and 100% blockage of air inlets.

The worst-case shielding consequence of the accidents evaluated in Section 11.2 for the loaded HI-STORM overpack assumes that as a result of a fire, the outer-most one inch of the concrete experiences temperatures above the concrete's design temperature. Therefore, the shielding effectiveness of this outer-most one inch of concrete is degraded. However, with over 25 inches of concrete providing shielding, the loss of one inch will have a negligible effect on the dose at the controlled area boundary.

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The worst case shielding consequence of the accidents evaluated in Section 11.2 for the loaded HI-TRAC transfer cask assumes that as a result of a fire, tornado missile, or handling accident, the all the water in the water jacket is lost. The shielding analysis of the 100-ton HI-TRAC transfer cask with complete loss of the water from the water jacket is discussed in Section 5.1.2. These results bound those for the 125-Ton HI-TRAC transfer cask by a large margin. The results in that section show that the resultant dose rate at the 100-meter controlled area boundary would be approximately 4.22 mrem/hour | for the loaded HI-TRAC transfer cask during the accident condition. At the calculated dose rate, it would take approximately 49 days for the dose at the controlled area | boundary to reach 5 rem. This length of time is sufficient to implement and complete the corrective actions outlined in Chapter 11. Therefore, the dose requirement of 10CFR72.106 [10.0.1] is satisfied. Once again, this dose is calculated assuming design basis fuel in all fuel cell locations. Users will need to perform site-specific analysis considering the actual site boundary distance and fuel characteristics.

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Table 10.4.1

ANNUAL DOSE FOR ARRAYS OF HI-STORM 100S VERSION B OVERPACKS WITH DESIGN BASIS ZIRCALOY CLAD FUEL 60,000 MWD/MTU AND 3-YEAR COOLING

Array	1 Cask	1 Cask	2x5 Array
Configuration			
Annual Dose	883.27	19.26	16.34
(mrem/year) [†]			
Distance to	100	350	550
Controlled Area			
Boundary			
(meters) ^{††} , ^{†††}			

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[†] 100% occupancy is assumed.

^{††} Dose location is at the center of the long side of the array.

Actual controlled area boundary dose rates will be lower because the maximum permissible burnup for 3-year cooling as specified in the Section 2.1.9 is lower than the burnup analyzed for the design basis fuel used in this table.

Table 10.4.2 DOSE RATE FOR THE 100-TON HI-TRAC TRANSFER CASK WITH DESIGN BASIS ZIRCALOY CLAD FUEL

Fuel Burnup & Cooling Time	100 Meters	200 Meters	300 Meters
60,000	0.91	0.14	0.04
MWD/MTU & 3	mrem/hr	mrem/hr	mrem/hr
Years			

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10.5 <u>REFERENCES</u>

- [10.0.1] 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."
- [10.1.1] U.S. Code of Federal Regulations, Title 10, "Energy" Part 20 "Standards for Protection Against Radiation."
- [10.1.2] U.S. Nuclear Regulatory Commission "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power at Nuclear Power Stations will be As Low As Reasonably Achievable", Regulatory Guide 8.8, June 1978.
- [10.1.3] U.S. Nuclear Regulatory Commission, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As is Reasonably Achievable", Regulatory Guide 8.10, Revision 1-R, May1997.

SUPPLEMENT 10.I

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SUPPLEMENT 10.II

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