

BSC

Criteria/Basis Change Notice

1. QA: QA
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Complete only applicable items.

3. Document Identifier: 000-3DR-MGR0-00300-000		4. Rev.: 002	5. CBCN: 009
6a. Title: <i>Basis of Design for the TAD Canister-Based Repository Design Concept</i>		6b. Safety Classification of SSC: ITS / ITWI	
7. Reason for Change: The <i>Basis of Design for the TAD Canister-Based Repository Design Concept</i> (BOD), 000-3DR-MGR0-00300-000, criteria must be changed to agree with recently approved version of the <i>Preclosure Nuclear Safety Design Bases</i> , 000-30R-MGR0-03500-000-000. This CBCN includes the changes to the requirements addressed in previously issued CBCNs 001 through 007 to Revision 002 of the BOD. Impact of this CBCN is minimal. Changes have been considered in the design documents.			
8. Supersedes Change Notice:		<input type="checkbox"/> Yes If, Yes, Change Notice: _____ <input checked="" type="checkbox"/> No	
9. Disciplines/Organizations Affected by this Change:			
Nuclear Facilities Project Engr. <i>13/MAR 08</i>	Balance of Plant Facilities Project Engr. <i>2008 03.13.2008</i>	Subsurface Facilities Project Engr. <i>St. Isidori FOR MARK JOHNSON</i>	
Civil/Structural/Architectural Discipline Engr. Manager <i>MS 3/13/08</i>	Electrical/I&C/Engr. Hazards/EQ Discipline Engr. Manager <i>KA 3/13/08</i>	Mechanical Discipline Engr. Manager <i>3/13/08</i>	
Nuclear & Radiological Discipline Engr. Manager <i>MSD 3/13/08</i>	Thermal/Structural Analysis Discipline Engr. Manager <i>3/13/08</i>	Mining Discipline Engr. Manager <i>3/13/08</i>	
LNS Document Review <i>3/13/08</i>	Preclosure Safety Analysis Manager <i>3/13/08</i>	ESH Review Coordinator <i>3/13/08</i>	
RPM Operations <i>3/13/08</i>	RPM Construction/Startup <i>3/13/08</i>	If 6b is ITS/ITWI: Quality Assurance: <i>3/13/08</i>	
10. Description of Change: Revise the following BOD requirements to reflect latest changes: GENERAL 1. Revision of minor editorial changes. 2. Revision to the referenced NSDB appendices and table needs to be changed as follows (global): For Receipt Facility requirements, revised from "Appendix C, Appendix Table C-1" to read "Appendix E, Table E-1". For CRCFs requirements, revised from "Appendix D, Appendix Table D-1" to read "Appendix C, Table C-1". For WHF requirements, revised from "Appendix E, Appendix Table E-1" to read "Appendix D, Table D-1". 6.2.3.1.6 Cask Preparation and Lid Bolting Room Platforms The Receipt Facility cask preparation and lid bolting room platforms shall be designed to protect against collapse and to protect against platform collapse or waste container breach due to an impact from the cask transfer trolley (cask preparation) or site transporter (lid bolting room) (safety functions). <ul style="list-style-type: none">The mean frequency of collapse of the platforms due to the spectrum of seismic events shall be less than or equal to $3.0 \times 10^{-06}/\text{yr}$.The mean frequency of platform collapse or waste container breach from the impact of the cask transfer trolley (cask preparation) or site transporter (lid bolting room) into the platform due to the spectrum of seismic events shall be less than or equal to $2.0 \times 10^{-05}/\text{yr}$. <i>[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix GE, Table GE-1, Items RF.HMH.01, RF.HMH.02, RF.HMC.01, and RF.HMC.02.]</i>			

7.2.3.1.1 Structural Contribution to ITS Electrical Equipment Cooling

Although the EDGF facility is designated as a non-ITS structure, in conjunction with the non-confinement HVAC system, the ITS electrical equipment and battery rooms in the EDGF shall support the ITS electrical function (safety function).

- The mean conditional probability of failure of the portions of the surface non-confinement HVAC system that support the cooling of ITS electrical equipment and battery rooms in the EDGF shall be less than or equal to 2.0×10^{-02} per ITS electrical train over a period of 720 hours following a radionuclide release.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix ~~CD~~C, Table ~~CD~~C-1, Items VN.CR.01 and Appendix ~~ED~~D, Table ~~ED~~D-1, Items VN.WH.01.]

10.2.3.1.4 Cask Tractor

The cask tractor, in conjunction with the cask transfer trailer, shall be designed to limit speed and preclude **fuel tank explosion cask breach** (safety functions).

- The speed of the cask tractor shall be limited to 2.5 mph.
- The cask tractor fuel tank shall preclude fuel tank explosions [~~e.g., low melting point construction~~].

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix ~~CE~~E, Table ~~CE~~E-1, Items AP.RF.HAT.07 and 08 for the Receipt Facility; Appendix ~~ED~~D, Table ~~ED~~D-1, Items AP.WHF.HAT.07 and 08 for the WHF; and Appendix F, Table F-1, Items AP.SB.HAT.01 and 02. These requirements are not listed for the CRCF.]

10.2.3.1.5 Site Transporter

The site transporter shall be designed to (a) protect against spurious movement, (b) limit speed, (c) preclude **fuel tank explosion-a cask breach**, (d) reduce the severity of a drop, (e) protect against sliding impact and inducing stresses on the waste container, and (f) protect against tipover of the site transporter (safety functions).

- The mean probability of spurious movement of the site transporter while the canister is being lifted or lowered shall be less than or equal to 1.0×10^{-05} per transfer
- The speed of the site transporter shall be limited to 2.5 mph
- The site transporter fuel tank shall preclude fuel tank explosions
- The site transporter shall preclude a [vertical] drop of an aging overpack from a height greater than 3 ft measured from the equipment base
- The mean frequency of sliding impact of the site transporter into a wall and inducing stresses that can breach a waste container [within the CRCFs, WHF, and the Receipt Facility] due to the spectrum of seismic events shall be less than or equal to 2.0×10^{-05} /yr
- The mean frequency of tipover of the site transporter due to the spectrum of seismic events shall be less than or equal to 2.0×10^{-06} /yr

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix ~~CE~~E, Table ~~CE~~E-1, Items AP.RF.HAT.01 through 06 for the Receipt Facility; Appendix ~~DC~~C, Table ~~DC~~C-1, Items AP.CR.HAT.01 through 06 for the CRCFs; Appendix ~~ED~~D, Table ~~ED~~D-1, Items AP.WH.HAT.01 through 06 for the WHF; and Appendix F, Table F-1, Items AP.SB.HAT.09 through 12.]

10.2.3.1.7 Cask Transfer Trailer

The cask transfer trailers, in conjunction with the cask tractor and transportation cask or horizontal STC, shall be designed to preclude **fuel tank explosion-cask breach**, reduce severity of a drop, and preclude puncture of a cask (including due to impact) (safety functions).

- The cask transfer trailer fuel tank shall preclude fuel tank explosions [~~e.g., low melting point construction~~].
- The cask transfer trailer shall preclude dropping a [horizontal] transportation cask or horizontal STC from a height greater than 6 ft measured from the equipment base.
- The cask transfer trailer shall preclude puncture of a [horizontal] transportation casks or horizontal STC due to collision.
- The cask transfer trailer shall preclude puncture of canister by the hydraulic ram.
- The speed of the cask transfer trailer shall be limited to 2.5 mph.
- The cask transfer trailer shall be designed to preclude puncture of a [horizontal] transportation casks and horizontal STCs due to the spectrum of seismic events.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix ~~CE~~E, Table ~~CE~~E-1, Items AP.RF.HAT.09 through 12; Appendix ~~ED~~D, Table ~~ED~~D-1, Items AP.WH.HAT.09 through 12 for the WHF; and Appendix F, Table F-1, Items AP.SB.HAT.03 through 08.]

10.2.3.1.8 Aging Overpack

The AOs shall be designed to protect against direct exposure to personnel, protect against sliding of an AO, and protect against tipover of the AO (safety functions).

- The mean conditional probability of loss of shielding of the AO resulting from:
 - a drop shall be less than or equal to 1.0×10^{-05} ~~5.0×10^{-06}~~ per drop and
 - an impact or collision shall be less than or equal to 1.0×10^{-05} per impact.
- The mean frequency of sliding of an AO with a waste container into another AO on the aging pad due to the spectrum of seismic events shall be less than or equal to 5.0×10^{-06} /yr, and
- The mean frequency of tipover of the AO [with a waste container] on the aging pad due to the spectrum of seismic events shall be less than or equal to 5.0×10^{-08} /yr.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix ~~CE~~, Table ~~CE-1~~, Items AP.RF.HAC.01 and 02 for the Receipt Facility; Appendix D, Table D-1, Items AP.WHF.HAC.01 and 02 for the WHF; Appendix ~~E~~, Table ~~E-1~~ Appendix ~~DC~~, Table ~~DC-1~~, Items AP.CR.HAC.01 and 02 for the CRCFs; and Appendix F, Table F-1, Items AP.SB.HAC.06 through 09. The "protect against" safety function means either "reduce the probability of" or "reduce frequency of".]

11.2.3.1.1 Waste Package Integrity

The DOE and commercial waste package shall be designed to provide containment (safety function).

- The mean conditional probability of breach of a sealed waste package resulting from:
 - a side impact shall be less than or equal to 1.0×10^{-08} per impact ~~drop~~,
 - a drop of a load onto the waste package shall be less than or equal to 1.0×10^{-05} per drop,
 - an end-on impact or collision shall be less than or equal to 1.0×10^{-05} per impact;
 - while inside a TEV, the end-on-impact or collision shall be less than or equal to 1.0×10^{-08} per impact, and
 - the spectrum of fires while contained within a sealed waste package shall be less than or equal to 3.0×10^{-04} per fire event in the Subsurface Facility.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix B, Table B-1, Items DS.IH.01 through 03 for the IHF; Appendix ~~DC~~, Table ~~DC-1~~, Items DS.CR.01 through 03 for the CRCFs; and Appendix G, Table G-1, Items DS.SS.01 through 0304 for the Subsurface Facility. CBCN007 to Revision 002 provided this change.]

11.2.3.2.2 Defense HLW Canisters

Although the HLW canisters are not provided by the repository, in conjunction with the waste package system, the defense HLW canisters shall be designed to provide containment (safety function).

- The mean conditional probability of breach of a HLW canister in the IHF and the CRCFs resulting from:
 - a drop of the canister shall be less than or equal to 3.0×10^{-02} per drop
 - a side impact or collision shall be less than or equal to 1.0×10^{-08} per drop
 - the spectrum of fires while contained within a waste package shall be less than or equal to 3.0×10^{-04} per fire event
 - ~~(for CRCFs only)~~ the spectrum of fires while contained within a cask shall be less than or equal to 2.0×10^{-06} per fire event
 - **(for CRCFs only) a drop of a load onto the canister shall be less than or equal to $3.0 \times 10^{-05.02}$ per drop**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix B, Table B-1, Items DS.IH.04 through 0607; Appendix ~~DC~~, Table ~~DC-1~~, Items DS.CR.12 through 16. Criteria for the HLW canisters that are not related to the waste package (such as cask fires) are addressed in the mechanical handling requirements (see Chapter 13).]

13.2.3.1.2 Cask Handling Cranes

The cask handling cranes in the IHF, CRCFs, Receipt Facility, and WHF shall be designed to (a) protect against drop, (b) limit drop height, (c) protect against drop of a load onto a transportation cask, (d) limit speed, (e) protect against crane collapse onto a waste container, (f) maintain moderator control, and (g) protect against a cask or heavy object drop from the crane (safety function).

- The mean probability of dropping a loaded cask from a less than two-block height resulting from the failure of a piece of equipment in the load bearing path shall be less than or equal to:
 - 3.0×10^{-05} per transfer for the IHF and CRCFs.
 - 3.0×10^{-05} per transfer with the cask yoke or 1.0×10^{-04} per transfer with sling for the CRCFs, WHF and Receipt Facility.
- The mean probability of dropping a loaded cask from the two-block height resulting from the failure of a piece of equipment in the load bearing path shall be less than or equal to 4.0×10^{-07} per transfer for the IHF, WHF, Receipt Facility, and CRCFs:
 - ~~4.0×10^{-07} per transfer for the IHF, WHF, Receipt Facility, and CRCFs~~
- The two-block drop height from bottom of shortest cask to the floor shall not exceed:
 - 40 feet for the IHF
 - 30 feet for the Receipt Facility, WHF, and CRCFs.
- The mean probability of dropping a load onto a loaded cask or its contents shall be less than or equal to:
 - 3.0×10^{-05} per cask handled for the IHF and WHF
 - 4.0×10^{-05} per cask handled for CRCFs
 - ~~3.0×10^{-05} per cask handled in the WHF~~
 - 9.0×10^{-05} per cask handled in the Receipt Facility.
- The speed of the cask handling crane trolley and bridge shall be limited to 20 ft/min in all facilities.
- The mean frequency of collapse of the cask handling crane due to a spectrum of seismic events shall be less than or equal to $8.0 \times 10^{-06}/\text{yr}$ in all facilities.
- The mean probability of inadvertent introduction of an oil moderator into a canister shall be less than or equal to:
 - 9.0×10^{-05} over a 720-hour period following a radionuclide release for the WHF, and CRCFs.
 - No specific criteria was identified for the IHF and the Receipt Facility.
- The mean frequency of a hoist system failure of the cask handling crane due to a spectrum of seismic event shall be less than or equal to $2.0 \times 10^{-05}/\text{yr}$ in all facilities.

[Preclosure NSDB (BSC 2008 [DIRS 184200]) Appendix B, Table B-1, Items H.IH.HM.02 through 08 for the IHF; Appendix ~~CE~~, Table ~~CE~~-1, Items H.RF.HM.02 through 08 for the Receipt Facility; Appendix ~~DC~~, Table ~~DC~~-1, Items H.CR.HM.02 through 09 for the CRCFs; and Appendix ~~ED~~, Table ~~ED~~-1, Items H.WH.HM.03 through 10 for the WHF.]

13.2.3.1.11 BWR and PWR Lifting Grapples

The BWR and PWR lifting grapples in the WHF shall be designed to protect against drop of an assembly (safety function).

- The PWR and BWR lifting grapples are an integral part of the load-bearing path. See ~~Spent Fuel Canister~~-Transfer Machine requirements.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix ED, Table ED-1, Item H.WH.HTF.05.]

13.2.3.1.27 Transportation Cask and STC

Transportation casks (not provided by the repository) and the shielded transfer cask (both analyzed as representative casks) provide containment of radionuclides, protect against direct exposure to personnel and lid contact with canister (safety function).

- The mean conditional probability of a breach of a canister in a sealed cask resulting from:
 - a drop shall be less than or equal to 1.0×10^{-05} per drop,
 - a drop of a load onto the cask shall be less than or equal to $.01 \times 10^{-05}$ per drop, and
 - a side impact or collision shall be less than or equal to 1.0×10^{-08} per impact.
- The mean conditional probability of loss of cask gamma shielding resulting from:
 - a drop of a cask shall be less than or equal to:
 - 1.0×10^{-05} per drop for the IHF, WHF, and CRCFs
 - $1.0 \times 10^{-06} 10^{-08}$ per drop for the Receipt Facility.
 - a collision or side impact to a cask shall be less than or equal to 1×10^{-08} per impact.
 - drop of a load onto a cask shall be less than or equal to:
 - 1.0×10^{-05} per impact for the IHF and CRCFs
 - $1.0 \times 10^{-06} 10^{-05}$ per impact for the Receipt Facility.
- The mean conditional probability of breach of a sealed cask containing uncanistered SNF resulting from
 - a drop of a cask shall be less than or equal to 1×10^{-5} per drop
 - a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop
 - a side impact or collision shall be less than or equal to 1×10^{-8} per impact.
- The geometry of the transportation casks that carry HLW and DOE standardized canisters shall preclude lid contact with canisters following a drop of a cask lid.
- The mean conditional probability of breach of a sealed cask containing uncanistered SNF resulting from the spectrum of fires shall be less than or equal to 5×10^{-2} per fire event.
- The mean conditional probability of breach of a sealed cask containing uncanistered commercial spent nuclear fuel on a truck trailer resulting from:
 - a collision followed by a rollover/drop shall be less than or equal to 1×10^{-8} per drop
 - a drop of a load onto the cask shall be less than or equal to 1×10^{-5} per drop

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix B, Table B-1, Items H.IH.01 through 07- for the IHF; Appendix CE, Table CE-1, Items H.RF.01 through 06 for the Receipt Facility; Appendix DC, Table DC-1, Items H.CR.01 through 07.; Appendix ED, Table ED-1, Items H.WH.01 through 10 for the WHF; and Appendix F, Table F-1, Items H.SB.01 through 08. The Preclosure NSDB state that "Only transportation casks may contain uncanistered SNF; STCs and transportation casks may contain canistered SNF".]

33.2.3.26 Transportation Cask Personnel Protection

The transportation cask (analyzed as a representative cask) shall be designed to provide containment and protect against direct personnel exposure (safety function).

- The geometry of the transportation casks that carry DOE standardized canisters or HLW canisters shall preclude lid contact with canisters following a drop of a cask lid.
- The mean conditional probability of breach of a canister, or uncanistered SNF, in a sealed cask resulting from a:
 - drop shall be less than or equal to 1.0×10^{-05} per drop,
 - drop of a load onto the cask shall be less than or equal to 1.0×10^{-05} per drop, and
 - side impact or collision shall be less than or equal to 1.0×10^{-08} per impact.
- The mean conditional probability of loss of cask gamma shielding resulting from:
 - a drop of a cask shall be less than or equal to 1.0×10^{-05} per drop
 - a drop of a cask shall be less than or equal to 1.0×10^{-08} ~~10^{-06}~~ per drop (in the Receipt Facility only)
 - a collision or side impact to a cask shall be less than or equal to 1.0×10^{-08} per impact
 - drop of a load onto a cask shall be less than or equal to: ~~1.0×10^{-08} per impact~~
 - 1.0×10^{-08} per impact in the WHF
 - 1.0×10^{-06} per impact in the Receipt Facility
 - 1.0×10^{-05} per impact in the IHF and CRCFs

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix B, Table B-1, Items H.IH.01 through 07 for casks in the IHF; Appendix CE, Table CE-1, Items H.RF.01 through 06 for casks in the Receipt Facility; Appendix DC, Table DC-1, Items H.CR.01 through 07 for casks in the CRCFs; Appendix ED, Table ED-1, Items H.WH.01 through 10 for casks in the WHF; and Appendix F, Table F-1, Items H.SB.01 through 08 for casks in the Intra-Site Operations Areas. The Preclosure NSDB state that "Only transportation casks may contain uncanistered SNF; STCs and transportation casks may contain canistered SNF".]

11. REVIEWS AND APPROVAL			
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11a. Preparer: Richard Foster David S. Rhodes <i>FOR D. RHODES</i>	Discipline Engineering Manager	<i>Richard Foster</i>	3/13/08
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11d. Approved: Barbara Rusinko	Engineering Manager	<i>Barbara Rusinko</i>	3/13/08