BSC

Criteria/Basis Change Notice

Complete only applicable items.

1. QA: QA
2. Page 1 of 6

3. Document Identifier:	ENG.20080312.0014	4. Rev.:	5. CBCN:
000-3DR-MGR0-00300-000		002	007
6a. Title: *Basis of Design for the TAD Canister-Based Repository Design Concept*		6b. Safety Classification of SSC: ITS / ITWI	

7. Reason for Change:

The *Basis of Design for the TAD Canister-Based Repository Design Concept* (BOD), 000-3DR-MGR0-00300-000, criteria must be changed to recently provided changes to the *Preclosure Nuclear Safety Design Bases*, 000-30R-MGR0-03500-000-000. This CBCN addresses the changes to the Waste Package, and the Intra-Site criteria in Chapters 11, 12, and 14 through 33 of the BOD. This CBCN is being issued in conjunction with CBCNs that address the mechanical handling, nuclear facilities, balance of plant facilities, aging facilities, and subsurface facility changes.

Although the NSDB is not issued yet, the BOD criteria will be confirmed before the License Application is submitted to be in conformance with the issued NSDB. The BOD currently carries a TBV to document this confirmation.

Impacts of this are minimal. The designers have been coordinating to coordinate with the analyses providing input to the NSDB. Some design products may require updating to reflect the most recent text. These changes are in progress and will be issued concurrently with or immediately after these CBCNs or the final NSDB.

8. Supersedes Change Notice:	☐ Yes If, Yes, Change Notice: _____	☒ No

9. Disciplines/Organizations Affected by this Change:

Nuclear Facilities Project Engr.	Balance of Plant Facilities Project Engr.	Subsurface Facilities Project Engr.
Civil/Structural/Architectural Discipline Engr. Manager	Electrical/I&C/Engr. Hazards/EQ Discipline Engr. Manager	Mechanical Discipline Engr. Manager
Nuclear & Radiological Discipline Engr. Manager	Thermal/Structural Analysis Discipline Engr. Manager	Mining Discipline Engr. Manager
LNS Document Review	PreClosure Safety Analysis Manager	ESH Review Coordinator
RPM Operations	RPM Construction/Startup	If 6b is ITS/ITWI: Quality Assurance: Quality Assurance

10. Description of Change:

Since these changes are extensive, revise the following criteria as follows:

11.2.3.1.1 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 ~~to the waste package~~ shall be less than or equal to 1.0×10^{-08} per drop,
  - -- a drop of a load onto the waste package shall be less than or equal to 1.0×10^{-05} per drop, ~~and~~
  - -- an end-on impact or collision shall be less than or equal to 1.0×10^{-0805} 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 D, Table D-1, Items DS.CR.01 through 03 for the CRCFs; and Appendix G, Table G-1, Items DS.SS.01 through ~~03~~04 for the Subsurface Facility.]

11.2.3.1.2 Waste Package Subsurface Impacts

The DOE and commercial waste package system shall be designed to protect against rockfall breaching a waste package and protect against a waste package breach due to seismic vibratory motion in an emplacement drift (safety functions).

- The mean frequency of breach of the waste package from:
  - -- a rockfall due to the spectrum of seismic events shall be less than or equal to 1.0×10^{-06}/yr.
  - -- vibratory motion impacts in an emplacement drift due to the spectrum of seismic events shall be less than or equal to 1.0×10^{-06}/yr.

[Preclosure NSDB (BSC 2008 [DIRS 184200]) Appendix G, Table G-1, Items DS.SS.~~0~~405 and ~~0~~506.]

11.2.3.2.1 DOE ~~SNF Disposable~~ Standardized Canisters

To work in conjunction with the defense HLW/DOE SNF codisposal waste package, the **DOE** standardized ~~DOE SNF~~ canisters shall be designed to provide containment (safety function).

- The mean conditional probability of breach of a **DOE** standardized ~~DOE SNF~~ canister in the CRCFs resulting from:
  - -- a drop of the canister shall be less than or equal to 1.0×10^{-05} per drop,
  - -- **a drop of a load onto the canister shall be less than or equal to 1×10^{-05} per drop,**
  - -- a side impact or collision shall be less than or equal to 1.0×10^{-08} per impact, and
  - -- the spectrum of fires while within a waste package shall be less than or equal to 3.0×10^{-04} per fire event.
- **The mean conditional probability of breach of a DOE standardized canister:**
  - **-- given the drop of an HLW canister onto the DOE standardized canister, shall be less than or equal to 3.0×10^{-02} per drop**
  - **-- given the drop of another DOE standardized canister onto the first canister, shall be less than or equal to 3.0×10^{-02} per drop**

*[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix D, Table D-1, Items DS.CR.04 through ~~0607~~, **and items DS.CR.10 and DS.CR.11** for the CRCFs. Criteria for the DOE SNF canisters that are not related to the waste package are addressed in the mechanical handling requirements (see Chapter 13).]*

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 ~~ana~~ 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** ~~in the IHF~~
  - ~~-- 3.0×10^{-02} per drop in the IHF,~~
  - ~~-- 7.0×10^{-02} per drop in the CRCFs,~~
  - -- a side impact or collision shall be less than or equal to 1.0×10^{-08} per **drop** ~~in the IHF and CRCFs, and~~
  - -- the spectrum of fires while **contained** within a waste package shall be less than or equal to 3.0×10^{-04} per fire event ~~in the IHF and CRCFs.~~
  - **-- (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**
  - **-- a drop of a load onto the canister shall be less than or equal to 3.0×10^{-05} per drop**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix B, Table B-1, Items DS.IH.04 through 06; Appendix D, Table D-1, Items DS.CR.~~0~~912 through ~~1~~116. 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).]

11.2.3.3.1 DPCs

Although DPCs are not provided by the repository, in conjunction with the waste package system, the DPC (analyzed as a representative canister) shall be designed to provide containment (safety function).

- The mean conditional probability of breach of a ~~representative~~ canister resulting from a:
  - -- drop of the canister shall be less than or equal to 1.0×10^{-05} per drop,
  - -- drop of a load onto a canister 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.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix C, Table C-1, Items DS.RF.01 through 03; Appendix D, Table D-1, Items DS.CR.~~1~~420 through ~~1~~622; and Appendix E, Table E-1, Items DS.WH.01 through 03. Criteria for the DPCs that are not related to the waste package (such as when in casks) are addressed in the mechanical handling requirements (see Chapter 13).]

11.2.3.3.2 TAD Canisters

The TAD canister (**analyzed** as a representative canister) shall be designed to provide for containment (safety function).

- The mean conditional probability of breach of a ~~representative~~ canister resulting from a:
  - -- drop of the canister shall be less than or equal to 1.0×10^{-05} per drop,
  - -- drop of a load onto the canister 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.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix C, Table C-1, Items DS.RF.07 through 09; Appendix D, Table D-1, Items DS.CR.~~2~~026 through ~~2~~228; and Appendix E, Table E-1, Items DS.WH.07 through 09. Criteria for the TAD canisters that are not related to the waste package (such as when in a cask) are addressed in the mechanical handling requirements (see Chapter 13).]

12.2.3.1.1 Waste Package Integrity

The naval SNF 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 ~~to the waste package~~ shall be less than or equal to 1.0×10^{-08} per impact,
  - -- a drop of a load onto the waste package shall be less than or equal to 1.0×10^{-05} per drop, and
  - -- an end-on impact or collision shall be less than or equal to:
    - 1.0×10^{-05} per impact in the IHF and
    - 1.0×10^{-08} per impact **while in the TEV** in the Subsurface Facility
- **The mean conditional probability of breach of a canister inside a sealed waste package as a result of the spectrum of fires shall be less than or equal to 1.0×10^{-04} per fire event in the Subsurface Facility**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix B, Table B-1, Items DN.IH.01 through 03 for the IHF; and Appendix G, Table G-1, Items DN.SS.01 through ~~0304~~ for the Subsurface Facility.]

12.2.3.1.2 Waste Package Subsurface Impacts

The naval SNF waste package system shall be designed to protect against a rockfall breaching a waste package and protect against a waste package breach due to seismic vibratory motion in an emplacement drift (safety functions).

- The mean frequency of a breach of the waste package from:
  - -- a rockfall due to the spectrum of seismic events shall be less than or equal to 1.0×10^{-06}/yr and
  - -- vibratory motion impacts in an emplacement drift due to the spectrum of seismic events shall be less than or equal to 1.0×10^{-06}/yr.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix G, Table G-1, Items DN.SS.~~0405~~ and ~~0506~~.]

12.2.3.1.3 Naval Spent Fuel Canisters

Although the naval SNF canisters are not provided by the repository, in conjunction with the waste package system, the naval SNF canisters provide containment (safety function).

- The mean ~~probability~~ frequency of ~~a~~ drop by **the CTM** ~~and breach~~ of the naval SNF canisters in the IHF **resulting in breach of the canist**er shall be less than or equal to 2.0×10^{-05} over the preclosure period.
- The mean conditional probability of breach of a naval SNF canister in the IHF resulting from a:
  - -- drop of a load onto the canister shall be less than or equal to 1.0×10^{-05} per drop,
  - -- side impact or collision shall be less than or equal to 1.0×10^{-08} per impact, and
  - -- spectrum of fires when the canister is within a waste package shall be less than or equal to 1.0×10^{-04} **or 1.0×10^{-06} if contained within a cask**, per fire event.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix B, Table B-1, Items DN.IH.04 through ~~0607~~ and DN.IH.09; ***and Appendix G, Table G-1, Items DN.SB.01.*** *Requirements on canister performance are interface information and the waste package in and of itself cannot demonstrate compliance with canister criteria. Criteria for the naval spent fuel canister that are not related to the waste package are included in the mechanical handling criteria (see Chapter 13). The naval SNF canisters, as handled only in the IHF, were analyzed as representative canisters in preclosure analyses.]*

16.2.3.1.1 ITS Electrical Power

The **[ITS electrical equipment and]** feeders up to and including ITS loads, ITS direct current power, and ITS UPS power shall provide electrical power to the ITS surface nuclear confinement HVAC systems (safety function).

- The mean conditional probability for ITS electrical power **distribution** failure, given the loss of offsite power, over a period of ~~360~~**720** hours following ~~the breach of a cask-canister system~~ **a radionuclide release shall be less than or equal to:**
  - **-- 7.0 x 10^{-03} in the CRCFs**
  - **-- 8.0 x 10^{-03} in the WHF**
- **In the WHF, following a cask overpressure or a cooling system line break, the mean conditional probability for ITS electrical power distribution failure shall be less than or equal to 5.0 x 10^{-04} over a period of 24 hours.**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), ~~Appendix C, Table C-1, Item EE.RF.01 for the Receipt Facility;~~ Appendix D, Table D-1, Item EE.CR.01 for the CRCFs; and Appendix E, Table E-1, Items EE.WH.01 ***and .02*** *for the WHF. Emergency changed to ITS in accordance with Repository System Codes (BSC 2007 [DIRS 184183]).]*

16.2.3.1.2 ITS Diesel Generators

The ITS diesel generators [A and B] (including their fuel oil, air start, jacket water cooling, lubricating oil, and air intake and exhaust systems) shall provide electrical power to the ITS surface nuclear confinement HVAC systems (safety function).

- The mean conditional probability for ITS electrical power failure, given the loss of offsite power, shall be less than or equal to ~~7.0~~**3.0** x 10^{-01} over a period of ~~360~~**720** hours following ~~the breach of a cask-canister system~~ **a radionuclide release.**
- **In the WHF, following a cask overpressure or a cooling system line break, the mean conditional probability for ITS electrical power distribution failure shall be less than or equal to 5.0 x 10^{-02} over a period of 24 hours.**

*[Preclosure NSDB (BSC 2008 [DIRS 184200]), ~~Appendix C, Table C-1, Item EE.RF.02 for the Receipt Facility;~~ Appendix D, Table D-1, Item EE.CR.02 for the CRCFs; and Appendix E, Table E-1, Items EE.WH.~~02~~**03 and 04** for the WHF. Emergency changed to ITS in accordance with Repository System Codes (BSC 2007 [DIRS 184183]).]*

18.2.3.1.2 Fire Suppression Moderator Control

The fire suppression system ~~double-interlock~~ preaction valves, sprinkler heads, and system actuation panels associated with double-interlock preaction suppression systems **that protect areas where there is a potential for canister breach** ~~for fire suppression in areas where nuclear materials are handled~~ shall be designed to maintain moderator control (safety function).

- **In the CRCFs,** the mean probability of inadvertent introduction of fire suppression water into a canister shall be less than or equal to 1.0 × 10^{-06} over a 720-hour period following ~~the breach of a cask-canister system~~ **a radionuclide release.**~~, WHF, and Receipt Facility.~~
- **In the WHF, the mean probability of inadvertent introduction of fire suppression water into a canister shall be less than or equal to 6.0 × 10^{-07} over a 720-hour period following a radionuclide release.**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), ~~Appendix B, Table B-1 does not contain criteria for the IHF; Appendix C, Table C-1, Item FP.RF.01 for the Receipt Facility;~~ Appendix D, Table D-1, Item FP.CR.01 for the CRCFs; and Appendix E, Table E-1, Item FP.WH.01 for the WHF. ***Appendix B, Table B-1 and Appendix C, Table C-1, does not contain criteria for the IHF and Receipt Facility, respectively.*** *This criterion also partially satisfies PO&PR (BSC 2008 [DIRS 185008]), Section 2.6.2.]*

18.2.3.1.3 Fire Detection Moderator Control

The fire detection system for the ~~double-interlock~~ **ITS** preaction valves with associated detectors and control box shall be designed to maintain moderator control (safety function).

- The mean probability of inadvertent introduction of fire suppression water into a canister ~~shall be less than or equal to~~ over a 720-hour period following a radionuclide release **shall be less than or equal to:**~~the breach of a cask-canister system in the CRCFs, WHF, and Receipt Facility~~
  - **-- 6.0 x 10^{-07} in the WHF**
  - **-- 1.0 x 10^{-06} in the CRCFs**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), ~~Appendix B, Table B-1 does not contain criteria for the IHF; Appendix C, Table C-1, Item FP.RF.02 for the Receipt Facility;~~ Appendix D, Table D-1, Item FP.CR.02 for the CRCFs; and Appendix E, Table E-1, Item FP.WH.02 for the WHF. ***Appendix B, Table B-1 and Appendix C, Table C-1 for the Receipt Facility does not contain criteria for the IHF and Receipt Facility respectively.*** *This criterion also partially satisfies PO&PR (BSC 2008 [DIRS 185008]), Section 2.6.2.]*

19.2.3.1.1 Confinement HVAC Availability

Portions of the surface nuclear confinement HVAC system that exhaust from areas with a potential for a breach in the CRCFs~~, Receipt Facility,~~ and WHF shall be designed to mitigate the consequences of radionuclide release (safety function).

- The mean probability that the ~~[ITS~~ surface nuclear~~]~~ confinement HVAC system (including HEPA filtration **of exhaust air from**~~) in~~ the confinement areas) becomes unavailable during:
  - **(for CRCFs and WHF)** a 30-day mission time following a radionuclide release shall be less than or equal to 4.0×10^{-02} ~~in the CRCFs, WHF, and Receipt Facility~~.
  - **(for WHF only) a 1-day mission time following a radionuclide release from the cask sampling and cooling process shall be less than or equal to 1.0×10^{-03}**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), ~~Appendix C, Table C-1, Item VC.RF.01 for the Receipt Facility;~~ Appendix D, Table D-1, Item VC.CR.01 for the CRCFs; and Appendix E, Table E-1, Items VC.WH.01 ***and 02*** *for the WHF. These parameters to not apply in the case of large fires, which may disable the HVAC system.]*

19.2.3.1.2 Confinement HVAC Supporting ITS Electrical Equipment

Portions of the surface nuclear confinement HVAC system that support the cooling of ITS electrical **equipment** and battery rooms **in the CRCFs and WHF** shall be designed to support the ITS electrical function (safety function).

- The mean conditional probability of failure of the portions of the surface nuclear confinement HVAC system that support the cooling of ITS electrical equipment and battery rooms ~~in the CRCF, WHF, and Receipt Facility~~ shall be less than or equal to:
  - **(for CRCFs and WHF)** ~~1.0~~**2.0** $\times 10^{-02}$ per ITS electrical train **over a period of 720 hours following a radionuclide release**
  - **(for WHF only) 5.0×10^{-04} per ITS electrical train over a period of 24 hours following a cask overpressure or a cooling system line break**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), ~~Appendix C, Table C-1, Item VC.RF.02 for the Receipt Facility;~~ Appendix D, Table D-1, Items VC.CR.02 ~~and 03~~ for the CRCFs; and Appendix E, Table E-1, Items VC.WH.~~02~~03 and ~~03~~04 for the WHF. Failures of this system are captured in the facility ITS electrical system reliability model. A similar criterion does not exist for the IHF.]

20.2.3.1.1 Non-Confinement HVAC ~~Availability~~Supporting ITS Electrical Equipment

Portions of the surface non-confinement HVAC system that support the cooling of ITS electrical equipment and battery rooms in the EDGF shall be designed to 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 ~~1.0~~**2.0** $\times 10^{-02}$ per ITS electrical train **over a period of 720 hours following a radionuclide release.**

*[Preclosure NSDB (BSC 2008 [DIRS 184200]), ~~SB.VN.01~~**Appendix D, Table D-1, Item VN.CR.01 for the CRCFs; and Appendix E, Table E-1, Item VN.WH.01 for the WHF.**]*

29.2.3.1 Cask Cooling

The cask cooling subsystem shall protect against cask failure due to overpressure (safety function).

- The mean probability of an overpressure of a cask **or cooling system line during the cask cooling operation**~~during sampling/cooling phase~~ shall be less than or equal to 8.0×10^{-06} per cask ~~or canister~~.

[Preclosure NSDB (BSC 2008 [DIRS 184200]) Appendix A, Table E-1, Item MR.WH.01.]

33.2.2.53 TAD Canister

The TAD canister (analyzed as a representative canister) shall be designed to provide for containment (safety functions).

- The mean conditional probability of breach of a ~~representative~~ canister resulting from a:
  - -- drop of the canister shall be less than or equal to 1.0 x 10^{-05} per drop,
  - ~~-- drop of a load onto a HAM shall be less than or equal to 1.0 x 10^{-08} per drop,~~
  - -- drop of a load onto the canister shall be less than or equal to 1.0 x 10^{-05} per drop, and
  - -- ~~low-speed~~**side** impact or collision shall be less than or equal to 1.0 x 10^{-08} per impact.
- The mean conditional probability of breach of a ~~representative~~ canister resulting from a fire while:
  - -- contained within a waste package resulting from a fire shall be less than or equal to **3.0 x 10^{-04}** ~~2.0 x 10^{-06}~~ per fire event,
  - -- contained within a ~~transportation~~ cask ~~[or STC]~~ shall be less than or equal to ~~1.0~~**2.0** x 10^{-06} per fire event,
  - -- located within the CTM shield bell shall be less than or equal to 1.0 x 10^{-04} per fire event, and
  - -- contained within an AO ~~or a HAM~~ shall be less than or equal to 1.0 x 10^{-06}~~4~~ per fire event.

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix C, Table C-1, Items DS.RF.07 through 12 for Receipt Facility; Appendix D, Table D-1, Items DS.CR.~~2026~~ through ~~2632~~ for the CRCFs; Appendix E, Table E-1, Items DS.WH.07 through 12 for the WHF; and Appendix F, Table F-1, items DS.SB.01 through ~~0709~~. Note that some of the values for probability of breach due to fires in Table F-1 are inconsistent with corresponding values in other tables listed here due to the current revisions of the Preclosure NSDB.]

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 ~~transportation~~ cask resulting from a
  - -- drop shall be less than or equal to 1.0 x 10^{-05} per drop,
  - -- drop of a load onto the cask shall be less than or equal to 1.0 x10^{-05} per drop, and
  - -- side impact or collision shall be less than or equal to 1.0 x 10^{-08} per impact.
- The mean conditional probability of loss of cask gamma shielding resulting from: ~~a drop, impact, or collision to a transportation shall be less than or equal to 1 x 10^{-05} per drop or impact.~~
  - **-- a drop of a cask shall be less than or equal to 1.0 x 10^{-05} per drop**
  - **-- a drop of a cask shall be less than or equal to 1.0 x 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 x 10^{-08} per impact**
  - **-- drop of a load onto a cask shall be less than or equal to 1.0 x 10^{-08} per impact**

[Preclosure NSDB (BSC 2008 [DIRS 184200]), Appendix B, Table B-1, Items H.IH.01 through ~~0507~~ for casks in the IHF; Appendix C, Table C-1, Items H.RF.01 through ~~0406~~ for casks in the Receipt Facility; Appendix D, Table D-1, Items H.CR.01 through ~~0507~~ for casks in the CRCFs; Appendix E, Table E-1, Items H.WH.01 through ~~0410~~ for casks in the WHF; and Appendix F, Table F-1, Items H.SB.01 through ~~0408~~ for casks in the Intra-Site Operations Areas.]

11. REVIEWS AND APPROVAL

Printed Name	Title	Signature	Date
11a. Preparer: David S. Rhodes	Discipline Engineering Manager	[signature]	3-11-08
11b. Concurrence: Richard Foster	Manager of Discipline Engineering	[signature]	3-11-08
11c. Concurrence: N/A	Project Engineering Manager	N/A	N/A
11d. Approved: Barbara Rusinko	Engineering Manager	[signature]	3-~~13~~ 12-08 BSC 3/12/08