BSC

Criteria/Basis Change Notice

Complete only applicable items.

1. QA: QA
2. Page 1 of 7

SLK 3/17/2008

3. Document Identifier:	4. Rev.:	5. CBCN:
000-3DR-MGR0-00100-000	007	012
6a. Title:	**6b. Safety Classification of SSC:**	
Project Design Criteria Document	ITS & non-ITWI	

7. Reason for Change:

Criterion 4.2.13.4 requires a change to delete "and nonemplacement" because the temperatures referenced were for emplacement areas. There are no technical impacts to this change.

Criterion 4.6.2.4.1 made a tie between a criterion statement and an industry code that was not applicable to the statement made. Revised Criterion 4.6.2.4.1 to clarify the different application of the code. Criterion 4.6.2.4.1 clears up a License Application validation activity. There are no other impacts.

Add Section 4.9.9 to incorporate ITS Diesel Generator support systems design criteria. There are no impacts to this change.

Criterion 4.10.1.5 requires change to reflect Contracting Officer Letter 08-012 direction to reference ICRP 60, 68, 72, and 74. The changes do not require change away from ANSI/ANS-6.1.1-1977; therefore, there are no technical impacts to this change.

Criterion 6.1.4 requires a change due to a change in the reference status for the tornado criterion source reference. Although the decision is not to change the design criterion, the rationale for using the existing, superseded reference is hereby updated with additional explanation in the rationale. Since the design bases are not changing, there are no impacts to these changes.

Criterion 6.1.13 requires a change in the threshold limit value (TLV) for crystalline silica was identified in the source reference (American Conference of Governmental Industrial Hygienists -2006). There are no technical impacts to this change.

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

9. Disciplines/Organizations Affected by this Change:

Nuclear Facilities Project Engineer 13MAR08	Mechanical Discipline Engineering Manager RA 3/13/08	Preclosure Safety Analysis Manager 3/17/08
Balance of Plant Facilities Project Engr. 03.13.2008	Electrical/I&C/Engineering Hazards/EQ Discipline Engineering Manager RA 3/13/08	LNS Document Review 3/13/08
Civil/Structural/Architectural Discipline Engineering Manager 3/13/08	Nuclear & Radiological Discipline Engineering Manager 3/13/08	ESH Review Coordinator 3/13/08
Mining Discipline Engr. Manager 3/13/08	Subsurface Facilities Manager FOR MARK JOHNSON	If 6b is ITS/ITWI: Quality Assurance: Quality Assurance 3/13/08

10. Description of Change:

Revise the following PDC criteria as follows:

4.2.13.4 Environment and Corrosion Effects

The emplacement ~~and nonemplacement~~ areas of the subsurface facility are subject to the normal air temperature ranges listed in Section 4.2.13.5.7 and to the following operating environment during the preclosure period:

- Relative Humidity - Low 3%, High 10%
- Ionizing Radiation - Low levels of beta particles, neutron, and high and low energy photons (gamma and x-rays)
- Biological - Minimal effects.

The emplacement drifts and downstream airway openings and structures are also subject to off-normal peak temperatures not to be exceeded for a predetermined duration, as listed in Section 4.2.13.5.7.

[High temperatures in the emplacement drifts and downstream airway openings are caused by heat output generated by the waste packages. Continuous ventilation during the preclosure period will moderate the relative humidity. The relative humidity in the emplacement drifts is based on ANSYS Calculations in Support of Natural Ventilation Parametric Study for SR (BSC 2001 [DIRS 155246]), Figure 6-5, page 62. In the repository environment, many different microbes could grow and provide potential chemical

(4.2.13.4 continued)

processes that may affect bulk chemistry within the emplacement drift construction materials. However, during the preclosure period, the emplacement drifts are expected to be dry and low in relative humidity (about 10% or lower). The potential microbiological affects on steel material will be insignificant under this environment. Further verification of the relative humidity range of 3% to 10% is required to verify if the range is applicable to the entire emplacement and nonemplacement area.]

4.6.2.4.1 Location of Continuous Air Monitors

The continuous air monitors (CAMs) shall be located where there is a potential for intake of airborne radioactive materials by personnel. Continuous air monitors may also be used to monitor air inlets to occupied areas or process streams which contribute to effluent pathways. The CAMS shall meet the requirements of ~~as required~~ by ANSI N42.17B-1989 (Reaffirmed 2005), *American National Standard Performance Specifications for Health Physics Instrumentation - Occupational Airborne Radioactivity Monitoring Instrumentation* [DIRS 177595].

[This criterion ensures adequate coverage of areas where personnel exposure to airborne radioactivity is possible. This criterion also ensures that monitoring is performed for process systems that may contribute to radioactive effluent pathways or process systems that may be a precursor to an effluent pathway. ~~***The previous ANSI standard is already addressed in Criterion 4.6.2.4.3.***~~*]*

~~4.6.2.4.3 Output Signals and Fault Alarms~~

~~The monitors shall provide output signals representing airborne radioactivity levels along with high-level and instrument fault alarms. as stated in~~ **Instrumentation shall comply with** ANSI N42.17B-1989 (Reaffirmed 2005)~~***, American National Standard Performance Specifications for Health Physics Instrumentation - Occupational Airborne Radioactivity Monitoring Instrumentation*** [DIRS 177595].~~

~~*[This criterion is required to provide input to the DCMIS for indication that an abnormality or off-normal event has occurred in a specific or general area of the RRM CAM system, which may indicate a release of radioactivity to an effluent pathway.]*~~

Add the new criteria below:

4.9.9 ITS Diesel Generator Support Systems Design Criteria

4.9.9.1 Codes and Standards

The design criteria for the electrical portions of the ITS diesel generator itself is discussed in Sections 4.3.1.1.29, 4.3.2.2, and 4.3.2.7. This section addresses the design criteria for the support systems for the ITS diesel generator (i.e., air start, fuel oil, lubricating oil, jacket water cooling, and combustion air intake/exhaust).

The following are the codes, standards, industry guides, and regulatory guides that shall be applied in the design of the support systems for the ITS diesel generator:

- **ASME B31.3-2004. 2005, *Process Piping* [DIRS 176242]**
- **ASME 2004. *ASME Boiler and Pressure Vessel Code.* [DIRS 171846] Section VIII, Div. 1 or 2,**
- **Boner, G.L. and Hanners, H.W. 1979, *Enhancement of On-Site Emergency Diesel Generator Reliability #URD-TR-79-07.* NUREG/CR-0660. [DIRS 184522],**
- **Regulatory Guide 1.9, Rev. 3. 1993. *Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants.* [DIRS 146732]**
- **NFPA 70, *National Electrical Code* [DIRS 177982],**
- **NFPA 780, *Standard for the Installation of Lightning Protection Systems* [DIRS 173517],**
- **IEEE STD.323-2003, "Qualifying Class 1E Equipment for Nuclear Power Generating Stations" [DIRS 166907].**
- ~~**IEEE Std 344-2004. 2005. *IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations* [DIRS 176259],**~~
- **IEEE Std 387-1995 (REAF 2001). 2001. *Standard Criteria for Diesel-Generator Units Applied as Standby Power Generating Stations,* with exception of reference to IEEE-344 [DIRS 178084].**

Specific design criteria and guidance for each support system is provided in the sections that follow. The specific criteria and guidance is in addition to the criteria listed above.

4.9.9.2 Air Start System

The following shall be used in the design of the Air Start System as applicable:

- **CGA G-7.1-2004, *Commodity Specification for Air* [DIRS 176434],**

The air start system should, at a minimum, provide air at sufficient pressure and volume to accommodate five (5) diesel generator starts without recharging the receiver(s). The starting air should be dried to a dew point of not more than 10 °C when installed in a normally-controlled 21 °C environment; otherwise, the starting air dew point should be controlled to at least 5.5 °C less than the lowest expected ambient temperature. Each ITS diesel engine should have a dedicated air starting system consisting of an air compressor, and air dryer, one or more air receiver(s), piping, injection lines and valves, and devices to crank the engine as recommended by the diesel engine manufacturer.

[Additional guidance provided in Section 9.5.6 of* NRC 1987. *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power PlantsNUREG-0800 [DIRS 103124].]

4.9.9.3 Fuel Oil System

The fuel oil system shall be designed in accordance with:

- **ANSI/ANS-59.51-1997, *Fuel Oil Systems for Safety-Related Emergency Diesel Generators* [DIRS 124636],**
- **NFPA 30. 2006. *Flammable and Combustible Liquids Code, with Errata* [DIRS 177974],**
- **ASTM D 4057-06. 2006. *Standard Practice for Manual Sampling of Petroleum and Petroleum Products* [DIRS 184838],**
- **Regulatory Guide 1.137, Rev. 1. 1979. *Fuel-Oil Systems for Standby Diesel Generators* [DIRS 144752],**
- **ASTM D 975-06. 2006. *Standard Specification for Diesel Fuel Oils* [DIRS 177902].**

4.9.9.4 Lubricating Oil System

The lubricating oil system shall be designed in accordance with:

- **ANSI/ANS-59.52-1998 (Reaffirmed 2007). 2007. *American National Standard, Lubricating Oil Systems for Safety-Related Emergency Diesel Generators* [DIRS 184521],**
- **NFPA 30. 2006. *Flammable and Combustible Liquids Code, with Errata* [DIRS 177974].**

4.9.9.5 Jacket Water Cooling System

The following shall be used in the design of the jacket water cooling system as applicable:

- **HI (Hydraulic Institute) 2005. *Pump Standards* [DIRS 184524],**
- **TEMA (Tubular Exchanger Manufacturers Association) 2007. *Standards of the Tubular Exchanger Manufactures Association* [DIRS 184523],**

Each ITS diesel engine should have a dedicated jacket water cooling system. The system should have the capability to transfer heat from systems and components to a heat sink under transient or accident conditions. Adequate volume should be available in the system to maintain coolant level and pump net positive suction head without refill, assuming expected water loss over a seven-day period of engine operation. Essential portions of the system should be protected from internally and externally generated missiles.

[Additional guidance provided in Section 9.5.5 of NUREG-0800 [DIRS 103124].]

4.9.9.6 Combustion Air Intake/Exhaust System

Each ITS diesel engine should have a dedicated combustion air intake/exhaust system. The exhaust discharge piping should also be designed to preclude exhaust entering the combustion air intake piping and degrading the diesel engine performance.

[Additional guidance provided in Section 9.5.8 of NUREG-0800 [DIRS 103124].]

Revise the following PDC criteria as follows:

4.10.1.5 Flux-to-Dose Rate Conversion Factors

Shielding calculations shall use the flux-to-dose-rate conversion factors as provided in ANSI/ANS-6.1.1-1977, *Neutron and Gamma-Ray Flux-to-Dose-Rate Factors* [DIRS 107016], for converting the calculated neutron and gamma fluxes to the respective dose rates.

[The selection of this standard complies with 10 CFR 20.1004 [DIRS 181962], Table 1004 (b) 2, and is consistent with the specifications in NUREG-1804 (NRC 2003 [DIRS 163274]), section 2.1.1.5.1.2. ~~*Impacts of other dose conversion factors, such as those in conversion coefficients for use in radiological protection against external radiation (ICRP 1997 [DIRS 152060]) on shielding design, shall be evaluated as the need arises.*~~ *RGA REG-CRW-RG-000399, Agreement for NUREG-1804, Rev 2 Yucca Mountain Review Plan, Final Report (BSC 2007 [DIRS 182359]) with clarification by mapping a crosswalk to the License Application.*

The flux-to-dose-rate conversion factors are required to convert the calculated neutron and gamma fluxes to dose rates for demonstration of regulatory compliance. The NRC has accepted the use of the ANSI/ANS-6.1.1-1977 [DIRS 107016] standard for this conversion. ~~*Although a later version of ANSI/ANS-6.1.1 is available, the responsible DEM has elected to utilize the referenced version.*~~

~~*Although*~~ *DOE provided Contracting Officer direction to implement an updated dose modeling protocol utilizing more recent International Commission on Radiation Protection (ICRP) publications (Miller 2004 [DIRS 178320]) and* ~~*BSC provided a plan to update the models (Mitchell 2005 [DIRS 178319]), DOE did not approve the changes and a BCP was not completed.*~~ ***Contracting Officer Letter 08-012 (DOE 2008 [DIRS 185210]) provided direction to use ICRP 60 (ICRP 1990 [DIRS 101836]), ICRP 68 (ICRP 1995 [DIRS 172721]), ICRP 72 (ICRP 1996 [DIRS 152446]), and ICRP 74 (ICRP 1997 [DIRS 152060]) in the design of the repository facilities. The ICRP descriptions for clarification are:***

- **ICRP 60 provides tissue weighting factors for organs and tissues and new dosimetric quantities.**
- **ICRP 68 provides inhalation and ingestion dose coefficients for workers based on the ICRP 60 weighting factors.**
- **ICRP 72 provides similar dose coefficients for the general public based on the ICRP 60 weighting factors.**
- **ICRP 74 provides neutron and gamma flux-to-dose conversion factors for external radiation that are based on ICRP 60 weighting factors.**

The CO letter also requires a comparison of the conversion factors being used against those of ICRP 74. Comparison of Flux-to-Dose Conversion Factors Used in Shielding Analyses (BSC 2007 [DIRS 183935]) determined that ANSI/ANS-6.1.1-1977 was more conservative than the ICRP 74 factors. Calculations performed after the NRC final rules for the repository are available will be performed consistent with the final rules and any impacts on the License Application will be evaluated. ~~*Therefore, the updated conversion factors will not be utilized for shielding calculations.*~~*]*

6.1.4 Tornadoes

The basic parameters for the tornado loads for ITS structures shall be:

- Maximum speed-189 mph
- Pressure drop-0.81 psi
- Rate of pressure drop-0.30 psi/sec
- Tornado generated missiles shall be defined as Spectrum II missiles and are applicable for the YMP site.

[Maximum speed, pressure drop, and rate of pressure drop are from Extreme Wind/Tornado/Tornado Missile Hazard Analysis (BSC 2005 [DIRS 174429]) and RGA REG-CRW-RG-000064, Agreement for Regulatory Guide 1.76, Rev 0 - Design Basis Tornado for Nuclear Power Plants (BSC 2006 [DIRS 181681]) has provided guidance for Regulatory Guide 1.76 [DIRS 106281] by the application of site-specific meteorological data that supports lower maximum wind speeds for credible tornadoes in keeping with the risk-informed licensing basis. ***The maximum speed value used exceeds the 160 mph identified for the Western Region (III) and is less than for the Eastern and Western-Central Region (II) provided in Regulatory Guide 1.76, Section B and Figure 1.*** *The definition of Spectrum is from NUREG-0800 (NRC 1996 [DIRS 177328], Section 3.5.1.4) and from the Extreme Wind/Tornado/Tornado Missile Hazard Analysis, Table 11.*

Although the cited reference Extreme Wind/Tornado/Tornado Missile Hazard Analysis (BSC 2005 [DIRS 174429]) has been superseded, the existing design parameters for tornadoes are more conservative than the parameters for the probabilistic frequencies identified in the superseding analysis. The currently established and more conservative parameters for wind speed, pressure drop, rate of pressure drop, and missile spectrum remain applicable to the design. The superseding reference External Events Hazards Screening Analysis (BSC 2008 [DIRS 180124]) is not being used as a source. It should be noted that this screening analysis also uses the 189 mph tornado in its calculations.]

6.1.13 Silica Dust

Airborne exposures to crystalline silica shall not exceed the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) of ~~0.05~~ **0.025** mg/m^3 for an eight-hour time-weighted average provided in, *TLVs® and BEIs®, Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices* (ACGIH 2006 [DIRS 180457]). The immediate danger to life and health limit for cristobolite and tridymite silica is 25 mg/m^3 and ~~the immediate danger to life and health limit~~ for quartz is 50 mg/m^3 in accordance with *National Institute for Occupational Safety and Health "Silica, Crystalline (as Respirable Dust)"* (NIOSH 1996 [DIRS 147940]).

*~~[DOE O 440.1A [DIRS 102288], Attachment 2, Section 12.g,~~ **Although the requirement source has been removed from the contract, it provided the basis for this functional requirement that should still be applied to the system. These immediate danger to life and health limits are based on 500 times the 1989 OSHA permissible exposure limits of 0.05 mg/m^3 and 0.1 mg/m^3. This criterion** invokes the ACGIH TLV requirements which are lower (more protective) than the OSHA permissible exposure limits for silica (0.1 mg/m^3) (NIOSH 1996 [DIRS 147940]) and represents a more protective work environment.]*

Add the following reference to Section 8.1:

[DIRS 180124]
BSC (Bechtel SAIC Company) 2008. *External Events Hazards Screening Analysis.* 000-00C-MGR0-00500-000-00C. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20080219.0001.
[DIRS 183935]
BSC (Bechtel SAIC Company) 2007. *Comparison of Flux-to-Dose Conversion Factors Used in Shielding Analyses.* 000-00C-MGR0-04600-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071116.0007.
[DIRS 185210]
Gomez, R.M. 2008. "Contracting Officer Letter to Bechtel SAIC Company, LLC (BSC), Contract Number DE-AC28-01RW12101, Direction to Revise Requirements Documents, Ltr No. 08-012." Letter from R.M. Gomez (DOE/ORD) to D.J. Schlissmann (BSC), March 03, 2008, 0305082804, OCE:SB-0579 ACC: CCU.20080304.0011.

Add the following references to Section 8.2:

[DIRS 101836]
ICRP (International Commission on Radiation Protection) 1990. *Title.* ICRP 60.
[DIRS 172721]
ICRP (International Commission on Radiation Protection) 1995. *Title.* ICRP 68.
[DIRS 152446]
ICRP (International Commission on Radiation Protection) 1996. *Title.* ICRP 72.
[DIRS 124636]
ANSI/ANS-59.51-1997. *Fuel Oil Systems for Safety-Related Emergency Diesel Generators.* La Grange Park, Illinois: American Nuclear Society. TIC: 241272.
[DIRS 184521]
ANSI/ANS-59.52-1998 (Reaffirmed 2007). 2007. *American National Standard, Lubricating Oil Systems for Safety-Related Emergency Diesel Generators.* La Grange Park, Illinois: American Nuclear Society. TIC: 259964.
[DIRS 184838]
ASTM D 4057-06. 2006. *Standard Practice for Manual Sampling of Petroleum and Petroleum Products.* West Conshohocken, Pennsylvania: American Society for Testing and Materials. TIC: 260018.
[DIRS 184524]
HI (Hydraulic Institute) 2005. *Pump Standards.* Parsippany, New Jersey: Hydraulic Institute.
[DIRS 184523]
TEMA (Tubular Exchanger Manufacturers Association) 2007. *Standards of the Tubular Exchanger Manufacturers Association.* 9th Edition. Tarrytown, New York: Tubular Exchanger Manufacturers Association. TIC: 260037.
[DIRS 184522]
Boner, G.L. and Hanners, H.W. 1979. *Enhancement of On-Site Emergency Diesel Generator Reliability #URD-TR-79-07.* NUREG/CR-0660. Washington, D.C.: U.S. Nuclear Regulatory Commission.

11. REVIEWS AND APPROVAL			
Printed Name	**Title**	**Signature**	**Date**
11a. Preparer: David S. Rhodes RICHARD FOSTER FOR D. RHODES	Discipline Engineering Manager	Richard Foster	3/13/08
11b. Concurrence: Richard Foster	Manager of Discipline Engineering	Richard Foster	3/13/08
11c. Concurrence: N/A	Project Engineering Manager	N/A	N/A
11d. Approved: Barbara Rusinko	Engineering Manager	R J Troetti	3/13/08