CRWMS/M&O

Design Analysis Cover Sheet

Complete only applicable items.

1.

WBS: 1.2.6

QA: QA

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2. DESIGN ANALYSIS TITLE			
Requirements Allocation Analysis for Linings and Ground Support, CII: BABEAB000			
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12. REMARKS None			

Design Analysis Revision Record

Complete only applicable items.

1.

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Page: 2 Of: 8

2. DESIGN ANALYSIS TITLE Requirements Allocation Analysis for North Ramp Linings and Ground Support, CII: BABEAB000			
3. DOCUMENT IDENTIFIER BABEAB000-01717-0200-00008 Rev. 02			4. REVISION NO. 02
5. Revision No.	6. Pages Added	7. Pages Deleted	8. Description of Revision
00	8	0	Initial Issue
01	0	0	General Revision as follows:
			Incorporated Handwritten Changes in Rev 00
			Editorial changes throughout, "Support Areas" to "Alcoves"
			throughout.
			Page 4 Add functional interface paragraph, Add surface
			based testing interface paragraph.
			Page 5 Add: 3.2.1 J3, 3.2.1 J13, 3.2.1.4 F
			Delete: 3.2.1 E, 3.2.1 J, 3.2.1 J11, 3.2.1 J12
			Page 6 Add: 3.2.1.9.2 A2e, 3.2.2.4 S6, 3.2.2.4 S8, TBD-146
			3.2.1.9.4 C1 & TBD - 098, Delete: 3.2.1.9.3 C3, 3.2.1.10.1E
			3.2.1.10.2 B2, 3.2.1.10.2 D, 3.2.1.19.2 C, 3.2.1.19.8 A,
			3.2.1.19.8 B, 3.2.2.4 H2, 3.2.2.4 M3, 3.2.2.4 O,
			3.2.2.4 T4, 3.2.2.4 C, "3.2.1.9.4 B2" to "3.2.1.9.4 B4"
			Page 8 Add Note 11.
02	0	0	Revision to incorporate changes from Rev. 01 of the
			ESFDR and Rev. 03 of the DIE as follows:
			Page 3 Updated Reference Revisions
			Page 5 Delete: 3.2.1 P, 3.2.1 AC
			Page 6 Delete: 3.2.1.9.2 A2e, 3.2.1.9.4 B4, TBV-192,
			and TBD-098
			Page 7 Delete: TBD-145
			Page 8 Revised notes 6, 9 & 11, also add note 12.
			Editorial changes to increase clarity.

1. PURPOSE

The purpose and objective of this analysis is to allocate all Exploratory Studies Facility Design Requirements (ESFDR) (reference 8.1) applicable to Configuration Item (CI), Linings and Ground Support, Configuration Item Identifier (CII) BABEAB000.

2. QUALITY ASSURANCE

The quality assurance classification and controls for the North Ramp Linings and Ground Support are presented in the Determination of Importance Evaluation (DIE) for Package 2C (see Reference 8.2). Sections 11.1 and 11.3 of the DIE provide the basis for classifying the Ground Support and Linings QA-1 and QA-5, and for establishing Q controls on materials and installation.

3. METHOD

Identify applicable requirements by detailed review of the ESFDR (Reference 8.1)

4. CODES AND STANDARDS

Not applicable.

5. DESIGN INPUTS

No design inputs other than the criteria identified in Section 6 are applicable to this analysis.

6. CRITERIA

ESFDR (Reference 8.1)

7. ASSUMPTIONS

Not applicable.

8. REFERENCES

- 8.1 Yucca Mountain Site Characterization Project, December 23, 1994. *Exploratory Studies Facility Design Requirements*, Rev. 01, YMP/CM-0019.
- 8.2 Document No. BAB000000-01717-2200-00005, Rev. 03, "Determination of Importance Evaluation for ESF Package 2C."

9. COMPUTER PROGRAMS

Not applicable.

10. DESIGN ANALYSIS

10.1 DEFINITION OF CI

Lining(s) - All permanent components placed between the inside limits of the Excavation and the accessible extent of the underground opening.

Ground support - any means used to reinforce rock and/or control movement of the rock.

Items in this CI meet one or both of the above definitions and may include rockbolts, weld wire fabric, concrete with or without reinforcement, shotcrete with or without reinforcement, lattice girders, liner plates, grout, and steel sets with or without lagging, utilized in the ramps and alcoves within the transition zone.

10.2 BOUNDARIES AND INTERFACES

The boundaries of the linings and ground support CI identification are the items defined in Section 10.1 installed in the ESF ramps including the ground support within the transition zone as identified in the DIE (Reference 8.2). This transition zone includes ground support installed in the alcoves that is important to stability of the Ramp. All North Ramp alcoves are considered to lie within the transition zone for conservatism. Therefore, boundaries for linings and ground support under this CI extend to the North ramp and to all operations and test alcoves intersecting the North Ramp.

The linings and ground support and Systems Structures Components (SSC) will interface with the North Ramp excavation; alcove excavations (both the Operations Alcoves and the Test Alcoves); the subsurface utility systems and furnishings including the power, lighting, ventilation, water, and compressed air; the 7.62 m (25 ft.) tunnel boring machine; the subsurface conveyor; and the Muck, Material and Personnel Handling systems.

The Linings and Ground Support shares functional interfaces with the following organizations: The Constructor, the Test Coordinator's Office and the Potential Repository Design Group.

Surface based testing is an interface to all construction activities in the ESF.

11. CONCLUSIONS

The following ESFDR criteria (Reference 8.1) are applicable to CII BABEAB000:

[3.2.1 C]	[3.2.1 N1]
[3.2.1 D]	[3.2.1 N2]
[3.2.1 E]	[3.2.1 N2a]
[3.2.1 G]	
[3.2.1 H]	[3.2.1 Q]
[3.2.1 H1]	[3.2.1 R]
[3.2.1 H1a]	[3.2.1 S]
[3.2.1 H1b]	[3.2.1 T]
[3.2.1 H1c]	[3.2.1 W]
[3.2.1 H2]	[3.2.1 W1]
[3.2.1 H2a]	[3.2.1 Z]
[3.2.1 H2b]	[3.2.1 Z1]
[3.2.1 H2c]	[3.2.1 Z2]
[3.2.1 H2c i]	[3.2.1 AA2]
[3.2.1 H2c ii]	[3.2.1 AA4]
[3.2.1 H2d]	[3.2.1 AA5]
[3.2.1 H2e]	[3.2.1 AA6]
[3.2.1 H2e i]	[3.2.1 AB]
[3.2.1 I]	
[3.2.1 I1]	[3.2.1.4]
[3.2.1 I2]	[3.2.1.4 B1]
[3.2.1 I3]	[3.2.1.4 B1a]
[3.2.1 I4]	[3.2.1.4 B1b]
[3.2.1 J1]	[3.2.1.4 B1b i]
[3.2.1 J2]	[3.2.1.4 B1b ii]
[3.2.1 J3]	[3.2.1.4 B1b iii]
[3.2.1 J5]	[3.2.1.4 B1b iv]
[3.2.1 J7]	[3.2.1.4 B1b v]
[3.2.1 J8]	[3.2.1.4 B1b vi]
[3.2.1 J9]	[3.2.1.4 B2]
[3.2.1 J10]	[3.2.1.4 B3]
[3.2.1 J13]	[3.2.1.4 B4]
[3.2.1 K]	[3.2.1.4 B5]
[3.2.1.M]	[3.2.1.4 C]
[3.2.1 M1]	[3.2.1.4 C1]
[3.2.1 M2]	[3.2.1.4 C3]
[3.2.1 M3]	[3.2.1.4 D1]
[3.2.1 M4]	[3.2.1.4 E1]
[3.2.1 M5]	[3.2.1.4 F]
[3.2.1 M5a]	[3.2.1.4 H]
[3.2.1 M5b]	[3.2.1.6 E]
[3.2.1 M6]	[3.2.1.6 F]
[3.2.1 N]	[3.2.1.7]

[3.2.1.9]	12		[3.2.2.4 D6]	
			[3.2.2.4 F3]	
[3.2.1.9.2 A3]			[3.2.2.4 I]	
[3.2.1.9.3 A]			[3.2.2.4 II]	
[3.2.1.9.3 C1]			[3.2.2.4 I5]	
[3.2.1.9.3 C1a]			[3.2.2.4 J1]	
[3.2.1.9.3 C1b]			[3.2.2.4 P]	
[3.2.1.9.3 C1e]			[3.2.2.4 P2]	
[3.2.1.9.3 C1f]			[3.2.2.4 Q]	
[3.2.1.9.3 G]			[3.2.2.4 R]	
[3.2.1.9.4 B]			[3.2.2.4 R1]	
			[3.2.2.4 S]	
[3.2.1.9.4 B5]	9		[3.2.2.4 S1]	
[3.2.1.9.4 C]	9		[3.2.2.4 S4]	
[3.2.1.9.4 C1]	11		[3.2.2.4 S5]	
[3.2.1.9.4 C2]			[3.2.2.4 S6]	
[3.2.1.9.4 C3]			[3.2.2.4 S8]	
[3.2.1.9.6]			[3.2.2.4 T]	
[3.2.1.10.1]			[3.2.2.4 T1]	
[3.2.1.10.1 A]			[3.2.2.4 T2]	
[3.2.1.10.1 B]			[3.2.2.4 T3]	
[3.2.1.10.1 I]			[3.2.2.4 T6]	
[3.2.1.10.2 C]			[3.2.2.4 U6]	
[3.2.1.17 A]			[3.2.2.4 U6b]	
[3.2.1.17 B]			[3.2.2.4 U6d]	
[3.2.1.18]			[3.2.2.4 V]	
[3.2.1.19.1 A]			[3.2.2.4 V1]	
[3.2.1.19.1 B]			[3.2.2.4 V2]	⁷ (TBD-146)
[3.2.1.19.2]			[3.2.2.4 V3]	¹⁰ (TBD-147)
[3.2.1.19.2 A]			[3.2.2.4 V4]	
[3.2.1.19.2 B]			[3.2.2.4 X2]	
[3.2.1.19.2 E1]			[3.2.2.4 X2a]	¹ (TBD-148)
[3.2.1.19.2 E3]			[3.2.2.4 X2b]	² (TBD-141)
[3.2.1.19.3]			[3.2.2.4 X2c]	³ (TBD-142)
[3.2.1.19.3 B]			[3.2.2.4 X2d]	⁴ (TBV-006)
[3.2.1.21 A1]			[3.2.2.4 X2e]	
[3.2.1.21 A2]			[3.2.2.4 X4]	
[3.2.1.21 A3]			[3.2.2.4.2 A]	
[3.2.1.21 A4]			[3.2.2.4.2 B]	
[3.2.1.24 B]			[3.2.2.4.2 D]	
[3.2.1.26.1]			[3.2.2.4.2 E]	
[3.2.1.26.1 B1]			[3.2.2.5 C]	
[3.2.1.26.1 B2]			[3.2.2.5 C1]	
[3.2.1.28]			[3.2.2.5 D]	
[3.2.2.4 D]			[3.2.2.5 D2]	
[3.2.2.4 D3]			[3.2.2.6 E]	
[3.2.2.4 D5]			[3.2.2.7.2 B4]	

[3.2.4.4.2 A] •
 [3.2.4.4.2 B] •
 [3.2.9 A]
 [3.2.9 A1]
 [3.2.9.4 A1] ⁵(TBD-143)
 [3.2.9.4 D4] ⁶
 [3.2.9.4 E]
 [3.2.9.4 E1]
 [Appendix A.4] ⁷(TBD-146)
 [Appendix A.5] ⁸ (TBD-193)

1. (TBD-148) This TBD is placed on a location or area which cannot be pressure grouted without prior approval. Since seal locations are unknown at this time, this requirement cannot be specifically addressed in the design at this time. All pressure grouting will require approval prior to commencement of the work, which meets the intent of the requirement. The TBD number will not be carried down to output documents. The TBD will be resolved, even though it will not appear on lower tier documents. The TBD remains open.
2. (TBD-141) This TBD is placed on a location or area which cannot be pressure grouted without prior approval. Since seal locations are unknown at this time, this requirement cannot be specifically addressed in the design at this time. All pressure grouting will require approval prior to commencement of the work, which meets the intent of the requirement. The TBD number will not be carried down to output documents. The TBD will be resolved, even though it will not appear on lower tier documents. The TBD remains open.
3. (TBD-142) This TBD is placed on a location or area which cannot be pressure grouted without prior approval. Since seal locations are unknown at this time, this requirement cannot be specifically addressed in the design at this time. All pressure grouting will require approval prior to commencement of the work, which meets the intent of the requirement. The TBD number will not be carried down to output documents. The TBD will be resolved, even though it will not appear on lower tier documents. The TBD remains open.
4. (TBV-006) This TBV is placed on a location or area which cannot be pressure grouted without prior approval. Since seal locations are unknown at this time, this requirement cannot be specifically addressed in the design at this time. All pressure grouting will require approval prior to commencement of the work, which meets the intent of the requirement. The TBV number will not be carried down to output documents. The TBD will be resolved, even though it will not appear on lower tier documents. The TBV remains open.

5. (TBD-143) The TBD number will not be carried down to output documents. The Lining and Ground Support do not in themselves preclude location of seals because they can be removed and/or supplemented in necessary for seal construction. Since seal locations are unknown at this time, this requirement cannot be specifically addressed any further in the design. Work may proceed. The TBD will be resolved, even though it will not appear on lower tier documents. The TBD remains open.
6. The ESFDR (reference 8.1) has deleted the TBD from the requirements. This change satisfied TBD-145 release requirements. (TBD-145 was used to track the ESFDR TBD in design documents.)
7. (TBD-146) The TBD number will not be carried down to Specification or Drawing, but will be posted on appropriate analysis. The thermal loads are unknown a present and will be determined during Performance Confirmation. A phased construction approach will be used to evaluate ESF and upgrade to repository requirements prior to incorporation into the repository. Therefore this requirement is not in the current scope of ESF north ramp construction. TBD-147 (note 10) captures the intent of this TBD and will be carried to output documents. The TBD will be resolved, even though it will not appear on lower tier documents. The TBD remains open.
8. (TBV-193) Seismic design value needs to be verified. Will be carried to output documents.
9. The ESFDR (reference 8.1) has deleted the TBV from the requirements. This change satisfied TBV 192 release requirements. (TBV-192 was used to track the ESFDR TBV in design documents relating to Linings and Ground Support CI.)
10. (TBD-147) Thermal Induced Stresses have not yet been determined. Will be carried down to output documents.
11. The ESFDR (reference 8.1) has deleted the TBD from the requirements. This change satisfied TBD-098 release requirements. (TBD-098 was used to track the ESFDR TBD in design documents.)
12. ESFDR requirement 3.2.1.9.2 A2 a through e were deleted and combined into a single requirement 3.2.1.9.2 A2 in Revision 1. This requirement originally stated " 3.2.1.9.2 A2 Conduct a failure mode and other analysis as part of the design process to determine critical functions and/or equipment..." and e was a subset condition " result in personal injury". Requirement 3.2.1.9.2 A2 has been rewritten to require a failure modes and affects analysis for equipment only, thus this requirement is not applicable to structures such as linings and ground support of the tunnel.

12. ATTACHMENTS

Not applicable.