U.S. NUCLEAR REGULATORY COMMISSION
DESIGN REVIEW OBSERVATION REPORT 94-02
FOR THE 90% DESIGN REVIEW OF DESIGN PACKAGE 2C
FOR THE EXPLORATORY STUDIES FACILITY

for 08/05/94
William L. Belke
High-Level Waste & Uranium Recovery
Projects Branch
Division of Waste Management

08/05/94
Shiann-Jang Chern
Engineering and Geosciences Branch
Division of Waste Management

Reviewed and approved by:

08/05/94
Keith McConnell
Engineering and Geosciences Branch
Division of Waste Management

08/05/94
Robert Johnson
High-Level Waste & Uranium
Recovery Projects Branch
Division of Waste Management

ENCLOSURE

1.0 INTRODUCTION

During May 16-20, 1994, in Las Vegas, Nevada, members of the staff of the U.S. Nuclear Regulatory Commission Division of Waste Management observed a U.S. Department of Energy (DOE), Office of Civilian Radioactive Waste Management (OCRWM) 90 percent design review for the Exploratory Studies Facility (ESF) Title II Design, Subsurface Facilities, Design Package 2C, "Topopah Spring North Ramps." The DOE design review for Design Package 2C involves structural analysis, mining analysis, mechanical analysis, electrical design, basis for design, designs, specifications, drawings, and determination of importance evaluations (DIE) of the North Ramp excavation and support facility from starter tunnel to the Topopah Spring Main Drift. It also includes the mining analysis for five test alcoves, four electrical switchgear alcoves, and two refuge chamber alcoves.

2.0 OBJECTIVES

The scope of the DOE design review was limited to design output documents (drawings, specifications, analyses) produced as part of Design Package 2C. The review objective was to ensure 1) compliance with project requirements, 2) technical adequacy, 3) minimized interferences and discrepancies, and 4) compliance with project requirements, and federal and state regulations. The general purpose of this review was to help the OCRWM Management and Operating Contractor (M&O), DOE managers, and other interested parties assess whether the ESF design is technically correct and if it is in compliance with the project objectives. The objectives of NRC staff observations of DOE design reviews are to gain confidence that designs are technically acceptable, that the DOE design review is effective, and that DOE and its contractors and subcontractors are implementing appropriate controls in the design process. Observation of the 90 percent design review by the NRC staff does not constitute an in-depth design review or imply NRC acceptance of the design.

3.0 SUMMARY AND CONCLUSIONS

For this DOE design review, the NRC staff concentrated on the technical aspects of the design, ramp excavations and supports, DIE, implementation of the design control process, and the conduct of the review. The DOE design review process for Design Package 2C is the same as for Design Package 2B. The review process consists of the following:

3.1 The design package is mailed to the reviewers and interested observers at least ten days prior to the design review meeting.

3.2 The design review meeting is held at which the design is described by the design organization.

3.3 The design organization prepares responses to mandatory comments and forwards them to reviewers for resolution/disposition.

3.4 Reviewers accept or reject comment responses.

3.5 A comment resolution meeting is held to close any outstanding comments.

For this review, the NRC staff provided verbal and documented comments on the programmatic and technical aspects of the design, design control process, the DIE, and the conduct of the design review. The NRC staff had also provided comments related to Design Package 2B based on the sample of the preliminary predecisional design package reviewed during the time available. The NRC staff programmatic and technical comments are summarized in Section 5.2 below.

The DOE design review was enhanced by providing a preliminary copy of the design package two weeks in advance to the reviewers and the observers. This allowed sufficient time for the review and the development of meaningful comments. The designers presented three days of detailed overviews to the reviewers and observers. During most of the presentations, numerous questions were asked. This sometimes led to lengthy discussions between the presenter and the reviewer or observer. Consequently, little time was left for the reviewers and observers to meet with DOE and M&O personnel for discussion and possible resolution of comments in their respective areas of interest until late in the afternoon of the last (third) day of the review.

The NRC staff based its evaluation of the technical adequacy on the Review Criteria in Section 9 of the Management and Independent Technical Review Plan (MITRP) which was included as part of the preliminary design package received two weeks prior to the 90 percent design review. For programmatic adequacy, the NRC staff based its evaluation on the requirements of the DOE Quality Assurance Requirements and Description document (DOE/RW-0333P, Revision 0, December 18, 1992). When an item or activity was identified by the NRC staff that did not appear to meet programmatic or technical criteria, it was (as established during the opening remarks on the first day of the design review) presented to the designated M&O observer point of contact. Some of the programmatic and technical issues raised during the observation of the DOE design review were resolved during the particular presentation. However, because of the limited time, some NRC staff comments were not completely addressed. These comments are listed below in Section 5.2 of this report, classified as General Programmatic or Specific Technical Comments. The General Comments were provided to the designated M&O observer point of contact early on the second day of the DOE design review and the finalized technical comments on the last day of the review. The representatives of the Nuclear Waste Technical Review Board and the State of Nevada indicated they had no problem with the NRC staff comments. Based on the sample of the design package reviewed during the time available, the NRC staff did not identify any major design flaws.

The new DOE design review process is a definite improvement over the previous process. Reviewers and observers have two weeks to review the design document and provide comments. Observers also have the opportunity to discuss the review comments with reviewers and oversee the DOE design review process. Many minor and editorial comments and other misunderstandings were resolved relatively easily. However, there was insufficient time for the reviewers and observers to discuss their comments with the actual designers.

The design package presentation process has improved. The DOE/M&O presentations divide the design package into many design items. Each design item has a detailed written report. The level of detail for design package

presentation was adequate. However, there was no document that described how the design items tie into a design system. For example, a brief integration document to summarize which design items are included in a design system such as the subsurface transportation system could have been provided. The rationale, flow chart, and studies that lead to the final selection for the design items should also have been discussed. Without an integration document, the NRC staff observers could not judge how the design integration was performed.

4.0 PARTICIPANTS

William Belke, Shiann-Jang Chern, John Gilray (part time) and Mikko Ahola (Center for Nuclear Waste Regulatory Analyses) served as observers for the NRC. The attendees, their affiliations, and their titles, from the first day of the review are listed in Attachment 1 to this report.

5.0 OBSERVATION OF THE DOE DESIGN REVIEW

5.1 Scope of the DOE Design Review

The scope of the DOE design review is defined in Section 3 of the MITRP. The scope of this review is limited to design output documents, that is, design drawings, design specifications, and design analyses produced as part of Design Package 2C. The review objective was to ensure 1) compliance with project requirements, 2) technical adequacy, 3) minimized interferences and discrepancies, and 4) compliance with project requirements, and federal and state regulations. The MITRP also contains applicable procedures and review criteria for the DOE design review.

5.2 Conduct of the DOE Design Review

Design Package 2C includes the North Ramp excavation, support, and utilities studies. The structural design analysis includes subsurface steel set analysis, walkway design, piping supports, ventilation supports, cable tray supports, utility supports, and miscellaneous concrete structures design calculations. Mining analysis includes North Ramp and utilities alcove analysis, blast design analysis, layout calculation, stability analysis, ventilation flexibility analysis, rock mass classification analysis, ground supports, scoping analysis, geology design analysis, emission and dispersion of dust analysis, and rail haulage system analysis. Mechanical analysis includes subsurface fire protection design, fire hazard analysis, muck handling systems flexibility analysis. Basis for design includes ESF design requirements and traceability of the design. DIE includes waste isolation evaluation; comparing drill-and-blast with mechanical excavation techniques; tracers, fluids, and materials for use in ESF; construction water for ESF construction; test interference evaluation for tunnel boring machine operation; support for North Ramp construction; and support for surface and subsurface conveyor belt system.

A list of the documents included in the Design Package 2C is given in section 6.0 of this report.

Most of the comments raised by the reviewers did not address test interference evaluation and/or waste isolation evaluation and, therefore, were not of major interest to the NRC staff. Eighteen comments were submitted by the NRC staff observers. The comments are listed in the Attachment 3. Based on a limited review and participation in DOE's review of Design Package 2C, NRC staff comments and observations related to the design review are summarized below.

5.2.1 NRC Staff Comments and Observations

- Improvement of integration among M&O disciplines - Design team integration has improved over that observed during the Design Package 2B 90 percent design review meeting. Fewer questions and comments were raised during this 90 percent design review meeting than were raised in the 90 percent review for Design Package 2B. Most comments on Design Package 2C were resolved during the 50 percent and pre-90 percent design reviews.

- Improper use of response spectrum in seismic design - In Design Package 2C, an improper scaling of seismic design response spectrum was used. This resulted in a significant underestimation of seismic load used in the design of some permanent and temporary structures. It should be noted that seismic loading may not be a controlling factor in Design Package 2C for structural design and, therefore, this error does not seem to have a major effect on the overall adequacy of the design. Three meetings were held between the NRC staff and the M&O structural design team to resolve this issue. Based on the M&O's recalculations, the seismic loading will only have an impact on the ventilation duct support. The ventilation duct support system design needs a minor change.

- Apparent lack of attention to detail - A peak ground acceleration of 0.37g was used in the seismic design. This value is less than the guideline requirement of 0.40g for steel sets structural design (permanent subsurface structure). Although the design value of 0.37g may not result in any design changes, it seems appropriate to follow the recommendations in the guideline document.

- Lack of appropriate degree of conservatism - The intact rock material properties were used for the stability analysis rather than the mass rock material properties. Perfect bonding between rock bolts and surrounding rock was assumed for the rock support analysis. The M&O stated that a qualified individual will be in charge of the roof support during ESF construction and will determine what type of support will be used. The mining analysis only provides the guideline for the field support applications. Therefore, installation of rock supports will depend on the judgement of the individual in charge. Still, the NRC staff believes that M&O should have selected a conservative value for the mining analysis.

- Other NRC staff observations - The presentation of DIE has improved. Five analyses were presented in the DIE report. In future design review, M&O should include the assumptions and provide the rationale for analysis parameters in the reports. This will eliminate many unnecessary comments.

5.2.2 Summary Comments Provided by Other Reviewers

- Lack of integration of design packages - The reviewers recommended that the ventilation system should be designed as a total system instead of being divided into three Design Packages. Because the complete ventilation system for the Topopah Spring Level; which includes the North Ramp (Design Package 2), the main drift (Design Package 8), and the South Ramp (Design Package 4); will be five miles long, there will be a substantial head loss in the ventilation system. The total head loss of the ventilation system should be considered in Design Package 2.

6.0 DOCUMENTS AVAILABLE FOR REVIEW

The design documents and references that were available for examination as part of the observation of Design Package 2C are listed in Attachment 3. Handouts provided at the design review are listed in Attachment 4.

90% REVIEW OF
DESIGN PACKAGE 2C
MAY 16, 1994

	PRINT NAME	COMPANY	TITLE
1	Richard J. Fournier	M&O	Review Secretary
2	Earl Dann	INYO COUNTY	MINING ENGINEER
3	Terry R. Paul	M+O	Systems Engineer
4	Jerry Nantz	M&O	ESF Dept Mtgr
5	JOHN CLARK	M&O	ESF MECH LEAD.
6	FRED ZINCEVICH	M+O	QA ENGINEER
7	WILLIAM BOYLE	DOE	Physical Scientist
8	NICK STELLATO	Nye Co.	OUSIDE Rep
9	Lawrence P Macken	M;O	Design Engr
10	FRED DJAHANGURI	U.S. BUREAU OF MINES	RESEARCH ENGR.
11	Shiann-Jang Chern	NRC	Geotech Engineer
12	Bill Belke	NRC	Senior QA Engineer
13	R. Lindsay Mundell	U S Bureau of Mines	STAFF Mining Engineer
14	Simon Hsiung	CNWRA	Sr. Res. Engr.
15	Pete Karnoski	TEMSS	Assessment Team Support Staff
16	William H. Hanshire	Kiewit/PB	Engineering Mgr.
17	James E Friant	Excavation Engineering	President
18	Bob Rommel	REECo Const	Project Engr
19	Nancy J. Chappell	M&O	REL
20	Robert Saunders	M+O	ESF Subsurface
21	John Oliray	NRC	Outside Rep
22	Ted Retrich	DOE	DAMEFO
23	Bernard J. Verna	DOE	Design Team Lead EFO
24	L.D. Foust	M;O	AGM, Nevada Site Mgr.

Attachment 1

90% REVIEW OF
DESIGN PACKAGE 2C
MAY 16, 1994

	PRINT NAME	COMPANY	TITLE
1	NORMAN T. SIMMS	M&O	REGULATORY REVIEWER
2	Robert W. Kirk	M&O	Engineer
3	Manny DeLeon	M&O	Design Support Supervisor
4	R. L. Bullock	RSN	Technical Advisor
5	E.V. JESENHAUSEN	CLARK COUNTY	ENG. SPEC.
6	WILLIAM R. JACOBS	SAIC	ENGINEER II
7	MATTHEW J. GOMEZ	M&O	STRUCTURAL ENGR
8	Levent Ozdemir	CSM	Professor
9	Alden Segrest	M&O	Mgr. MGDS Development
10	Ken Herold	M&O	ESF Subsurface
11	DANA ROGERS	M&O	REPOSITORY SUBSURF
12	JERRY HEANEY	MK	ESF SUBSURFACE
13	BHARAT MAJMUDAR	M&O	ESF SURFACE
14	JAIME GONZALEZ	DOE	ENGINEER
15	KEN ASHLOCK	M&O	SYSTEMS ENGINEERING
16	RICHARD G. KNACH	LBNL	Test Coordinator
17	DON SCHUTT	M&O	Design Review Leader
18	JIM GRUBB	STATE	ENGINEER
19	DAN MCKENZIE	M&O	ESF PROJECT ENGR
20	JOHN JENKINS	IT/NEVADA	CONSULTANT.
21	M. SAM KINDSKOPF	M&O/TRW	REMTS MGR
22	LEIF RENFGAR	M&O	CONST MGR.
23	Bob Sandifer	M&O	Deputy, MGDS Operation
24	Steve Dana	SAIC	Lead QAE / QRTSS

90% REVIEW OF
DESIGN PACKAGE 2C
MAY 16, 1994

	PRINT NAME	COMPANY	TITLE
1	P E SPERRY	CONSULTANT TO WATERS	CONSULTANT.
2	MICK MILLER	KIEWIT/PB	PROJ ENG
3	RALPH DRESEL	M&O CMO	CONST MGMT
4	Gene Pokorny	REECo	Project Engineer
5	RUSSELL E. FLUE	M&O ESF SURFACE	LEAD MECH ENGINEER
6	Ron Smith	M&O Site	
7	Mark Meyer	CER	QA Engineering Lead
8	JAMES GEORGE	QATSS/CER	SR. QA SPEC.
9	TRIEU TRUONG	DOE.	SY. ENGINEER
10	CARL Reece	TRW	M + O SYS ENG
11	Debra Edwards	USGS	ESF and SB Testing Coordinator
12	PETER HASTINGS	M&O	D.I.E. Manager
13	ED MCCANN	SAIC	ENVIRONMENTAL COMPLIANCE
14	JOHN MEDER	NEV. LEGISLATURE STAFF	SR. RESEARCH ANALYST
15	PIERRE MOUSSET-JONES	MSH/UNR	Professor.
16	DAN KISS	REECo	YMP DIVISION MANAGER
17	THOMAS C. GEER	M&O	MGDS SE MANAGER
18	WILLIAM REED	M&O	LEAD ELECT ENG. SUBSURFACE
19			
20			
21			
22			
23			
24			

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
ESF Subsurface Design piping Support Calculation	0B	5/18/94	BABFAH000-01717-0200-00123

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
1	page 8 and Fig 3.9, page 27.8 of Attachment 4.	☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) The maximum base shear (Vmax) calculation Vmax = 0.144 W is base on the 1.0 g normalized scale of design spectrum and 5% damping. However, actual Normalized scale of the design spectrum is 0.25 (observer's interpretation). Therefore, the maximum base shear should be 400% larger than the input value used in seismic design if the design spectrum is site specific. The 400% larger seismic loading may cause piping support failure. The seismic analysis has to be reevaluated. Same problems have occurred on Ventilation Support, and other structure support. Seismic loading on the steel sets design needs to be checked too.		

REVIEWED BY: Norman T. Simms (M&O) — Printed Name & Signature — Date

RESPONSE BY: — Printed Name & Signature — Date

Attachment 2

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record
(Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E.	0A	5/18/94	BABOOOOOO-01717-2200-00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
2	Attachment 4	☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) It is a reasonable assumption that some of the water, used to construct the ESF through the Topopah Springs welded unit could flow thru open fractures and faults into underlying rock units. This water might perch on top of or flow into the Calico Hills nonwelded unit. Rock material could no longer be sampled for isotopes such as chlorine-36, Tritium, Deuterium, or Oxygen-16 or -18, etc. It is recognized that Li/Br will be used as a tracer in ESF construction water so that future repository tests can determine if water and rock samples have been compromised by ESF construction water. How has the DOE determined that there will be an adequate volume of rock to obtain water samples of isotopes, which have not been compromised by past wet drilling activities and ESF construction water ?		

REVIEWED BY:		RESPONSE BY:	
Norman T. Simms			
Printed Name & Signature	Date	Printed Name & Signature	Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D.I.E.	0A	5/18/94	BABB00000-01717-2200-00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
3	Attachment 6	☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) The DIE of comparing Drill-and-Blast with mechanical Excavation Techniques provides the qualitative description of the damage of rock mass around daft. The seismic and thermal impacts on the drill-and-blast are not performed. The relationship between fractured zone and changing of permeability is still unknown. The calculation parameters such as peak particle velocity need to be verified. what is DOE/M&O plan to address above mentioned issues? what is the ~~cost~~ schedule for completing the Drill-and Blast DIE analysis?		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
B.F.D for 90% reviews, TS North Ramp Ground Support Scoping Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
4		☒ Mandatory - Requirement # 10 CFR 60.133(e)(2) ☐ Non-Mandatory (No Response Required) The phased approach for the ground support system may be risky. The possibility exists for deleterious rock movement around an excavation due to inadequate ground support. If the deleteribus rock movement occurs, this excavation is not likely to meet 10 CFR 60.133(e)(2) requirement and consequently, ~~cannot be used~~ is not suitable for repository use.		

REVIEWED BY: Norman T. Simms — Printed Name & Signature / Date

RESPONSE BY: — Printed Name & Signature / Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Stability Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
5		☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) Intact rock properties were used in the elastic isotropic and the Mohr-Coulomb plastic analyses using the FLAC computer code to evaluate the stability of various portions of the north ramp. This approach may not be conservative since intact rock properties are alway greater than the rock mass properties. Therefore, the stability (estimation) of an excavation tends to be ~~overestimated~~ nonconservative. Furthermore, ramp closure will be underestimated if intact rock properties are used in the analysis. This underestimation may result in inadequate design of ground supports.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY: _____
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record
(Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Stability Analysis		5/10/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
6		☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) In the TS North Ramp seismic stability analysis, the peak particle velocity of 111 mm/sec was used. What is the basis to use this value? Is this value equivalent to 0.4g (design base for permanent structure)? If it is not, please explain why a different value was used.		

REVIEWED BY:		RESPONSE BY:	
Norman T. Simms			
Printed Name & Signature	Date	Printed Name & Signature	Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Support Scoping Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
7		☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) This scoping analysis states that "the appropriate parameter in the Q system in which to incorporate the thermal and seismic loads in the Stress Reduction Factor (SRF) which is dependent on the stress to strength ratio." Examining Figure (7) on p. 27, only the PTn unit has its SRF adjusted to include effects of seismic and thermal loading. This implies that the ground support systems to be selected for excavations in these rock units will be temporary in nature. This approach does not seem to be consistent with the related design criteria. It would seem proper to provide rationale for not considering effects of seismic and thermal loads in other rock units. Although the SRF has been adjusted for the PTn unit, the modified Q value listed in Figure (7) does not fully reflect the adjustment. The actual modified Q values should be 0.33, 0.51, 0.998, and 1.02 instead of those listed in the Figure.		

REVIEWED BY:		RESPONSE BY:	
Norman T. Simms			
Printed Name & Signature	Date	Printed Name & Signature	Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record
(Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Blast Design Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
8		☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) The equation used to predict the peak particle velocity is Equation (5-68) in Ref. 9.10. In that equation, Q is the charge weight (Kg) not charge weight per unit length (kg/m) as used in Section 10.3.5 and subsequently. Moreover, as explained in Ref 9.10, this equation ~~cannot~~ may not be used directly to calculate the extent of damage (estimating damage zone). Using Figure 5-46 of Ref 9.10, for a charge density of 1.37 kg/m (Powermite) and a hole length of 3.0 m (5.0 m x 5.0 m x 3000 mm alcove drift round Sta 1+85), the estimated damage zone is about 1.8m not 1.15m as indicated in p.34. It may be necessary to reevaluate this aspect to ensure that the fifth design criterion is met.		

REVIEWED BY:		RESPONSE BY:	
Norman T. Simms			
Printed Name & Signature	Date	Printed Name & Signature	Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E	0A	5/18/94	BAB000000-1717-2200-00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
9.	Attachment 4	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) If some of the water, which is used to construct the ESF through open fractures and faults into underlying rock units, this water could perch on top of or flow into the of Calico Hills nonwelded unit. Has the DOE considered the effect on future repository performance of water movement into underlying rock units?		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record
(Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E.	0A	5/18/94	BABOOOOOO-01717-2200-OOOO5

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
10	Attachment 5 P.12/Para 5	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) Potential grout materials are given here as "Sodium silicate", and "Sodium aluminate." This contradicts statements on page 41 paragraph 5 which says "only non-Sodium, non-chloride based ground enhancing material is to be used ..."		
11	P.47/Para 7	Requirement 20 states "Only non-sodium, non-chloride based ground enhancing material shall be used ..." This contradicts page 12 paragraph 5.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E.	0A	5/18/94	BABOOOOOC-01717-2200-00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
12	Attachment 5 page 7/ para 6	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) Attachment 5, page 7, paragraph 6 states that the concentration of SF_i is given as "about a few parts per million." what is the corresponding estimate for concentrations of LiBr to be used?		
13	pages 4, 5/ para 4	The choice of a surrogate performance measure has not been demonstrated to be conservative. In fact, in Attachment 5, pages 4 and 5, paragraph 4 states that the "calculations represent scenarios that should conservatively bound the potential impacts to waste isolation." However, in the same paragraph it is stated that "this bounding ~~scenario~~ scenario is not the worst-case scenario either." This calculation assumes advection-dispersion in a saturated homogeneous porous medium. This assumption is nonconservative		

REVIEWED BY:	RESPONSE BY:
Norman T. Simms	
Printed Name & Signature / Date	Printed Name & Signature / Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E.	0A	5/18/94	BAB000000-01717-2200-00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
14	Attachment 5	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) The surrogate measure is based on the assumption that increasing the concentration of an ambient constituent by 10% should not impact the performance of the site. Thus, calculations are performed that model the peak concentration of material introduced during the ESF construction. If the peak concentration is less than 10% of the concentration found in the ambient groundwater, the performance of the repository is said to be unaffected. There is no justification provided for choosing a value of the surrogate performance measure of 10%.		

REVIEWED BY:		RESPONSE BY:	
Norman T. Simms			
Printed Name & Signature	Date	Printed Name & Signature	Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D.I.E.	0A	5/18/94	BABxxxxx-01717-2200-xxxxx5

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
15	attachment 5	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) The document generalizes the constituents of diesel fuel by considering all hydrocarbons as dissolved organic carbon (DOC). Thus, the ambient groundwater which contains DOC can be compared to this introduced material. However, it is most likely that many of the actual hydrocarbons introduced in the construction of the ESF are not found in the ambient groundwater. The effects of the new species on the performance of the site is thus unknown.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Stability Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
16		☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) In the UDEC analysis, the grouted rockbolt was treated as a cable. Therefore, only the yielding strength of the cable was used to determine the condition of the cable (rockbolt). In reality, the effectiveness of a grounted rockbolt (without mechanical anchor) may be affected by (a) installation procedure, (b) strength of the grout and steal rod, and (c) contact shear and tensile bonding strengths between grout and borehole wall. In many cases, the controlling parameter is the third item. It will not be a conservative approach without taking the third item into design consideration.		

REVIEWED BY: Norman T. Simms — Printed Name & Signature / Date

RESPONSE BY: — Printed Name & Signature / Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: 01:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
B.F.D for 90% review, section 7.5.1.2, IV. A. Criterion 40		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
17	7.5.1.2, IV, A Criterion 40	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) This criterion allows consideration of seismic and thermal loadings in the design of ground supports be deferred. It is understandable for not considering thermal loading since there may not have any thermal load during site characterization. However, it is going to take a considerable risk not to include seismic loading in the ground support design even if the intended life for these ground supports is to support site characterization activities, simply because the occurrence of earthquakes is not predictable. If an excavation that is intended for repository use is damaged due to seismic events, the possibility for it to be fixed to meet the repository requirements will be low. Therefore, it would seem prudent to include at least seismic loads in the ground support design at this stage.		

REVIEWED BY:		RESPONSE BY:	
Norman T. Simms	5/18/94		
Printed Name & Signature	Date	Printed Name & Signature	Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Ground Support Scoping Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
18	last para of p. 47	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) This paragraph states that "It should be noted that the A/E assumes a 60% (probability of a lower value) probability, To assume a higher value would require the use of more conservative ground support systems such as shotcrete and concrete on a more extensive basis." This sentence suggests that a higher probability value associates a weaker rock. This implication is not consistent with the approach used to link the probability value with the NGI rock mass classification as indicated in p. 23, where a lower probability value corresponds to a weaker rock.		

REVIEWED BY: Norman T. Simms — Printed Name & Signature — Date

RESPONSE BY: Printed Name & Signature — Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
ESF Subsurface Design piping Support Calculation	0B	5/18/94	BABFAH000-01717-0200-00123

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
1	page 8 and Fig 3.9, page 27.8 of Attachment 4.	☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) The maximum base shear (Vmax) calculation Vmax = 0.144W is base on the 1.0g normalized scale of design spectrum and 5% damping. However, actual normalized scale of the design spectrum is 0.25 (observer's interpretation). Therefore, the maximum base shear should be 400% larger than the input value used in seismic design if the design spectrum is site specific. The 400% larger seismic loading may cause piping support failure. The seismic analysis has to be reevaluated. Same problems have occurred on Ventilation Support, and other structure support. Seismic loading on the steel sets design needs to be checked too.		

REVIEWED BY: Norman T. Simms — Printed Name & Signature — Date

RESPONSE BY: — Printed Name & Signature — Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E.	0A	5/18/94	BABOOOOOO - 01717 - 2200 - 00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
2	Attachment 4	☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) It is a reasonable assumption that some of the water, used to construct the ESF through the Topopah Springs welded unit could flow thru open fractures and faults into underlying rock units. This water might perch on top of or flow into the Calico Hills nonwelded unit. Rock material could no longer be sampled for isotopes such as chlorine-36, Tritium, Deuterium, or Oxygen-16 or -18, etc. It is recognized that Li/Br will be used as a Tracer in ESF Construction water so that future repository tests can determine if water and rock samples have been compromised by ESF construction water. How has the DOE determined that there will be an adequate volume of rock to obtain water samples of isotopes, which have not been compromised by past wet drilling activities and ESF construction water ?		

REVIEWED BY: Norman T. Simms
Printed Name & Signature — Date

RESPONSE BY:
Printed Name & Signature — Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D.I.E.	0A	5/18/94	BABOOOOOO-01717-2200-00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
3	Attachment 6	☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) The DIE of comparing Drill-and-Blast with mechanical Excavation Techniques provides the qualitative description of the damage of rock mass around daft. The seismic and thermal impacts on the drill-and-blast are not performed. The relationship between fractured zone and changing of permeability is still unknown. The calculation parameters such as peak particle velocity need to be verified. what is DOE/M&O plan to address above mentioned issues? what is the ~~cost~~ schedule for completing the Drill-and Blast DIE analysis?		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
B.F.D for 90% review, TS North Ramp Ground Support Scoping Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
4		☒ Mandatory - Requirement # 10 CFR 60.133(e)(2) ☐ Non-Mandatory (No Response Required) The phased approach for the ground support system may be risky. The possibility exists for deleterious rock movement around an excavation due to inadequate ground support. If the deleteribus rock movement occurs, this excavation is not likely to meet 10 CFR 60.133(e)(2) requirement and consequently, ~~cannot be used~~ is not suitable for repository use.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature — Date

RESPONSE BY:
Printed Name & Signature — Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Stability Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
5		☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) Intact rock properties were used in the elastic isotropic and the Mohr-Coulomb plastic analyses using the FLAC computer code to evaluate the stability of various portions of the north ramp. This approach may not be conservative since intact rock properties are alway greater than the rock mass properties. Therefore, the stability (estimation) of an excavation tends to be ~~overestimated~~ nonconservative. Furthermore, ramp closure will be underestimated if intact rock properties are used in the analysis. This underestimation may result in inadequate design of ground supports.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record
(Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Stability Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
6		☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) In the TS North Ramp seismic stability analysis, the peak particle velocity of 111 mm/sec was used. What is the basis to use this value? Is this value equivalent to 0.4g (design base for permanent structure)? If it is not, please explain why a different value was used.		

REVIEWED BY:
Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Support Scoping Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
7		☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) This scoping analysis states that "the appropriate parameter in the Q system in which to incorporate the thermal and seismic loads in the Stress Reduction Factor (SRF) which is dependent on the stress to strength ratio." Examining Figure (7) on p. 27, only the PTn unit has its SRF adjusted to include effects of seismic and thermal loading. This implies that the ground support systems to be selected for excavations in these rock units will be temporary in nature. This approach does not seem to be consistent with the related design criteria. It would seem proper to provide rationale for not considering effects of seismic and thermal loads in other rock units. Although the SRF has been adjusted for the PTn unit, the modified Q value listed in Figure (7) does not fully reflect the adjustment. The actual modified Q values should be 0.33, 0.51, 0.998, and 5.02 instead of those listed in the Figure.		

REVIEWED BY: Norman T. Simms — Printed Name & Signature — Date

RESPONSE BY: Printed Name & Signature — Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record
(Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Blast Design Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
8		☒ Mandatory - Requirement #_____ ☐ Non-Mandatory (No Response Required) The equation used to predict the peak particle velocity is Equation (5-68) in Ref. 9.10. In that equation, Q is the charge weight (Kg) not charge weight per unit length (kg/m) as used in Section 10.3.5 and subsequently. Moreover, as explained in Ref 9.10, this equation may not be used directly to calculate the extent of damage (estimating damage zone). Using Figure 5-46 of Ref 9.10, for a charge density of 1.37 kg/m (Powermite) and a hole length of 3.0 m (5.0 m x 5.0 m x 3000 mm alcove drift round Sta 1+85), the estimated damage zone is about 1.8 m not 1.15 m as indicated in p.34. It may be necessary to reevaluate this aspect to ensure that the fifth design criterion is met.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record
(Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E	0A	5/18/94	BAB000000-9717-2200-00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
9	Attachment 4	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) If some of the water, which is used to construct the ESF through open fractures and faults into underlying rock units, this water could perch on top of or flow into the of Calico Hills nonwelded unit. Has the DOE considered the effect on future repository performance of water movement into underlying rock units?		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY: _____
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E.	0A	5/18/94	BABOOOOOO - 01717 - 2200 - 00005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
10	Attachment 5 P.12/Para 5	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) Potential grout materials are given here as "Sodium silicate", and "Sodium aluminate." This contradicts statements on page 41 paragraph 5 which says "only non-Sodium, non-chloride based ground enhancing material is to be used ..."		
11	P.47/Para 7	Requirement 20 states "Only non-sodium, non-chloride based ground enhancing material shall be used ..." This contradicts page 12 paragraph 5.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY: _____
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E.	0A	5/18/94	BABOOOOOC-01717-2200-OOOOO5

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
12	Attachment 5 page 7/ para 6	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) Attachment 5, page 7, paragraph 6 states that the concentration of SF_6 is given as "about a few parts per million." what is the corresponding estimate for concentrations of LiBr to be used?		
13	pages 4,5/ para 4	The choice of a surrogate performance measure has not been demonstrated to be conservative. In fact, in Attachment 5, pages 4 and 5, paragraph 4 states that the "calculations represent scenarios that should conservatively bound the potential impacts to waste isolation." However, in the same paragraph it is stated that "this bounding ~~case~~ scenario is not the worst-case scenario either." This calculation assumes advection-dispersion in a saturated homogeneous porous medium. This assumption is nonconservative		

REVIEWED BY:		RESPONSE BY:	
Norman T. Simms			
Printed Name & Signature	Date	Printed Name & Signature	Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D. I. E.	0A	5/18/94	BABOOOOOO-01717-2200-OOOO5

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
14	Attachment 5	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) The surrogate measure is based on the assumption that increasing the concentration of an ambient constituent by 10% should not impact the performance of the site. Thus, calculations are performed that model the peak concentration of material introduced during the ESF construction. If the peak concentration is less than 10% of the concentration found in the ambient groundwater, the performance of the repository is said to be unaffected. There is no justification provided for choosing a value of the surrogate performance measure of 10%.		

REVIEWED BY: Norman T. Simms — Printed Name & Signature — Date

RESPONSE BY: Printed Name & Signature — Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
D.I.E.	0A	5/18/94	BABC00000-01717-2200-000005

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
15	attachment 5	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) The document generalizes the constituents of diesel fuel by considering all hydrocarbons as dissolved organic carbon (DOC). Thus, the ambient groundwater which contains DOC can be compared to this introduced material. However, it is most likely that many of the actual hydrocarbons introduced in the construction of the ESF are not found in the ambient groundwater. The effects of the new species on the performance of the site is thus unknown.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Stability Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
16		☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) In the UDEC analysis, the grouted rockbolt was treated as a cable. Therefore, only the yielding strength of the cable was used to determine the condition of the cable (rockbolt). In reality, the effectiveness of a grounted rockbolt (without mechanical anchor) may be affected by (a) installation procedure, (b) strength of the grout and steal rod, and (c) shear and tensile bonding (contact) strengths between grout and borehole wall. In many cases, the controlling parameter is the third item. It will not be a conservative approach without taking the third item into design consideration.		

REVIEWED BY: Norman T. Simms
Printed Name & Signature _____ Date _____

RESPONSE BY:
Printed Name & Signature _____ Date _____

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record (Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
B.F.D for 90% review, section 7.5.1.2, IV. A. Criterion 40		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
17	7.5.1.2, IV, A Criterion 40	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) This criterion allows consideration of seismic and thermal loadings in the design of ground supports be deferred. It is understandable for not considering thermal loading since there may not have any thermal load during site characterization. However, it is going to take a considerable risk not to include seismic loading in the ground support design even if the intended life for these ground supports is to support site characterization activities, simply because the occurrence of earthquakes is not predictable. If an excavation that is intended for repository use is damaged due to seismic events, the possibility for it to be fixed to meet the repository requirements will be low. Therefore, it would seem prudent to include at least seismic loads in the ground support design at this stage.		

REVIEWED BY: Norman T. Simms — Printed Name & Signature — 5/18/94 — Date

RESPONSE BY: _____ — Printed Name & Signature — _____ — Date

90% Design Review - Design Package 2C

CRWMS/M&O

Document Review Record
(Continued)

WBS: 1.2.6
QA: QA
Page: Of:

DOCUMENT TITLE	REVISION	DATE	DOCUMENT IDENTIFIER
TS North Ramp Ground Support Scoping Analysis		5/18/94	

COMMENT NO.	SECTION/ PARAGRAPH	COMMENTS	RESPONSE	ACCEPT/ REJECT
18	last para of p. 47	☐ Mandatory - Requirement #_____ ☒ Non-Mandatory (No Response Required) This paragraph states that "It should be noted that the A/E assumes a 60% (probability of a lower value) probability. To assume a higher value would require the use of more conservative ground support systems such as shotcrete and concrete on a more extensive basis." This sentence suggests that a higher probability value associates a weaker rock. This implication is not consistent with the approach used to link the probability value with the NGI rock mass classification as indicated in p. 23, where a lower probability value corresponds to a weaker rock.		

REVIEWED BY:	RESPONSE BY:
Norman T. Simms	
Printed Name & Signature / Date	Printed Name & Signature / Date

Design Package 2C - Topopah Spring North Ramp

General

BAB000000-01717-6300-00002	ESF Basis for Design Document
BAB000000-01717-2200-00005	DIE FOR PACKAGE 2C

Drawings:

BABF00000-01717-2100-39002	DRAWING INDEX

Specifications:

BAB000000-01717-6300-01014	SUMMARY OF WORK PACKAGE 2C
BAB000000-01717-6300-01300	*SUBMITTALS
BAB000000-01717-6300-01400	*CONTRACTOR QUALITY CONTROL/QUALITY ASSURANCE
BAB000000-01717-6300-01501	SUBSURFACE GENERAL CONSTRUCTION
BAB000000-01717-6300-01600	*MATERIAL AND EQUIPMENT

Subsurface

Drawings:

BABEAD000-01717-2100-40100	OVERALL SUBSURFACE LAYOUT TS LEVEL PLAN
BABEAD000-01717-2100-40104	TS NORTH RAMP LAYOUT GENERAL ARRANGEMENT PLAN & PROFILE
BABEAD000-01717-2100-40110	TS NORTH RAMP EXCAVATION LAYOUT PROFILE - SHEET 1 OF 7
BABEAD000-01717-2100-40111	TS NORTH RAMP EXCAVATION LAYOUT PROFILE - SHEET 2 OF 7
BABEAD000-01717-2100-40112	TS NORTH RAMP EXCAVATION LAYOUT PROFILE - SHEET 3 OF 7
BABEAD000-01717-2100-40113	TS NORTH RAMP EXCAVATION LAYOUT PROFILE - SHEET 4 OF 7
BABEAD000-01717-2100-40114	TS NORTH RAMP EXCAVATION LAYOUT PROFILE - SHEET 5 OF 7
BABEAD000-01717-2100-40115	TS NORTH RAMP EXCAVATION LAYOUT PROFILE - SHEET 6 OF 7
BABEAD000-01717-2100-40116	TS NORTH RAMP EXCAVATION LAYOUT PROFILE - SHEET 7 OF 7
BABEAD000-01717-2100-40120	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 1 OF 10
BABEAD000-01717-2100-40121	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 2 OF 10
BABEAD000-01717-2100-40122	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 3 OF 10
BABEAD000-01717-2100-40123	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 4 OF 10
BABEAD000-01717-2100-40124	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 5 OF 10
BABEAD000-01717-2100-40125	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 6 OF 10
BABEAD000-01717-2100-40126	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 7 OF 10
BABEAD000-01717-2100-40127	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 8 OF 10
BABEAD000-01717-2100-40128	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 9 OF 10
BABEAD000-01717-2100-40129	TS NORTH RAMP EXCAVATION LAYOUT PLAN - SHEET 10 OF 10
BABEC0000-01717-2100-40142	TS NORTH RAMP COLLECTION SUMP/TANK ALCOVE GA PLAN & SECTIONS
BABEC0000-01717-2100-40144	TS NORTH RAMP REFUGE CHAMBER ALCOVE GA PLANS & SECTIONS
BABEC0000-01717-2100-40146	TS NORTH RAMP ELECT EQUIPMENT ALCOVE GA PLAN & SECTIONS
BABED0000-01717-2100-40147	TS NORTH RAMP BOW RIDGE FAULT TEST ALCOVE GA PLAN & SECTIONS
BABED0000-01717-2100-40148	TS NORTH RAMP BOW RIDGE FAULT TEST ALCOVE GA SECTIONS
BABED0000-01717-2100-40149	TS NORTH RAMP CONTACT RBT TEST ALCOVE GA PLANS & SECTIONS
BABEAD000-01717-2100-40151	TS NORTH RAMP GROUND SUPPORT MASTER ELEVATION AND SECTIONS
BABEAD000-01717-2100-40152	TS NORTH RAMP GROUND SUPPORT CATEGORY 1 ELEVATION AND SECTION
BABEAD000-01717-2100-40153	TS NORTH RAMP GROUND SUPPORT CATEGORY 2 ELEVATION AND SECTION
BABEAD000-01717-2100-40154	TS NORTH RAMP GROUND SUPPORT CATEGORY 3 ELEVATION AND SECTION
BABEAD000-01717-2100-40155	TS NORTH RAMP GROUND SUPPORT CATEGORY 4 ELEVATION AND SECTION
BABEAD000-01717-2100-40156	TS NORTH RAMP GROUND SUPPORT CATEGORY 5 ELEVATION AND SECTION
BABEAD000-01717-2100-40157	ROCK BOLTS AND ACCESSORIES DETAILS
BABEAD000-01717-2100-40161	TS NORTH RAMP ALCOVES ROCKBOLTS & SHOTCRETE SECTIONS
BABEAD000-01717-2100-40162	TS NORTH RAMP ALCOVES ROCKBOLTS & SHOTCRETE PLAN & SECTIONS
BABEAD000-01717-2100-40165	TS NORTH RAMP CONTACT RBT TEST ALCOVE BLAST LAYOUT PLAN, SECTION & DETAILS
BABEAD000-01717-2100-40166	TS NORTH RAMP BOW RIDGE FAULT ALCOVE BLAST LAYOUT PLAN, SECTION & ELEVATION-SHEET 2
BABEAD000-01717-2100-40167	TS NORTH RAMP ELECT EQUIP ALCOVE BLAST LAYOUT PLAN, SECTION & ELEVATION
BABEAD000-01717-2100-40168	TS NORTH RAMP SUMP ALCOVE BLAST LAYOUT PLAN, ELEVATION & SECTION
BABEAD000-01717-2100-40169	TS NORTH RAMP REFUGE CHAMBER ALCOVE BLAST LAYOUT PLAN, SECT. & ELEV
BABFA0000-01717-2100-40170	TS NORTH RAMP STARTER TUNNEL EQUIPT. & UTILITIES GA PLANS
BABFA0000-01717-2100-40171	TS NORTH RAMP STARTER TUNNEL EQUIPT. & UTILITIES GA SECTIONS & ELEVATIONS

Electrical

Drawings:

BABFC0000-01717-2100-44001	CONVEYOR TRANSFER TOWER POWER/LTG/GND DETAILS
BABFC0000-01717-2100-44002	SUBSURFACE CNVR W-T03 LTG/POWER/GND PLAN
BABFC0000-01717-2100-44003	SURFACE CONVEYOR W-S01 LTG/POWER/GND PLAN
BABFC0000-01717-2100-44004	CONVEYOR LTG/POWER/GND STANDARD DETAILS SHEET 1
BABFC0000-01717-2100-44005	CONVEYOR LTG/POWER/GND STANDARD DETAILS SHEET 2
BABFC0000-01717-2100-44006	MUCK CONVEYORS CABLE BLOCK DIAGRAMS
BABFC0000-01717-2100-44007	MUCK CONVEYORS PANEL SCHEDULES
BABFC0000-01717-2100-44008	MUCK CONVEYORS CONDUIT & CABLE SCHEDULE
BABFA0000-01717-2100-44009	ELECTRICAL SUBSURFACE FIXTURE SCHEDULE
BABFAA000-01717-2100-44010	SUBSURFACE ELECTRICAL EQUIPMENT LAYOUT DIAGRAM
BABF00000-01717-2100-44016	NORTH PORTAL 0000 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44017	TS NORTH RAMP 0000-0300 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44018	TS NORTH RAMP 0300-0600 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABFA0000-01717-2100-44019	TS NORTH RAMP 0600-0900 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44020	TS NORTH RAMP 0900-1200 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44021	TS NORTH RAMP 1200-1500 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44022	TS NORTH RAMP 1500-1800 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44023	TS NORTH RAMP 1800-2100 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44024	TS NORTH RAMP 2100-2400 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44025	TS NORTH RAMP 2400-2700 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABF00000-01717-2100-44026	TS NORTH RAMP 2700-2900 POWER LIGHTING GROUNDING PLAN AND DETAIL
BABFA0000-01717-2100-44027	TS SUBSURFACE ELECTRICAL PANEL SCHEDULES SHT 1
BABFC0000-01717-2100-44028	TS SUBSURFACE ELECTRICAL PANEL SCHEDULES SHT 2
BABFA0000-01717-2100-44030	SUBSURFACE POWER, LTG CONTROL, INSTR CABLE BLOCK DIAGRAM, SHEET 1
BABFA0000-01717-2100-44031	SUBSURFACE POWER, LTG CONTROL, INSTR CABLE BLK DIAGRAM, SHEET 2
BABFA0000-01717-2100-44032	SUBSURFACE POWER, LTG CONTROL, INSTR CABLE BLK DIAGRAM SHEET 3
BABFA0000-01717-2100-44033	SUBSURFACE POWER, LTG CONTROL, INSTR CABLE BLK DIAGRAM SHEET 4
BABFA0000-01717-2100-44034	SUBSURFACE POWER, LTG CONTROL, INSTR CABLE BLK DIAGRAM SHEET 5
BABFA0000-01717-2100-44035	SUBSURFACE POWER, LTG CONTROL, INSTR CABLE BLK DIAGRAM SHEET 6
BABFCC000-01717-2100-44036	SUBSURFACE CABLE BLOCK DIAGRAM DATA LIST SHT 1
BABFCC000-01717-2100-44037	SUBSURFACE CABLE BLOCK DIAGRAM DATA LIST SHT 2
BABF00000-01717-2100-44038	SUBSURFACE CABLE BLOCK DIAGRAM DATA LIST SHT 3
BABF00000-01717-2100-44039	SUBSURFACE CABLE BLOCK DIAGRAM DATA LIST SHT 4
BABF00000-01717-2100-44040	SUBSURFACE ELECTRICAL STANDARD DETAILS SHT 1
BABF00000-01717-2100-44041	SUBSURFACE ELECTRICAL STANDARD DETAILS SHT 2
BABFAA000-01717-2100-44042	SUBSURFACE ELECTRICAL STANDARD DETAILS SHT 3
BABFAA000-01717-2100-44043	SUBSURFACE ELECTRICAL STANDARD DETAILS SHT 4
BABF00000-01717-2100-44044	SUBSURFACE ELECTRICAL STANDARD DETAILS SHT 5
BABFA0000-01717-2100-44045	SUBSURFACE ELECTRICAL STANDARD DETAILS SHT 6
BABF00000-01717-2100-44046	SUBSURFACE ELECTRICAL PLAN & DETAILS SHT 1
BABF00000-01717-2100-44047	SUBSURFACE ELECTRICAL PLAN & DETAILS SHT 2
BABF00000-01717-2100-44048	SUBSURFACE ELECTRICAL PLAN & DETAILS SHT 3
BABFCC000-01717-2100-44062	SUBSURFACE POWER LIGHTING & GNDG CABLE & RACEWAY SCHEDULE

Specifications:

BAB000000-01717-6300-16050	*BASIC ELECTRICAL MATERIALS & METHODS
BAB000000-01717-6300-16110	*CONDUIT
BAB000000-01717-6300-16111	*CABLE TRAYS
BABBD0000-01717-6300-16112	*UNDERGROUND DUCTS AND MANHOLES
BAB000000-01717-6300-16121	*MEDIUM VOLTAGE POWER CABLE
BAB000000-01717-6300-16122	*600 V POWER AND CONTROL CABLE
BAB000000-01717-6300-16123	*600 V INSTRUMENT CABLE
BAB000000-01717-6300-16130	*PULL AND JUNCTION BOXES
BAB000000-01717-6300-16131	*OUTLET BOXES
BAB000000-01717-6300-16141	*WIRING DEVICES
BAB000000-01717-6300-16152	*PACKAGED MECHANICAL EQUIPMENT
BABFAA000-01717-6300-16153	*SUBSURFACE POWER CENTER ENCLOSURE
BAB000000-01717-6300-16190	*SUPPORTING DEVICES
BAB000000-01717-6300-16195	*ELECTRICAL IDENTIFICATION
BAB000000-01717-6300-16310	*MEDIUM VOLTAGE SWITCHGEAR
BABBDA000-01717-6300-16311	*MEDIUM VOLTAGE PAD MOUNTED SWITCHGEAR

Specifications (continued):

BABFAA000-01717-6300-16312	*SUBSURFACE MEDIUM VOLTAGE SWITCHGEAR
BABFAA000-01717-6300-16363	*MEDIUM VOLTAGE PORTAL LOAD INTERRUPTER SWITCHES
BAB000000-01717-6300-16405	*NEMA FRAME INDUCTION MOTORS (SMALL)
BAB000000-01717-6300-16420	*SERVICE ENTRANCE
BAB000000-01717-6300-16425	*LOW VOLTAGE SWITCHGEAR
BAB000000-01717-6300-16440	*SERVICES SWITCHES
BAB000000-01717-6300-16450	*GROUNDING
BABBD0000-01717-6300-16460	*PAD MOUNTED TRANSFORMERS
BABBDA000-01717-6300-16461	*LIQUID IMMERSED TRANSFORMERS
BAB000000-01717-6300-16462	*DRY TYPE TRANSFORMERS
BABFCC000-01717-6300-16466	*SUBSURFACE ELECTRIC TROLLEY SYSTEM
BAB000000-01717-6300-16471	*POWER DISTRIBUTION PANELS & PANELBOARDS
BABFAA000-01717-6300-16475	*SUBSURFACE SUBSTATION (PACKAGED EQUIPMENT)
BAB000000-01717-6300-16481	*LOW VOLTAGE MOTOR STARTERS
BABFC0000-01717-6300-16482	*VARIABLE SPEED DRIVES FOR CONVEYOR BELTS
BABBDA000-01717-6300-16484	*LOW VOLTAGE MOTOR CONTROL CENTERS
BAB000000-01717-6300-16501	*LAMPS
BAB000000-01717-6300-16502	*FIXTURE ACCESSORIES
BAB000000-01717-6300-16510	*FLUORESCENT LIGHTS
BABBDA000-01717-6300-16512	*HIGH INTENSITY DISCHARGE LIGHTS
BAB000000-01717-6300-16535	*EMERGENCY LIGHTS
BAB000000-01717-6300-16631	*DC BATTERY SYSTEM
BAB000000-01717-6300-16671	*LIGHTNING PROTECTION SYSTEMS

Structural

Drawings:

BABF00000-01717-2100-41001	TS NORTH PORTAL STRUCTURAL STANDARDS - GENERAL NOTES
BABF00000-01717-2100-41002	STRUCTURAL STANDARDS ABBREVIATIONS
BABF00000-01717-2100-41099	*RAIL PLACEMENT INVERT SEGMENTS - A, PLAN, SECTIONS & DETAILS
BABF00000-01717-2100-41100	*RAIL PLACEMENT INVERT SEGMENTS - B, PLAN & SECTIONS
BABEAB000-01717-2100-41101	TS NORTH RAMP STEEL SETS & LAGGING ELEVATION
BABEAB000-01717-2100-41102	TS NORTH RAMP STEEL SETS & LAGGING SECTIONS & DETAILS
BABEAB000-01717-2100-41103	TS NORTH RAMP STEEL SETS & LAGGING SECTIONS & DETAILS
BABFA0000-01717-2100-41110	TS NORTH RAMP PIPING BRACKETS PLAN, ELEVATIONS, DETAILS
BABFA0000-01717-2100-41111	TS NORTH RAMP PIPING BRACKETS INSTALLATION
BABFA0000-01717-2100-41120	TS NORTH RAMP UTILITY SUPPORT COLUMNS PLANS DETAILS, SECTIONS
BABFA0000-01717-2100-41121	TS NORTH RAMP CABLE TRAY SUPPORTS ELEV, DETAILS, SECT
BABFAD000-01717-2100-41130	TS NORTH RAMP VENTILATION BRACKETS ELEVATIONS, DETAILS
BABFAD000-01717-2100-41135	TS NORTH RAMP DISCHARGE DUCT SUPPORT PLAN, DETAILS, SECTIONS
BABE00000-01717-2100-41140	TS NORTH RAMP WALKWAY AND HANDRAILS PLANS, SECT, DETAILS
BABE00000-01717-2100-41141	TS NORTH RAMP WALKWAY AND STAIRS PLANS, SECT, DETAILS
BABFAF000-01717-2100-41150	TS NORTH RAMP SUMP PUMP ALCOVE PLAN & SECTIONS
BABFAF000-01717-2100-41151	TS NORTH RAMP SUMP PUMP ALCOVE DETAILS
BABFA0000-01717-2100-41152	TS NORTH PORTAL MISC CONCRETE DETAILS PLAN, DETAILS, SECTIONS
BABEC0000-01717-2100-41160	TS NORTH RAMP REFUGE CHAMBER ALCOVE PLAN, SECTION, DETAILS

Specifications:

BABEAB000-01717-6300-02341	STEEL SETS AND ACCESSORIES SUBSURFACE
BABFCC000-0171706300-02453	*SUBSURFACE RAILROAD TURNOUT
BAB000000-01717-6300-03101	*CONCRETE FORMWORK SUBSURFACE
BAB000000-01717-6300-03201	*CONCRETE REINFORCEMENT - SUBSURFACE
BAB000000-01717-6300-03202	QA-CONTROL CONCRETE REINFORCEMENT
BAB000000-01717-6300-03301	*CAST-IN-PLACE CONCRETE SUBSURFACE
BAB000000-01717-6300-03302	CAST-IN-PLACE QA-CONTROL CONCRETE
BAB000000-01717-6300-03480	*PRECAST CONCRETE
BAB000000-01717-6300-03600	*EQUIPMENT AND STRUCTURAL SUPPORT BASE PLATE GROUT - SUBSURFACE
BABC00000-01717-6300-05121	STRUCTURAL STEEL AND MISCELLANEOUS METAL

Instrumentation

Drawings:

BABFAH000-01717-2100-43010	SUBSURFACE FIRE PROTECTION P&ID
BABFAE000-01717-2100-43011	SUBSURFACE WATER DISTRIBUTION P&ID
BABFAF000-01717-2100-43020	SUBSURFACE WASTEWATER HANDLING SYSTEM P&ID
BABFA0000-01717-2100-43030	NORTH PORTAL 0000 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43031	TS NORTH RAMP 0000 m - 0300 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43032	TS NORTH RAMP 0300 - 0600 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43033	TS NORTH RAMP 0600 - 0900 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43034	TS NORTH RAMP 0900 - 1200 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43035	TS NORTH RAMP 1200 - 1500 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43036	TS NORTH RAMP 1500 - 1800 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43037	TS NORTH RAMP 1800 - 2100 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43038	TS NORTH RAMP 2100 - 2400 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43039	TS NORTH RAMP 2400 - 2700 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43040	TS NORTH RAMP 2700 - 2900 m CONTROL & INSTRUMENTATION PLAN
BABFA0000-01717-2100-43050	SUBSURFACE INSTRUMENTATION STANDARD DETAILS SHT 1
BABFA0000-01717-2100-43051	SUBSURFACE INSTRUMENTATION STANDARD DETAILS SHT 2
BABFA0000-01717-2100-43052	SUBSURFACE INSTRUMENTATION STANDARD DETAILS SHT 3
BABFA0000-01717-2100-43053	SUBSURFACE INSTRUMENTATION STANDARD DETAILS SHT 4
BABF00000-01717-2100-43065	TS NORTH RAMP CABLE SCHEDULE, INSTRUMENT & CONTROL SHEET 1
BABF00000-01717-2100-43066	TS NORTH RAMP CABLE SCHEDULE, INSTRUMENT & CONTROL SHEET 2

Specifications:

BAB000000-01717-6300-13430	GENERAL DESIGN SPECIFICATIONS FOR INSTRUMENTS
BAB000000-01717-6300-13432	INSTALLATION, CALIBRATION, COMMISSIONING, AND STARTUP FOR INSTRUMENTATION AND CONTROLS

ATTACHMENT 2

REFERENCE DOCUMENTS PROVIDED

DOCUMENTS PROVIDED AS REFERENCE MATERIAL

The following documents are provided as reference material. They also appear by functional category in Attachment 1.

General

Specifications:

BAB000000-01717-6300-01300	SUBMITTALS
BAB000000-01717-6300-01400	CONTRACTOR QUALITY CONTROL/QUALITY ASSURANCE
BAB000000-01717-6300-01600	MATERIAL AND EQUIPMENT

Subsurface

Specifications:

BABFCC000-01717-6300-02452	SUBSURFACE RAILROAD TRACKWORK
BABFCC000-01717-6300-14960	RAIL CARS-TRANSPORTATION OF MATERIALS AND SUPPLIES
BABFCC000-01717-6300-14961	TROLLEY/BATTERY LOCOMOTIVES
BABFCC000-01717-6300-14962	SUBSURFACE DIESEL LOCOMOTIVES

Electrical

Specifications:

BAB000000-01717-6300-16050	BASIC ELECTRICAL MATERIALS & METHODS
BAB000000-01717-6300-16110	CONDUIT
BAB000000-01717-6300-16111	CABLE TRAYS
BABBD0000-01717-6300-16112	UNDERGROUND DUCTS AND MANHOLES
BAB000000-01717-6300-16121	MEDIUM VOLTAGE POWER CABLE
BAB000000-01717-6300-16122	600 V POWER AND CONTROL CABLE
BAB000000-01717-6300-16123	600 V INSTRUMENT CABLE
BAB000000-01717-6300-16130	PULL AND JUNCTION BOXES
BAB000000-01717-6300-16131	OUTLET BOXES
BAB000000-01717-6300-16141	WIRING DEVICES
BAB000000-01717-6300-16152	PACKAGED MECHANICAL EQUIPMENT
BABFAA000-01717-6300-16153	SUBSURFACE POWER CENTER ENCLOSURE
BAB000000-01717-6300-16190	SUPPORTING DEVICES
BAB000000-01717-6300-16195	ELECTRICAL IDENTIFICATION
BAB000000-01717-6300-16310	MEDIUM VOLTAGE SWITCHGEAR
BABBDA000-01717-6300-16311	MEDIUM VOLTAGE PAD MOUNTED SWITCHGEAR
BABFAA000-01717-6300-16312	SUBSURFACE MEDIUM VOLTAGE SWITCHGEAR
BABFAA000-01717-6300-16363	MEDIUM VOLTAGE PORTAL LOAD INTERRUPTER SWITCHES
BAB000000-01717-6300-16405	NEMA FRAME INDUCTION MOTORS (SMALL)
BAB000000-01717-6300-16420	SERVICE ENTRANCE
BAB000000-01717-6300-16425	LOW VOLTAGE SWITCHGEAR
BAB000000-01717-6300-16440	SERVICES SWITCHES
BAB000000-01717-6300-16450	GROUNDING
BABBD0000-01717-6300-16460	PAD MOUNTED TRANSFORMERS
BABBDA000-01717-6300-16461	LIQUID IMMERSED TRANSFORMERS
BAB000000-01717-6300-16462	DRY TYPE TRANSFORMERS
BABFCC000-01717-6300-16466	SUBSURFACE ELECTRIC TROLLEY SYSTEM
BAB000000-01717-6300-16471	POWER DISTRIBUTION PANELS & PANELBOARDS
BABFAA000-01717-6300-16475	SUBSURFACE SUBSTATION (PACKAGED EQUIPMENT)
BAB000000-01717-6300-16481	LOW VOLTAGE MOTOR STARTERS
BABFC0000-01717-6300-16482	VARIABLE SPEED DRIVES FOR CONVEYOR BELTS
BABBDA000-01717-6300-16484	LOW VOLTAGE MOTOR CONTROL CENTERS
BAB000000-01717-6300-16501	LAMPS
BAB000000-01717-6300-16502	FIXTURE ACCESSORIES
BAB000000-01717-6300-16510	FLUORESCENT LIGHTS
BABBDA000-01717-6300-16512	HIGH INTENSITY DISCHARGE LIGHTS
BAB000000-01717-6300-16535	EMERGENCY LIGHTS
BAB000000-01717-6300-16631	DC BATTERY SYSTEM
BAB000000-01717-6300-16671	LIGHTNING PROTECTION SYSTEMS

Structural

Drawings:

BABF00000-01717-2100-41099	RAIL PLACEMENT INVERT SEGMENTS - A, PLAN, SECTIONS & DETAILS
BABF00000-01717-2100-41100	RAIL PLACEMENT INVERT SEGMENTS - B, PLAN & SECTIONS

Specifications:

BABFCC000-0171706300-02453	SUBSURFACE RAILROAD TURNOUT
BAB000000-01717-6300-03101	CONCRETE FORMWORK SUBSURFACE
BAB000000-01717-6300-03201	CONCRETE REINFORCEMENT - SUBSURFACE
BAB000000-01717-6300-03301	CAST-IN-PLACE CONCRETE SUBSURFACE
BAB000000-01717-6300-03480	PRECAST CONCRETE
BAB000000-01717-6300-03600	EQUIPMENT AND STRUCTURAL SUPPORT BASE PLATE GROUT - SUBSURFACE

Any other material deemed necessary by a reviewer may be obtained by contacting the review secretary at any time during the review process.

LIST OF HANDOUTS PRESENTED AT DAILY DESIGN REVIEW MEETINGS

- 90% Design Review - Package 2C Topopah Spring North Ramp (Agenda and overview)
- Management and Independent Technical Review Plan
- 90% Design Review Briefing - Subsurface Design
- 90% Design Review Briefing - Subsurface Design Sketches
- 90% Design Review Briefing - Ground Control
- 90% Design Review Briefing - Electrical/Instrumentation
- 90% Design Review Briefing - Mechanical
- 90% Design Review Briefing - Determination of Importance Evaluation Discussion