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ITASCA
Consulting Group, Inc.

27 April 1987

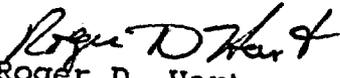
David Tiktinsky - SS623
U.S. Nuclear Regulatory Commission
Division of Waste Management
Washington, D.C. 20555

"NRC Technical Assistance
for Design Reviews"
Contract No. NRC-02-85-002
FIN D1016

Dear David:

Enclosed is Itasca's trip report for the 22-24 April 1987 meeting on the 30% Title II Design Review Meeting for SRP Exploratory Shaft Facility. Please call me if you have any questions.

Sincerely,


Roger D. Hart
Project Manager

cc: R. Ballard, Engineering Branch
Office of the Director, NMSS
E. Wiggins, Division of Contracts
DWM Document Control Room

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Itasca

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ITASCA TRIP REPORT

DATES: 22-24 April 1987

LOCATION: Hyatt Regency West
Houston, Texas

PURPOSE: 30% Title II Design Review Meeting for SRP
Exploratory Shaft Facility

ATTENDEES: J. Daemen and M. Board (Itasca) and Naiem Tanious
(NRC)

PREPARED BY: M. Board and J. Daemen

SUMMARY

This meeting was the culmination of a two-week review of the salt ESF 30% Title II design. The design of the shafts and underground facilities was accomplished by PB/KBB for DOE/SRPO, and the review was performed by DOE and its subcontractor (Weston) and ONWI and its subcontractors (Parsons-Redpath, the construction manager), and several government organizations, including MSHA and the U.S. Army Corps of Engineers). A complete listing of the reviewers is given in Attachment A. NRC was invited to observe the resolution of the comments generated by this design review. The reviewers produced a total of 781 comments in the following major areas: mining; civil; architectural; mechanical; electrical; miscellaneous; and specifications.

The meeting was led by Ken Beall of ONWI and Bob Janowski of PB/KBB. Prior to the meeting, review forms in each of the major topic areas were handed out to each participant. These forms contained each comment, the PB/KBB suggested resolution, and the name of the comment submitter. Each comment was taken, in turn, and discussion accepted from the participants until a resolution was obtained. The meeting was handled very well, allowing time for each comment to be resolved to the satisfaction of the commentator. All comments were resolved in the first two days of the meeting. An exit review between Naiem Tanious and Mark Board (of NRC and Itasca, respectively), Andy Avel and Manny Comar (of

ITASCA

DOE-SRPO), Dean Stucker (of DOE-HQ), and Ken Beall and George Huang (of ONWI) was held at the end of the comment resolution.

Specific Observations (M. Board)

The meeting was quite valuable for NRC in that it allowed examination of the up-to-date progress of the ESF. By observing the discussion of the various project participants in a design meeting, a rather detailed understanding of the problem areas inherent in the program was obtained. This type of information cannot be gathered by simple document review. The meeting, however, did not address performance of the ES facility but was oriented specifically to design issues and specifications.

In our opinion, the important points resulting from this meeting are listed below.

1. The ESF shaft is to be functional over a 100-year time span; however, it is a vital part of the overall repository and must be considered in licensing.
- 2 (a). The shafts use a rather complex freezing, lining, and sealing system for excavation through the non-salt aquifers below ground surface. This lining design is apparently the work of the Thyssen engineering staff and is based on German mining experience. Two major aquifers, the Ogalalla and Dockum, must be penetrated and sealed above the evaporites. This ground must first be frozen, then excavated using drill-and-blast and chipping (by pneumatic spades), and provided with a liner consisting of some or all of the following:
 - shotcrete
 - concrete bricks or cast-in-place concrete
 - welded steel liner plate
 - asphalt
 - expansive chemical seal rings.

The design of these components is presently at the Title II 30% phase—i.e., at the point where detailed specifications are being finalized. Yet, to our knowledge, no performance assessment has been released which details the mechanisms of radionuclide movement through this seal system. At present, we do not know if the proposed seals are to be permanent or temporary. If (as we assume) they are only to last through the closure, more information is required of the removal and interface with the permanent seal system. In other words, the engineering design of the seal system apparently has ad-

vanced beyond the performance studies upon which the design should be based. Of the hundreds of comments made on the Title II 30% design review, not one concerned the ability of the seal system to perform properly.

- 2(b). There were no detailed performance specifications discussed for the liner (either during this meeting or in Appendix E of Revision 2 of the General Requirements for a Mined Geologic Disposal System). It is, therefore, impossible to determine if the monitoring instruments given in the design actually can be used to verify the liner performance.
- 2(c). The design methodology discussed at this meeting employs what appears to be a detailed QA program for components easily specified by a performance specification (i.e., parts, welds, etc.). However, critical components of the liner such as the installation of concrete, steel liners, asphalt and chemical seal rings as well as the ground freezing do not appear to be well defined by specifications. For example, under the relevant specifications in the design, the asphalt pouring was governed by a standard highway asphalt specification. For this critical application, surely there must be detailed requirements regarding temperature, length of pour, non-destructive testing methods, etc. to verify the installation and performance. In this same general area, penetrations will be made through the liner for instrumentation. Such penetrations at WIPP have resulted in leakage problems.
3. The design of the liner may not be conservative. The documents released thus far do not detail the liner design calculations and will not be known until the release of the "Shaft Design Guide" sometime this summer. In common mining practice, shafts are not lined through salt or potash due to the liner stresses induced by closure. Here, the shaft will be lined through extensive portions of evaporites. The design calls for over-excavation of the salt in these zones and backfilling behind the liner with a weak, crushable material which can accept closure without excessive liner loading. The stresses shown in the back-up document ES-225-01 show the liner unloaded in these sections. The most conservative methodology here would be to design a liner based on a full lithostatic rock load. This may be particularly important at the contacts between evaporites and non-evaporites where point loading may be important.
4. The freeze wall design is non-standard, involving long (approximately 1,000 feet) angled holes. This appears to be impractical and should be replaced by standard methods. Strict

control of the freeze design should be maintained by the designer and not left to the construction contractor, as is presently planned so that control of induced rock damage upon freeze and thaw may be maintained. It is not apparent from the instrumentation exactly how damage will be established for performance assessment.

5. At the meeting, there appeared to be an ill-defined interface between the ES A/E (PB/KBB) and the repository A/E (Fluor). The impression from the meeting was that PB/KBB was not adequately assessing the impacts of ES construction on the repository performance. For example, at one point, PB/KBB stated that its flexibility in design allowed drifting in any coordinate direction, whereas the Fluor representative stated that such a plan would impact repository design and was not possible. The questions which need to be addressed now are whether ES design will affect repository performance, how integration of the performance assessment will occur, and how it will be determined that no adverse performance effects result.

Specific Observations (Jaak Daemen)

Attending the Title II 30% ESTF design review meeting was extremely valuable; it provided considerable detailed insight to the design approach being used. As such, it was excellent preparation for the upcoming 5-7 May NRC/SRP meeting on ESF design and construction.

The 30% design review is extensive and subject to stringent QA requirements but remains quite superficial—e.g., strongly emphasizing detailed construction specifications and drawings but not addressing design analyses or performance requirements or criteria. The latter, presumably, have been furnished to the designer and should include licensing and repository implications. Nevertheless, it was surprising to see how very little attention is being paid to potential consequences of ESTF construction with regard to licensing requirements as well as with regard to repository performance requirements given that the facility, particularly the shafts, eventually may become part of a repository and, notably, of the permanent sealing system. Although a few reviewers occasionally expressed concern about this regard, such comments had very little, if any, effect on the design group, who virtually never admitted to any significant concern in this regard. The designers predominately emphasized constructability (ease of construction). It remains quite uncertain how much site characterization (e.g., shaft wall geological mapping) will be performed

during shaft sinking. Of particular concern should be the fact that, in several important aspects with potentially major impact on repository performance (e.g., freeze wall design, freeze hole arrangement, freezing and thawing sequence and control, shaft excavation), extreme latitude, if not complete freedom, will be given to the construction contractor.

Conclusion

It is the opinion of the authors that several potentially serious problems may arise due to the apparent lack of performance analysis of the present shaft design. It is stressed that the shaft design has progressed to an advanced stage without apparent performance assessment.

Respectfully submitted,

Mark Board

Mark Board

mb/ks

COST BREAK-OUT

Labor

Mark Board	24 hrs @ \$23.56/hr	\$ 565.44
Jaak Daemen	8 hrs @ \$57.75/hr	462.00
		<hr/>
	TOTAL LABOR	\$1,027.44

Actual Expenses

Travel

Airfare		
Board		\$ 324.00
Daemen		298.00
Miscellaneous Travel Expenses		
Board (taxi, mileage)		\$ 28.00
Daemen (taxi)		21.00

Lodging

Board		
(3 nights @ \$61.05/night)		\$ 183.15
Daemen		
(1 night @ \$61.05/night)		61.05

Meals

Board		\$ 49.30
Daemen		35.30

Miscellaneous Expenses

Board (telephone)		\$ 14.12
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	TOTAL EXPENSES:	\$1,013.92
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ATTENDANCE LIST

APRIL 22-24, 1987

NAME	ROOM NO.	ORGANIZATION	COMMERCIAL PHONE
1. Austin Cooley	-	PB/PB-KBB	713-531-6069
2. BOB JANOWSKI	-	PB/PB-KBB	713-531-6069
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10. Romeo S. Jurani		Battelle ONWI	614 424 5111
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16. Randy Lentell		Woodward-Clyde (PB/PB-KBB)	(713) 531-6069
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18. Harry Gleser		PB/PB-KBB	(713) 531-6069.
19. ILL A. LANGR		PARSONS BRINCKERHOFF	(713) 531-6069
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21. MANNY COMAR		SRPD/COLUMBUS	614-424-5916
22. WAYNE SADIK		PB/PB-KBB	(713) 531-6069
23. Dean Stecker		DOE/HQ	(202) - 586 - 1244
24. Robert H. Robinson		Weston/Williams Bros.	(202) 646-6750

NAME	NO.	ORGANIZATION	COMMERCIAL PHONE
25. MARK Board		Intero Cons Grp (NRC)	612-623-9599
26. ERIK SVETON		WESTON/JACOBS	(202) 646-6699
27. NAJEM TANIOUS		NRC	FTS-427-4736
28. George B. Brooks		US ARMY Corps of Engneers/Ofc	716-876-5751/2231
29. James B. Warriner		Corps of Engineers Waterways Exp. Sta.	601-634-3610
30. Jack Darnen		Univ of Ar for NRC	602 621 2501
31. KEU BEALL		ONWI/ENFOR	614-424-4509
32. Susan Zimmerman		Nuclear Waste Programs office State of Texas	512-463-2198
33. Margaret Hart		Texas Water Commission	512-463-7797
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35. DONALD R. McMURRY	5401	J.S. REDPATH	602/345-2611
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