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CONCEPTUAL DESIGN PLAN
NEAR-SURFACE TEST FACILITY
PHASE II
PROJECT B-300b

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CONCEPTUAL DESIGN PLAN
NEAR-SURFACE TEST FACILITY
PHASE II
PROJECT B-300b

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Facilities Engineering and Construction Department
Research and Engineering

for

Basalt Waste Isolation Program

December 15, 1978

Prepared for the U. S. Department of Energy by
Rockwell Hanford Operations Under Contract EY-77-C-06-1030

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CONCEPTUAL DESIGN PLAN
NEAR-SURFACE TEST FACILITY
PHASE II
PROJECT B-300b
ROCKWELL HANFORD OPERATIONS
for the
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
RICHLAND, WASHINGTON

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Date 1-9-79

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1.0 PROJECT SUMMARY

1.1 OFFICIAL PROJECT TITLE

Project Number B-300b
Near-Surface Test Facility
Phase II
Spent Fuel Test

1.2 BRIEF DESCRIPTION OF PURPOSE

- Demonstrate and develop techniques for the safe placement and retrieval of the spent fuel canisters in a near-surface flow of the Columbia River Basalt.
- Determine whether there are any unacceptable effects resulting from the interaction of the nuclear waste and basalt.
- Provide information to be used for near-term validation of the current numerical design models of the repository.
- Develop a data base for the design, construction and licensing of a permanent large-scale basalt repository.

1.2.1 Test Summary

The in situ basalt test shall safely place, store and retrieve up to 20 spent fuel canisters in lined storage test holes during the 3-year period.

Three arrays of canisters are proposed: a single unheated canister; a multiple array of unheated canisters; and a multiple array of canisters supplemented with heaters. Instrumentation will be provided in the basalt near-field around each array to measure temperature, stress, displacement and radiation. Thermocouples will also be placed on each test hole liner to monitor liner temperatures throughout the test. From these data, canister and fuel element temperatures will be calculated.

1.2.2 Spent Fuel Form

Each test canister shall contain one pressurized water reactor (PWR) spent fuel assembly, nominally rated at one kilowatt of waste heat, delivered by truck in a licensed shipping cask.

1.3 PROJECT DESCRIPTION

1.3.1 Location

A site selection committee was established to evaluate and select a site for the location of the Near-Surface Test Facility. Primary criteria used in the selection process were basalt flow thickness, dryness, shallow depth and similarity to basalt units which are repository candidates. The Committee selected a site on Gable Mountain

on the Hanford Site (Figure 1). This site provides convenient access to the Pomona Basalt flow which exhibits the characteristics established in the primary criteria. The results of their study will be reported in RHO-BWI-CD-20.

1.3.2 Tunnels, Excavation and Test Holes

The underground tunnels include a test room for the storage of spent fuel, transfer and monitoring rooms, a ventilation raise and access tunnels (Figure 2). The excavation consists of box cuts approaching the tunnel portals. The test room includes test holes for spent fuel canister storage, rock monitoring instrumentation holes and ventilation and utility shafts. Cask interim storage holes are located in the transfer room.

The Phase II test shall utilize the west access tunnel and box cut (to be constructed for the Phase I test) as an emergency exit in the event of blockage of the nuclear waste access tunnel. The design for the tunnels and excavation has been issued and a construction contract has been awarded for both test areas.

1.3.3 Facility Systems

Facility systems include the site and tunnel improvements, mechanical, electrical (non-test), security and safeguards systems required for facility operations. The components of each facility system are described below.

1.3.3.1 Mechanical Systems

Facility mechanical systems include heating, ventilation and air conditioning, dewatering, safety and fire protection equipment and equipment enclosures.

1.3.3.2 Electrical Systems

The facility electrical system supplies power for the facility, handling equipment and test instrumentation. All wiring from the Phase I main power line to the point of use is included. Facility electrical systems include power, lights, alarms, radiation and environmental monitoring, test instrumentation power and communications. Cable trays for all wiring and instrument leads shall be provided in this system. A standby power system shall be provided to supply emergency power during periods of normal power outage.

1.3.3.3 Tunnel Outfitting

Tunnel outfitting shall include all isolation doors, walkways and shield walls.

FIGURE 1
HANFORD SITE

FIGURE 2

NEAR-SURFACE TEST FACILITY PHASE II TUNNEL SYSTEM

1.3.3.4 Security and Safeguards

A security system shall be provided to safeguard the facility during the test period. A protected area shall be established and personnel access controlled. Included in this system are an access guard station, perimeter fencing, intrusion alarms, personnel and facility monitoring equipment, alarms and security monitoring facility. Provisions for redundant alarm monitoring at another existing guard station shall be included.

1.3.3.5 Site Improvements

Site improvements shall include construction, final surfacing and upgrading of roads and parking areas and health physics and office trailers. These improvements are in addition to those specified in 1.3.3.4 above.

1.3.4 Remote Handling Equipment

This system shall include the design, fabrication, and installation of equipment required for remote handling of the shipping casks and canisters. Sub-systems to be installed are cask unloading, canister transfer and installation and instrumentation.

1.4 PROJECT TOTAL ESTIMATED COST

The rough order of magnitude estimated cost for the project is \$12,800,000*.

1.5 SCHEDULE

- Planned Budget--\$407,000 - Fiscal Year (FY) 1979.
- Construction Completion Date--Second Quarter FY 1981.
- Initial Operation Date--Second Quarter FY 1981.

1.6 CONSTRUCTION, PLANNING AND DESIGN FUNDS

No Construction, Planning and Design Funds are required for this project.

*Presented in the revised Schedule 47 (letter R70-0018, January 4, 1979, R.A. Deju to R.B. Goranson).

2.0 CONCEPTUAL DESIGN SUMMARY

2.1 SCOPE OF WORK TO BE ACCOMPLISHED DURING CONCEPTUAL DESIGN

During the conceptual effort, it is planned that the following items of work shall be accomplished.

- Establishment of facility functions, requirements and criteria will be an extension and refinement of the functional design criteria (RHO-CD-381). Output documents are to be conceptual drawings, specifications, project cost estimates and the conceptual design report.
- Completion of facility design layouts of major equipment and interfaces with existing facilities and utilities. Output documents are to be conceptual drawings and outline specifications.
- Development of an equipment list which will include electrical and remote handling equipment, ventilation and air conditioning equipment, facility, instrument lists, specialty items and safety monitor and alarm systems. Long-lead procurement items will be identified. Output documents are to be lists included in the conceptual design report.
- As identified in the Network Schedule, certain conceptual design efforts will require evaluation of alternate designs. Evaluation of the alternate designs will produce a recommended primary design which the Rockwell Hanford Operations (Rockwell) project engineer and normal Rockwell design review functions will review and approve. Alternate design layouts will be available for the Rockwell reviews of the recommended primary design candidates.
- Site evaluation and selection have been completed.
- A cost estimate to be compiled by Rockwell will be prepared by each organization for its part of the conceptual design. This report will include the estimated costs of Titles I, II and III design; advanced procurement costs for long-lead materials or engineered components; major facility construction costs; contingency and escalation percentages; plus any related contractor overhead.
- A master schedule for the performance of the major project activities has been developed by Rockwell and will be included in the conceptual design report. Each participant shall provide lower level schedules that show key milestones and key interface points. These schedules will also be provided in the conceptual design report.
- In addition to project management and control requirements outlined in U. S. Energy Research and Development Administration (U. S. Department of Energy) Appendix 6101, Management of Construction Projects, management plans and control procedures will be established by Rockwell to include the following:

- a. Project management plan (RHO-BWI-CD-29) for Phase II activities;
 - b. Weekly status review meetings of conceptual design effort;
 - c. Controlled release of engineering drawings and documents;
 - d. Project engineer assignment to interface remote handling designer effort with all conceptual effort related to remote handling equipment;
 - e. Project engineer assignment to interface test design and planning activity with all conceptual effort related to testing.
- An environmental impact assessment (RHO-BWI-CD-14) of the Near-Surface Test Facility to accommodate spent fuel has been prepared. Facility pollution control and environmental protection will be reviewed with respect to the assessment and a narrative summary will be included in the conceptual design report.
 - Safeguards and security design criteria were established during preconceptual studies and are included in the release of the functional design criteria for conceptual design application.
 - Facility safety provisions and needs will be reviewed. The conceptual design will include provisions for personnel safety, radiation control, wind analysis, tornado and earthquake effects on the storage facility. Output data are included in the functional design criteria for conceptual design application.

2.2 METHOD OF ACCOMPLISHMENT

The description of work, responsibility and schedule for accomplishment are shown in the Schedule-Conceptual Design Plan and in the Network Schedule (Figure 3). The scope of work will be provided in the work statements which accompany the purchase orders or work orders. The interfaces between the organizations will be accomplished and controlled by a Rockwell activity leader.

2.2.1

The tunnel design will be revised as required by the approved test plan (RHO-BWI-CD-24), remote handling system design and information from Phase I tunnel construction.

LEGEND

- ▼ ACTUAL
- △ SCHEDULED
- △ START WORK
- △ SUBMIT TO ROCKWELL
- △ SUBMIT TO DOE
- △ COMPLETE

SCHEDULE CONCEPTUAL DESIGN PLAN

NEAR SURFACE TEST FACILITY
PHASE II
PROJECT No. B-300b

NOTES

- ① SUB-CONTRACTED
- ② INTERFACING WORK NOT PART OF PROJECT DIRECTIVE
- ③ INCLUDES OVERHEAD

SOURCE OF FUNDS FY 1979

DESCRIPTION OF WORK	CONTRACTOR	③ EST COST \$ x 1,000 FY 79	MAN MONTHS	FY 1979								
				OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
FUNCTIONAL DESIGN CRITERIA	ROCKWELL	5	1				△					
CONCEPTUAL DESIGN PLAN	ROCKWELL	2	0.5		△	△						
FACILITY CONCEPTUAL DESIGN TUNNELS & TESTHOLES FACILITY & SITE REQUIREMENTS	ROCKWELL	17	3.5		△							
	VITRO	119	25.5				△				△	
REMOTE HANDLING CONCEPTS TRADE STUDIES	ROCKWELL	12	2.5					△				
CONCEPTUAL DESIGN	ATOMICS INT	102	①			△	△					
TEST & TEST SYSTEM CONCEPTS ② TEST PLAN	ROCKWELL	—	—		△	△						
② EQUIP. DESIGN EQJIP. INSTALLATION	ROCKWELL	—	—			△						
	ROCKWELL	30	6			△						
COST ESTIMATE PREPARATION	ROCKWELL	5	1						△			△
CONCEPTUAL DESIGN REPORT	ROCKWELL	10	2				△					3/2
REQUEST FOR DIRECTIVE ②	ROCKWELL	5	1						△			3/2

2.2.2

Facility and site systems conceptual designs will be accomplished in accordance with the Phase II test plan and functional design criteria requirements.

2.2.3

The remote handling system conceptual design shall provide equipment to remove a spent fuel canister from the shipping cask, place it in the test hole and then place a shield plug in the hole.

Conceptual design shall develop interface data to confirm tunnel and facility compatibility. Physical size, power requirements, installation constraints and instrumentation are the major interface outputs.

2.2.4

Remote handling equipment installation conceptual design will integrate the handling equipment with the facility whether it is permanently affixed or mobile.

2.3 SCHEDULE

The schedule for the accomplishment of work is shown in the Network Schedule and Figure 3. The schedules are preliminary information and will be confirmed in the conceptual design report.

2.4 ESTIMATED COSTS

The estimated costs to accomplish the conceptual design in dollars and man-months are shown on the Schedule-Conceptual Design Plan. These are preliminary estimates prepared by Rockwell cost estimators and are based on their experience in the field using inputs from various Rockwell groups. Detailed cost estimates for Titles I, II and III will be prepared by the design participants during the conceptual design phase. Rockwell will monitor and control costs through updated cost summaries included in each monthly report submitted by the participants.

2.5 WORK PLANS

A complete outline, including work scope, description, estimates and schedules for major engineering and development efforts is contained in RHO-CD-132 REV 1. In addition, each phase of the conceptual design will be governed by a work plan prepared by the responsible contractor showing, for each task, the schedule and manpower requirements.

2.5.1 Non-Directive Work Integration with Directive Work

The work items in the Schedule-Conceptual Design Plan marked ② are not covered by the project directive. Since these items are not to be in the conceptual design report, they will be reported separately. Non-directive work items include test plan, test equipment and installation and the request for directive.

The project team functions are organized so that project plans, schedules, and actions will identify physical, schedule and cost interfacing points to assure proper integration of directive and non-directive tasks.

3.0 REFERENCES

1. S. D. Sharpe, Site Selection Report, Basalt Waste Isolation Program, Near-Surface Test Facility, RHO-BWI-CD-20, Rockwell Hanford Operations, Richland, Washington (December 4, 1978). ✓
2. H. D. McDonald, Functional Design Criteria, Waste Isolation Program, Near-Surface Test Facility, Phase II, Project Number B-300b, RHO-CD-381 REV 1, Rockwell Hanford Operations, Richland Washington (July 25, 1978). ✓
3. ERDA, Management of Construction Projects, Appendix 6101.
4. D. J. Carrell and G. J. Pilicy, Environmental Impact Assessment, Extension of the Near-Surface Test Facility to Accommodate Spent Fuel, RHO-BWI-CD-14, Rockwell Hanford Operations, Richland, Washington (June 1978). ✓
5. M. P. Board, M. P. Hardy, W. H. Heneveld, and D. L. Martin, Near-Surface Test Facility, Phase II Test Plan, Project Number B-300b, Rockwell Hanford Operations, Richland, Washington (November 10, 1978).
6. R. A. Deju, Basalt Waste Isolation Program Plan, RHO-CD-132 REV 1, Rockwell Hanford Operations, Richland, Washington (November 1978).
7. J. E. Hammond, Project Management Plan, Near-Surface Test Facility, Phase II, Project B-300b, Rockwell Hanford Operations, Richland, Washington (November 30, 1978).