See Pocket 13 for encl.

WM Record File 106

WM Project 16
Docket No.
PDR ✓
LPDR ✓

T. Verma

Distribution:
D Galson
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J Linehan
(Return to WM, 623-SS) Sac

Department of Energy
Chicago Operations Office
Salt Repository Project Office
505 King Avenue
Columbus, Ohio 43201-2693

February 19, 1986

'86 OCT -2 A10:41
WM DOCKET CONTROL CENTER

R. Lahoti, SRPO

SUBJECT: MEETING NOTES - SRP/WIPP TECHNICAL INFORMATION EXCHANGE MEETING

Location and Date: SRPO Conference Room, Columbus, Ohio, February 11-12, 1986.

Purpose: The purpose of the meeting was to discuss with WIPP personnel and their contractors, the methods available for technical information exchange between WIPP and SRP. See attached agenda.

Attendees: See attached list.

Discussion: On February 11, 1986, introductions and presentations were made according to the agenda. Attached are the handouts given to accompany the presentations.

Following action items resulted from the meeting:

1. SRPO and WIPP will establish a schedule for Quarterly Formal Meetings, suggested at end of February, May, August, and November. SRPO will prepare a draft agenda for the next quarterly meeting by mid-March and provide a copy to WIPP for concurrence.

2. Both WIPP and SRPO agreed that informal technical exchanges should take place on an as-needed basis and can start immediately.

3. Sandia will provide a list of Sandia publications to SRPO by February 19, 1986.

4. WIPP will check and notify SRPO on availability of a list of WIPP publications within the next two weeks.

5. SRP will prepare a draft proposal for stationing SRP designated personnel at WIPP and provide WIPP with a draft for their comments by February 28, 1986.

6. SRP will prepare a draft proposal for testing at WIPP two pieces of SRP equipment and provide draft copy of the proposal to WIPP by February 28, 1986.

7. WIPP will provide information on core availability for core degradation tests by February 19, 1986.

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P-13

8. WIPP will notify SRP of the scheduled date for the horizontal emplacement equipment prototype demonstration by Westinghouse, in Pittsburg, by February 19, 1986.

9. SRP will provide NRC Meeting Notices and a copy of the NRC Site Specific Agreement to WIPP by February 20, 1986.

10. WIPP visits of 5 or less people from SRP will be coordinated informally. Visits of more than 5 people will need to be coordinated formally.

Jane Powell

Jane Powell
Project Engineer
In Situ Testing
Salt Repository Project Office

SRPO:JP:max:1398C

Enclosures:
As Stated

cc: J. Neff, SRPO
P. Van Loan, SRPO
T. Taylor, SRPO
J. Sherwin, SRPO
J. England, SRPO
G. Appel, SRPO
R. Stein, DOE-HQ
R. Cooper, WIPP
D. Crawley, WIPP

ST# 293-86

TENTATIVE AGENDA FOR SRP/WIPP

TECHNICAL INFORMATION EXCHANGE MEETING

February 11 and 12, 1986

BATTELLE, ROOM 11 CONFERENCE ROOM C (Main Lobby)

February 11, 1986

8:00 - 8:15	Introductions	SRPO/WIPP
8:15 - 8:30	SRP Organization, Objective Schedule & Current Activities	SRPO
8:30 - 9:00	Overview, Rationale & Schedule for SRP In-Situ Testing and Experiments	SRPO/ONWI
9:00 - 9:30	WIPP's R&D Program Background/Objectives/ Responsibilities	WPO
9:30 - 10:00	WIPP Experimental Program Overview/Rationale/Summary of Accomplishments	SNL
10:00 - 10:15	Discussion	
10:15 - 10:30	Break	
10:30 - 11:00	Waste Package Activities at SRP Update/Reference Materials/Schedule	SRPO/ONWI
11:00 - 11:30	Waste Package Experiment at WIPP WIPP R&D Rationale WIPP Materials Testing Update	SNL
11:30 - 12:00	Discussion	
12:00 - 1:00	LUNCH	

February 11, 1986 p.m.

1:00 - 1:45	SRP Repository Design and Waste Emplacement Concepts	SRPO/ONWI
1:45 - 2:00	Emplacement Concepts for Defense Waste	WPO
2:00 - 2:45	Waste Emplacement Lessons Learned and New Applications	Westinghouse
2:45 - 3:00	Break	
3:00 - 3:30	Experimental Concepts Relative To Waste Emplacement	SNL
3:30 - 4:00	General Discussion	

February 12, 1986

9:00 - 9:30	Recap of Past Exchanges	WPO/SRPO
9:30 - 10:15	Discussion of SRPO/WPO Interactions: Status, Assessment of Benefits, Future Activities	SRPO/WPO
10:15 - 11:00	Optional Closeout Discussions and Planning Meeting	DOE Representatives

SRP/WIPP POINTS OF CONTACT

	SRPO*	ONWI**	DOE/WIPP	CONTRACTORS
1. Overall Coordination	Ram Lahoti	Hemi Kalia 614 424-4956	Dick Crawley FTS 571-2214 Randy Robinson FTS 571-2213	Wendell Weart, SNL FTS 844-5678
2. Rock Mechanics	Bob Waters	Howard Hume 614 424-7539	Randy Robinson	Lynn Tyler FTS 844-8179
3. Waste Package	Roger Wu	John Carr 614 424-7636	Randy Robinson	Lynn Tyler
4. Hydrology	Jo-Ann Sherwin	Walt Newcomb 614 424-7685	Dick Crawley	Al Lappin, SNL Roy McKinney, WE 505 887-0586
5. Sealing	Steve Webster	Judith Moody 614 424-5536	Randy Robinson	Lynn Tyler, SNL
6. Repository Design Construction, Operation for Repository	Keith Robinette	Vincent Rutkauskas 614 424-7816	Randy Robinson	Vic DeJong, WE 505 887-0586
7. Performance Assessment	Gordon Appel	John Kircher 614 424-5628	Dick Crawley	Becky Rigney, WE 505 887-0586
8. Environmental	Ted Taylor	Bob Kennedy 614 424-4291	Dick Crawley FTS 571-2214	Becky Rigney, WE

* SRPO telephone number is (FTS) 976-5916
** FTS 976 - last four digits

AREAS OF POTENTIAL APPLICATION TO RW/SRPO

- Regional hydrology and modeling
- Site characterization, methodology, and related programmatic issues
- Repository development
- R&D Programs (lab/models/insitu)
- Institutional experience
- Development of criteria and requirements (repository and waste)
- Lessons learned and experience from emplacement/retrieval equipment design
- Experimental program mobilization
- Instrumentation development, installation, and maintenance
- Experimental modeling and data acquisition/reduction/analysis
- Design validation, strategy, and implementation
- Repository, design, and implementation experience
- Environmental monitoring methodology
- Computer applications
- Radiation safety/operational shielding/exposure
- Waste transportation and handling
- Waste acceptance criteria and management
- Mining and shaft sinking . . . methods/planning/costs
- Public Relations/Project Support/Community Support/Spin off Activities
- Quality Assurance experience
- Facility planning, integration, start-up, and staffing
- Lessons learned in all areas

WIPP AND SRPO TECHNICAL EXCHANGES

TECHNICAL EXCHANGES TO DATE:

1) KICKOFF AND INSITU TEST
2) THERMAL STRUCTURAL INTERACTIONS
3) PLUGGING AND SEALING AND WASTE PACKAGE INTERACTIONS
4) WIPP OPERATIONS AND EQUIPMENT
5) SITE CHARACTERIZATION
6) WIPP SPDV COST DATA
7) WASTE PACKAGE MATERIALS AND HORIZONTAL EMPLACEMENT OF WASTE PLANNED

RECENT WIPP AND SALT REPOSITORY PROJECT OFFICE (SRPO) INTERACTIONS

- POINTS OF CONTACT, BOTH DOE AND CONTRACTOR ESTABLISHED
- SEVEN FORMAL TECHNICAL EXCHANGES WITH SRPO
- ONE COOPERATIVE WORK EFFORT UNDERWAY
- TWO TO FOUR DOCUMENT REVIEWS PER YEAR
- INTER-PROJECT OR LOWER LEVEL PROCEDURAL AGREEMENT "ON HOLD"

Department of Energy
Chicago Operations Office
Salt Repository Project Office
505 King Avenue
Columbus, Ohio 43201-2693

February 4, 1986

SRPO Staff

SUBJECT: SRPO/WIPP TECHNICAL INFORMATION EXCHANGE MEETING, FEBRUARY 11-12, 1986

Please find attached a tentative agenda for subject meeting.

If you have any questions or wish to attend, please contact Jane Powell.

Ram B. Lahoti
Chief
Engineering and Technology
Salt Repository Project Office

SRPO:JP:max:1202C

Enclosure:
As Stated

cc: J. Neff, SRPO
R. Wunderlich, SRPO
K. Kalia, ONWI
W. Carbeiner, ONWI, w/encl.

ST# 261-86

TENTATIVE AGENDA FOR SRP/WIPP

TECHNICAL INFORMATION EXCHANGE MEETING

February 11 and 12, 1986

SRPO CONFERENCE ROOM

February 11, 1986

8:00 - 8:15	Introductions	SRPO/WIPP
8:15 - 8:30	SRP Organization, Objective Schedule & Current Activities	SRPO * Interaction * WIPP experiments, data * equipment, instrumentation etc. * lessons learned
8:30 - 9:00	Overview, Rationale & Schedule for SRP In-Situ Testing and Experiments	SRPO/ONWI
9:00 - 9:30	WIPP's R&D Program Background/Objectives/ Responsibilities	WPO
9:30 - 10:00	WIPP Experimental Program Overview/Rationale/Summary of Accomplishments	SNL
10:00 - 10:15	Discussion	
10:15 - 10:30	Break	
10:30 - 11:00	Waste Package Activities at SRP Update/Reference Materials/Schedule	SRPO/ONWI
11:00 - 11:30	Waste Package Experiment at WIPP WIPP R&D Rationale WIPP Materials Testing Update	SNL
11:30 - 12:00	Discussion	
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February 11, 1986 p.m.

1:00 - 1:45	SRP Repository Design and Waste Emplacement Concepts	SRPO/ONWI
1:45 - 2:00	Emplacement Concepts for Defense Waste	WPO
2:00 - 2:45	Waste Emplacement Lessons Learned and New Applications	Westinghouse
2:45 - 3:00	Break	
3:00 - 3:30	Experimental Concepts Relative To Waste Emplacement	SNL
3:30 - 4:00	General Discussion	

February 12, 1986

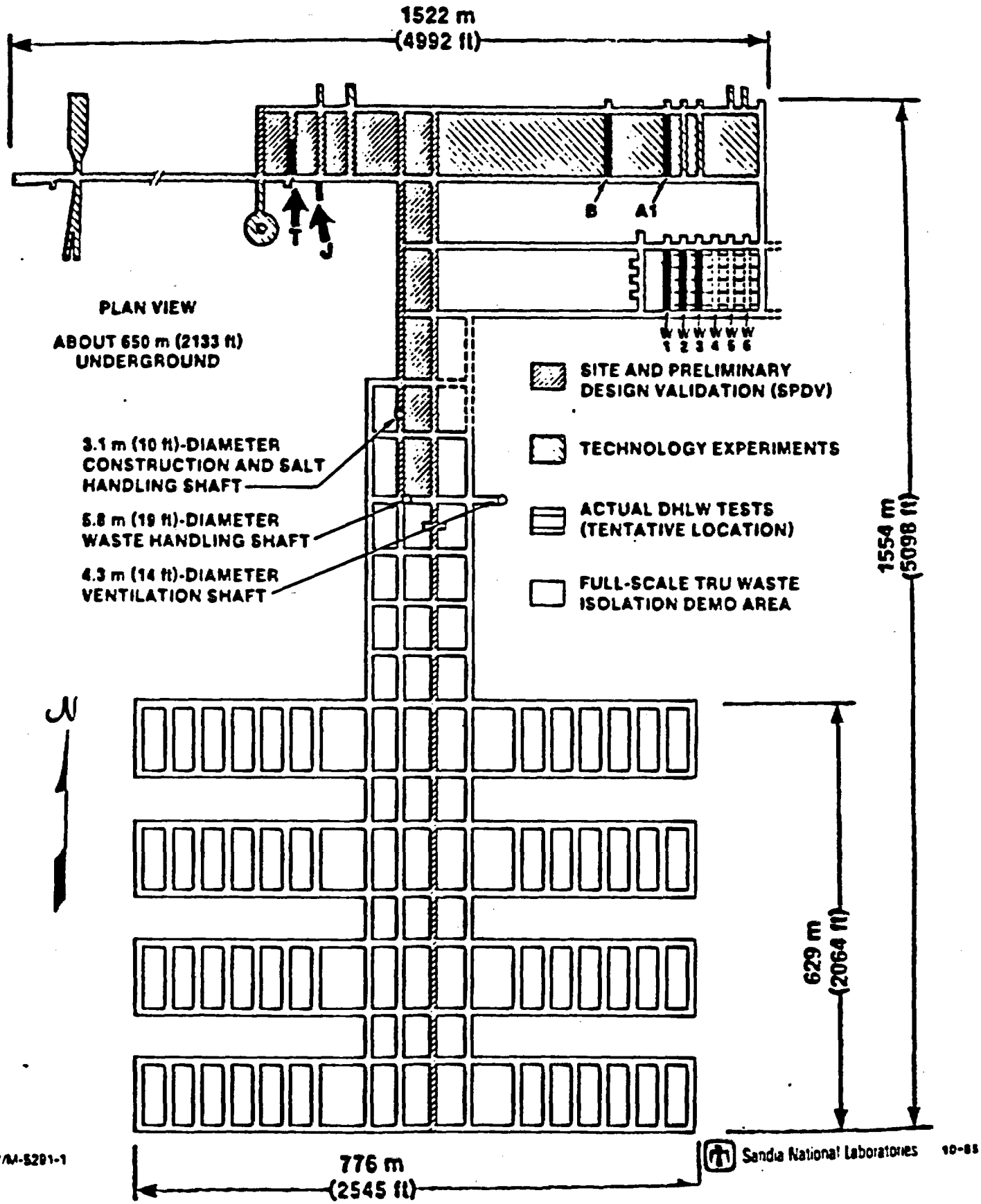
9:00 - 9:30	Recap of Past Exchanges	WPO/SRPO
9:30 - 10:15	Discussion of SRPO/WPO Interactions: Status, Assessment of Benefits, Future Activities	SRPO/WPO
10:15 - 11:00	Optional Closeout Discussions and Planning Meeting	DOE Representatives

WIPP MISSION
(PL-96-164)

"... FOR THE EXPRESS PURPOSE OF PROVIDING A RESEARCH AND DEVELOPMENT FACILITY TO DEMONSTRATE THE SAFE DISPOSAL OF RADIOACTIVE WASTES RESULTING FROM THE DEFENSE ACTIVITIES AND PROGRAMS OF THE U.S. EXEMPTED FROM REGULATION BY THE NUCLEAR REGULATORY COMMISSION ..."

Sandia National Laboratories

WIPP WASTE PACKAGE PERFORMANCE EXPERIMENT ROOMS



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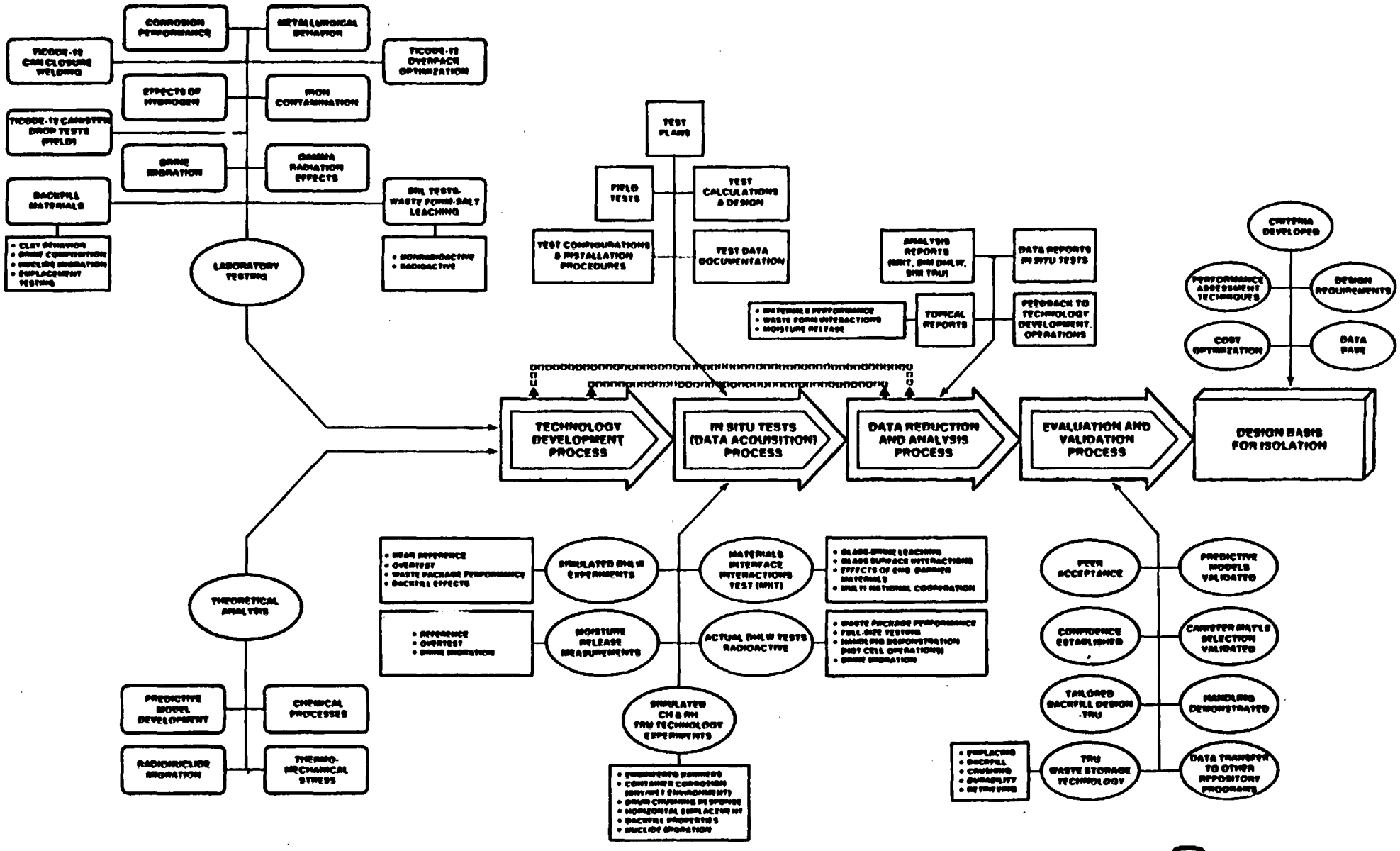
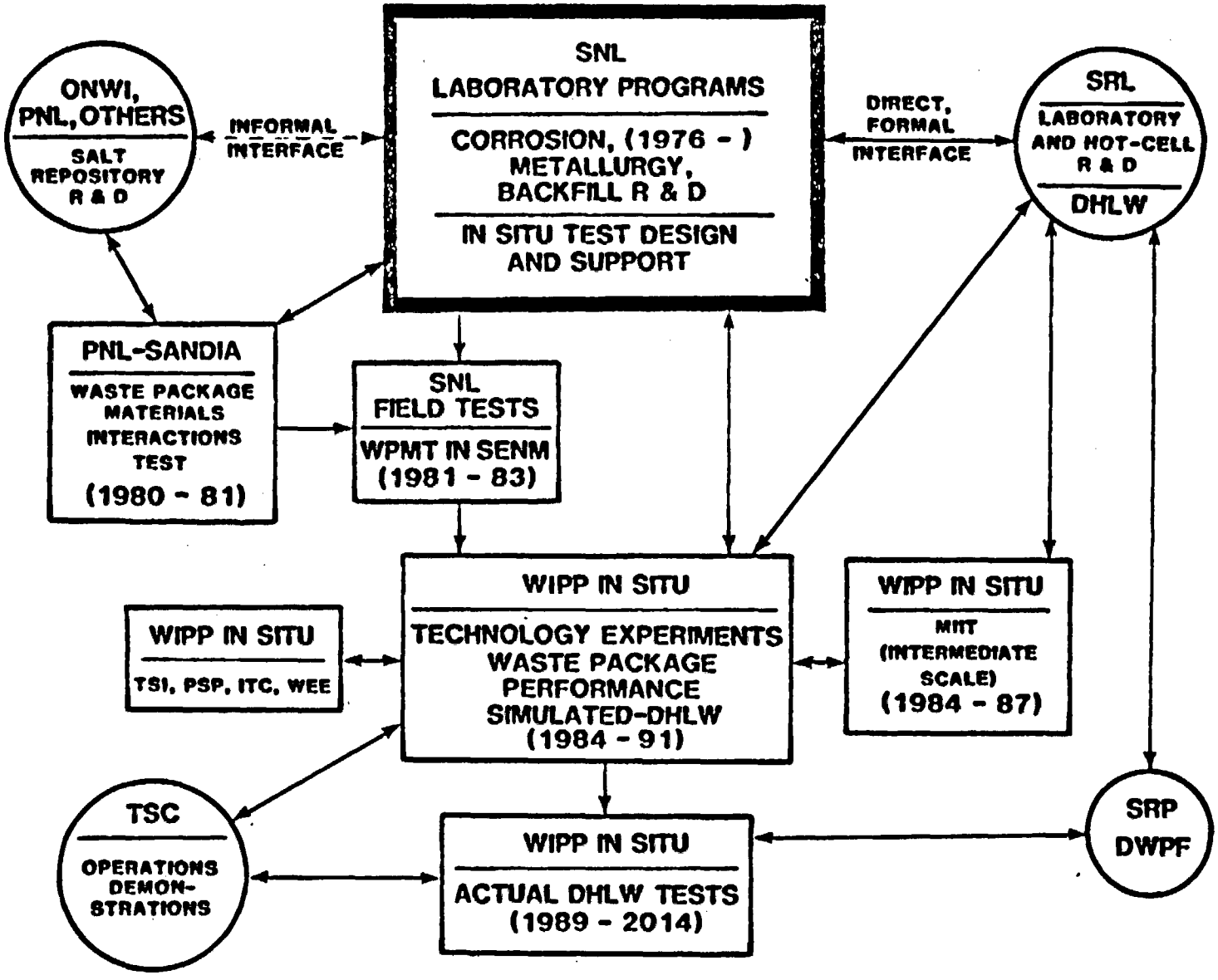
WASTE PACKAGE INTERACTIONS
WASTE PACKAGE PERFORMANCE PROGRAM
(WIPP PROJECT)



Sandia National Laboratories



SANDIA WASTE PACKAGE RESEARCH PROGRAMS:
TIME PROGRESSIONS AND INTERFACES

Sandia National Laboratories

WIPP WASTE PACKAGE PERFORMANCE TECHNOLOGY EXPERIMENTS-SIMULATED DHLW OBJECTIVES

- EVALUATE IN SITU DHLW PACKAGE MATERIALS DURABILITY & INTEGRITY, UNDER NEAR-REFERENCE & ACCELERATED SALT REPOSITORY CONDITIONS

  1. SRL-DWPF GLASS WASTE FORM (NONRADIOACTIVE)
     - •• FULL-SIZE CANISTERS
     - •• SMALL-SCALE BARE GLASS PELLETS
     - •• MATERIALS INTERFACE INTERACTIONS TEST

  2. WASTE PACKAGE DESIGN COMPARISONS
     - SNL TiCODE-12 CANISTER
     - ONWI-DESIGN, MILD STEEL OVERPACK

  3. CANISTER & OVERPACK CORROSION, METALLURGY

  4. BACKFILL FEASIBILITY AND PERFORMANCE

  5. NEAR-FIELD EFFECTS, BRINE MIGRATION

- COMPARE WITH LABORATORY TESTING, MODELING FOR LONG-TERM PREDICTIONS

- REFINEMENT OF TESTING & INSTRUMENTATION SYSTEMS, TESTING PRECURSOR TO ACTUAL DHLW TESTS••

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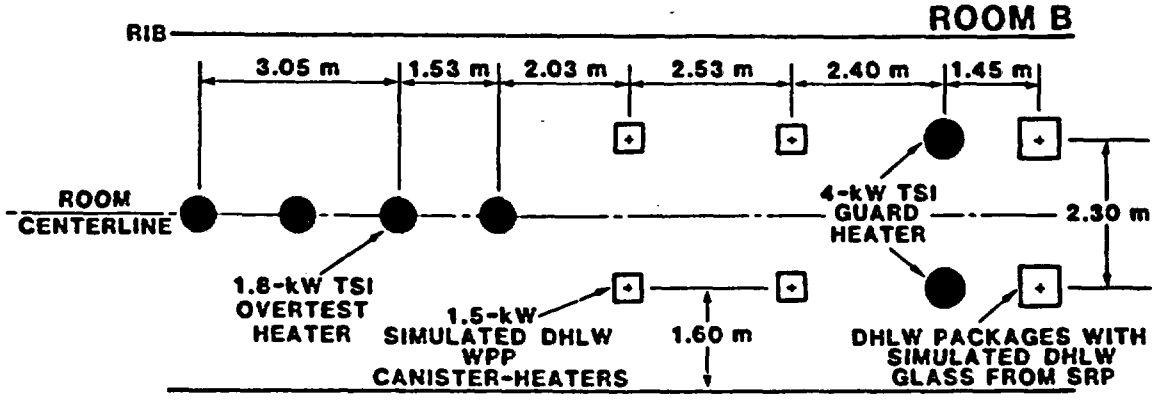

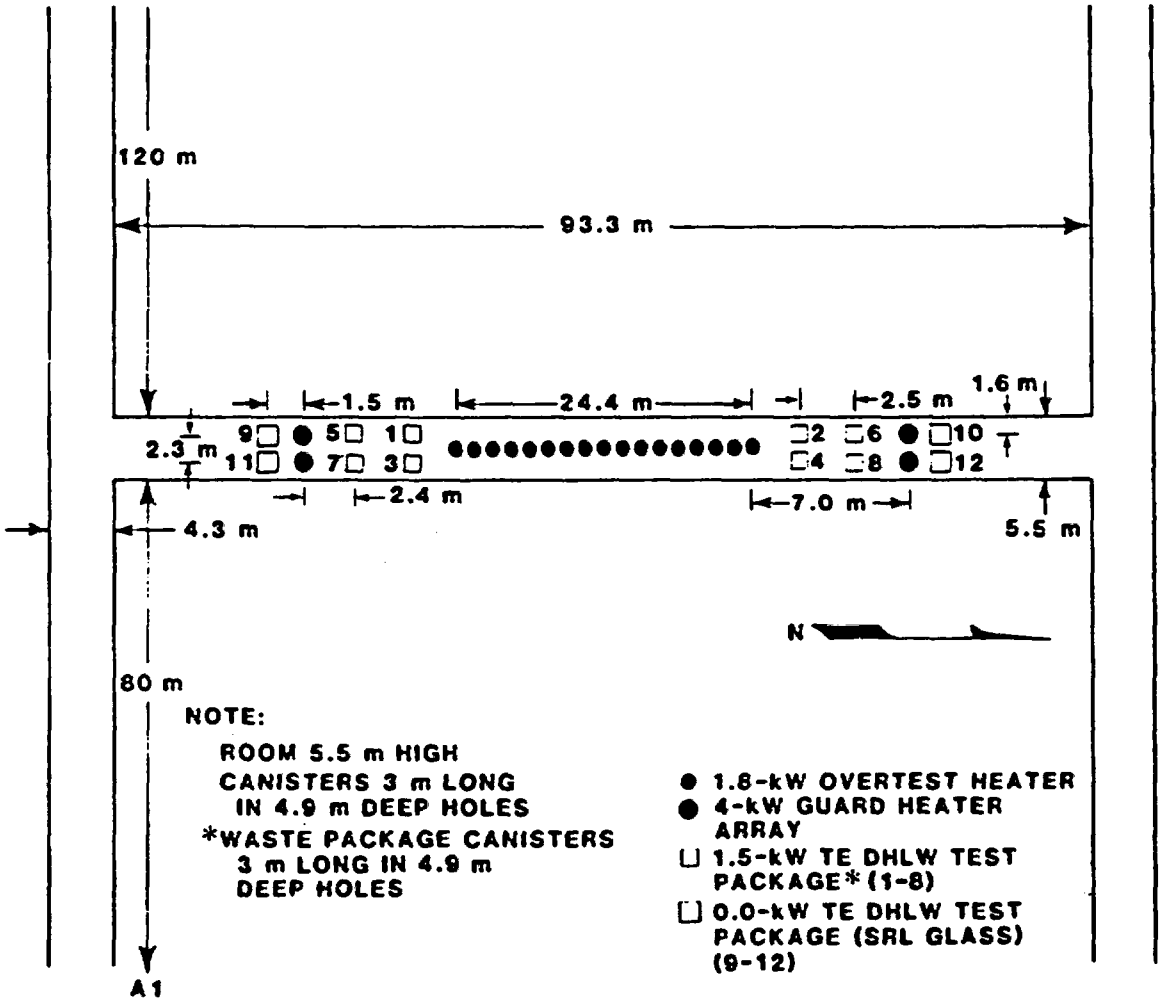

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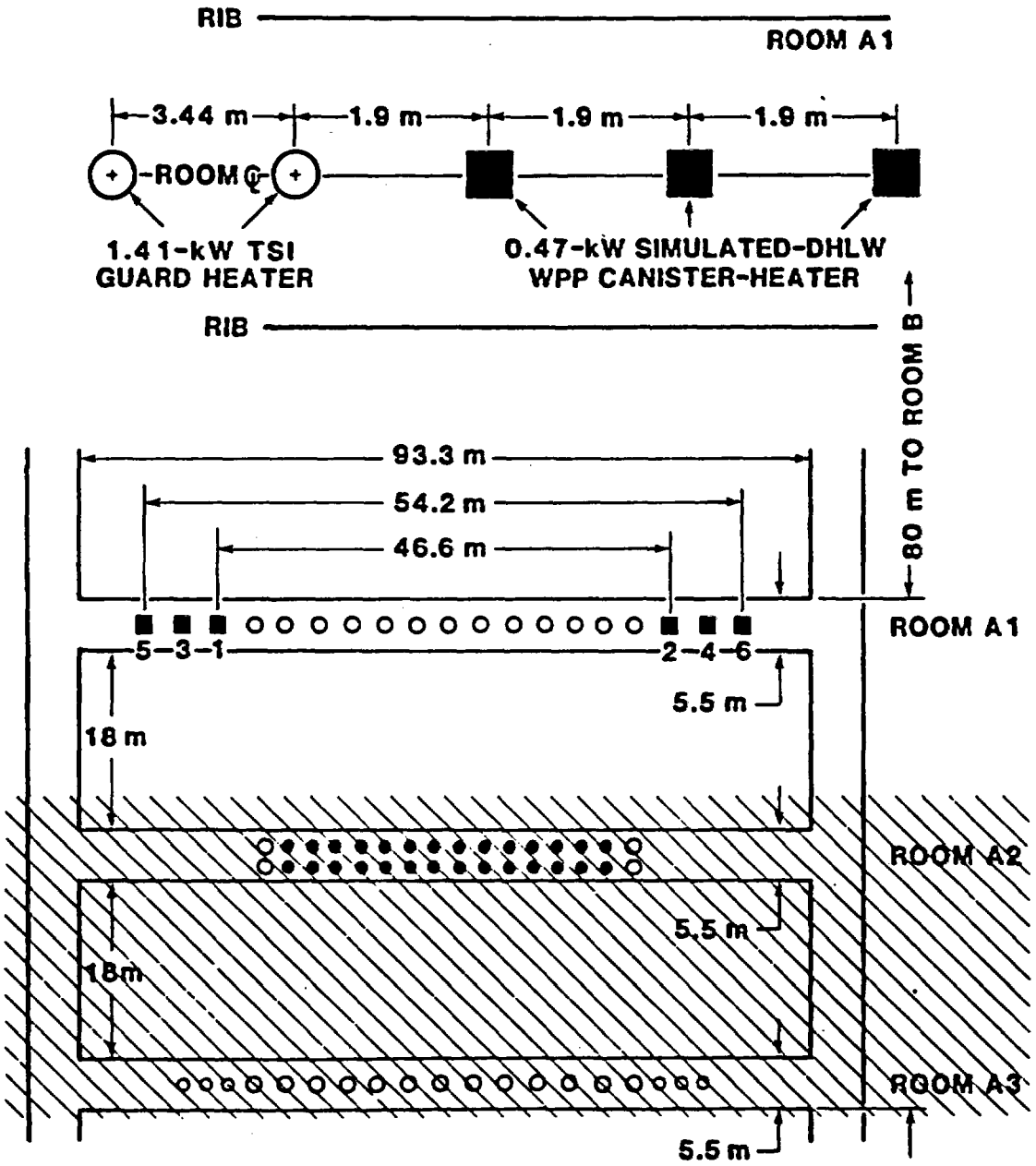


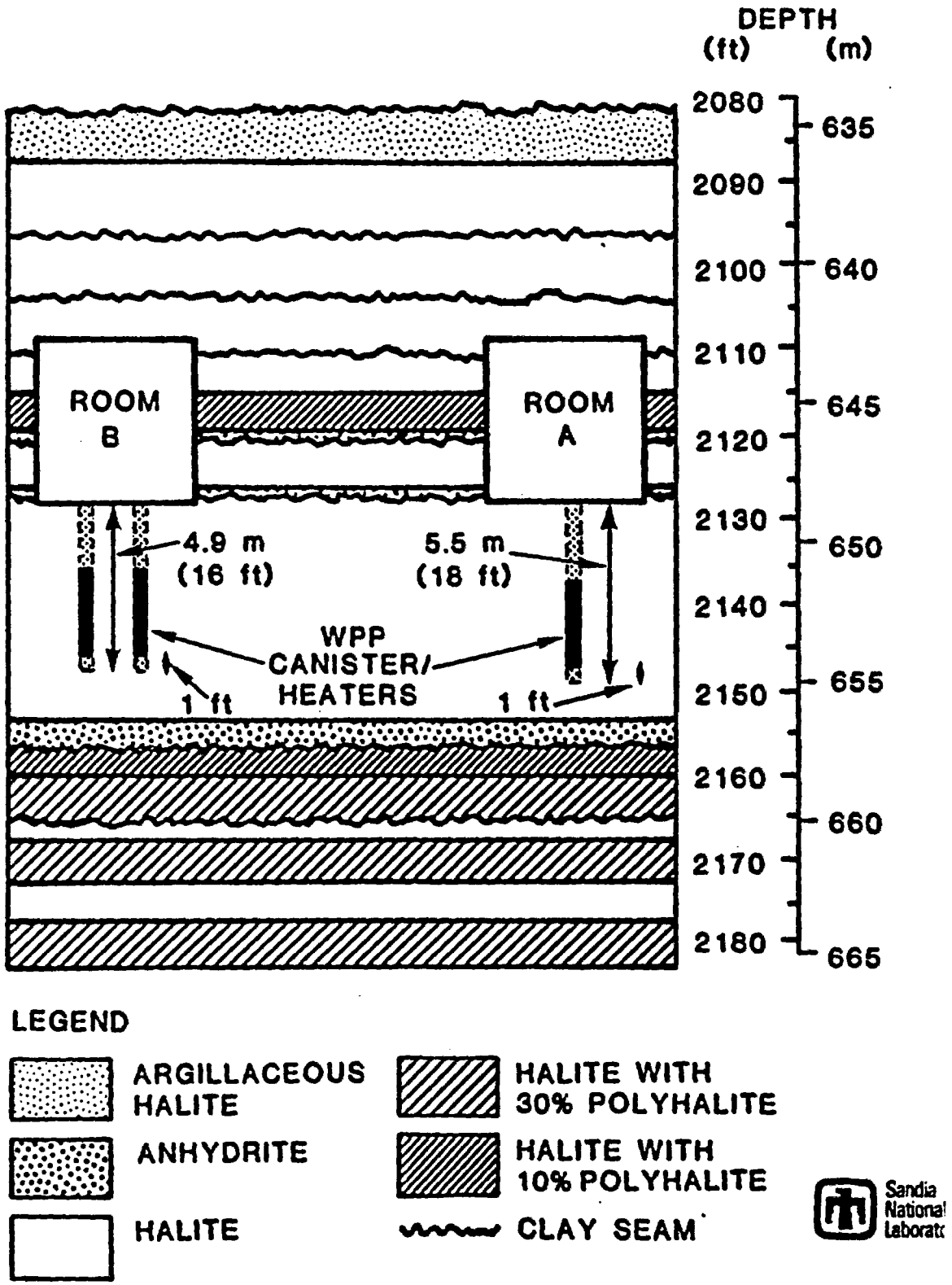
NOTES:

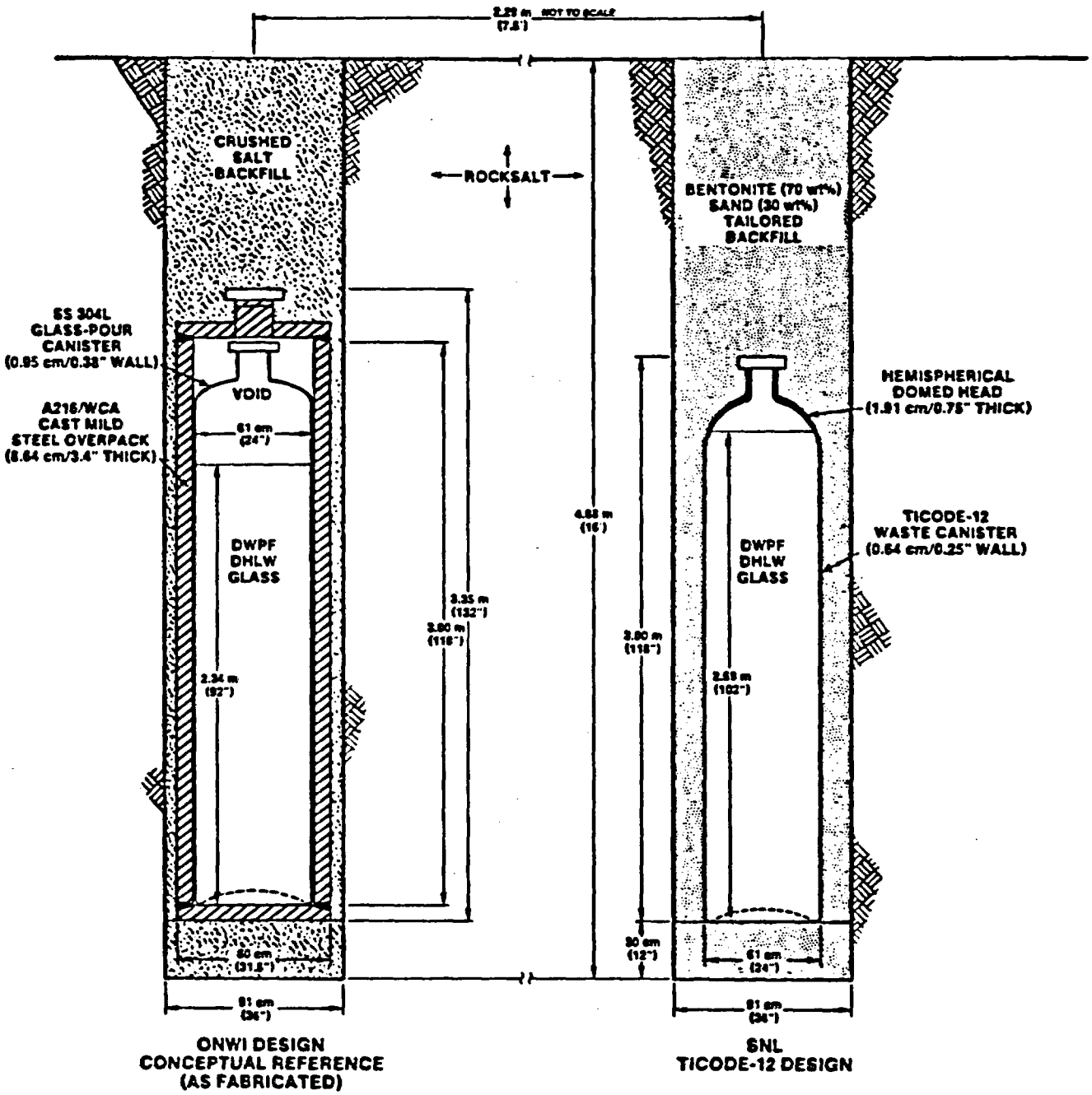
ROOMS 5.5 m HIGH
CANISTERS 3 m LONG
IN 5.5-m-DEEP HOLES
NOT TO SCALE

■ SIMULATED-DHLW WPP CANISTER-HEATERS, 0.47-kW

● 0.47-kW TSI CANISTER HEATER

○ 1.41-kW TSI GUARD HEATER


DEPTH
(ft)
(m)
2080
635
2090
2100
640
2110
645
2120
2130
650
2140
655
2150
2160
660
2170
2180
665
ROOM B
ROOM A
4.9 m
(16 ft)
5.5 m
(18 ft)
WPP
CANISTER/
HEATERS
1 ft
1 ft
LEGEND
ARGILLACEOUS HALITE
ANHYDRITE
HALITE
HALITE WITH 30% POLYHALITE
HALITE WITH 10% POLYHALITE
CLAY SEAM

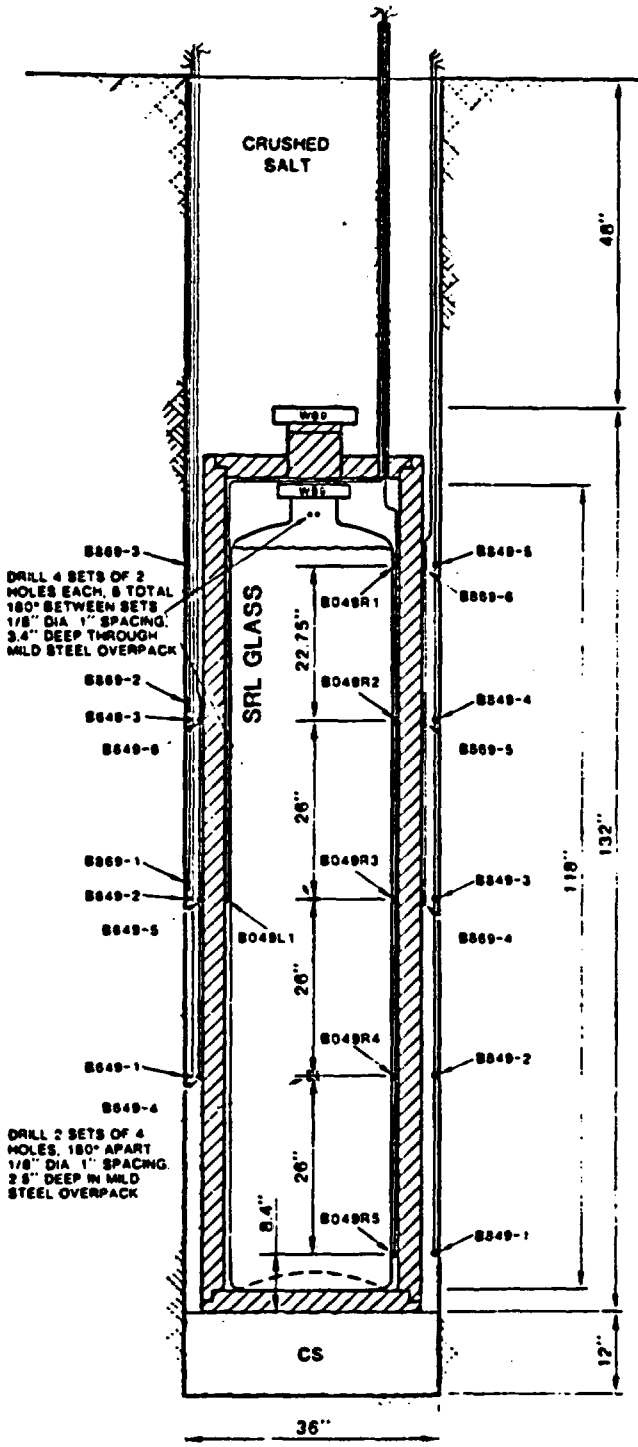


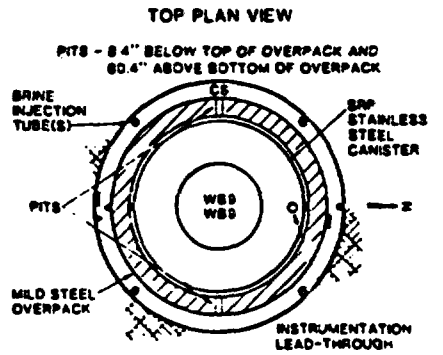
DHLW PACKAGES

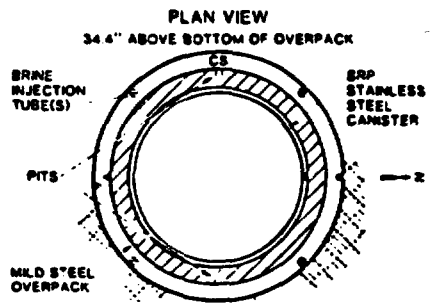
W/M-5199-1

Sandia National Laboratories

WIPP SIMULATED DHLW TECHNOLOGY EXPERIMENT







WASTE PACKAGE WB9/B049

SRL GLASS-FILLED

ONWI/W DESIGN, MILD STEEL OVERPACK WITH SIMULATED PITTING, SS 304L SRP CANISTER

BACKFILL-CRUSHED SALT (CS)

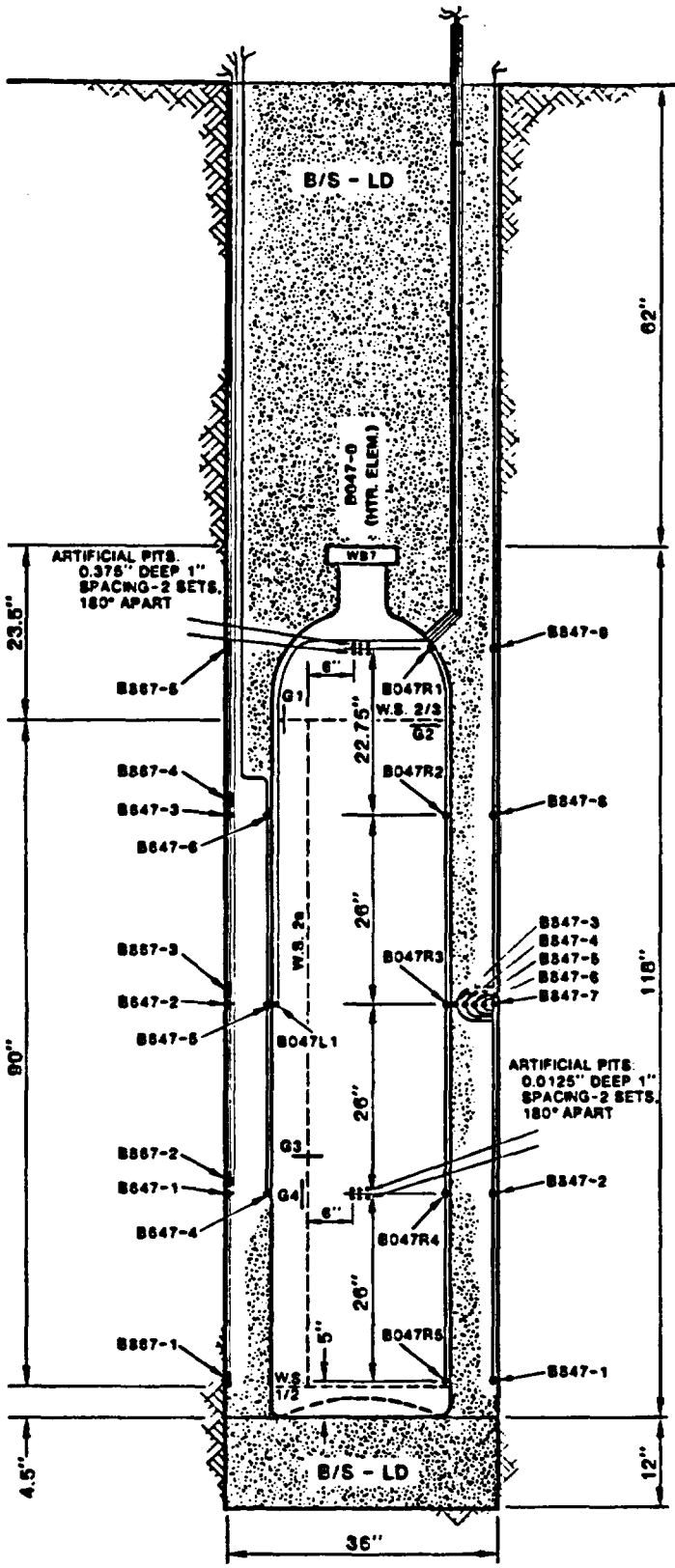
BRINE INJECTED

• = THERMOCOUPLES

▲ = PRESSURE GAGES

▮ = SRL GLASS SAMPLES WITH THERMOCOUPLE

Sandia National Laboratories



WASTE PACKAGE WB7/B047

1500 W HEATER (SAND FILLED)

ALL Ti CODE-12 CANISTER, INTENTIONALLY DEFECTED WITH GROOVES AND ARTIFICIAL PITS

BACKFILL-BENTONITE/SAND, LOW DENSITY (B/S - LD)

BRINE INJECTED

• = THERMOCOUPLES

▲ = PRESSURE GAGES

▯ = SRL GLASS SAMPLES WITH THERMOCOUPLE

W.S. = WELD SEAMS

G = GROOVES

Sandia National Laboratories

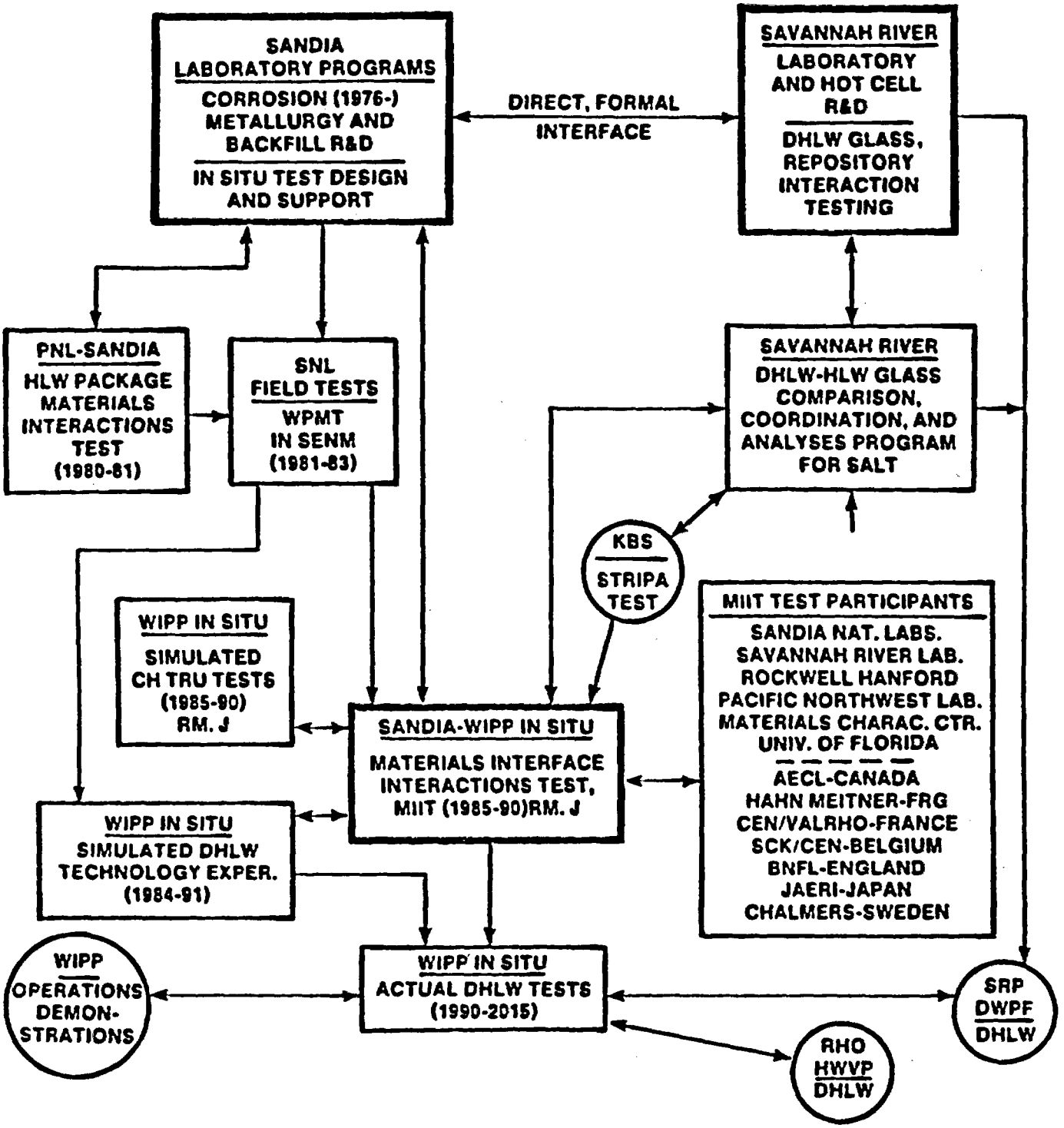


Figure 8.1. WIPP MIIT Network Interface

6. TEST OBJECTIVES

The technical objectives of the WIPP Materials Interface Interactions Test (MIIT) are as follows:

- TO DETERMINE THE PERFORMANCE OF SAVANNAH RIVER-DEFENSE WASTE PROCESSING FACILITY (DWPF) GLASS WASTE COMPOSITIONS (DHLW) UNDER ANTICIPATED AND ACCELERATED-TESTING SALT "REPOSITORY-RELEVANT" CONDITIONS.

- TO EVALUTE THE RELATIVE, IN SITU PERFORMANCE OF SAVANNAH RIVER WASTE GLASS WITH THE PERFORMANCE OF OTHER U.S. AND FOREIGN WASTE GLASSES, UNDER THE SAME TEST CONDITIONS.

- TO DETERMINE ANY BENEFICIAL OR ADVERSE EFFECTS OF WASTE PACKAGE COMPONENTS ON WASTE GLASS DURABILITY, AND TO PROVIDE POTENTIAL GUIDANCE TO WASTE PACKAGE DESIGNERS.

- TO PROVIDE A STANDARDIZED AND COMMON IN SITU DATA BASE ON WASTE GLASS LEACHING AND WASTE PACKAGE-GLASS-HOST ROCK SALT-BRINE INTERACTIONS WHICH CAN COUPLE AND/OR BE COMPARED WITH A LARGE BODY OF COMPARABLE, EXISTING LABORATORY DATA.

- TO AID MECHANISTIC STUDIES AIMED AT UNDERSTANDING WASTE GLASS BEHAVIOR BY COUPLING SOLUTION ANALYSES WITH SURFACE-INTERACTIONS STUDIES OF GLASS WASTE FORMS AS WELL AS OTHER WASTE PACKAGE COMPONENTS. THIS INFORMATION WILL HELP IN DEVELOPMENT OF SOURCE TERMS AND PERFORMANCE ASSESSMENT THAT CAN BE USED TO DESCRIBE LONG-TERM WASTE PACKAGE BEHAVIOR IN SALT.

- TO PROVIDE DATA WHICH MAY ULTIMATELY BE USED TO HELP DEMONSTRATE COMPLIANCE WITH EMERGING U.S. FEDERAL REGULATIONS (E.G., NRC AND EPA).

- TO PROVIDE A LARGE BODY OF IN SITU TEST INFORMATION, DATA, RESULTS, AND EXPERIENCE TO BE FREELY SHARED BY ALL TEST PARTICIPANTS AND INTERESTED PARTIES.

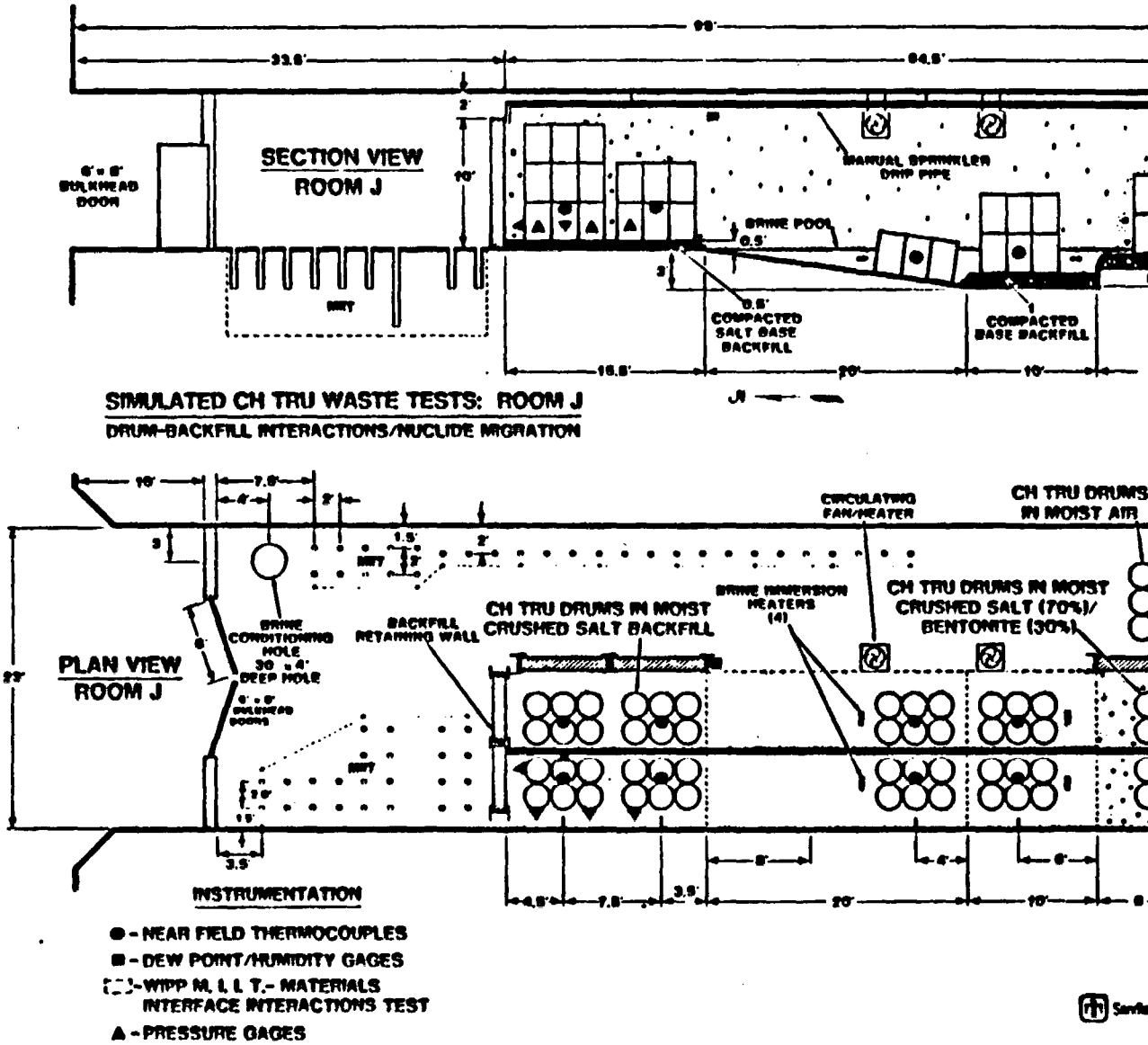
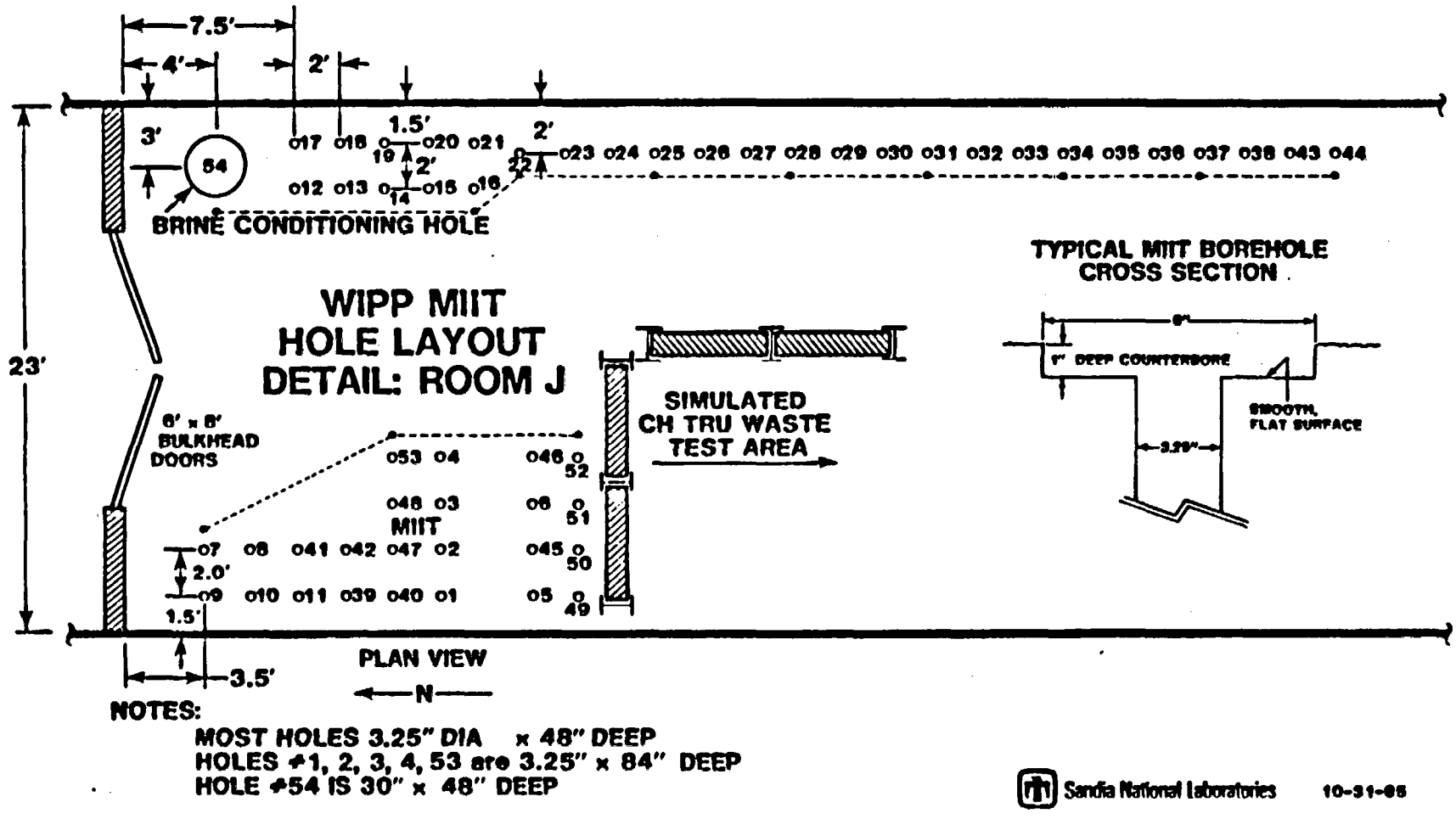


Figure 9.3. General Details of WIPP MIIT and Other Tests, Room J



NOTES:

MOST HOLES 3.25" DIA x 48" DEEP
HOLES #1, 2, 3, 4, 53 are 3.25" x 84" DEEP
HOLE #54 IS 30" x 48" DEEP

Sandia National Laboratories 10-31-85

W/J-5081-1

Figure 9.4. Detailed Plan View of WIPP MIIT, Room J

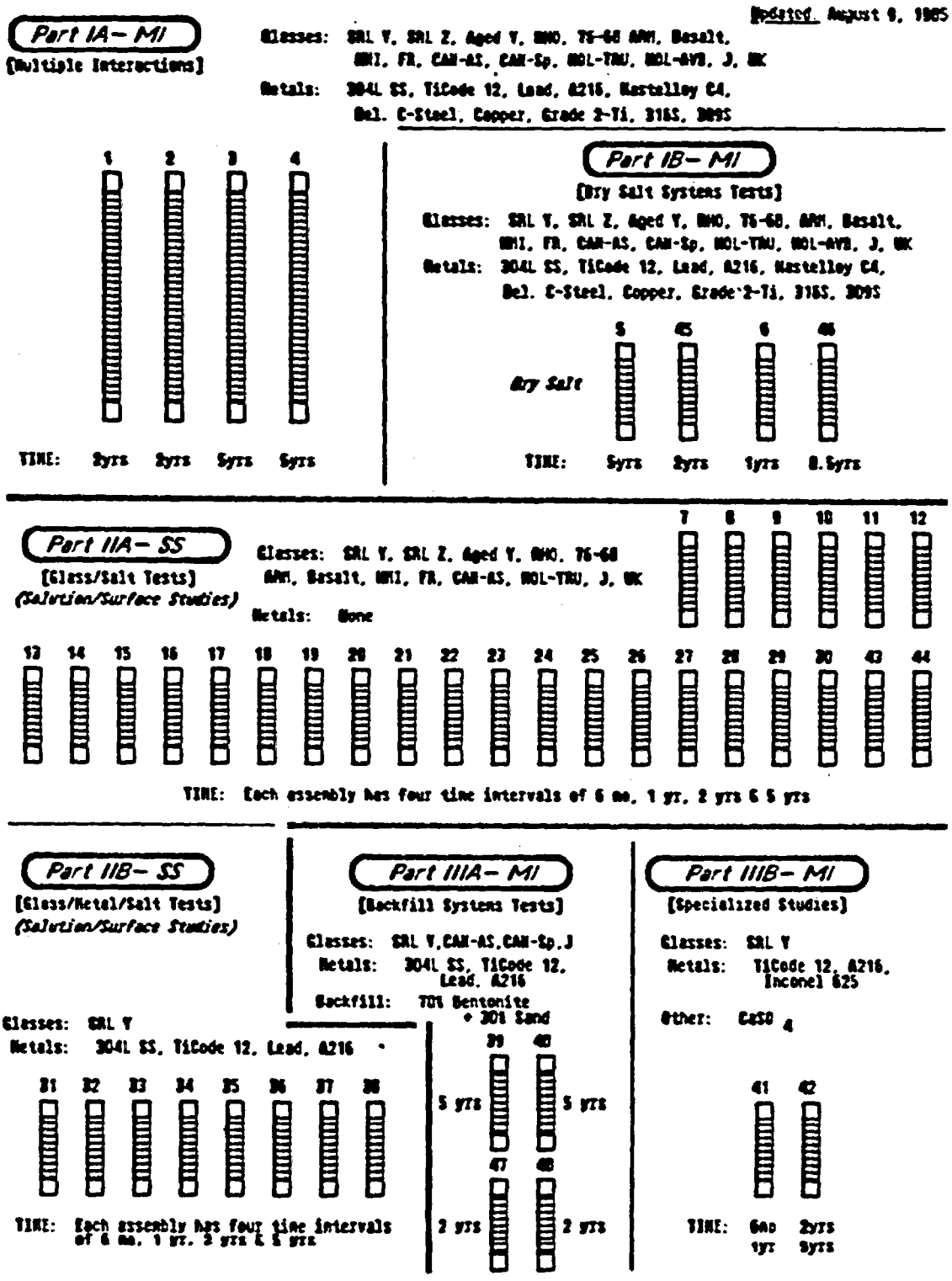


Figure 9.6. WIPP MIIT: Test Assembly Configuration Overview

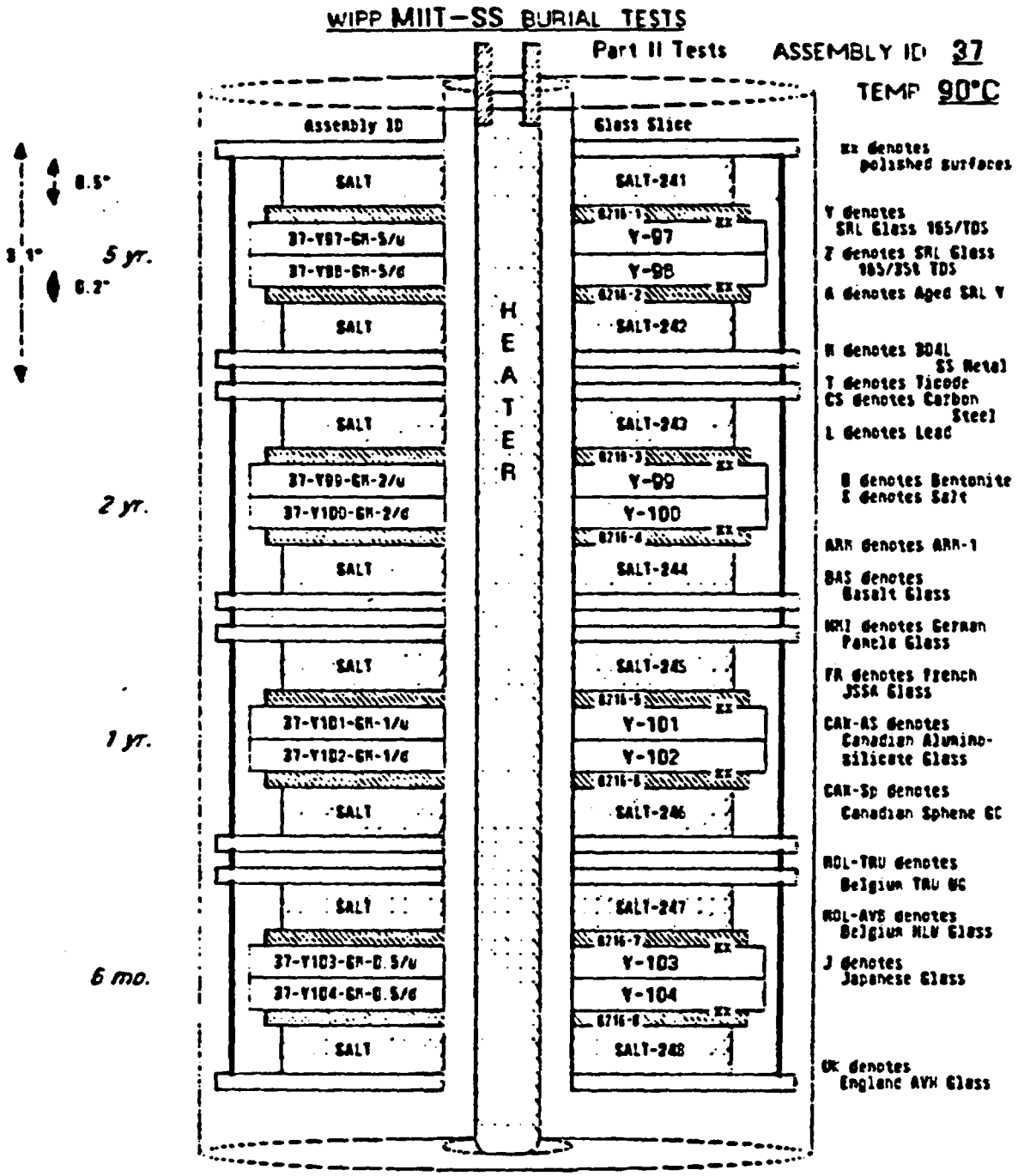
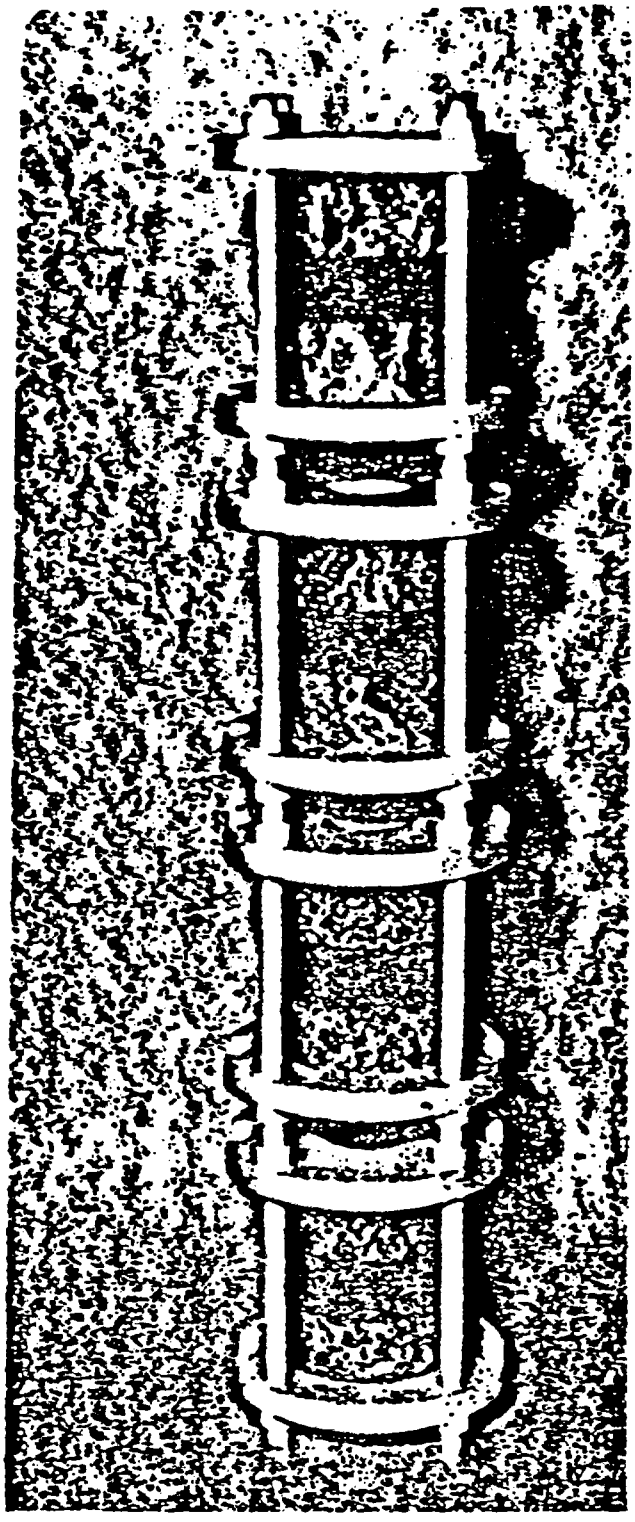


Figure 7.6. Representative MIIT-SS Test Assembly



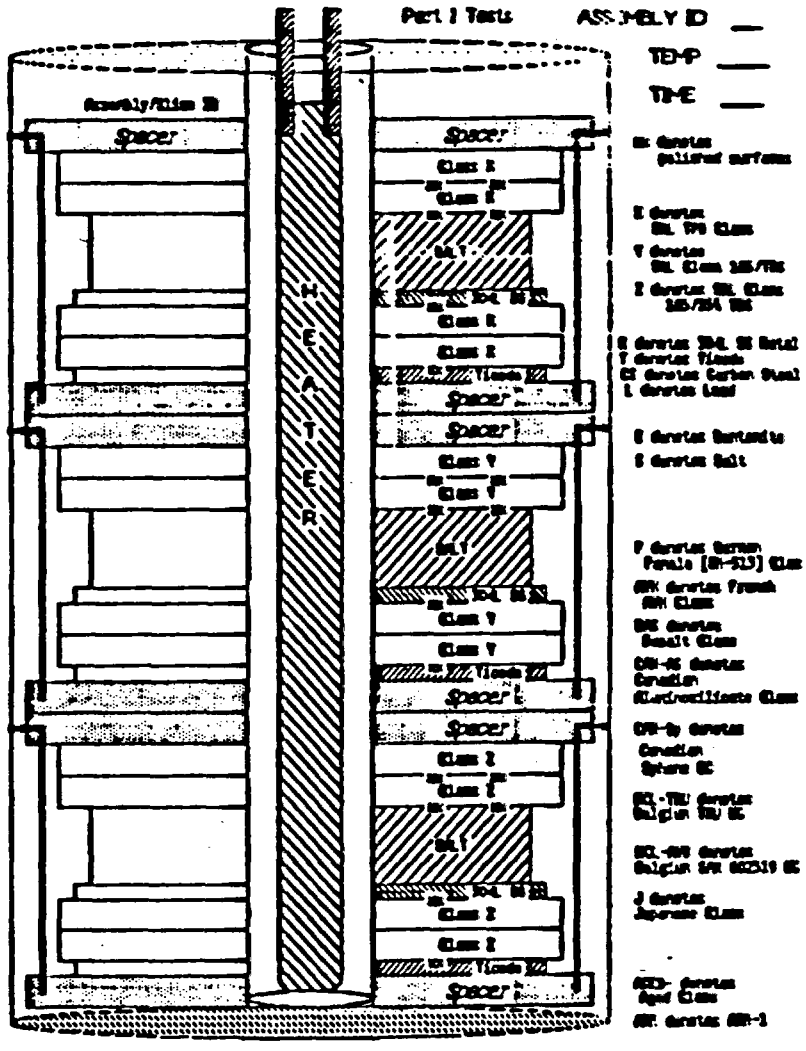
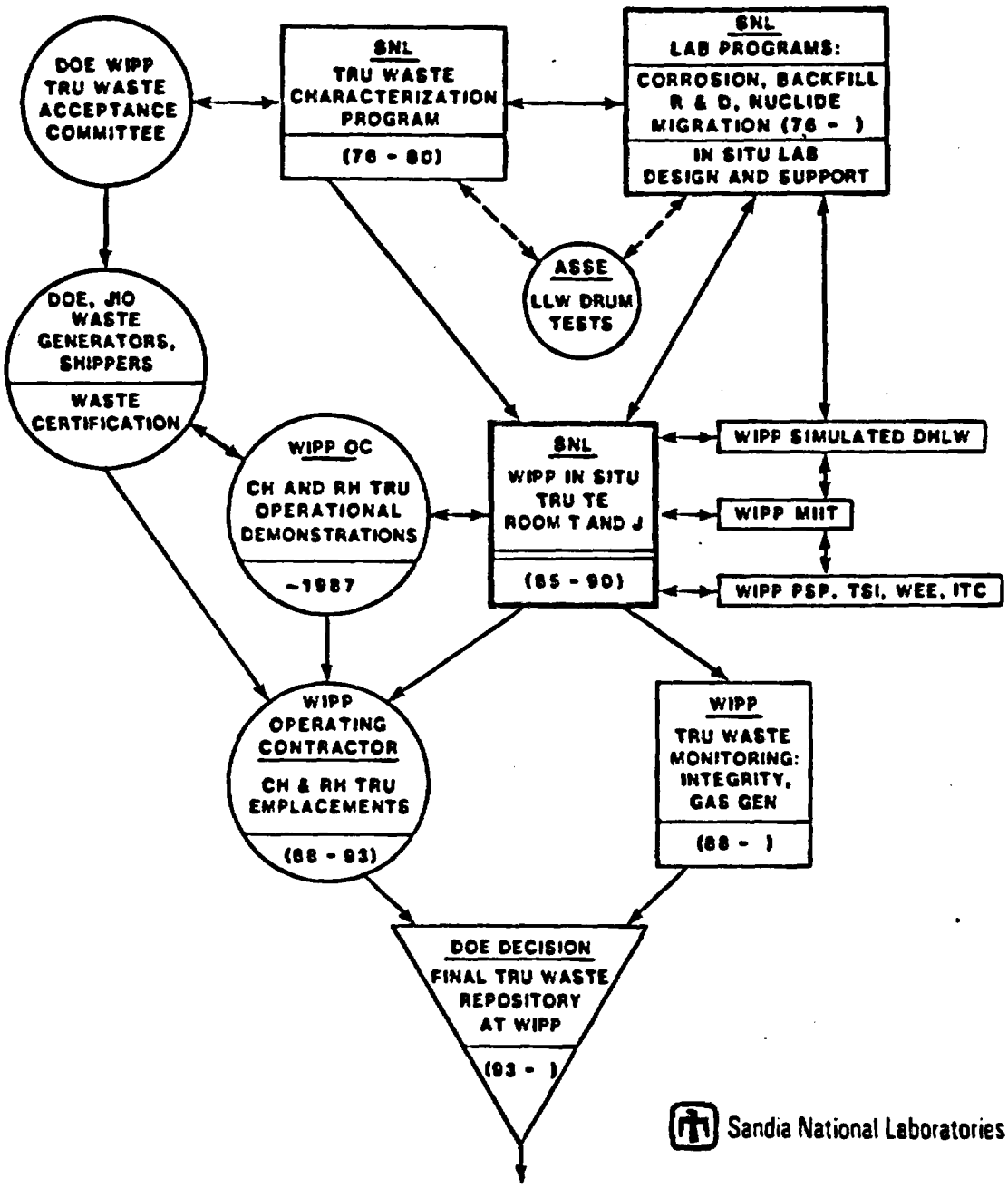


Figure 7.5. Representative MIIT-MI Test Assembly



W M-4123-1

Figure 7.1. WIPP TRU Waste Interfaces and Time Progression

6. TEST OBJECTIVES

The technical objectives of the TRU waste technology experiments are as follows:

- TO EXTEND THE STATE OF THE ART OF TRU WASTE PACKAGE TECHNOLOGY BEYOND LABORATORY TESTING WITH IN SITU EMPLACEMENT AND TESTING OF SIMULATED CH AND RH TRU CONTAINERS.
- TO PROVIDE IN SITU VERIFICATION OF THE ADEQUATE CONTAINMENT INTEGRITY OF TRU CONTAINERS IN THE WIPP, UNDER NEAR-REFERENCE AND OVERTEST REPOSITORY CONDITIONS.
- TO EVALUATE, BY MEANS OF OVERTESTING, THE EFFECTS OF ROOM CLOSURE ON CH TRU DRUM CRUSHING AND THE CONSEQUENT IMPACTS ON DRUM-CLOSURE INTEGRITY AND RETRIEVAL-HANDLING OPERATIONS. THIS EVALUATION IS CONSIDERED HIGHLY DESIRABLE BEFORE ANY ACTUAL TRU WASTES ARE ACCEPTED AT THE WIPP.
- TO EVALUATE THE EFFECTS OF CRUSHED SALT AND TAILORED BACKFILLS ON TRU CONTAINER DURABILITY, HANDLING OPERATIONS, AND FLUID AND NUCLIDE MIGRATION.
- TO PROVIDE DATA ON THE APPLICABILITY OF TAILORED BACKFILLS FOR TRU WASTES FOR SATISFYING EPA ENGINEERED BARRIER CRITERIA (40 CFR 191, SUBPART B).
- TO EVALUATE AND DEMONSTRATE THE HORIZONTAL EMPLACEMENT OF RH TRU CANISTERS IN UNLINED BOREHOLES IN SALT, SIMPLY AND COST-EFFECTIVELY.
- TO COMPARE IN SITU RESULTS WITH PREVIOUS LABORATORY MATERIALS DATA, FOR PROVIDING LONG-TERM PREDICTIVE MODELS ON TRU WASTE ENGINEERED BARRIER INTEGRITY.
- TO HELP PROVIDE A TECHNICAL BASIS FOR VALIDATING THE CONCEPT OF SAFE CH AND RH TRU WASTE DISPOSAL IN THE WIPP, AS A PRECURSOR FOR, AND PRIOR TO, THE SHIPMENT OF ACTUAL TRU WASTES.

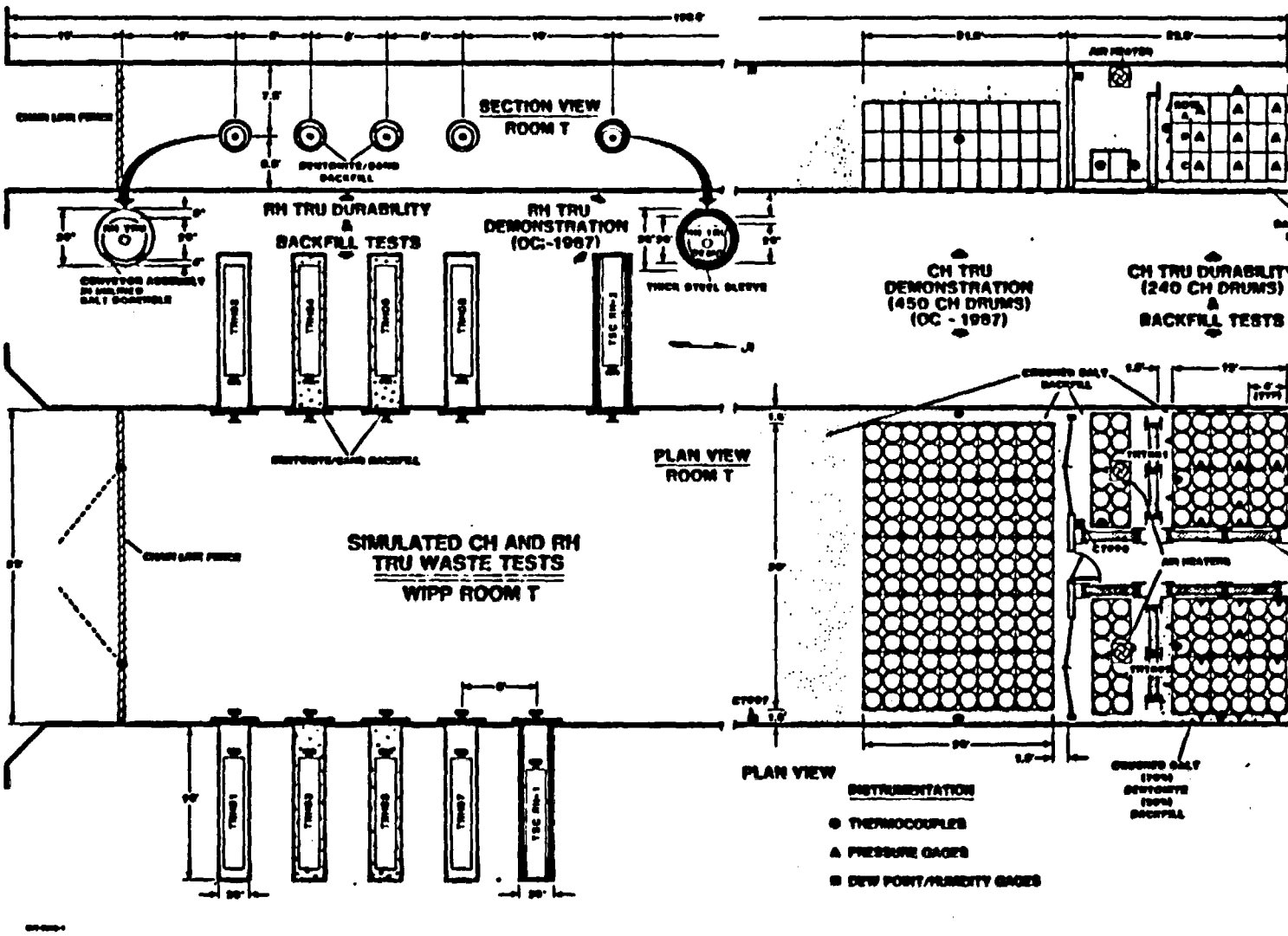


Figure 10.4. General Details of Simulated CH and RH TRU Waste Tests, Room T

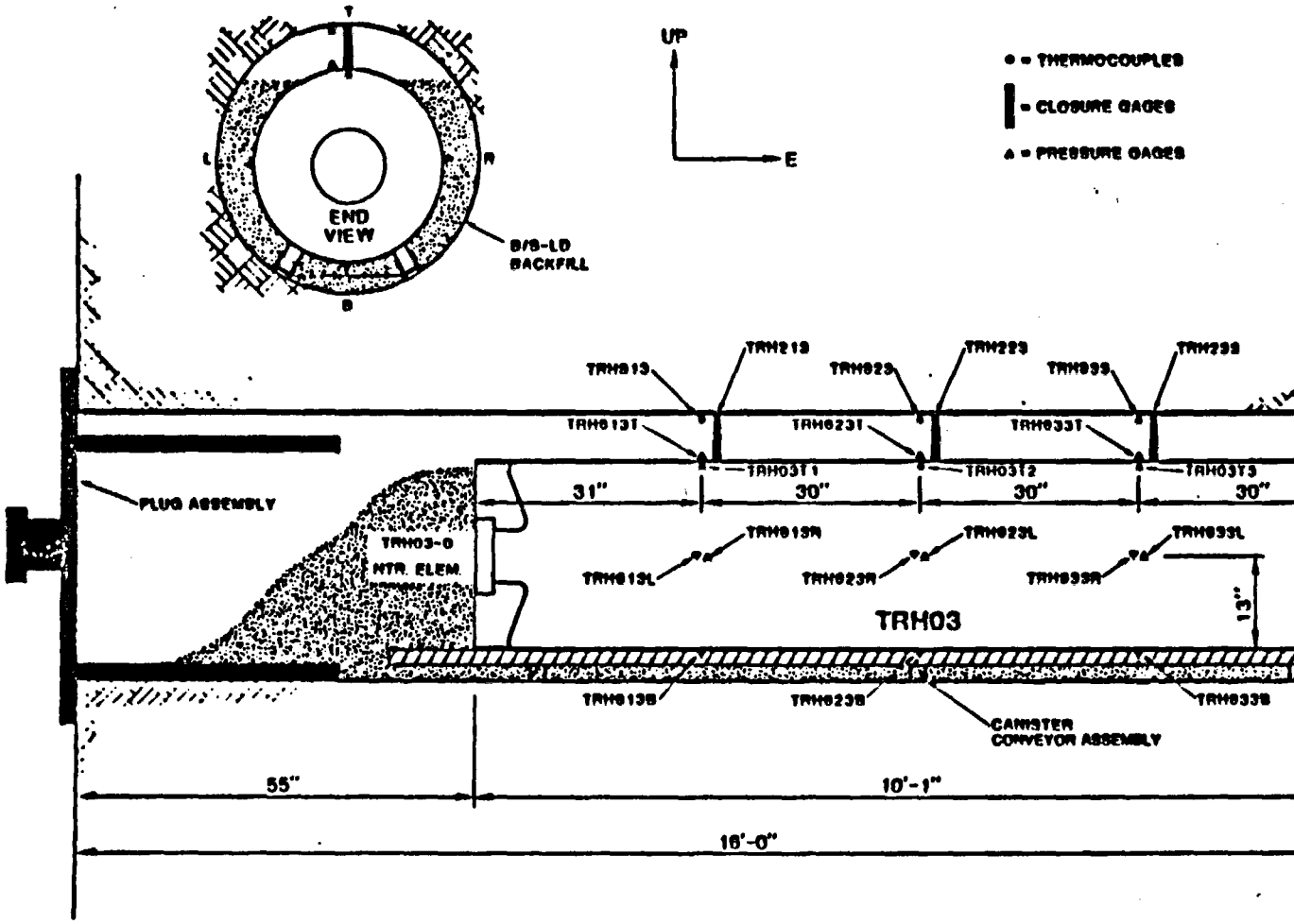


Figure 10.17. Simulated RH TRU Emplacement TRH03

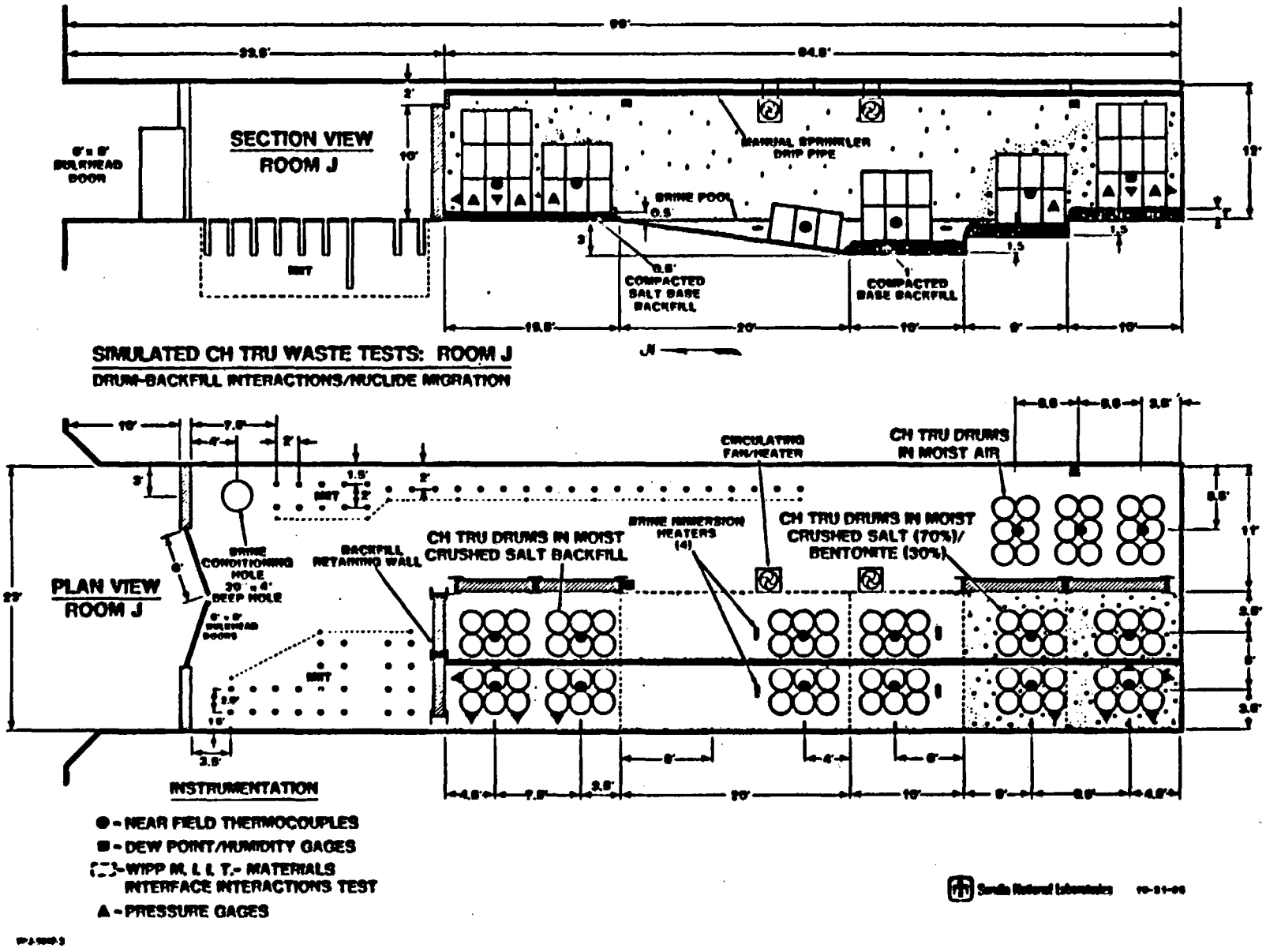


Figure 10.5. General Details of Simulated CH TRU Waste Tests, Room J

WIPP ACTUAL DHLW TESTS

PHASE I		PHASE II	
Part 1: NEAR-REFERENCE (NON-Degraded)	**Part 2:** ACCELERATED AGING (NON-Degraded)	**Part 3:** ACCELERATED AGING (DEGRADED)	**Part 4:** "1000-YR-OLD" AGED WASTE (Nuclide Migration)
A. Vertical	A. Vertical		1 – 5 Liter Emplacements
B. Horizontal	B. Horizontal		
OPERATIONAL DEMONSTRATIONS & MATERIALS TESTING		OVERTESTING Of OPERATIONS, MATERIALS DEGADATION, NUCLIDE RELEASE	NUCLIDE MIGRATION SOURCE TERM
OPERATIONAL PERIOD	CONTAINMENT PERIOD		LONG-TERM PERIOD

MAM : 11/85

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WIPP ACTUAL DHLW TESTS RATIONALE AND OBJECTIVES:

PHASE I. TESTS

PART 1. "NEAR-REFERENCE"/OPERATIONAL PERIOD TESTS:

&

PART 2. "ACCELERATED AGING"/CONTAINMENT PERIOD TESTS: (INITIAL)

* TO PROVIDE PROOF TEST-DEMONSTRATIONS OF ALL HANDLING EQUIPMENT & OPERATIONS UNDER BOTH REFERENCE AND BOUNDARY/OVERTEST CONDITIONS
* TO EMPLACE WASTE IN A MANNER REPRESENTATIVE OF AN OPERATING (LICENSED) REPOSITORY IN SALT
* TO EVALUATE WASTE PACKAGE MATERIALS PROPERTY ALTERATIONS & NEAR-FIELD INTERACTIONS UNDER BOTH REFERENCE AND CREDIBLE OVERTEST, REAL-WORLD CONDITIONS
* DATA OBTAINED WILL SUPPORT NRC INTEGRITY CRITERIA
* TO SATISFACTORILY ELIMINATE CREDIBLE "WHAT IF" QUESTIONS"
* TO PROVIDE TECHNICAL BASIS, ACTUAL OPERATIONAL EXPERIENCE FOR SAFETY & PERFORMANCE ASSESSMENTS, GOVERNMENTAL REVIEWS, TO SUPPORT LICENSING OF FUTURE HLW REPOSITORY IN SALT

NAM: 11/14/85 Sandia National Laboratories

WIPP ACTUAL DHLW TESTS RATIONALE AND OBJECTIVES:

PHASE II. TESTS

PART 3. "ACCELERATED AGING - DEGRADED"/ CONTAINMENT PERIOD:

&

PART 4. "1000-YEAR-OLD AGED WASTE"/ LONG-TERM PERIOD:

* TO PROVIDE NECESSARY IN SITU R & D ON W/ BRINE INJECTIONS, WASTE FORM LEACHING, & NUCLIDE MIGRATION WITHIN BACKFILL
* TO VERIFY & EXTEND PREVIOUS LAB TESTING & ANALYTICAL MODELING/PREDICTIONS, PERFORMANCE ASSESSMENTS
* TO PROVIDE RELEASE DATA, SUPPORTING MODELING, AND PERFORMANCE ASSESSMENTS FOR NRC CRITERIA
* TO DEMONSTRATE SAFE "OFF-NORMAL" OPERATIONS
* TO HELP RESOLVE CREDIBLE "WHAT IF" QUESTIONS
* TO ADDRESS EPA LONG-TERM CRITERIA W/ RELEASE DATA
* TO PROVIDE TECHNICAL BASIS, ACTUAL OPERATIONAL EXPERIENCE AND DEMONSTRATIONS SUPPORTING THE CONCEPT OF SAFE ISOLATION IN A DEEP GEOLOGIC (SALT) REPOSITORY

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WIPP DHLW - CHLW INTERFACE

The WIPP radioactive Actual DHLW Tests will provide performance information for:

- DESIGN OF THE DHLW PORTION OF A COMMERCIAL REPOSITORY.
- DESIGN AND OPERATING EXPERIENCE FOR THE RADIOACTIVE WASTE HANDLING EQUIPMENT FOR EITHER A DHLW OR COMMERCIAL HLW REPOSITORY.
- DEFINITION AND CALIBRATION OF A DHLW SOURCE TERM (WASTE AND BACKFILL RADIONUCLIDE TRANSPORT) FOR PERFORMANCE ASSESSMENT ANALYSES.
- IDENTIFICATION AND DEFINITION OF RADIOACTIVE TESTS NECESSARY FOR FUTURE COMMERCIAL REPOSITORY DEVELOPMENT.
- A BASIS TO DEVELOP MORE SOPHISTICATED TESTING METHODS AND INSTRUMENTATION NECESSARY TO CONDUCT THE COMMERCIAL HLW TESTS.

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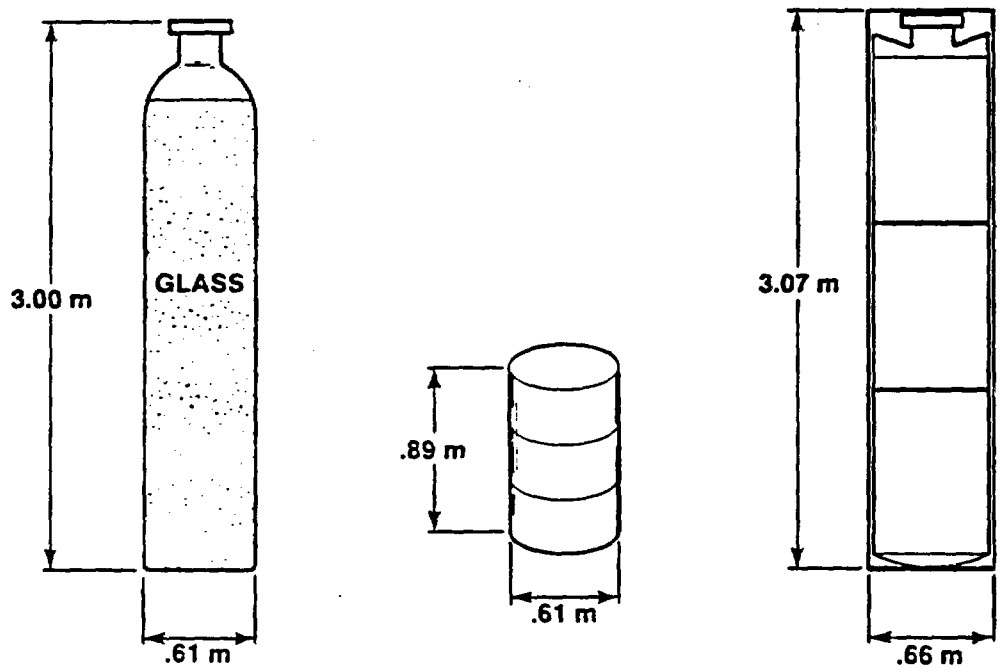
LYNN D. TYLER, SUPERVISOR
EXPERIMENTAL PROGRAMS DIVISION
SANDIA NATIONAL LABORATORIES

WIPP RESEARCH AND DEVELOPMENT PROGRAM IN SITU TESTS

WIPP MISSION
(PL-96-164)

"... FOR THE EXPRESS PURPOSE OF PROVIDING A RESEARCH AND DEVELOPMENT FACILITY TO DEMONSTRATE THE SAFE DISPOSAL OF RADIOACTIVE WASTES RESULTING FROM THE DEFENSE ACTIVITIES AND PROGRAMS OF THE U.S. EXEMPTED FROM REGULATION BY THE NUCLEAR REGULATORY COMMISSION ..."

REFERENCE NUCLEAR WASTE FORM CHARACTERISTICS



	DEFENSE HIGH LEVEL WASTE (DHLW)	TRANSURANIC WASTE (TRU) CONTACT-HANDLED (CH)	TRANSURANIC WASTE (TRU) REMOTE-HANDLED (RH)
ACTIVE VOLUME (l)	630	210	630
MASS (kg)	2100	60	3692
POWER (Watts)	692*	.001	60-300
SURFACE DOSE RATE (SDR)			
MAXIMUM (R/hr)	~8900	.02	100
EXPECTED (R/hr)	5500	.0031	<100

(* 470 W expected for WIPP)

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F W-5225-1

1983 INVENTORY OF RADIOACTIVE WASTE (m^3)

	LLW	TRU		HLW	SF
		BURIED	STORED		
COMMERCIAL	1,010,000	-	-	2,320	4,060
DEFENSE	2,060,000	171,000	75,000	324,000	-
HANF		92,100	12,800	203,000	
SRP		4,500	3,400	111,000	
INEL		57,100	51,100	9,700	
OTHER		17,600	7,740	-	
TOTAL	3,070,000	171,000	75,000	326,000	4,060

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RADIOACTIVITY IN RADIOACTIVE WASTE (10^6 Ci)

	LLW		TRU				HLW		SF	
	THROUGH 1983	THROUGH 2020*	THROUGH 1983		THROUGH 2020*		THROUGH 1983	THROUGH 2020*	THROUGH 1983	THROUGH 2020*
			BURIED	STORED	BURIED	STORED				
DEFENSE	10.3	18.1	0.3	1.5	0.2	6.2	1,315	1,473	-	-
COMMERCIAL	0.5	15.6	-		-		34.8	13.9	12,900	71,300
TOTAL	10.8	33.7	1.8		6.4		1,350	1,487	12,900	71,300

*FIGURES ASSUME NO COMMERCIAL REPROCESSING

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WIPP EXPERIMENTAL PROGRAM

WASTE ACCEPTANCE
9/88
MS 1/88

TRU ISOLATION
- INTERIM INPUT TO PERFORMANCE ASSESSMENT
  - BACKFILL RESPONSE
  - STORAGE ROOM RESPONSE
  - PRELIMINARY SEAL DESIGN

CONCEPTUAL DESIGN FOR FACILITY SEALING
- SMALL SCALE SEAL PERFORMANCE TESTS SERIES A–D
- FORMATION PERMEABILITY
- SEAL/HOST ROCK INTERACTIONS (G & H)
- SALT/BLOCK CONSOLIDATION
- PRELIMINARY SEAL DESIGN CONCEPT

ENGINEERED BARRIERS
- CONSOLIDATION STUDIES
  - SALT, SALT/BENTONITE
- ROOM CLOSURE/BACKFILL INTERACTIONS
- BACKFILL SYSTEM MODEL
- FACILITY MOISTURE FLOWS
- BACKFILL PERFORMANCE EVALUATION

STORAGE ROOM PERFORMANCE
- THEORETICAL ANALYSIS
- LABORATORY TESTING
- ROOM RESPONSE DATA
  - GEOMETRY AFFECTS
  - INTERSECTION (CROSS–CUT)
  - FRACTURE/FAILURE MODEL (WEDGE PILLAR)
  - IN SITU STRESS (HYDROFRAC)
  - CLAY SEAM BEHAVIOR
- DATA ANALYSIS/EVALUATION (G & H)
- STORAGE ROOM DESIGN

PILOT–REPOSITORY TRANSITION
9/93
MS 1/93

TRU ISOLATION
- INPUT TO PERFORMANCE ASSESSMENT
- FINAL CONCEPTUAL SEAL DESIGN
  - PLUGGING AND SEALING PROGRAM (GEOCHEMISTRY, PLUG TEST MATRIX, PERMEABILITY)
- DEMONSTRATION OF SAFE DISPOSAL
  - SEAL PERFORMANCE MODEL
  - ROOM RESPONSE MODEL
  - BACKFILL STUDIES
  - MOISTURE FLOW

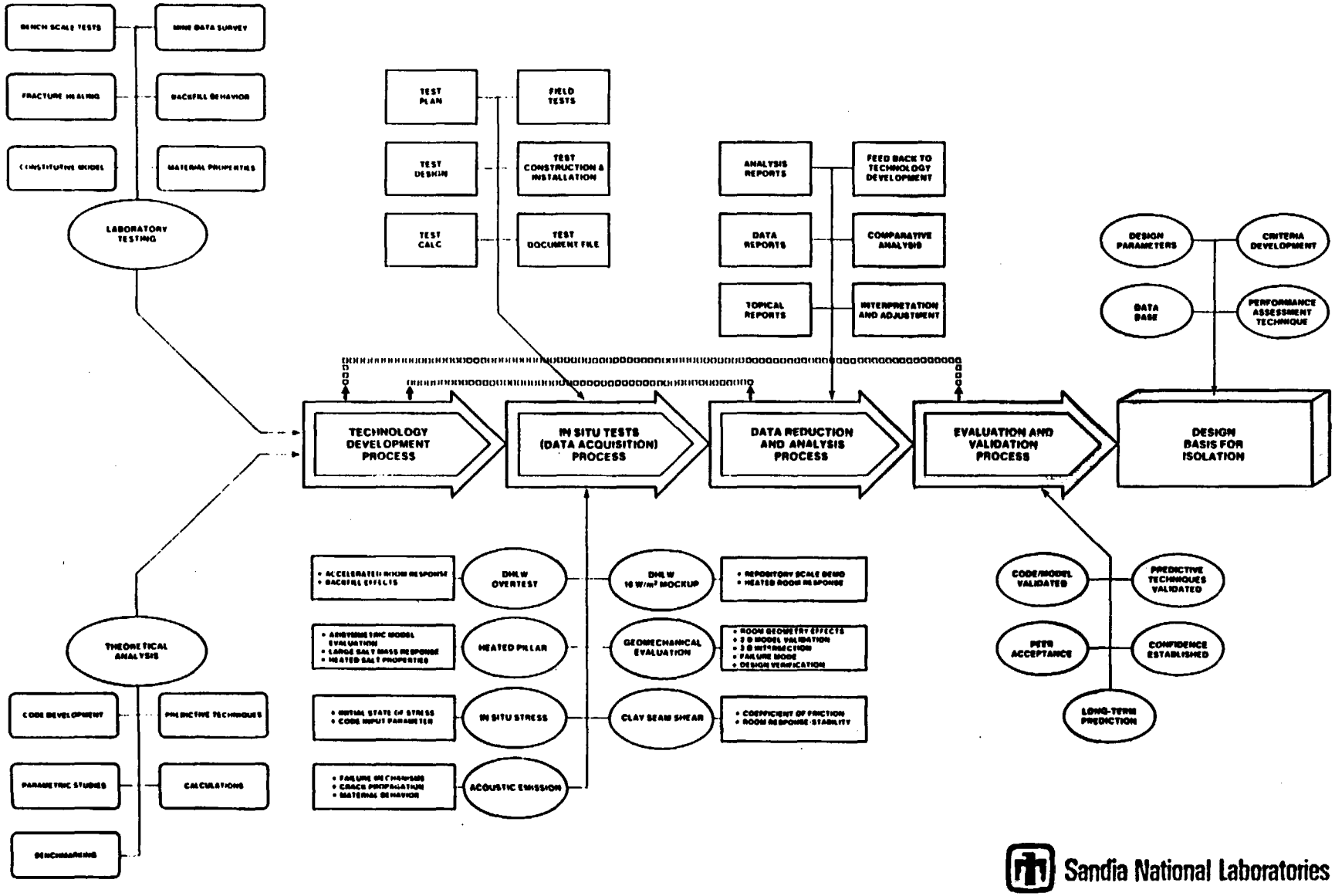
STORAGE ROOM PERFORMANCE
- THEORETICAL ANALYSIS
- LABORATORY TESTING
- ROOM RESPONSE DATA
  - GEOMETRY AFFECTS
  - INTERSECTION (CROSS–CUT)
  - FRACTURE/FAILURE MODEL (WEDGE PILLAR)
  - IN SITU STRESS (HYDROFRAC)
  - CLAY SEAM BEHAVIOR
- DATA ANALYSIS/EVALUATION (G & H)
- STORAGE ROOM DESIGN
- ROOM RESPONSE & WASTE ENCAP.
- DECOMMISSIONING EVALUATION

RETRIEVABILITY DECISION
- STORAGE ROOM PERFORMANCE
  - ROCK MECHANICS TESTS (G & H)
- TRU SIMULATION – ROOMS T & J
  - BACKFILL
  - DRUM LOADING
- ENGINEERED BARRIERS SYSTEM MODEL
- EVALUATION OF STORAGE CONDITIONS IN PANEL

WIPP MISSION

DEMONSTRATION OF SAFE DISPOSAL OF DHLW
- ROCK MECHANICS
  - ROOM CLOSURE
- SYSTEM MODEL DATA { REFERENCE CONDITIONS – ROOM A; OVERTEST – ROOM B }
- CONSTITUTIVE MODEL DATA { ROOM G; ROOM H }
- CLAY SEAM
- IN SITU STRESS
- LAB TESTS
- CONSTITUTIVE MODEL DEVELOPMENT
- SYSTEM MODEL
- WASTE PACKAGE PERFORMANCE
- NON–RADIOACTIVE
  - FULL SCALE – ROOM A
  - OVERTEST – ROOM B
- MATERIALS TEST – MIIT
- BRINE MIGRATION
  - ROOMS A & B
- LAB STUDIES
- WPP MODEL
- RADIOACTIVE

REPOSITORY DEVELOPMENT
THERMAL/STRUCTURAL INTERACTIONS
(WIPP PROJECT)



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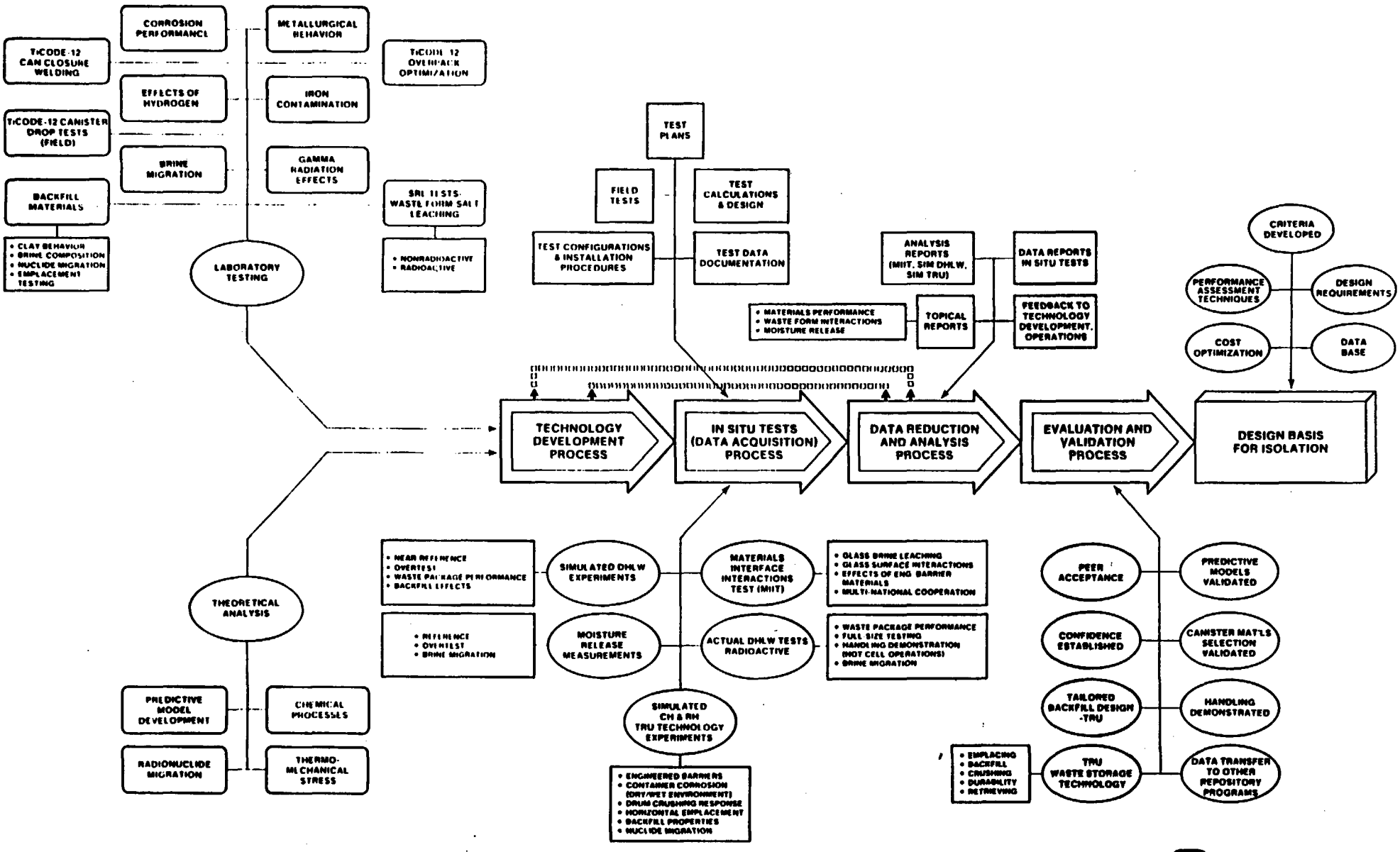
WASTE PACKAGE INTERACTIONS
WASTE PACKAGE PERFORMANCE PROGRAM
(WIPP PROJECT)



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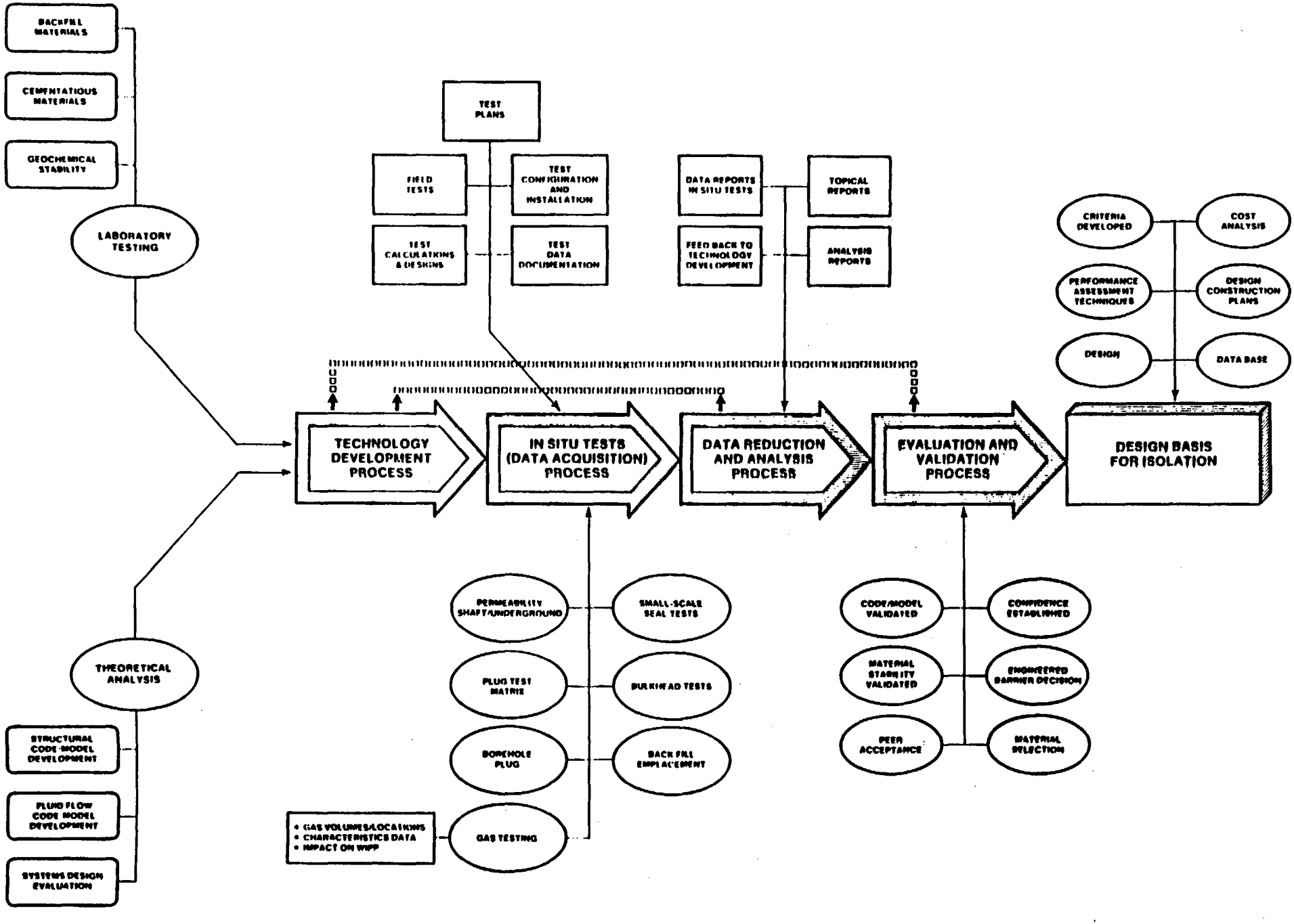
REPOSITORY DEVELOPMENT
PLUGGING AND SEALING PROGRAM
(WIPP PROJECT)



WIPP R&D PROGRAM

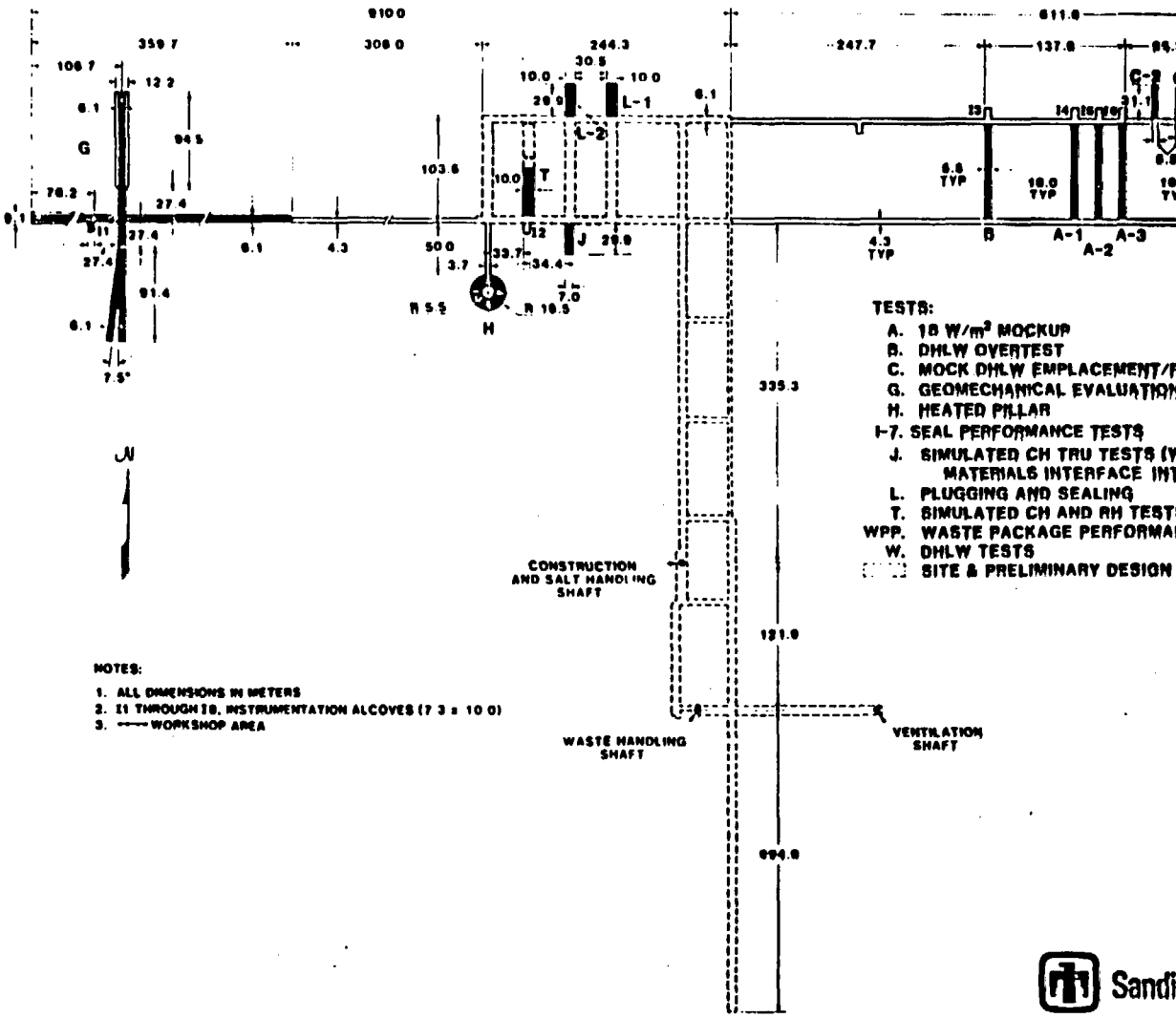
	TECHNICAL DEVELOPMENT			IN SITU TESTS WITHOUT RADIOACTIVITY			IN SITU TESTS WITH RADIOACTIVITY	
	MODEL DEVELOPMENT	LAB TESTING	FIELD TESTING	SPDV	TECHNOLOGY EXPS (TEs)	TECHNOLOGY DEMO	DHLW TESTS	TECHNOLOGY DEMO
SITE CHARACTERIZATION AND EVALUATION	▲	▲	▲	▲	▲			
REPOSITORY DEVELOPMENT								
THERMAL/STRUCTURAL INTERACTIONS	▲	▲	▲	▲	▲			
PLUGGING AND SEALING	▲	▲	▲		▲			
WASTE PACKAGE INTERACTIONS								
WASTE PACKAGE PERFORMANCE	▲	▲	▲		▲		▲	
NEAR-FIELD EFFECTS	▲	▲	▲		▲			

▲ DENOTES ACTIVITY

WIPP IN SITU TEST MATRIX

	WITHOUT RADIOACTIVITY			WITH RADIOACTIVITY	
	SPDV	TECHNOLOGY EXPERIMENTS	DEMONSTRATIONS	DHLW TESTS	DEMONSTRATIONS
SITE CHARACTERIZATION AND EVALUATION	• SITE VALIDATION INVESTIGATION	• HYDROLOGICAL AND GEOLOGICAL STUDIES			
REPOSITORY DEVELOPMENT					
THERMAL/STRUCTURAL INTERACTIONS	• PRELIMINARY DESIGN VALIDATION	• 18 W/m² MOCKUP • DHLW OVERTEST • GEOMECHANICAL EVALUATIONS • HEATED AXISYMMETRIC PILLAR • IN SITU STRESS FIELD • DIRECT SHEAR OF CLAY SEAM			
PLUGGING AND SEALING		• PERMEABILITY TESTS • PLUG TEST MATRIX • FIELD (BOREHOLE) TESTS • GAS TESTING • SEAL SYSTEM PERFORMANCE TESTS			
WASTE PACKAGE INTERACTIONS					
WASTE PACKAGE PERFORMANCE		• SIMULATED-WASTE PACKAGE PERFORMANCE • SIMULATED TRU WASTE TECHNOLOGY EXPERIMENTS		• DHLW TESTS	
NEAR-FIELD EFFECTS		• BRINE MIGRATION			

LAYOUT OF IN-SITU TESTS FOR WIPP



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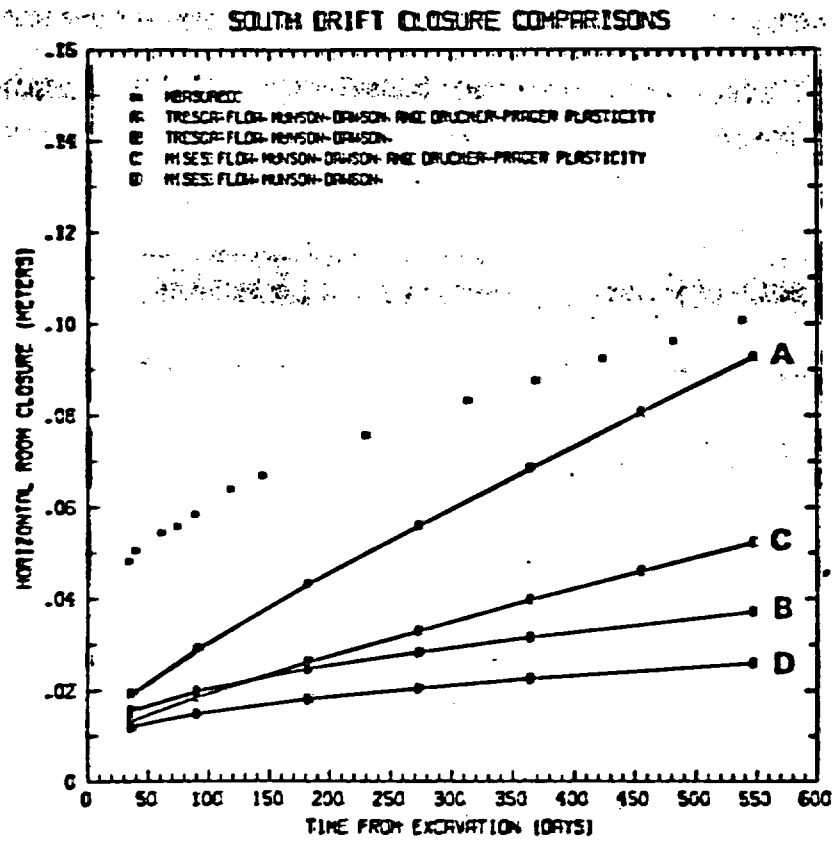
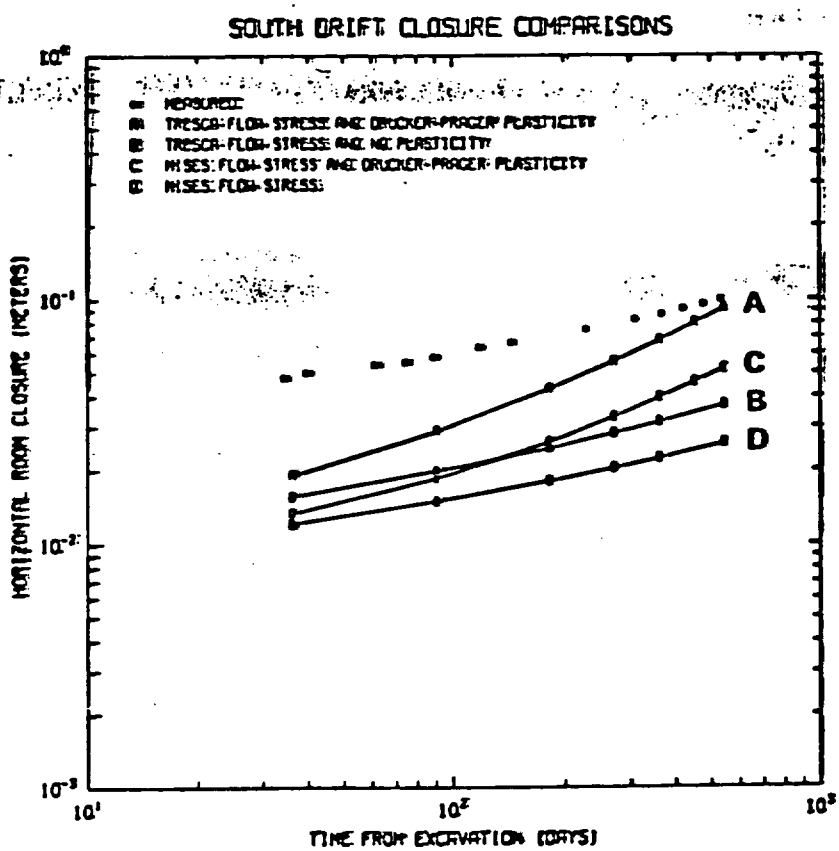
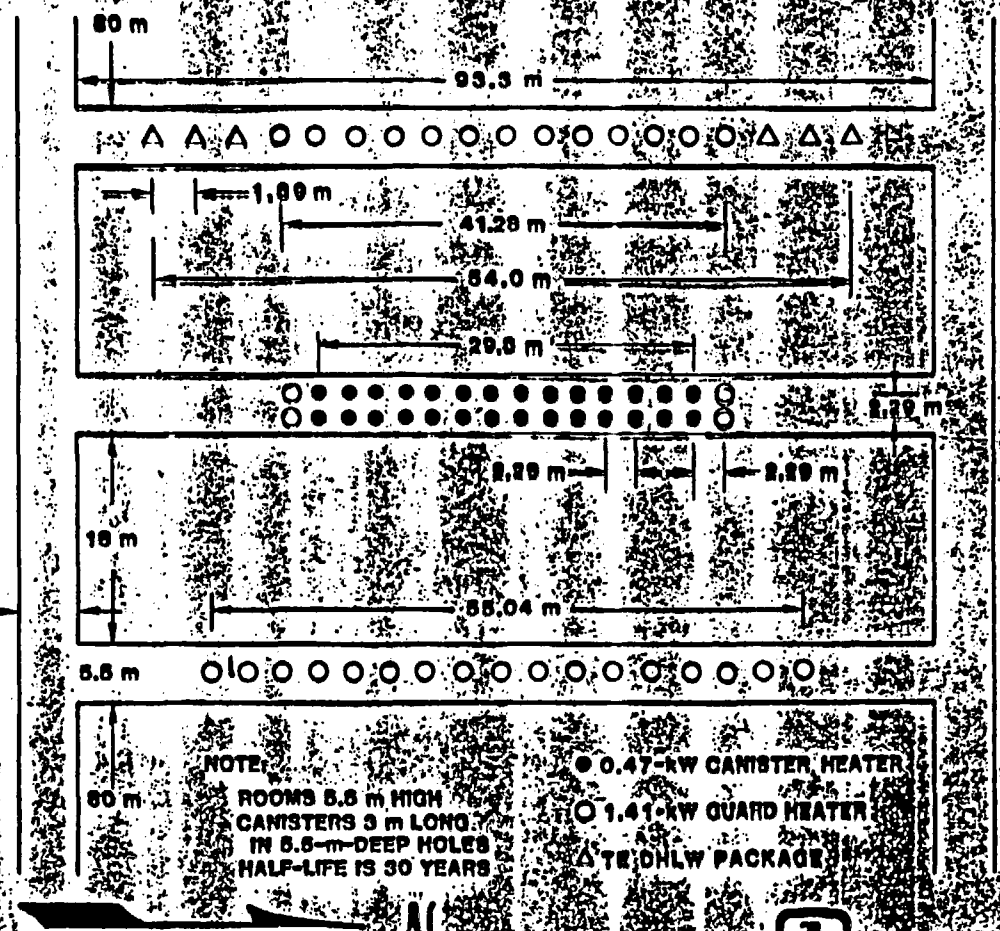

SOUTH DRIFT CLOSURE COMPARISONS
MEASURED
TRESCA FLOW MUNSON-DAWSON AND DRUCKER-PRAGER PLASTICITY
TRESCA FLOW MUNSON-DAWSON
MISES FLOW MUNSON-DAWSON AND DRUCKER-PRAGER PLASTICITY
MISES FLOW MUNSON-DAWSON
HORIZONTAL ROOM CLOSURE (METERS)
TIME FROM EXCAVATION (DAYS)
A
B
C
D
0
.02
.04
.06
.08
.10
.12
.14
.16
50
100
150
200
250
300
350
400
450
500
550
600


SOUTH DRIFT CLOSURE COMPARISONS
MEASURED
TRESCA-FLOW-STRESS AND DRUCKER-PRAGER PLASTICITY
TRESCA-FLOW-STRESS AND NO PLASTICITY
MISES-FLOW-STRESS AND DRUCKER-PRAGER-PLASTICITY
MISES-FLOW-STRESS
A
C
B
D
HORIZONTAL ROOM CLOSURE (METERS)
TIME FROM EXCAVATION (DAYS)

TSI EXPERIMENTS
(ROOMS A, B, G & H)

- PROVIDE THE EMPIRICAL AND THEORETICAL DATA BASE TO
  - (a) DEVELOP AND OPERATE A DHLW REPOSITORY
  - (b) ESTABLISH/DEMONSTRATE THE POTENTIAL OF BEDDED SALT FOR LONG-TERM WASTE ISOLATION
- ADDRESS A DESIGN BASIS AND PREDICTIVE TECHNIQUES FOR ESTABLISHING:
  - (a) ROCK RESPONSE DURING OPERATIONAL/RETRIEVAL PERIOD
  - (b) LONG-TERM ENCAPSULATION POTENTIAL

18 W/m² MOCKUP



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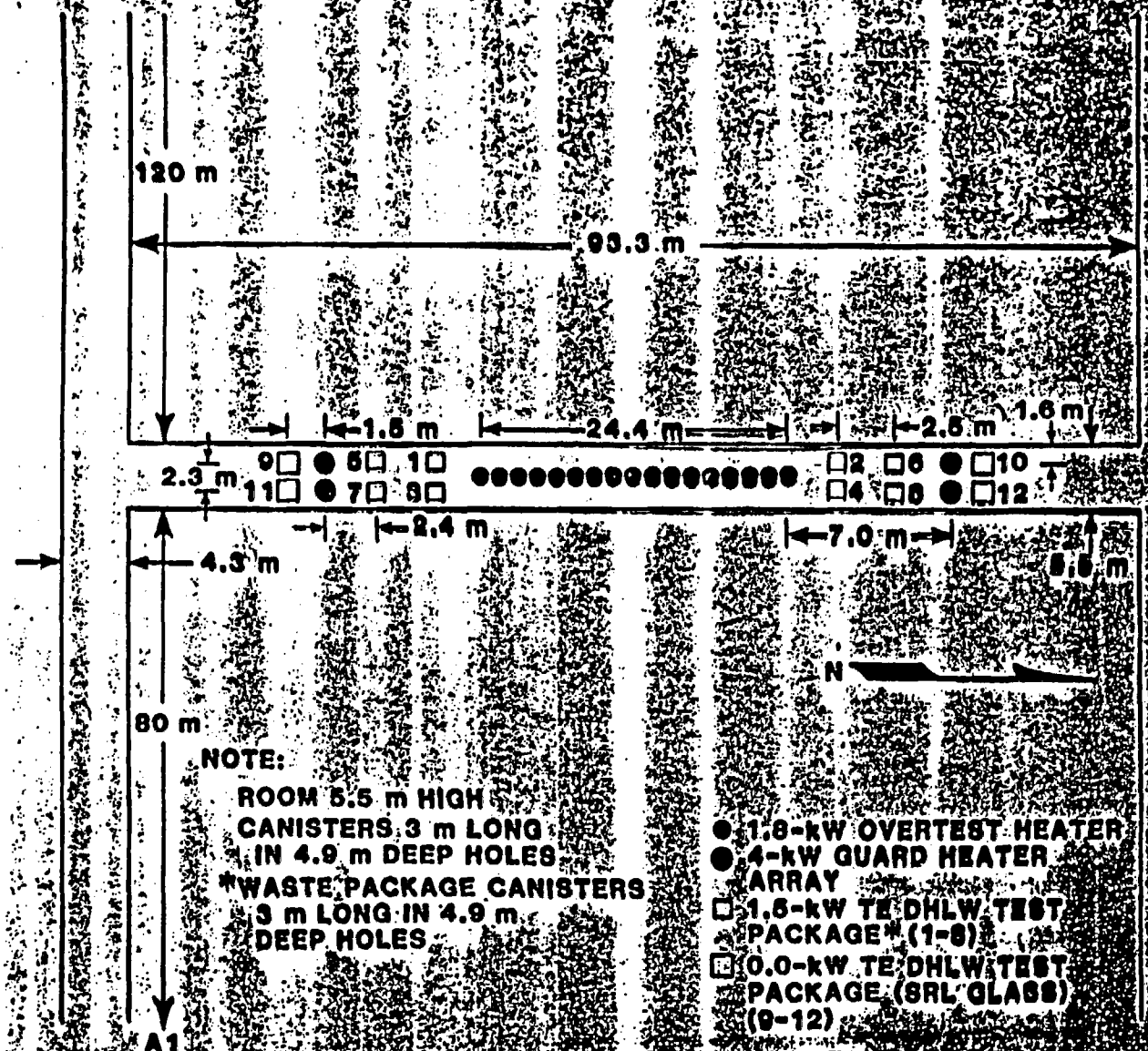
DHLW OVERTEST



NOTE:
ROOM 5.5 m HIGH
CANISTERS 3 m LONG
IN 4.9 m DEEP HOLES
*WASTE PACKAGE CANISTERS
3 m LONG IN 4.9 m
DEEP HOLES

● 1.8-kW OVERTEST HEATER
● .4-kW GUARD HEATER
ARRAY
□ 1.5-kW TE DHLW TEST
PACKAGE* (1-8)
□ 0.0-kW TE DHLW TEST
PACKAGE (SRL GLASS)
(9-12)

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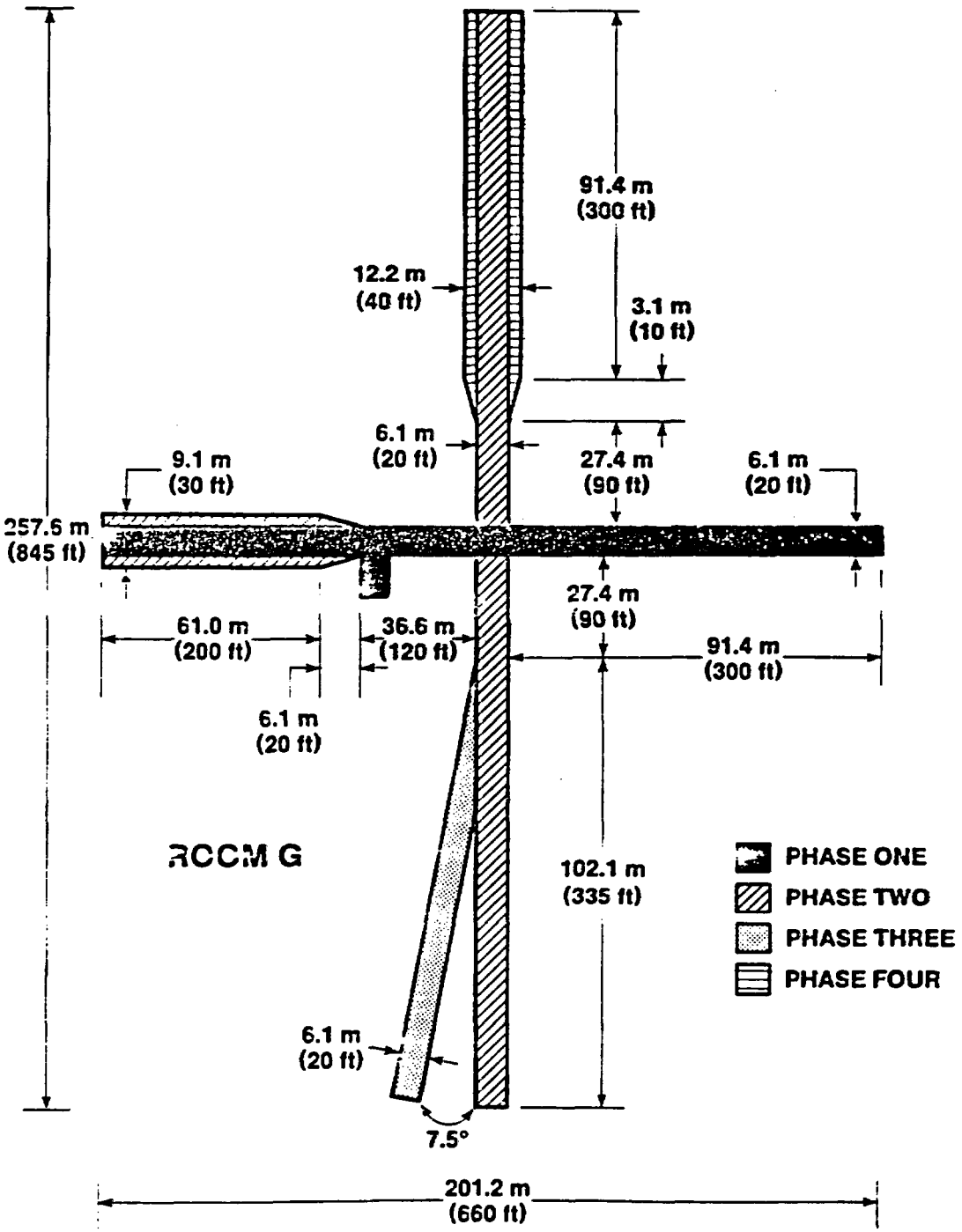
GEOMECHANICAL EVALUATION



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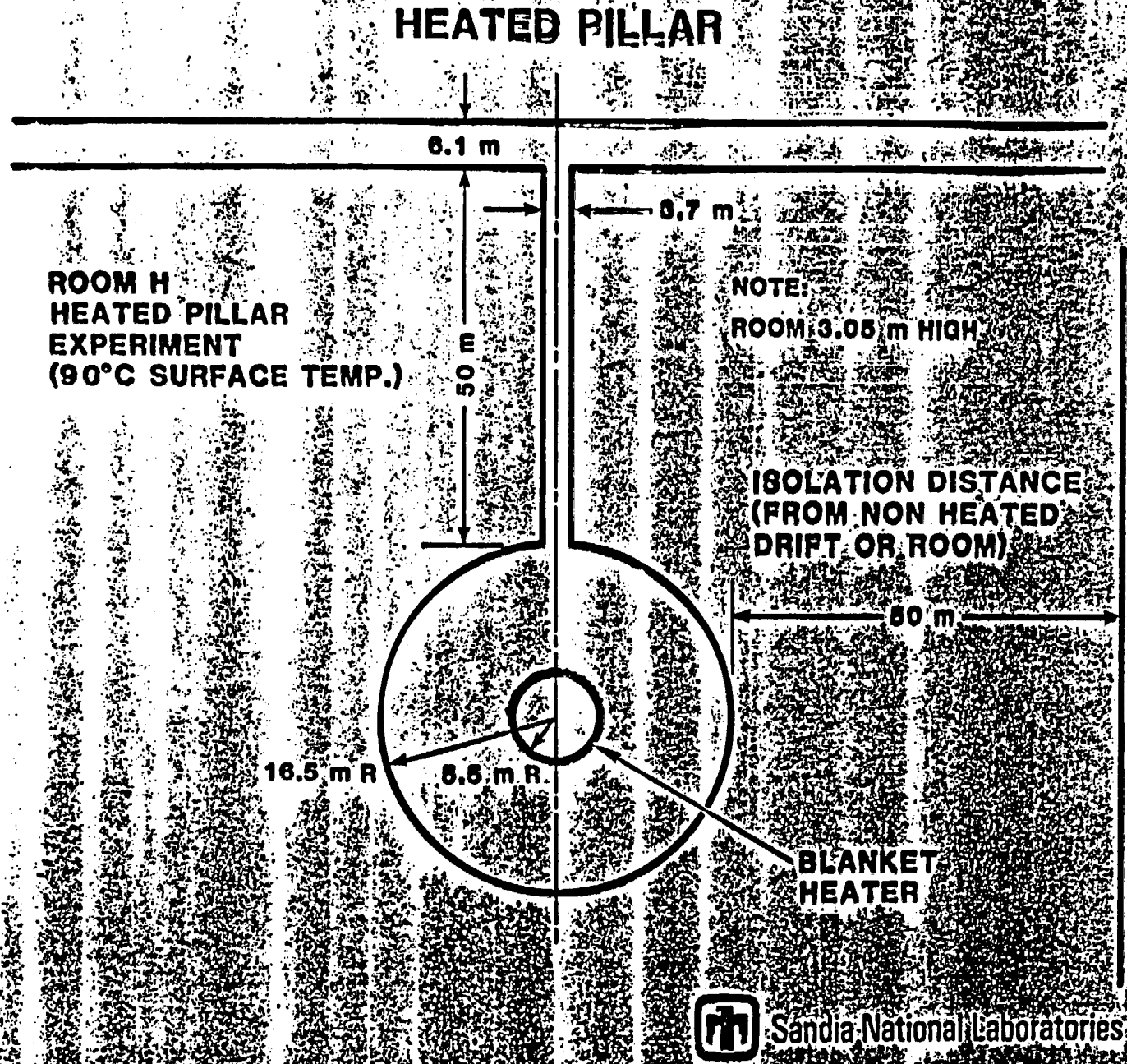

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SMALL SCALE
SEAL PERFORMANCE TESTS

OBJECTIVE:
TO OBTAIN DATA ON IN SITU SEAL SYSTEM HYDROLOGIC AND STRUCTURAL PERFORMANCE INCLUDING EVALUATION OF:

- SCALING EFFECTS
- HORIZONTAL VERSUS VERTICAL PERFORMANCE
- BRINE AND GAS WORKING FLUIDS
- FLOW PATHS

TEST SERIES	SEAL MATERIAL	CONFIGURATION	INITIATE
A	SALT-WATER BASED CONCRETE	VERTICAL 6" TO 36" DIA.	7/85
B	SALT-WATER BASED CONCRETE	HORIZONTAL 6" TO 36" DIA.	1/86
C	SALT AND BENTONITE BLOCK AND MORTAR	HORIZONTAL 36" DIA.	5/86
D	SALT AND BENTONITE AS BACKFILL	VERTICAL 36" DIA.	6/86
E	SALT-WATER BASED CONCRETE	VERTICAL (THRU MB 139)	1/87

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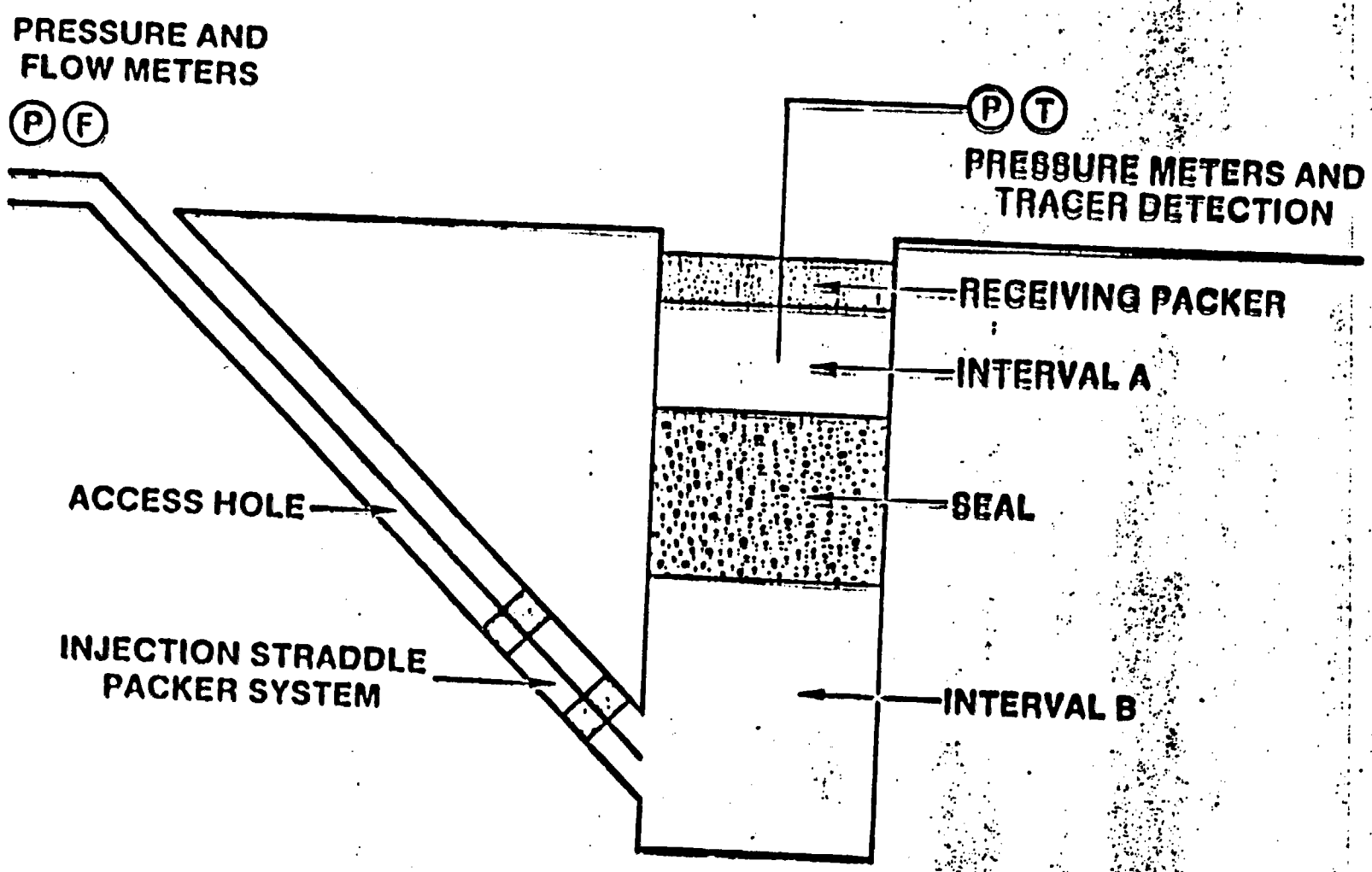
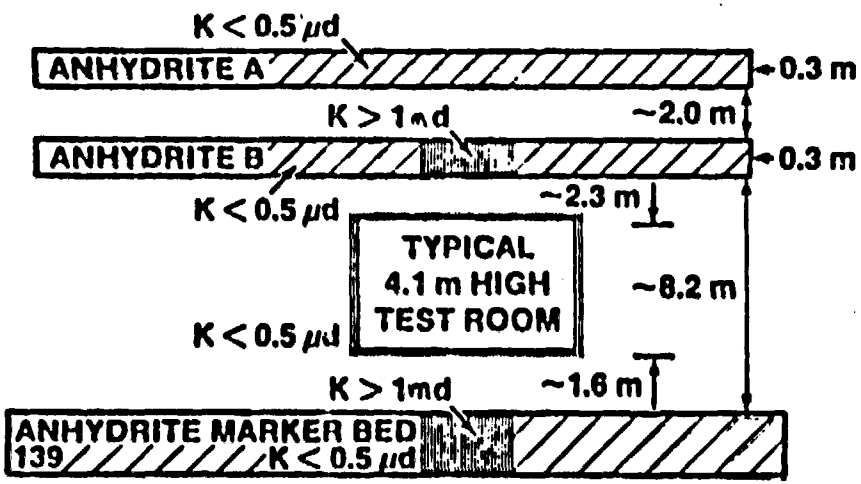


General Schematic of Small Scale Seal Performance Tests

PERMEABILITY MEASUREMENTS

TEST RESULTS



- PERMEABILITIES OF ROCK EXCLUDING ANHYDRITE/CLAY SEAMS DECREASES FROM ~1 μd at 1 m FROM EXCAVATION TO ~.01 μd at 10 m FROM EXCAVATION
- PERMEABILITIES OF ANHYDRITE/CLAY SEAMS GREATER THAN OTHER ROCK ONLY IMMEDIATELY ABOVE AND BELOW EXCAVATION

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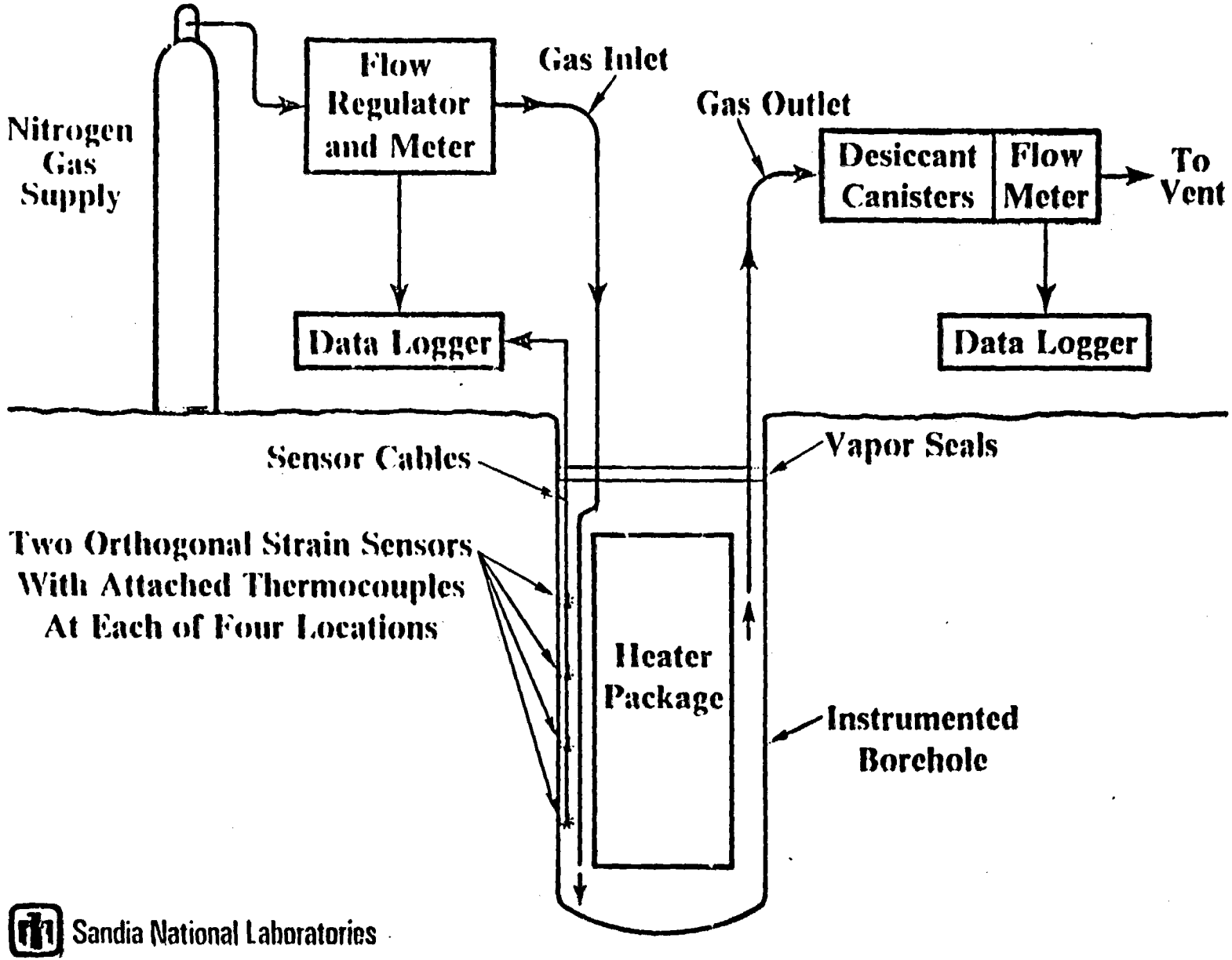
SCHEMATIC OF MOISTURE RELEASE TEST SYSTEM



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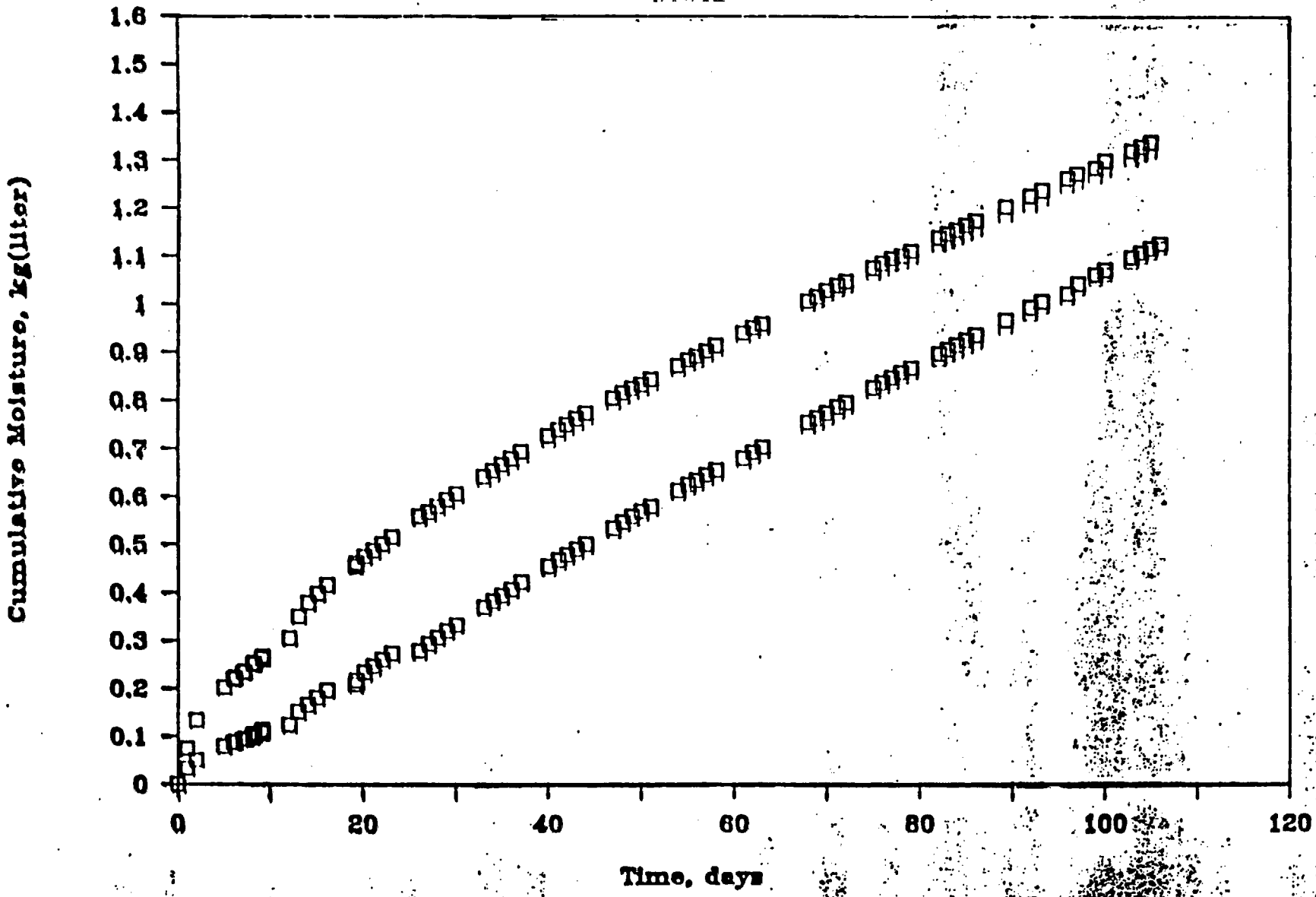
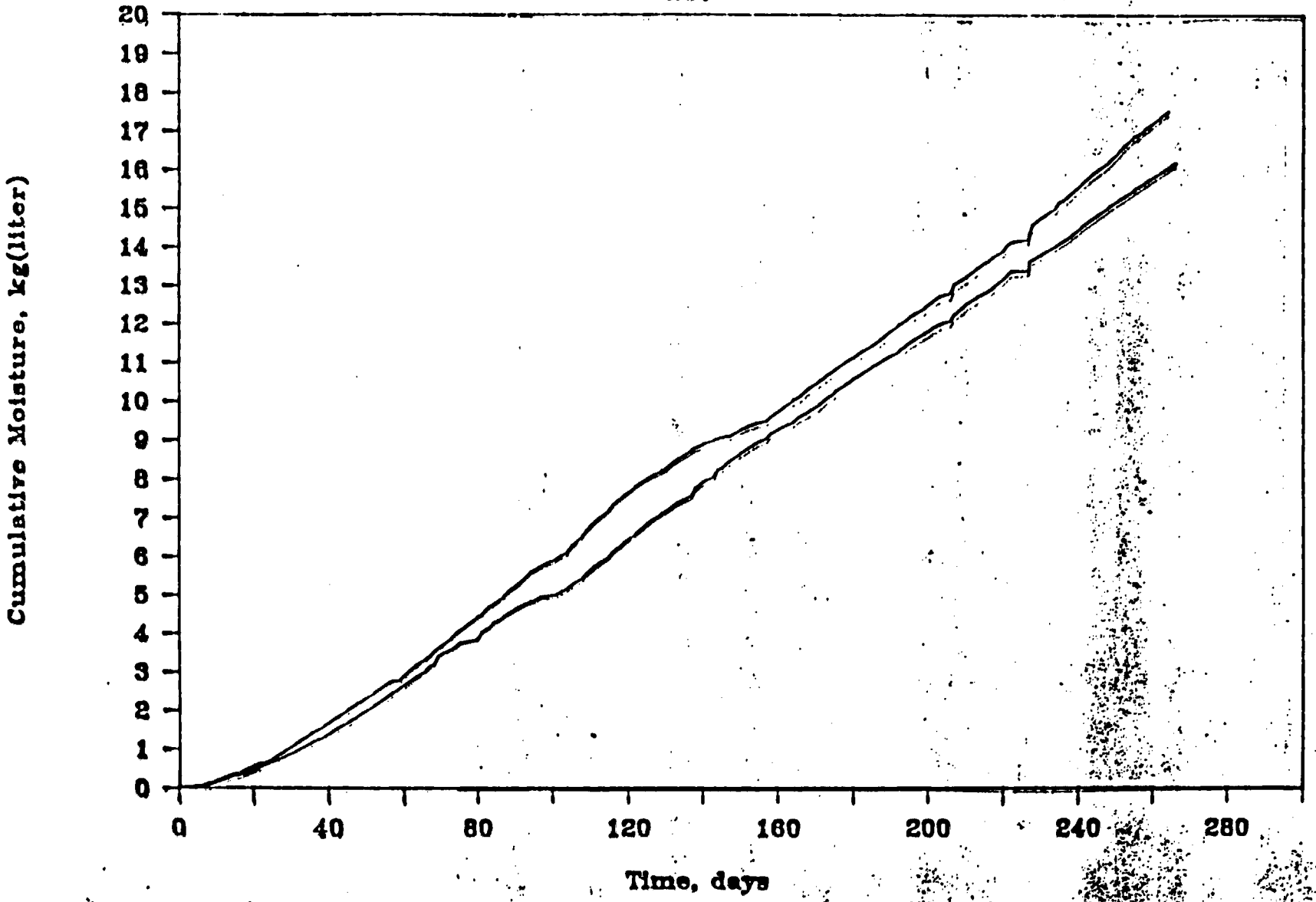
Cumulative Moisture Collected vs Time

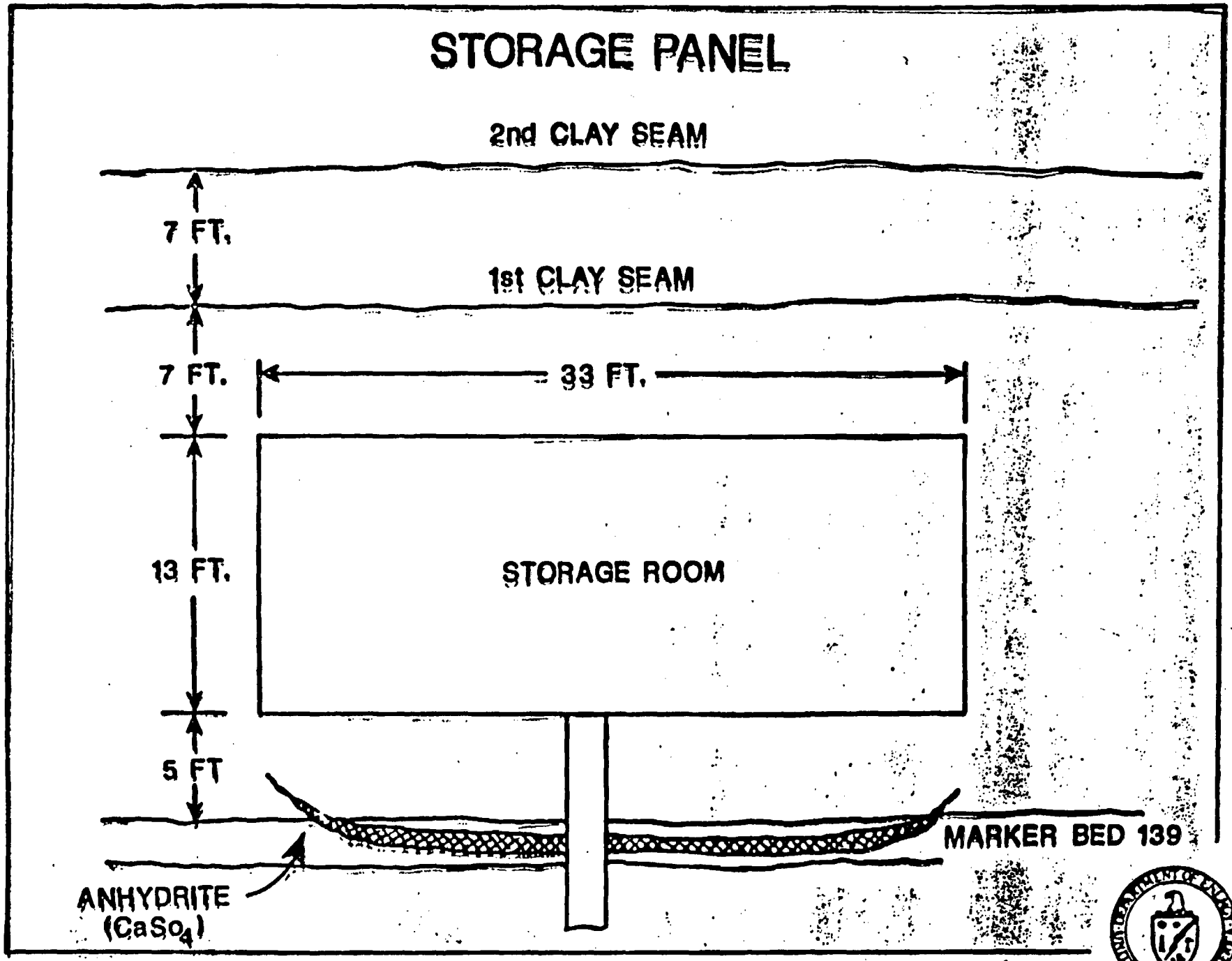
A1042

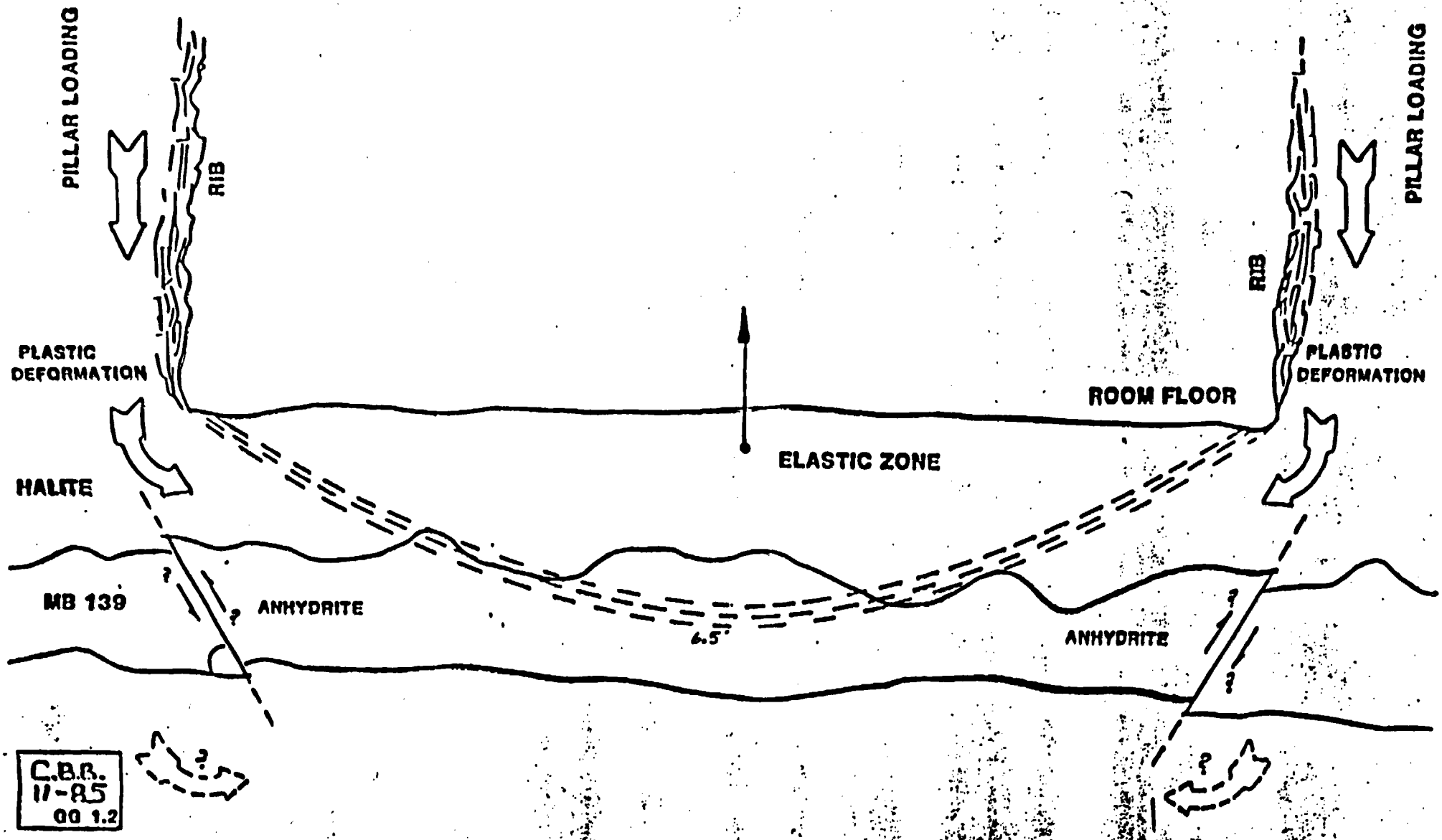


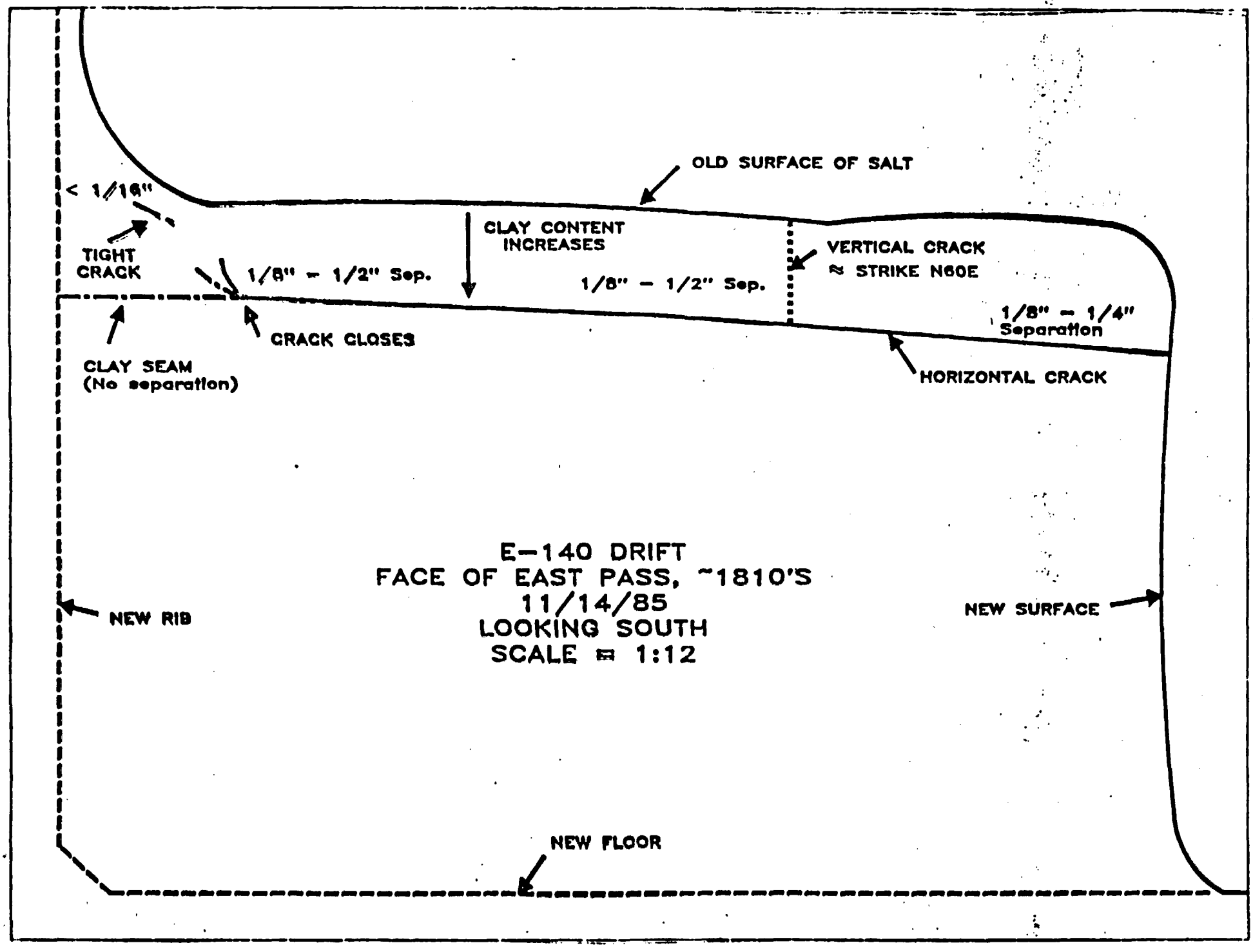
Cumulative Moisture Collected vs Time

B042




STORAGE PANEL
2nd CLAY SEAM
7 FT.
1st CLAY SEAM
7 FT.
33 FT.
13 FT.
STORAGE ROOM
5 FT
MARKER BED 139
ANHYDRITE
(CaSo4)


PILLAR LOADING
RIB
PLASTIC DEFORMATION
HALITE
MB 139
ANHYDRITE
ELASTIC ZONE
6.5'
ROOM FLOOR
ANHYDRITE
RIB
PLASTIC DEFORMATION
PILLAR LOADING
C.B.R.
11-85
GG 1.2


OLD SURFACE OF SALT
< 1/16"
TIGHT CRACK
1/8" - 1/2" Sep.
CLAY CONTENT INCREASES
1/8" - 1/2" Sep.
VERTICAL CRACK
≈ STRIKE N60E
1/8" - 1/4" Separation
CRACK CLOSES
CLAY SEAM (No separation)
HORIZONTAL CRACK
E-140 DRIFT
FACE OF EAST PASS, ~1810'S
11/14/85
LOOKING SOUTH
SCALE ≈ 1:12
NEW RIB
NEW SURFACE
NEW FLOOR

OBSERVATIONS

- FRACTURE OBSERVED IN 36" DIAMETER CONSTRUCTION HOLES IN FLOOR OF SPDV ROOM 3

- SUBHORIZONTAL FRACTURE(S) IN ANHYDRITE BED 4-5 FEET BELOW FLOOR OF ROOM 3 SHOW MAXIMUM OPENING OF 4 INCHES

- FRACTURE GEOMETRY ACROSS THE ROOM IS SAUCER-SHAPED

- NEAR THE ROOM WALLS, FRACTURES MOVE UP INTO OVERLYING SALT AND APERTURE DECREASES MARKEDLY

- FRACTURE SYSTEM EXTENDS A CONSIDERABLE DISTANCE ALONG THE ROOM

- TESTING HAS INDICATED INCREASED PERMEABILITY ASSOCIATED WITH THIS, AND OTHER INTERBEDS IS LIMITED TO THE REGION ABOVE AND BELOW THE EXCAVATIONS

- THE OBSERVATIONS DISCUSSED REFLECT ANTICIPATED TRENDS BUT ARE MORE DISCREET AND PRONOUNCED THAN EXPECTED - PERHAPS DUE TO:

  - VERTICAL AND HORIZONTAL CONVERGENCE IN EXCAVATION IS MORE RAPID THAN INITIALLY EXPECTED

  - DILATION IS LOCALIZED BY PRE-EXISTING WEAKNESSES IN THE ANHYDRITE AND/OR HALITE

12/10/85

PRESENTATION ON ROOMS X

– HORIZONTAL EMPLACEMENT –

L. D. TYLER

November 14, 1985

Sandia National Laboratories

INITIAL

- Pillar stability concerns
- Hole preparation simplicity
- Shielding plug concerns
- Backfill difficulty

(RCC - configuration adaptation of commercial for DHLW, therefore: Rooms A)

RECENT

- Mining economy
- Transporter simplicity
- Strata uniformity

(No RCC - possible commercial configurations, as design studies, therefore: Rooms X)

Sandia National Laboratories

STUDIES

ONWI-210 SAI SEPTEMBER 1982
Thermomechanical Analysis of Nuclear Waste Repositories With Horizontal Emplacement

MEMO REPORT SANDIA MARCH 1983
Calculations for Variations on the Room A Configuration

MEMO REPORT SANDIA DECEMBER 1983
Pretest Calculations for Room X

REPORT INSPECTOR GENERAL MAY 1984
The Potential for Cost Reduction in the Waste Isolation Pilot Plant (WIPP) Project

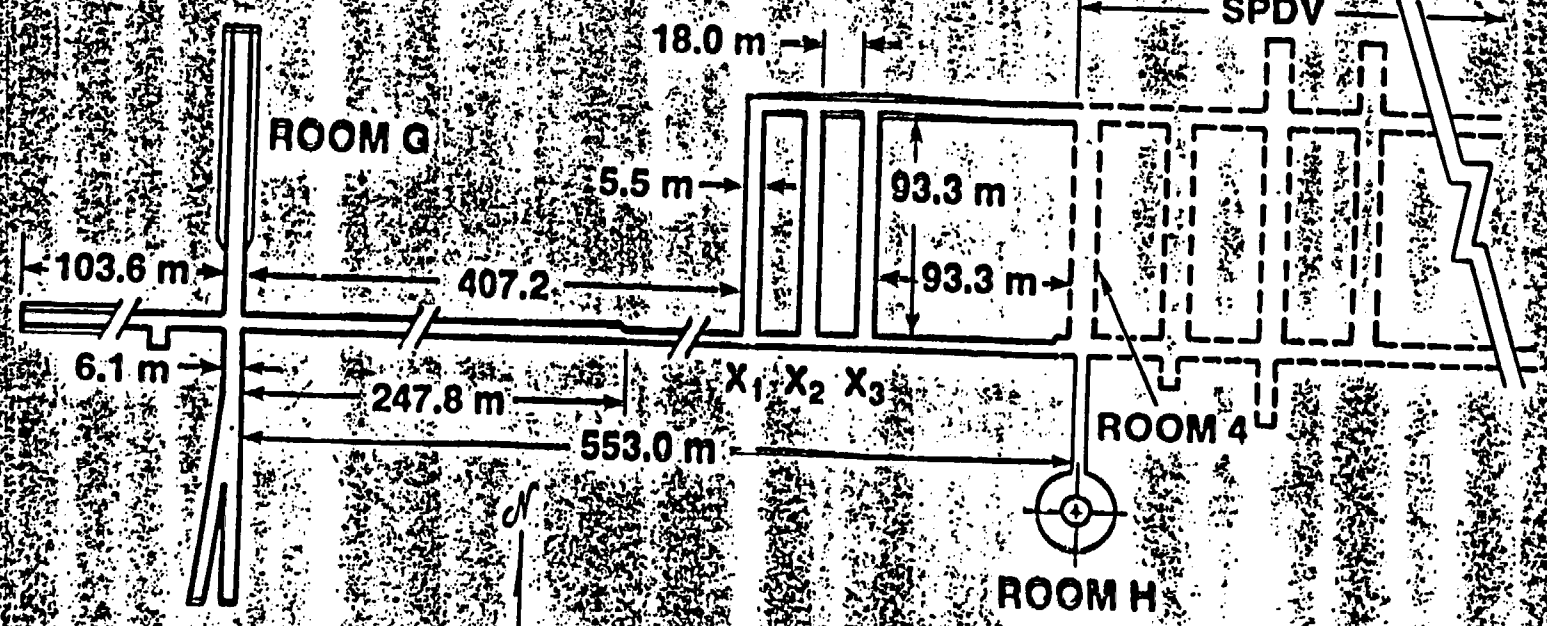
EXPERIMENT:

- Horizontal emplacement (18 W/m2) mockup simulating room and explacement geometries (Rooms X)

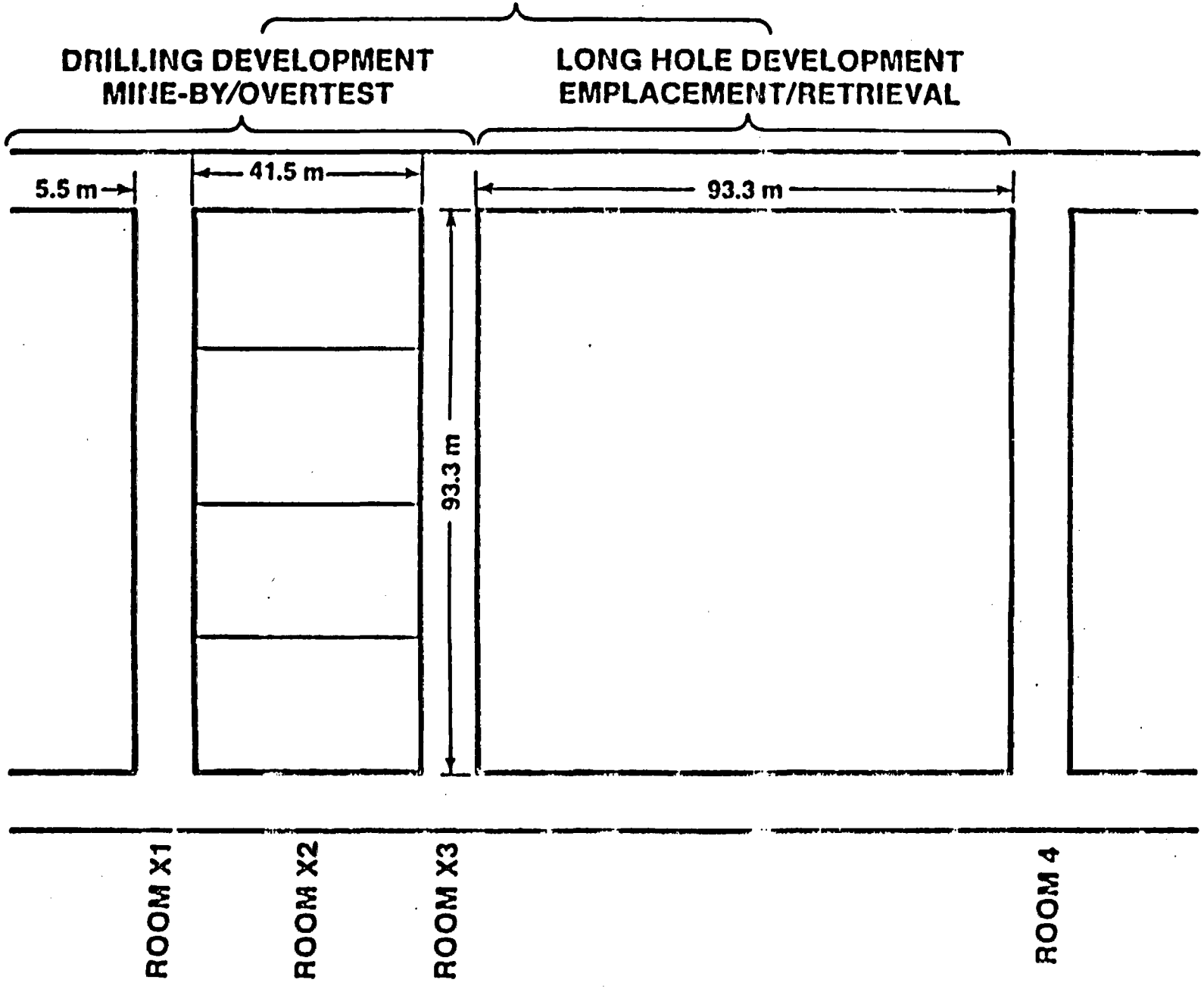
ISSUE:

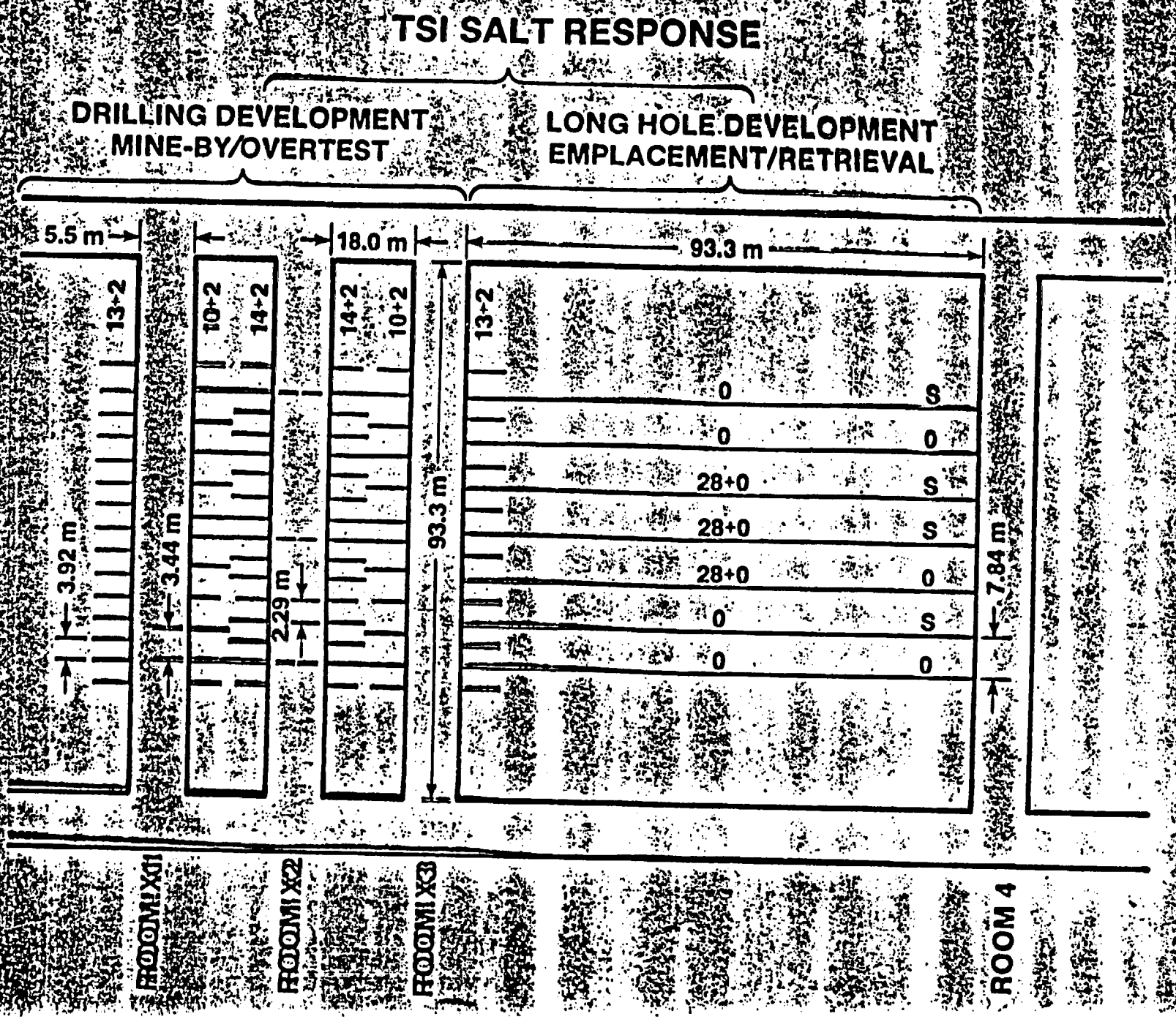
- Predict heated rock response for structural design and waste retrievability for horizontal emplacement
- Horizontal vs. vertical emplacement schemes
- Predict sleeved (overpack) and unsleeved emplacement hole
- Predict response interactions of waste cannister/sleeve or salt
- Predict hole and room backfill/sealing

HORIZONTAL EMPLACEMENT
ROOMS X_1, X_2, X_3



TSI SALT RESPONSE




TSI SALT RESPONSE
DRILLING DEVELOPMENT
MINE-BY/OVERTEST
LONG HOLE DEVELOPMENT
EMPLACEMENT/RETRIEVAL
5.5 m
18.0 m
93.3 m
13+2
10+2
14+2
14+2
10+2
13+2
0
S
0
0
28+0
S
28+0
S
28+0
0
0
S
0
0
3.92 m
3.44 m
2.29 m
93.3 m
7.84 m
ROOM 1 X1
ROOM 1 X2
ROOM 1 X3
ROOM 4

OBJECTIVES

- Determine changes in pillar deformation, if any
- Determine canister hole closure rates
- Identify horizontal drilling requirements
- Identify canister insertion requirements
- Study sleeved and unsleeved response
- Study backfill methods
- Study radiation plug methods
- Demonstrate recovery methods
- Study canister/sleeve/salt interactions

SRP/WIPP

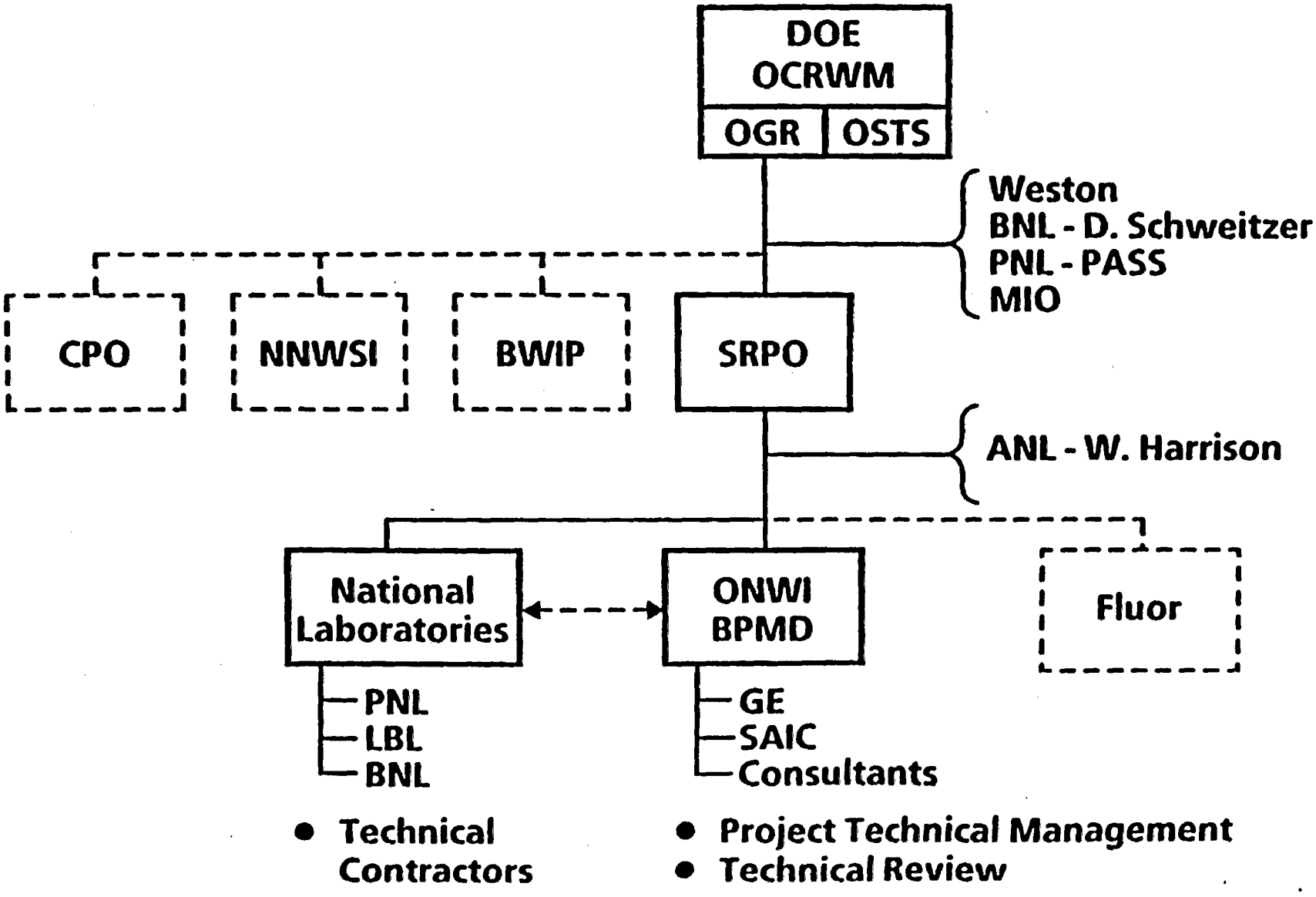
TECHNICAL INFORMATION EXCHANGE MEETING

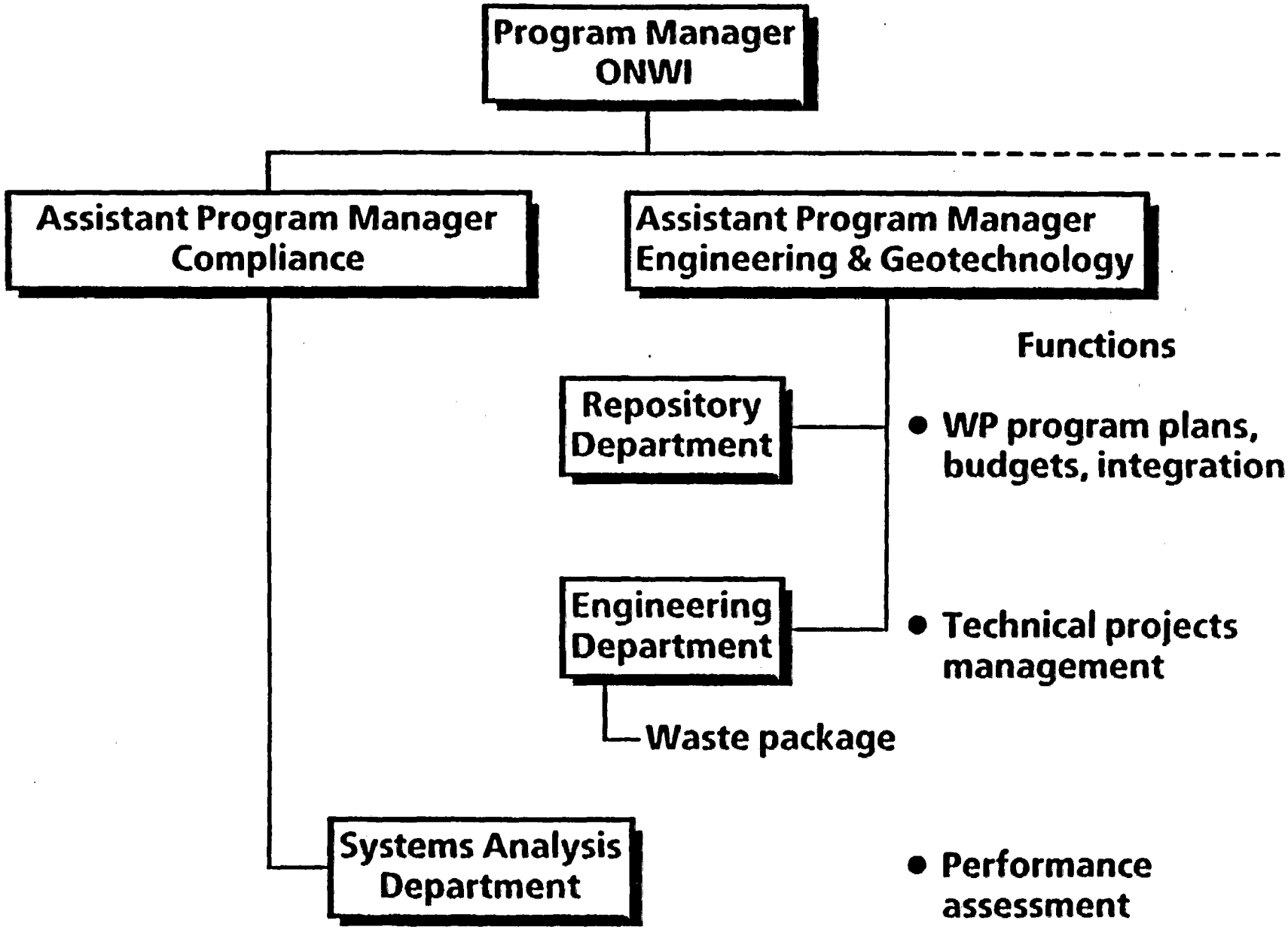
WASTE PACKAGE ACTIVITIES AT SRP

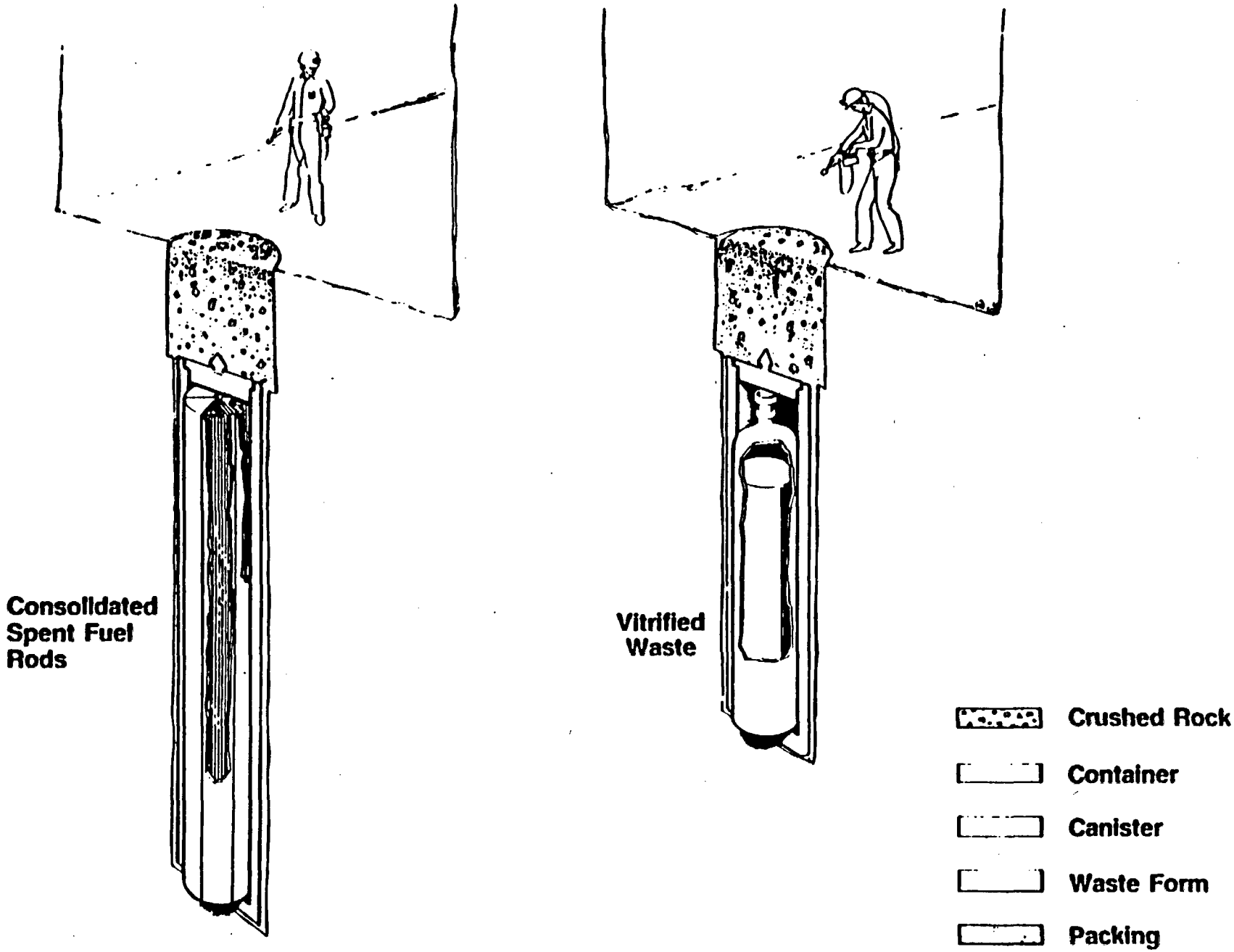
FEBRUARY 11-12, 1986

COLUMBUS, OHIO

SRPO Waste Package Program Participants

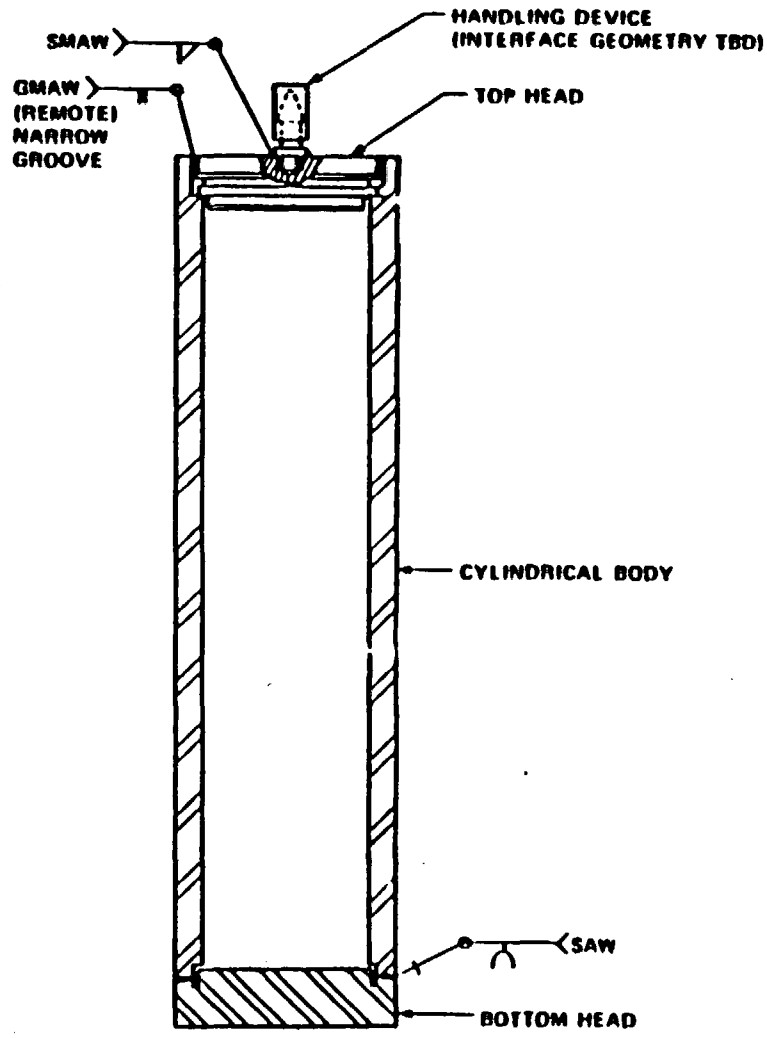



Program Manager
ONWI
Assistant Program Manager
Compliance
Assistant Program Manager
Engineering & Geotechnology
Functions
Repository
Department
• WP program plans, budgets, integration
Engineering
Department
• Technical projects management
Waste package
Systems Analysis
Department
• Performance assessment



Reference Conceptual Designs

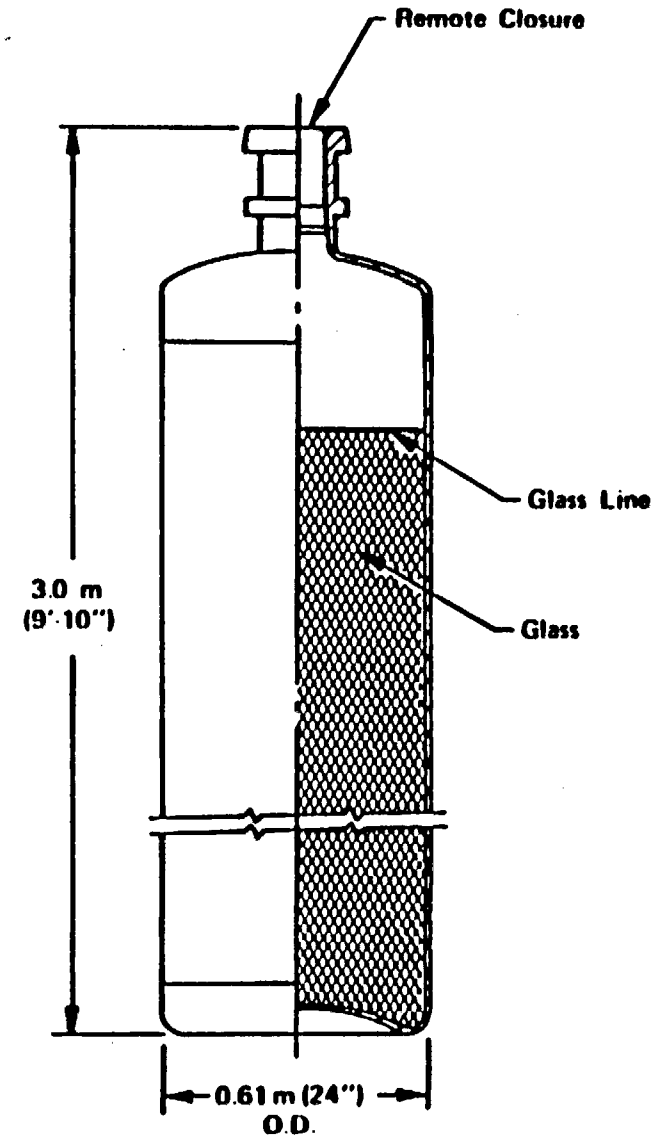
Container


HANDLING DEVICE
(INTERFACE GEOMETRY TBD)
SMAW
GMAW
(REMOTE)
NARROW
GROOVE
TOP HEAD
CYLINDRICAL BODY
SAW
BOTTOM HEAD

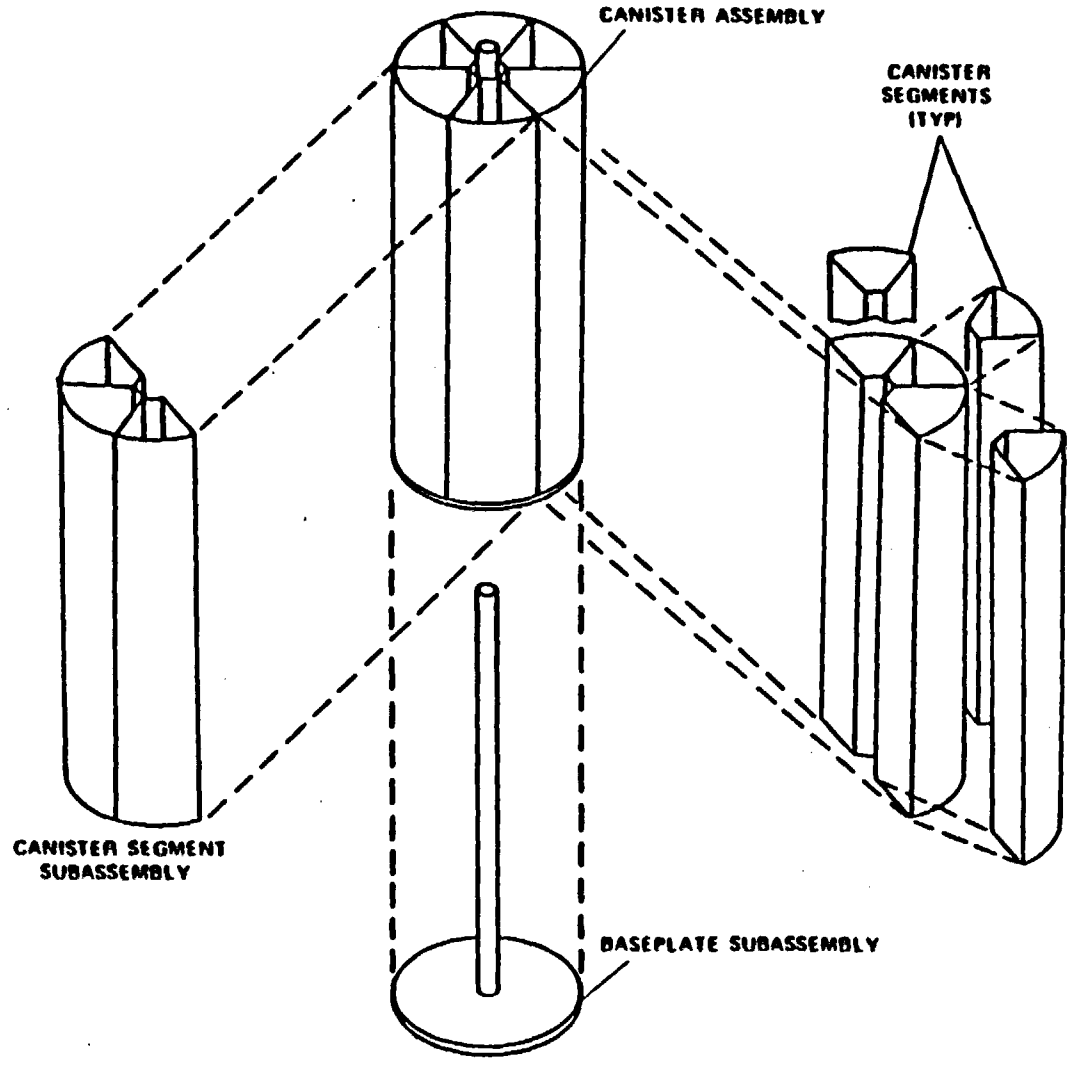
Conceptual Design Parameters

	DWPF	PWR
Waste form		
Weight (kg)	1470	7920
Canister		
Diameter (cm)	61	62
Length (cm)	300	400
Container		
Diameter (cm)	80.8	84.5
Length (cm)	338.5	446.5
Wall thickness (cm)	8.6	10.0
Weight (kg)	6030	9250
Waste package		
Total weight (kg)	7970	17,640

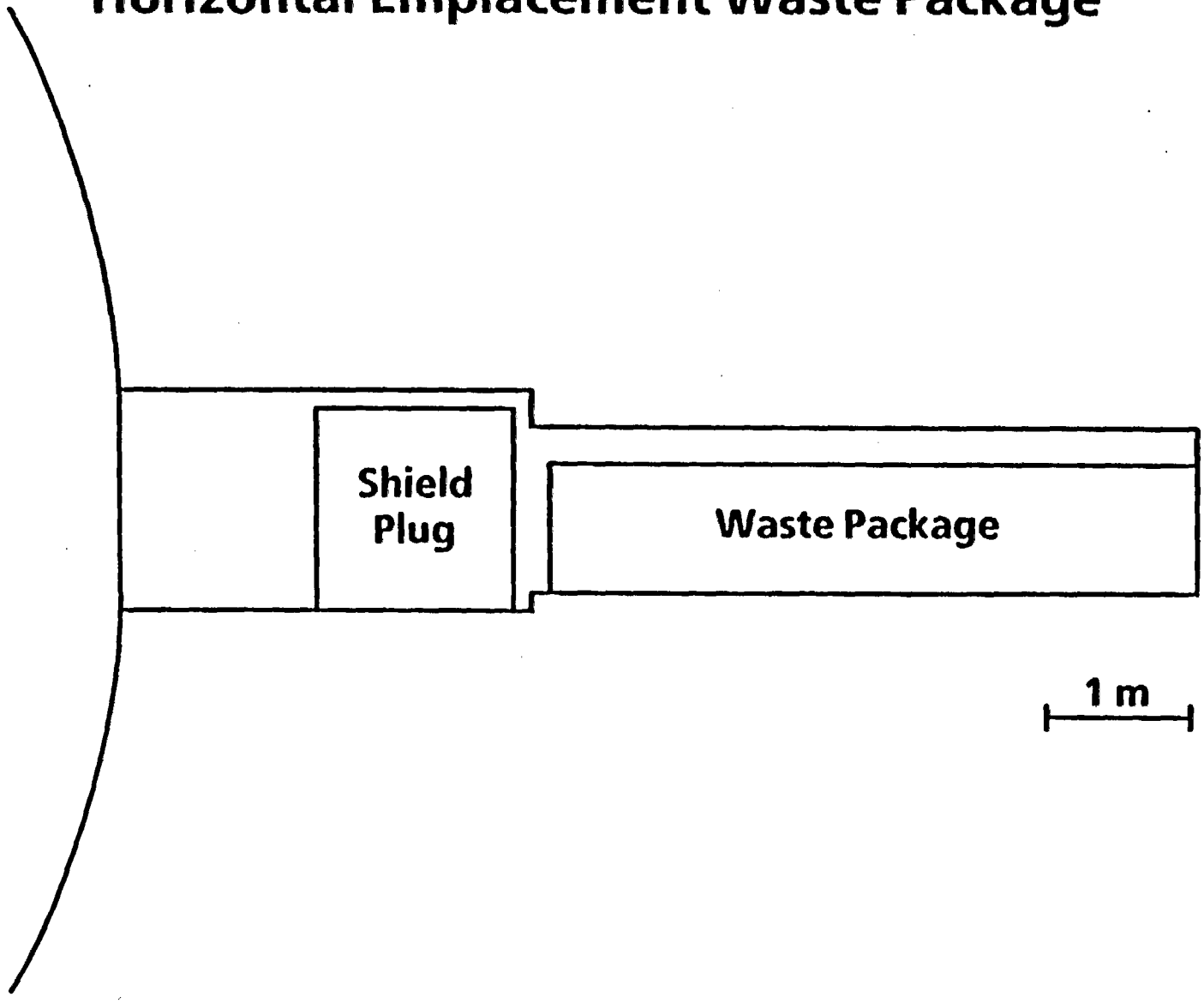
Defense High-Level Waste Form (DWPF)



Consolidated Spent Fuel Canister



Horizontal Emplacement Waste Package



Container Material

Desirable Properties

- Acceptable uniform corrosion rate
- No local corrosion
- Simple material
- History of application
- Weldability
- Castability
- Radiation attenuation
- Material strength
- Cost

Material Selected

ASTM A216, Grade WCA

Reference Overpack Material

ASTM A216-77, Grade WCA

Element	Composition, Max., %
C	0.25
Mn	0.70
P	0.04
S	0.045
Si	0.6
Total Cu, Ni, Cr, Mo, V	1.0
Tensile Strength, Min.	60 to 85 KSI (415 to 585 MPa)
Yield Strength, Min.	30 KSI (205 MPa)
Elongation, Min.	24%
Reduction of Area	35%

Expected Processes

Brine quantity << -- Container consumption quantity

Brine rate < -- Container corrosion consumption rate

Surrounding porosity/permeability -- very low

Alternate and Contingency Concepts

- Alternate Container Materials
- Thicker container
- Galvanic package
- Tailored packing material

Alternate Container Material Concept

Alternate Materials

- Ti Code 12
- Nickel alloys

Uses

- If low carbon steel is unacceptable
  - General
  - Local

Disadvantages

- May not react sufficient brine
- Susceptibility to localized corrosion

Potential Material Degradation Modes

- General corrosion
- Non-uniform corrosion
  - Pitting
  - Crevice
  - Intergranular
- Stress-corrosion cracking
- Hydrogen embrittlement
- Bacterial corrosion
- Aging
- Mechanical failure
  - Creep
  - Overload

Comparison of Estimated Corrosion Rate Averages for General Corrosion in Oxic (1.5 ppm O_2) PBB2 at 150 C

Material	Estimated Rate, $\mu m/yr$[a]	Standard Error	Comparison[b]
A216 Steel	25.2	0.68	A
High Purity Iron	24.5	1.06	A
Normalized Cast A27	17.1	0.76	B
1025 Wrought Steel	14.7	0.90	BC
Ductile Cast Iron	14.5	0.84	BC
A27 Cast Steel	12.1	0.84	CD
2 1/2% Cr, 1% Mo Steel	10.1	0.84	D

[a]Rates are estimated at the average time period (4100 hours).

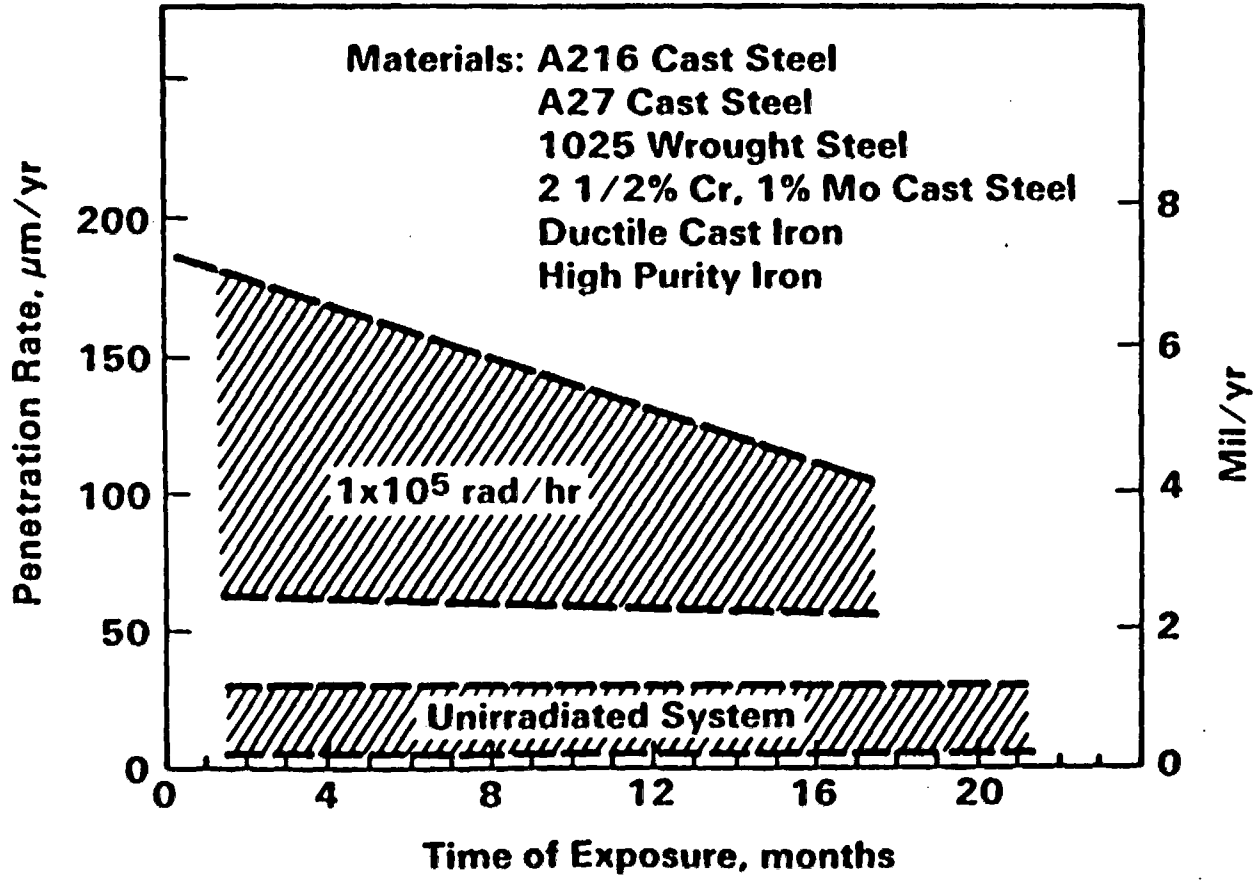
[b]Materials that share at least one letter are not significantly different with respect to corrosion rate at the 95% confidence level.

Magnetite Corrosion Product

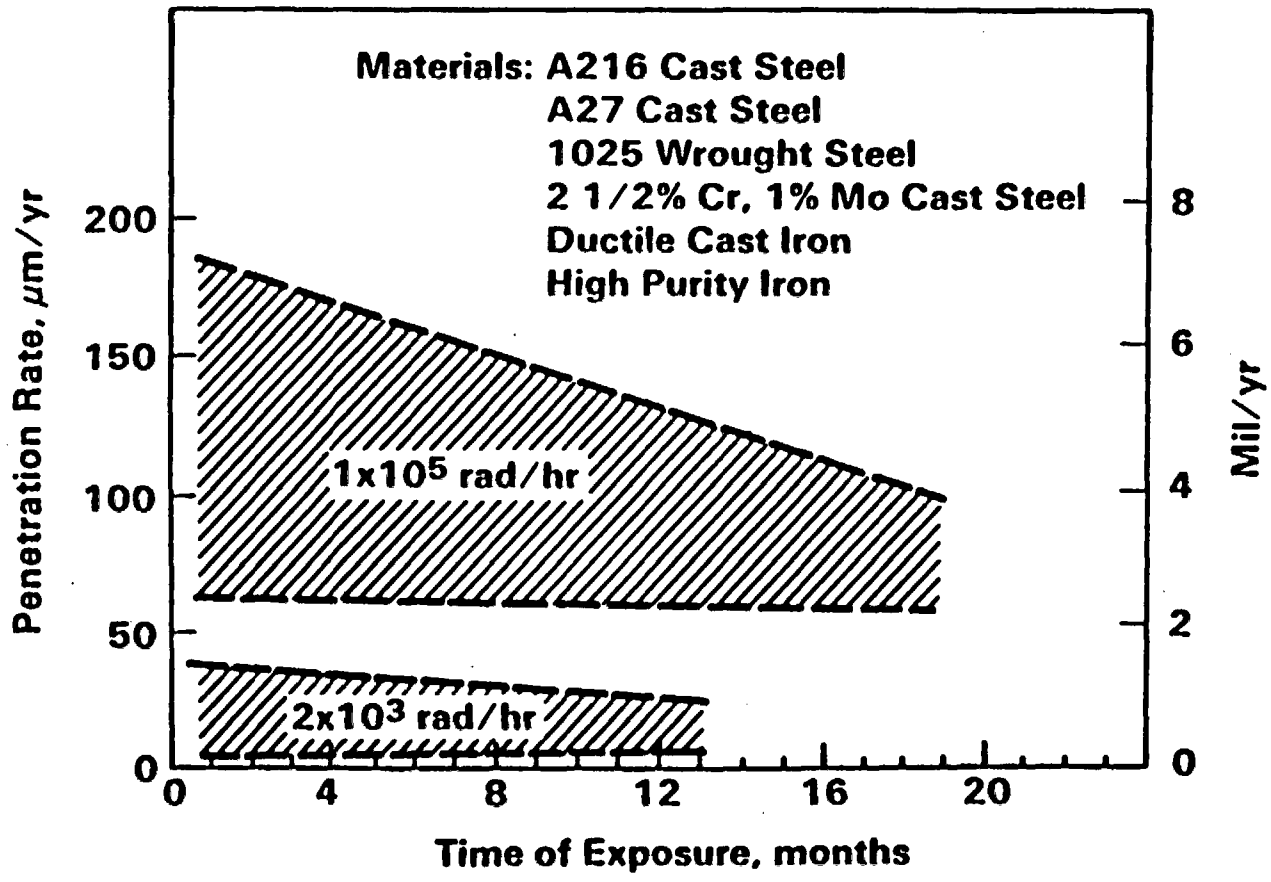
- Forms in all low-Mg brines on all ferrous materials tested
- Offers some degree of protection
- Produced by reaction of iron and water:

$$3\,Fe + 4H_2O = Fe_3O_4 + 4H_2$$

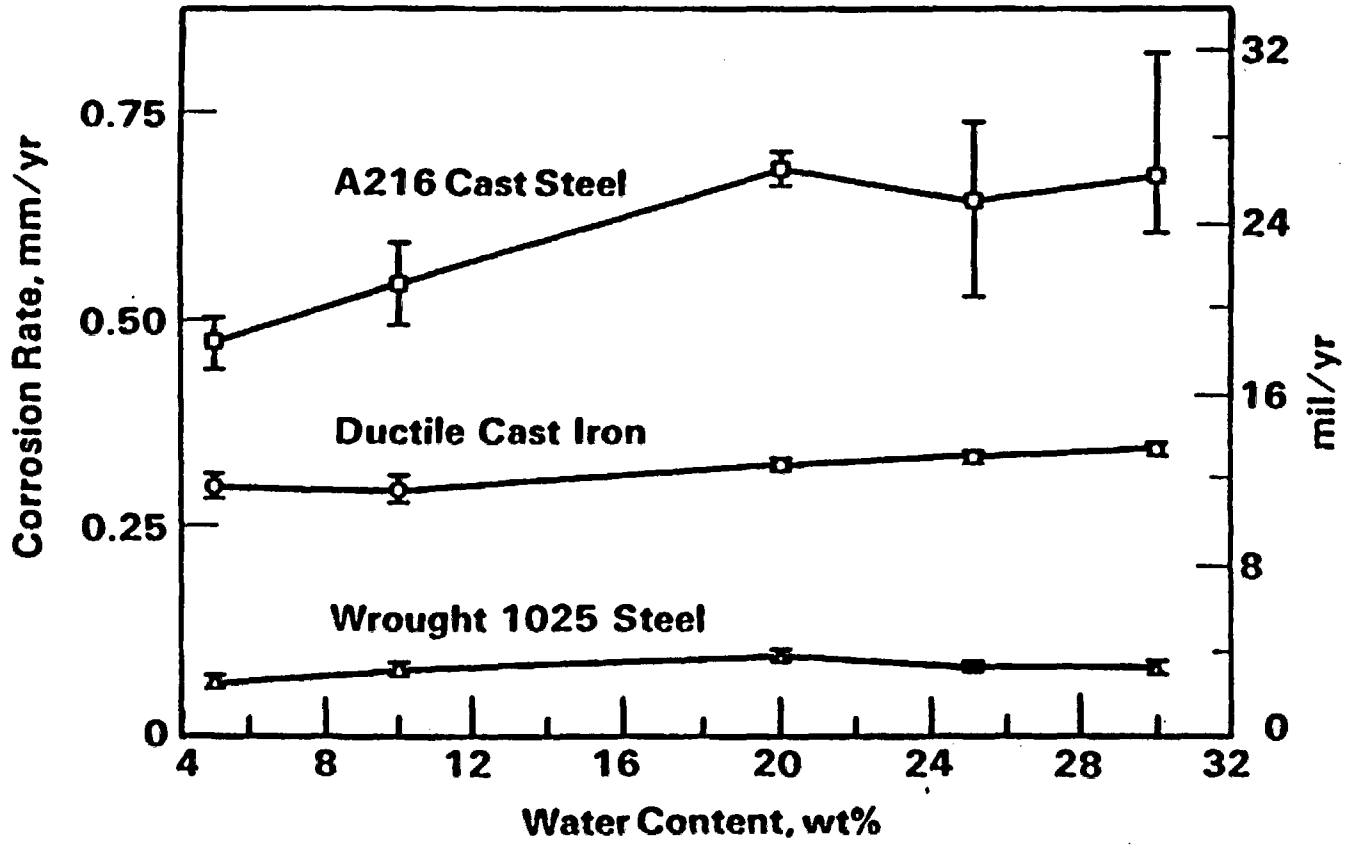
Irradiation-Corrosion of Ferrous Materials in Permian Basin Brine No. 2 at 1×10^5 Rad/Hr, 150°C



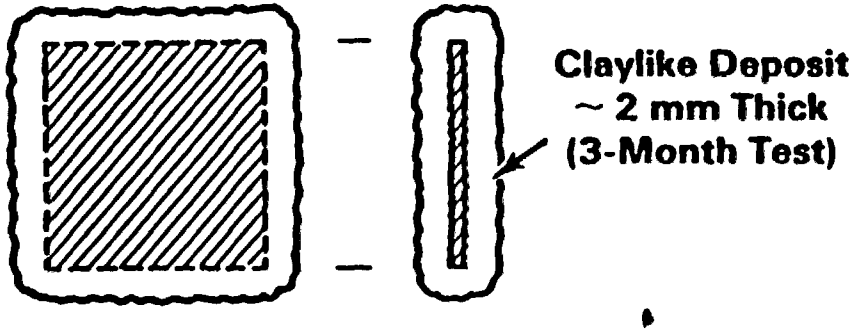
Irradiation-Corrosion of Ferrous Materials in Permian Basin Brine No. 2 at 150°C and Either 1×10^5 Rad/Hr or 2×10^3 Rad/Hr



Corrosion Rates of Ferrous Materials in PBB1 Salt Moistened with PBB3 Brine, 3 Months Exposure at 150°C



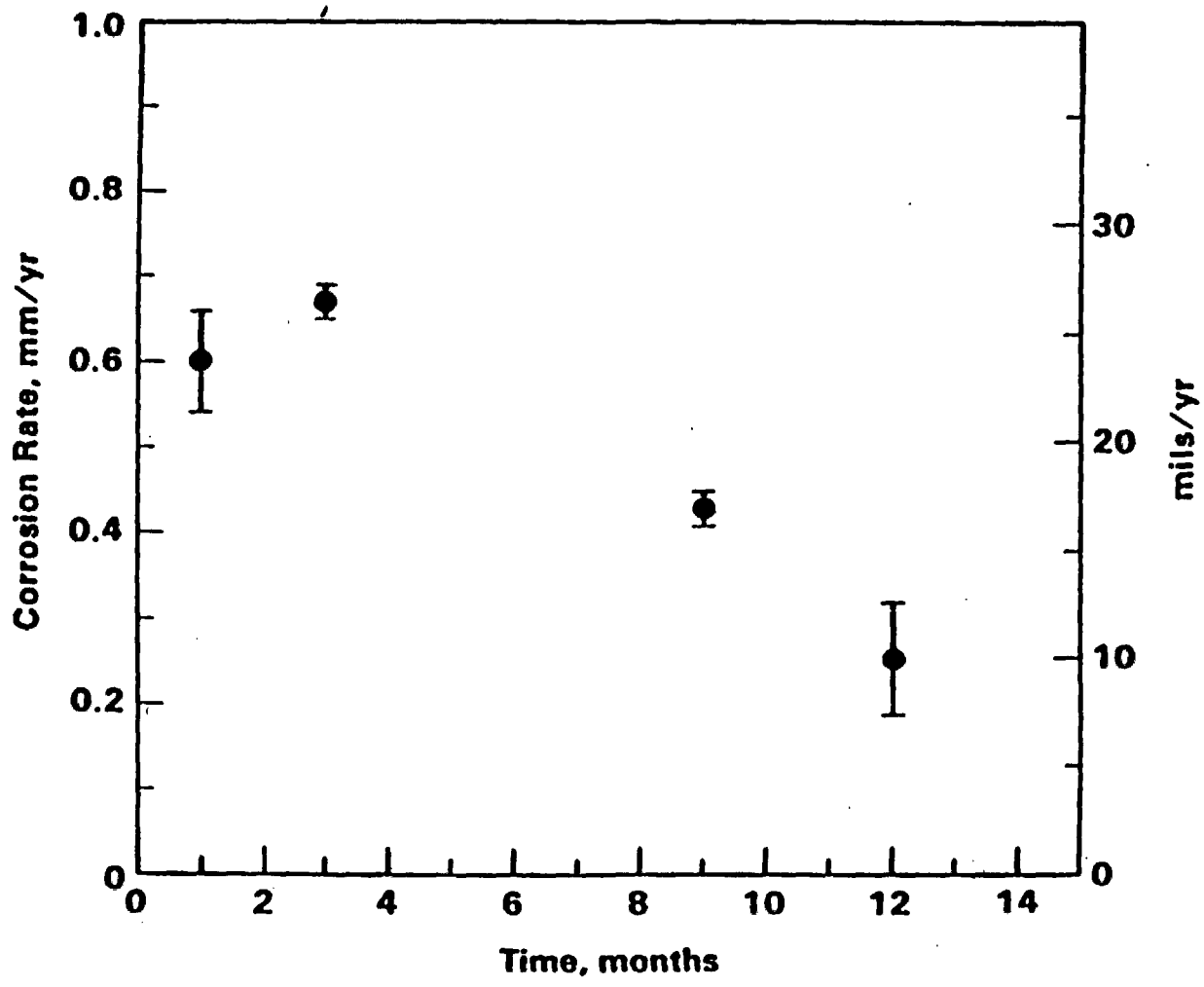
Surface Deposition Found on Specimens not Forming Magnetite



Deposit is

- Bluish Gray
- Not Water Soluble, Easily Rinsed From Sample Surface
- Non-Crystalline in Bulk
- Fe, Mg $(OH)_2$ on Rinsed Surface

Average Corrosion Rates of As-Cast A216 Steel Specimens
PBB1 Salt, PBB3 Brine, 20% H_2O, 150°C



WIPP/SRPO Meeting
February 11, 1986

NAME	ORGANIZATION	TELEPHONE NUMBER
H.N. Kalia	ONWI	614 424 4956
R. John Byrne	Golder	206 883-0777
Martin Molecke	Sandia/WIPP	505 844-0781
Lynn D. Tyler	Sandia/WIPP	505 844-8179
Randy Robinson	DOE/WIPP	FTS 571-2213
Dick Crawley	DOE/WIPP	FTS 571-2214
Jane Powell	DOE/SRPO	FTS 976-5916
Michael Ferrrigan	DOE/SRPO	FTS 976-5916
John W. Sadler	WIPP	505 887-0586
Tod Burrington	WIPP	505 887-0586
Tilak Verma	NRC/Cols	FTS 976-5916
B.R. Chytrowski	ONWI	614 424-6504
Bob Waters	DOE/SRPO	FTS 976-5916
Jack Fitch	Fluor	FTS 976-5916
Nabil Ghantous	ONWI	614 424-5015
Judith B. Moody	Battelle/ONWI	FTS 976-5536
Owen E. Swanson	FOD/ONWI	FTS 976-5241
Arthur J. Coyle	ONWI	FTS 976-5037
William F. Jebb	ONWI	424-4576
John Lux	ONWI	424-5080
Tim Wagar	ONWI	424-6395
Shirley McMaster	ONWI	424-6532
Steven Smith	ONWI	424-5198
George Jansen	ONWI/SAD	FTS 976-7317
Henry Paul Nunes	BPMD/QAD	424-7604
M.J. Golis	ONWI/Waste Package	614 424-7806
B. Tylock	ONWI/SAD	614 424-4991
Susan Buchanan	DOE/SRPO	614 424-5916
A.M. LaSala, Jr.	USGS/SRPO	FTS 976-5916
Chris J. Perry	ONWI/Geohydrology	614 424-6569

WIPP/SRPO Meeting (continued)
February 11, 1986

NAME	ORGANIZATION	TELEPHONE NUMBER
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Bill McClain	Weston	301 963-6811
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Richard Wright	ONWI/In Situ Testing	Ref. H. Kalia
Jim Cunnane	ONWI/Engineering	614 424-4710
Stephen Petty	ONWI/Engineering	614 424-4306
John A. Carr	ONWI/Waste Package	FTS 976-7636
Jim R. Schornhorst	ONWI/Waste Package	614 424-6187
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Ram Lahoti	DOE/SRPO	FTS 976-5916