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PRELIMINARY THERMAL AND THERMOMECH-ANICAL MODELING FOR THE NEAR SURFACE TEST FACILITY HEATER EXPERIMANTS AT HANFORD: Appendix D

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Preliminary Thermal and Thermomechanical Modeling for the Near Surface Test Facility Heater Experiments at Hanford

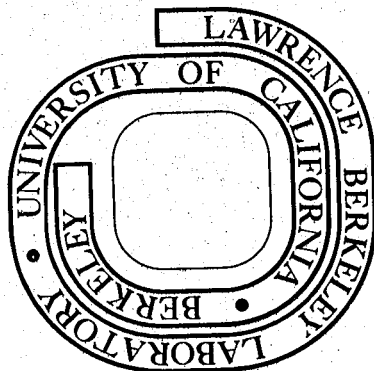
VOLUME II (Appendix D)

Tin Chan and Janet S. Remer
Earth Sciences Division

December 1978

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Prepared for the U. S. Department of Energy
under Contract W-7405-ENG-48
and for Rockwell Hanford Operations —
a Department of Energy Prime Contractor —
under Memorandum Order No. W8A-SBB-51760

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LBL-7069

PRELIMINARY THERMAL AND THERMOMECHANICAL MODELING FOR
THE NEAR SURFACE TEST FACILITY HEATER EXPERIMENTS AT HANFORD

Volume 2 (Appendix D)

Tin Chan and Janet S. Remer

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Lawrence Berkeley Laboratory
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Berkeley, California 94720

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(d)	180 days	32
(e)	365 days	33
(f)	372 days	34
(g)	395 days	35
(h)	455 days	36
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(j)	737 days	38
(k)	760 days	39
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PREFACE

Appendix D is a complete set of figures illustrating the detailed calculations necessary for designing the heater experiments at the Near Surface Test Facility (NSTF) at Hanford, Washington. The discussion of the thermal and thermomechanical modeling that yielded these calculations is presented in Volume 1. A summary of the figures and the models they illustrate is given in Table D1. The most important figures have also been included in the discussion in Volume 1, and Table D2 lists the figure numbers in this volume that correspond to figure numbers used there.

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Appendix D

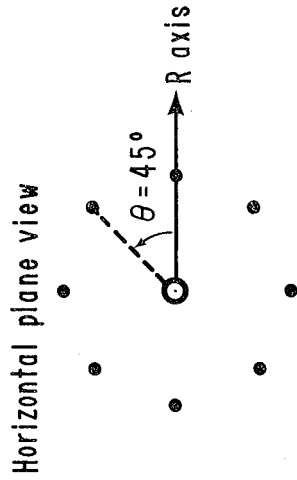
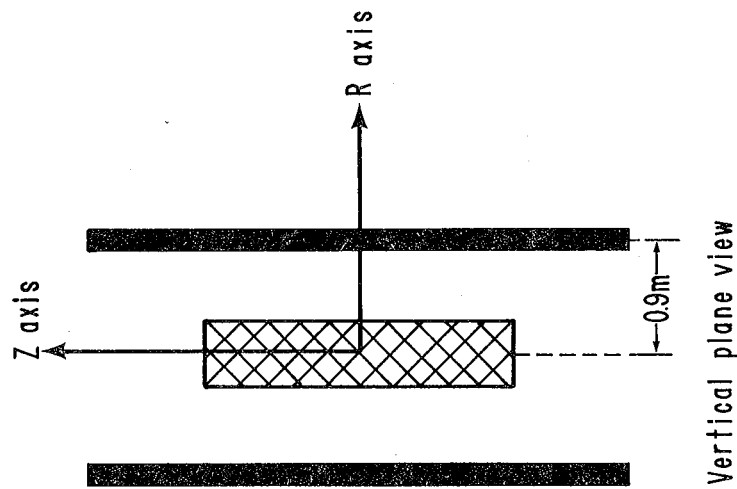
Table D1. Summary of figures representing models studied.

Power Schedule	(a) Full-Scale Experiments					
	Temperature Calculations		Displacement Calculations		Stress Calculations	
	Infinite Medium	Isothermal Boundary	Mesh 1	Mesh 7	Mesh 1	Mesh 7
1a (Fig. 2a)	D6a, D7a D8a-D8m	D9a-D9m	D12a, D12b D14a, D14b D15a, D15b D16a, D16b D20a-D20l	D12a, D12b D17a, D17b D18a, D18b D19a, D19b D22a, D22b	D24a-D24m	D26a, D26b, D27a, D27b
1b (Fig. 2b)	D6b, D7b					
1c (Fig. 2c)	D6c, D7c					
2a (Fig. 2d)	D6d, D7d D10a-D10m	D11a-D11m	D13a, D13b D14a, D14b D15a, D15b D16a, D16b D21a-D21l	D13a, D13b D17a, D17b D18a, D18b D19a, D19b D23a, D23b	D25a-D25m	D26a, D26b, D27a, D27b
2b (Fig. 2e)	D6e, D7e					
2c (Fig. 2f)	D6f, D7f					
Interference between Experiments with 1a (Fig. 2a) and 2a (Fig. 2d)	D28a, D28b		D30a, D30b		D29a, D29b	
(b) Time-Scaled Experiment						
3 (Fig. 4)	D31a-D31h D32a-D32k D33					

Table D2. Correspondence between figures in Volume 1 and Appendix D, Volume 2.

Figure Number in Volume 1	Figure Number in Appendix D, Volume 2
1	D1
2a-2f	D2a-D2f
3	D3
4	D4
5a-5c	D5a-D5c
6a-6c	D6a,D6d,D6f
7a-7c	D7a,D7d,D7f
8a,8b	D8e,D8i
9a-9c	D9b,D9e,D9i
10a,10b	D10e,D10i
11a-11c	D11b,D11e,D11i
12a,12b	D12a,D12b
13a-13c	D17a,D18a,D19a
14a-14f	D20b-D20f,D20i
15	D22a
16a-16e	D24a-D24c,D24f,D24g
17	D26a
18	D27a
19	D28a
20	D29a
21	D30a
22	D31a
23a,23b	D31b,D31i
24a,24h	D32a,D32c-D32g,D32j,D32k
25	D33

HANFORD FULL-SCALE EXPERIMENT



Central (main) heater:
length = 2.4384 m (8 ft.), radius = 0.2286 m (9 in)
energized at start of experiment.

Peripheral heaters:
length = 4.2672 m (14 ft), radius = 0.0191 m (0.75 in);
energized 365 days after start of experiment

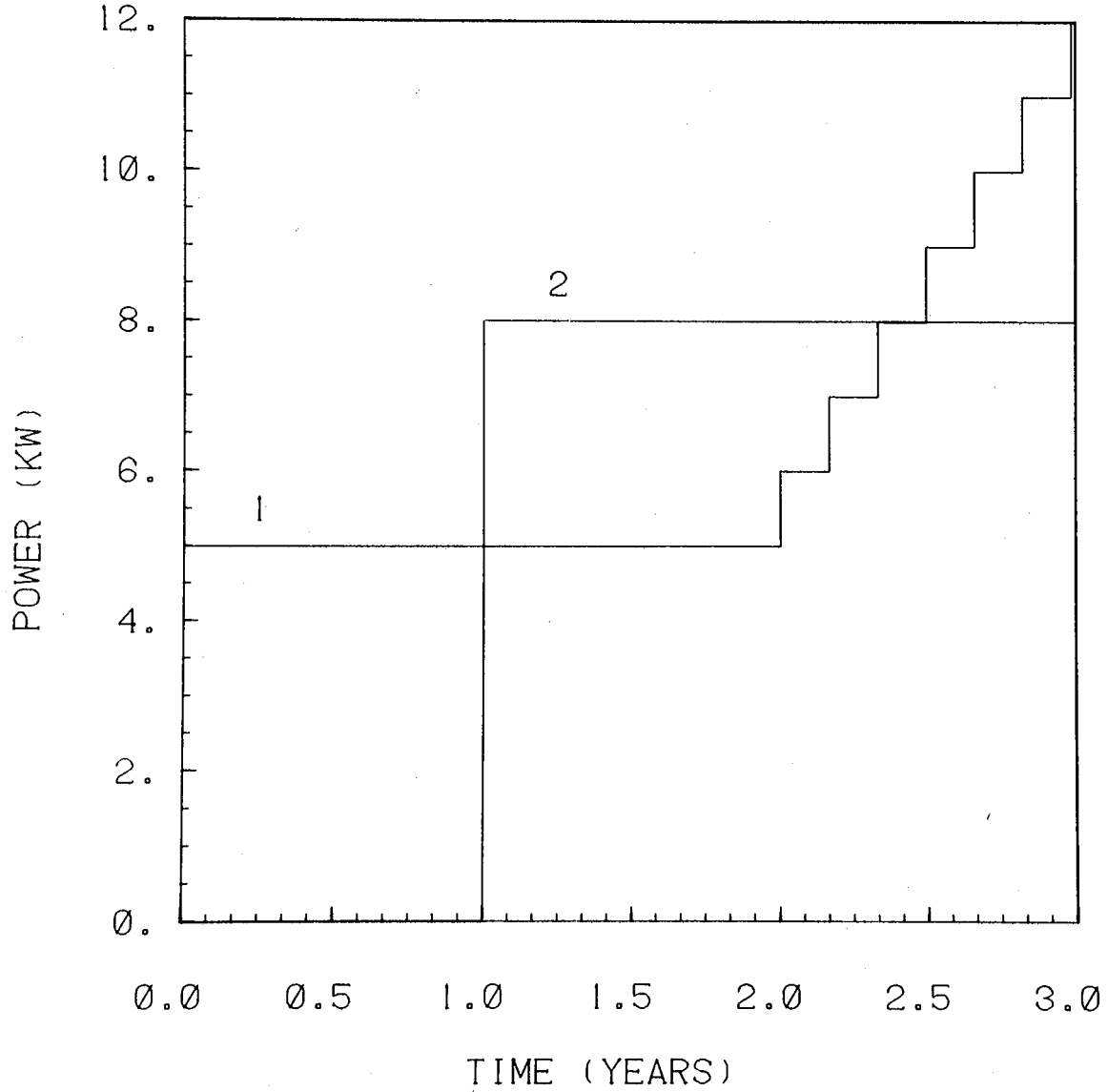
Axes represented are those used in numerical modeling.
Diameters of heaters in diagram are greatly exaggerated.

Figure DT
XBL 787-1993

HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 1A

1 - CENTRAL HEATER

2 - PERIPHERAL HEATERS (8)



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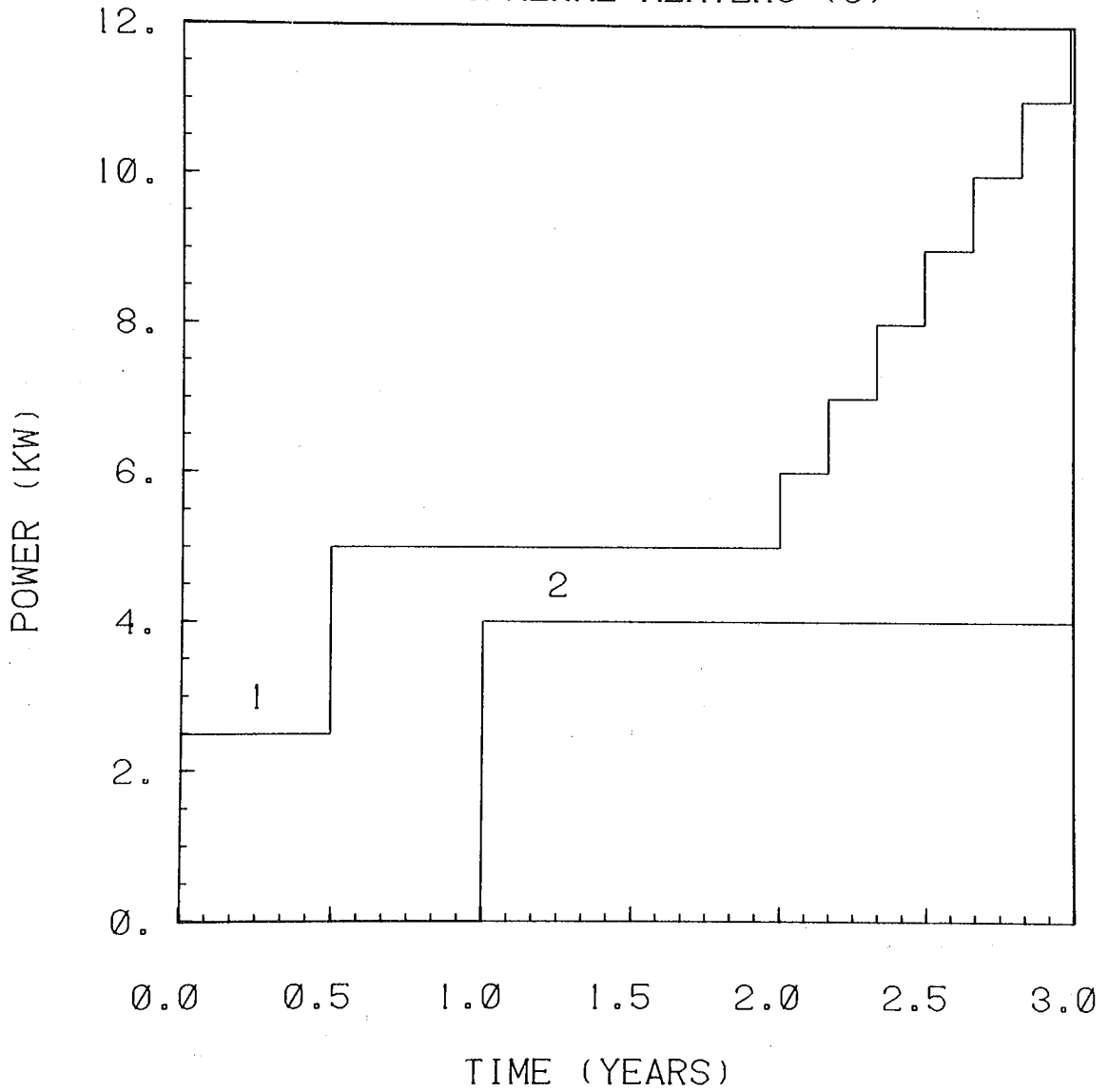
Figure D2a

HANFORD FULL-SCALE EXPERIMENT

POWER SCHEDULE 1B

1 - CENTRAL HEATER

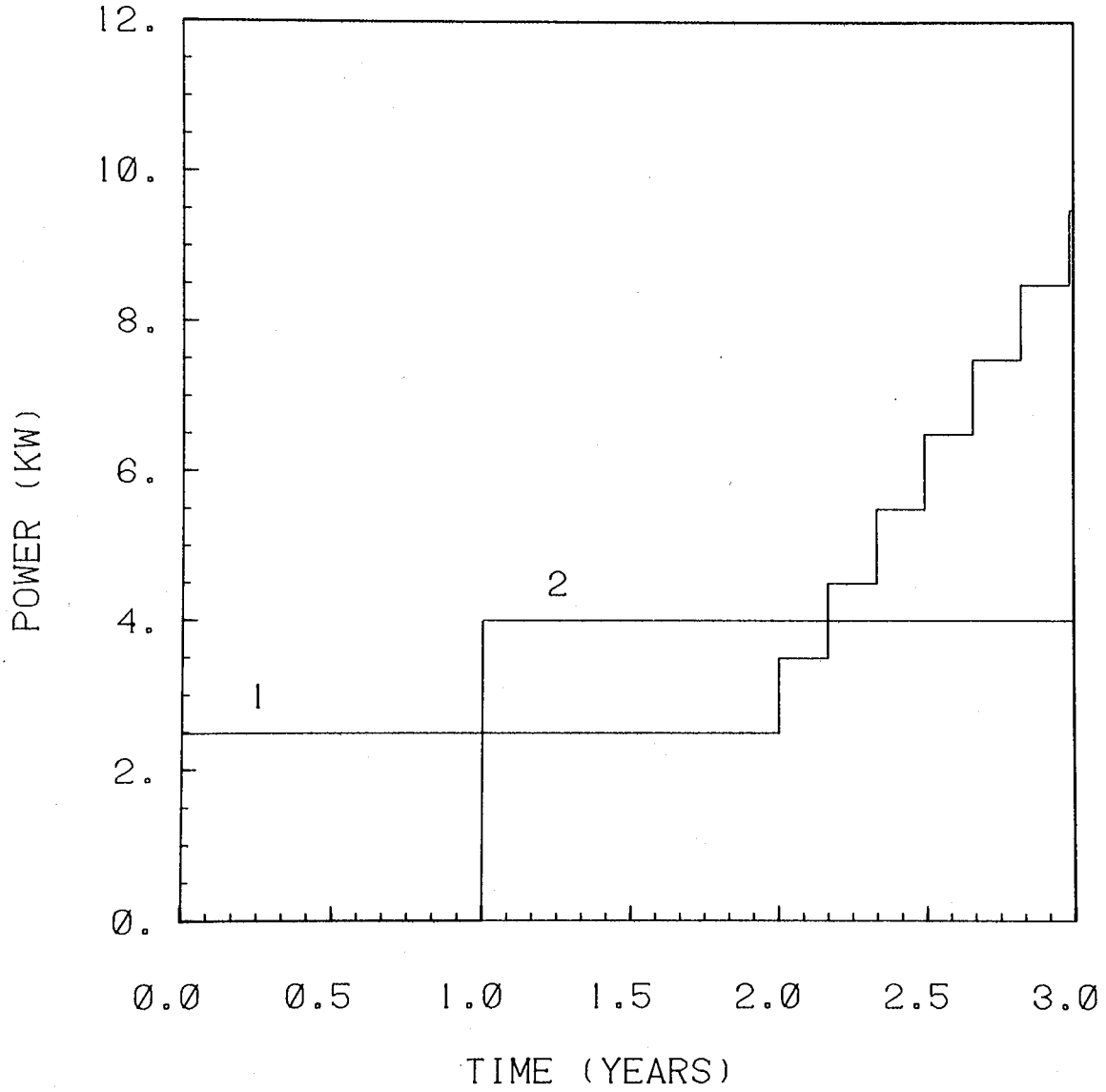
2 - PERIPHERAL HEATERS (8)



XBL 787-9733

Figure D2b

HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 1C
1 - CENTRAL HEATER
2 - PERIPHERAL HEATERS (8)



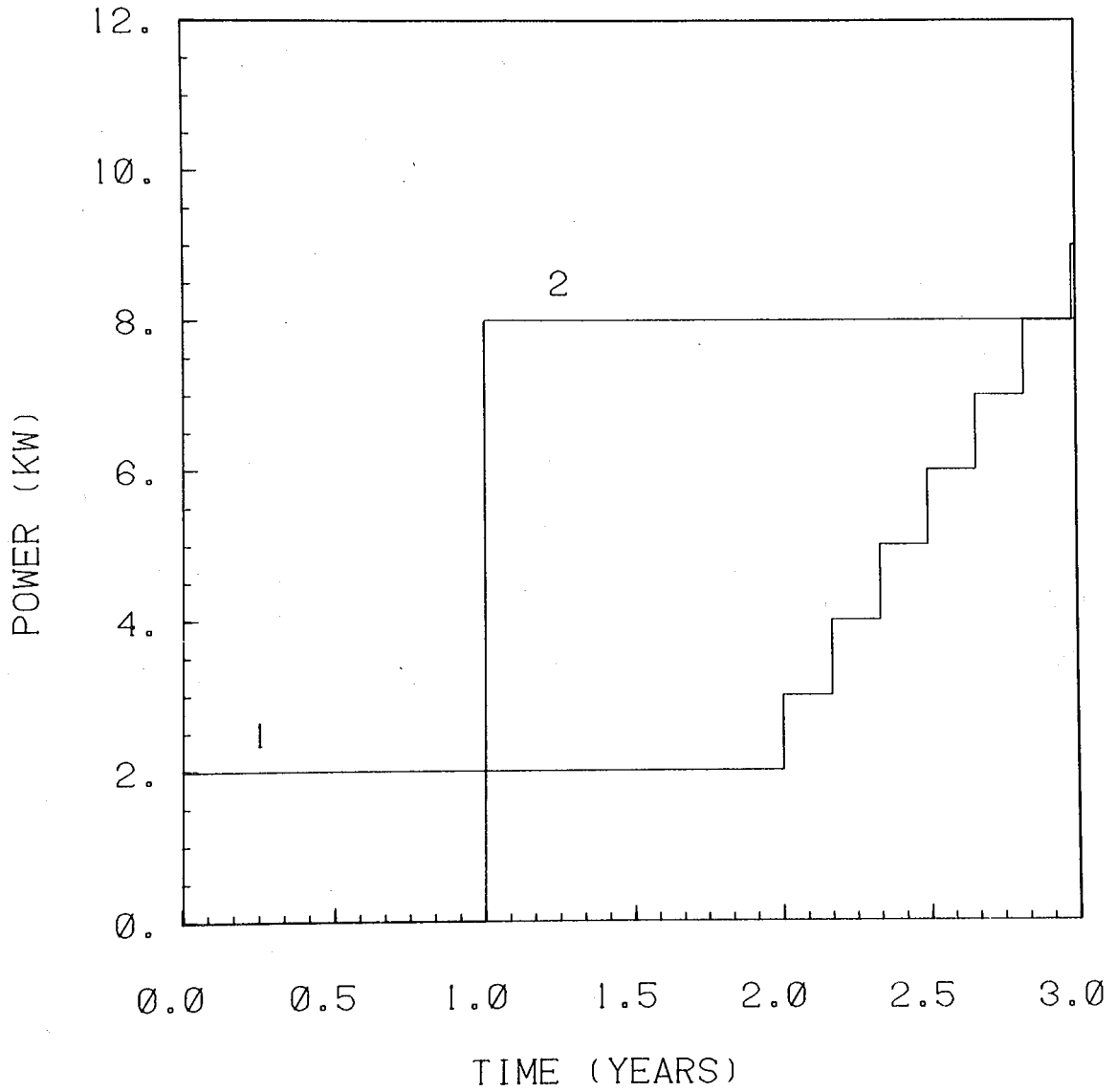
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Figure D2c

HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2A

1 - CENTRAL HEATER

2 - PERIPHERAL HEATERS (8)



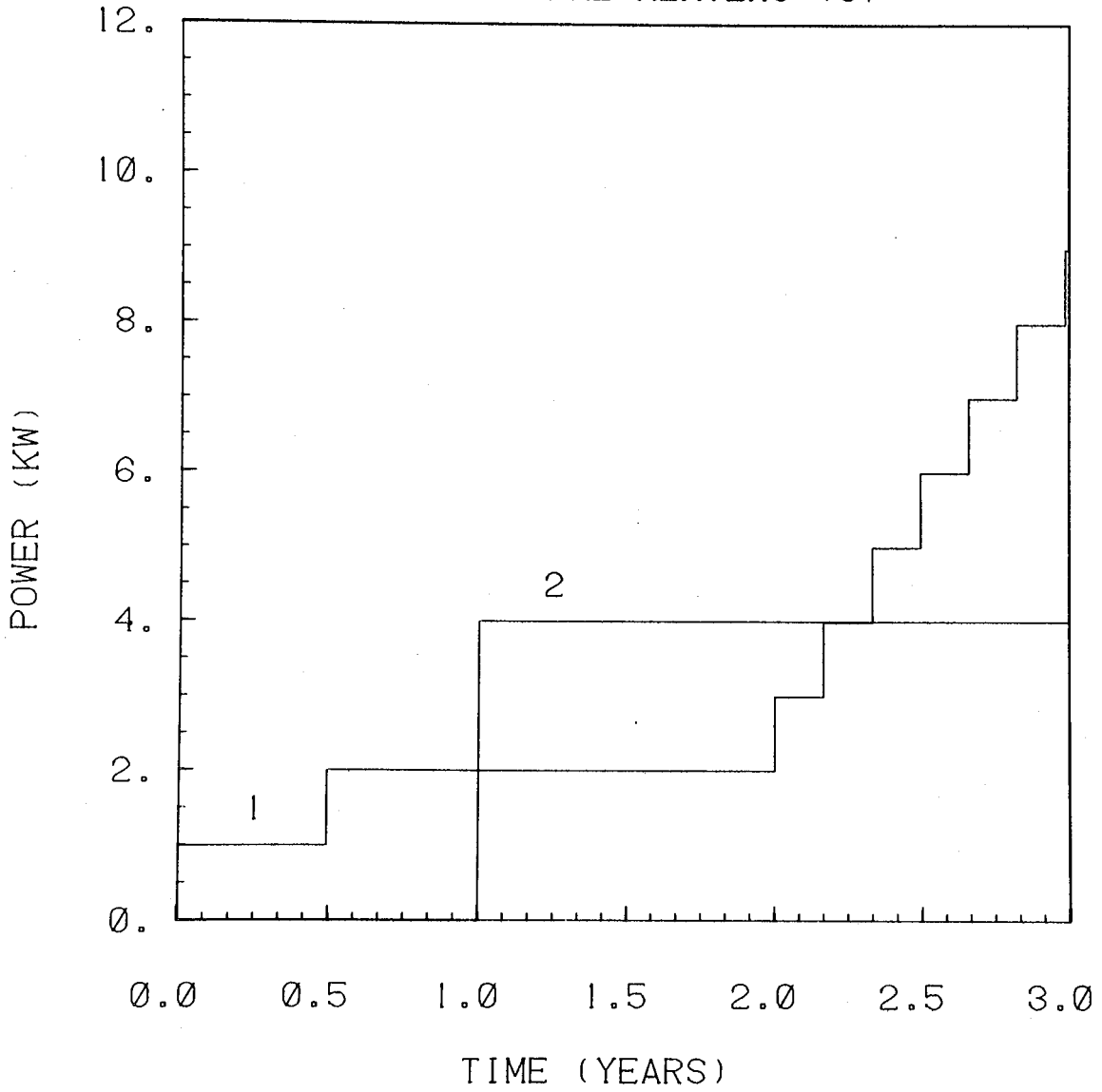
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Figure D2d

HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2B

1 - CENTRAL HEATER

2 - PERIPHERAL HEATERS (8)



XBL 787-9731

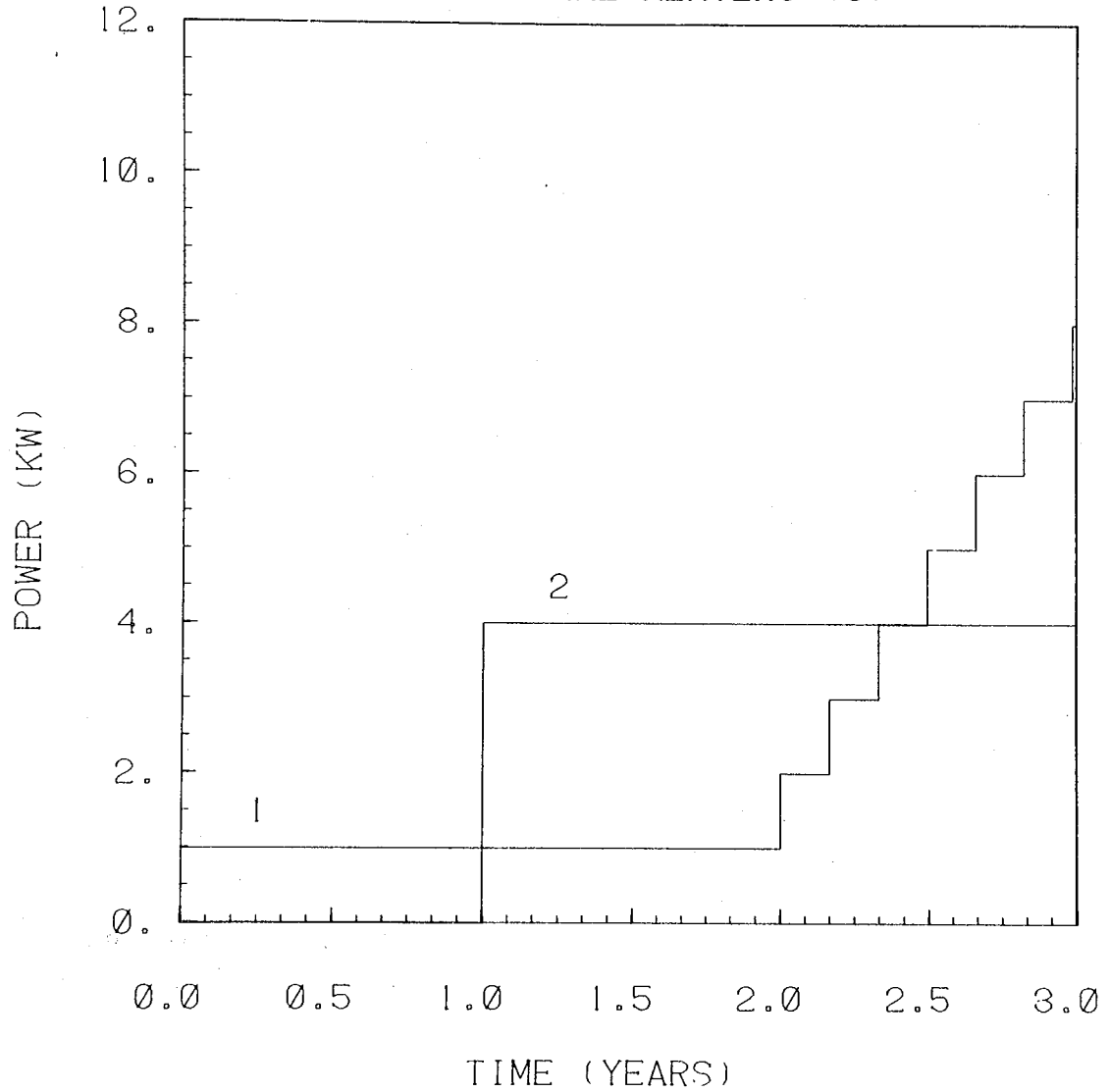
Figure D2e

HANFORD FULL-SCALE EXPERIMENT

POWER SCHEDULE 2C

1 - CENTRAL HEATER

2 - PERIPHERAL HEATERS (8)

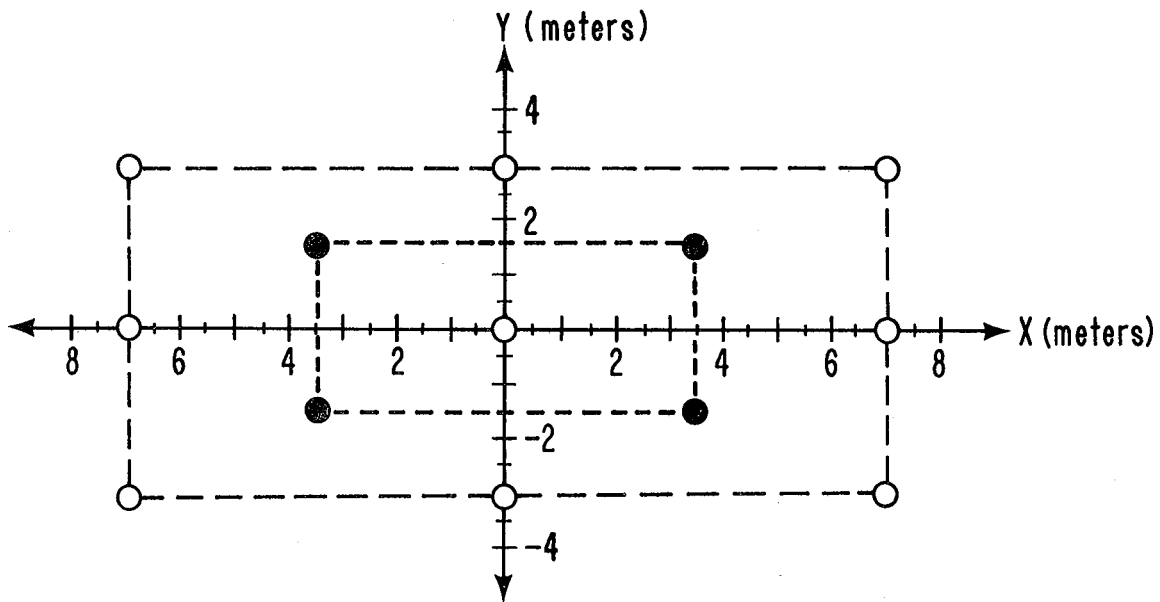


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Figure D2f

HANFORD TIME - SCALE EXPERIMENT

Horizontal plane view of arrangement of heaters.



- Primary heaters : length = 0.81 m ; radius = 0.0635 m ; energized at start of experiment.
 - Secondary heaters : length = 0.81 m ; radius = 0.0635 m ; energized 730 days after start of experiment.
- Axes represented are those used in numerical modeling.
Diameter of heaters in diagram is greatly exaggerated.

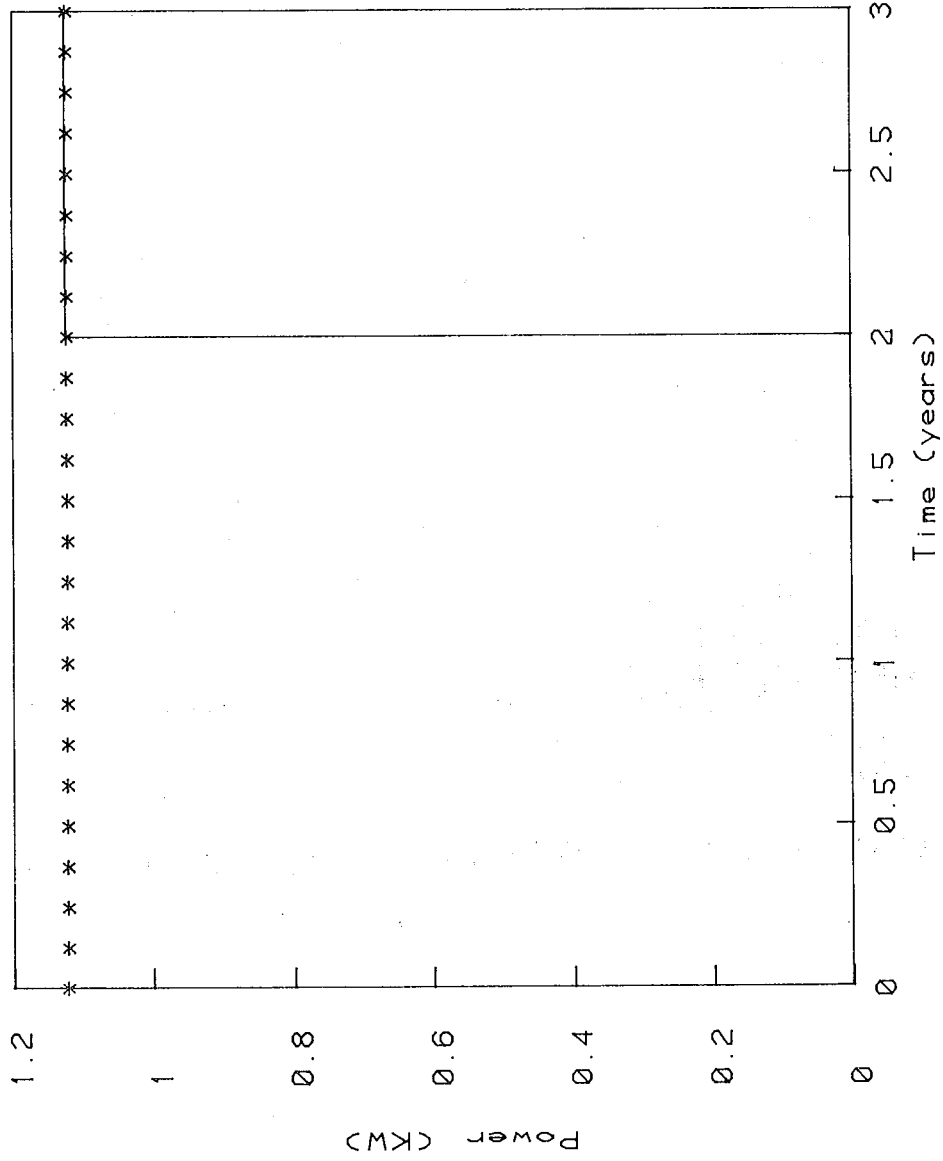
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Figure D3

HANFORD TIME-SCALED EXPERIMENT Power Schedule 3

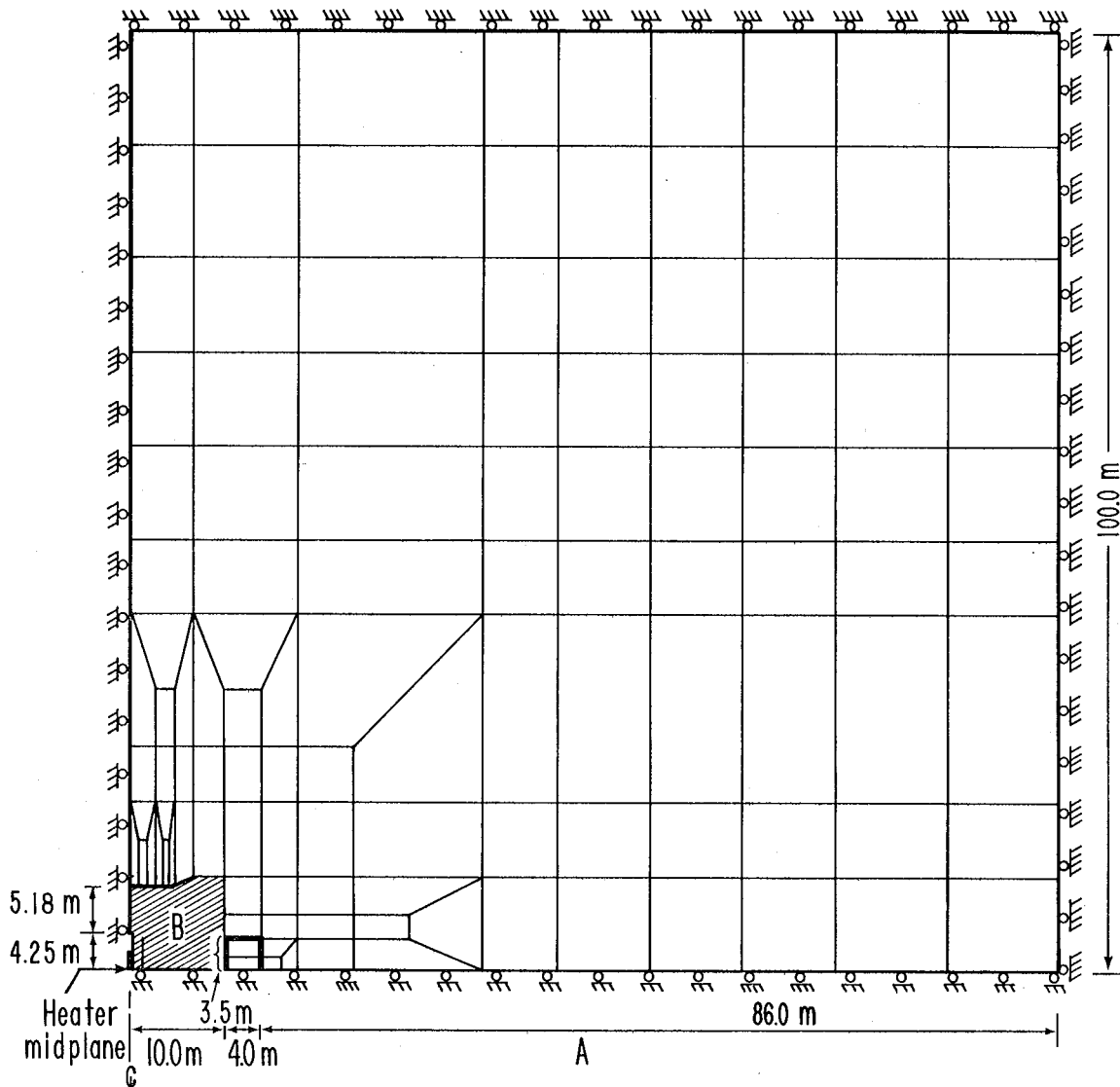
* Primary heaters (9)

- Secondary heaters (4)



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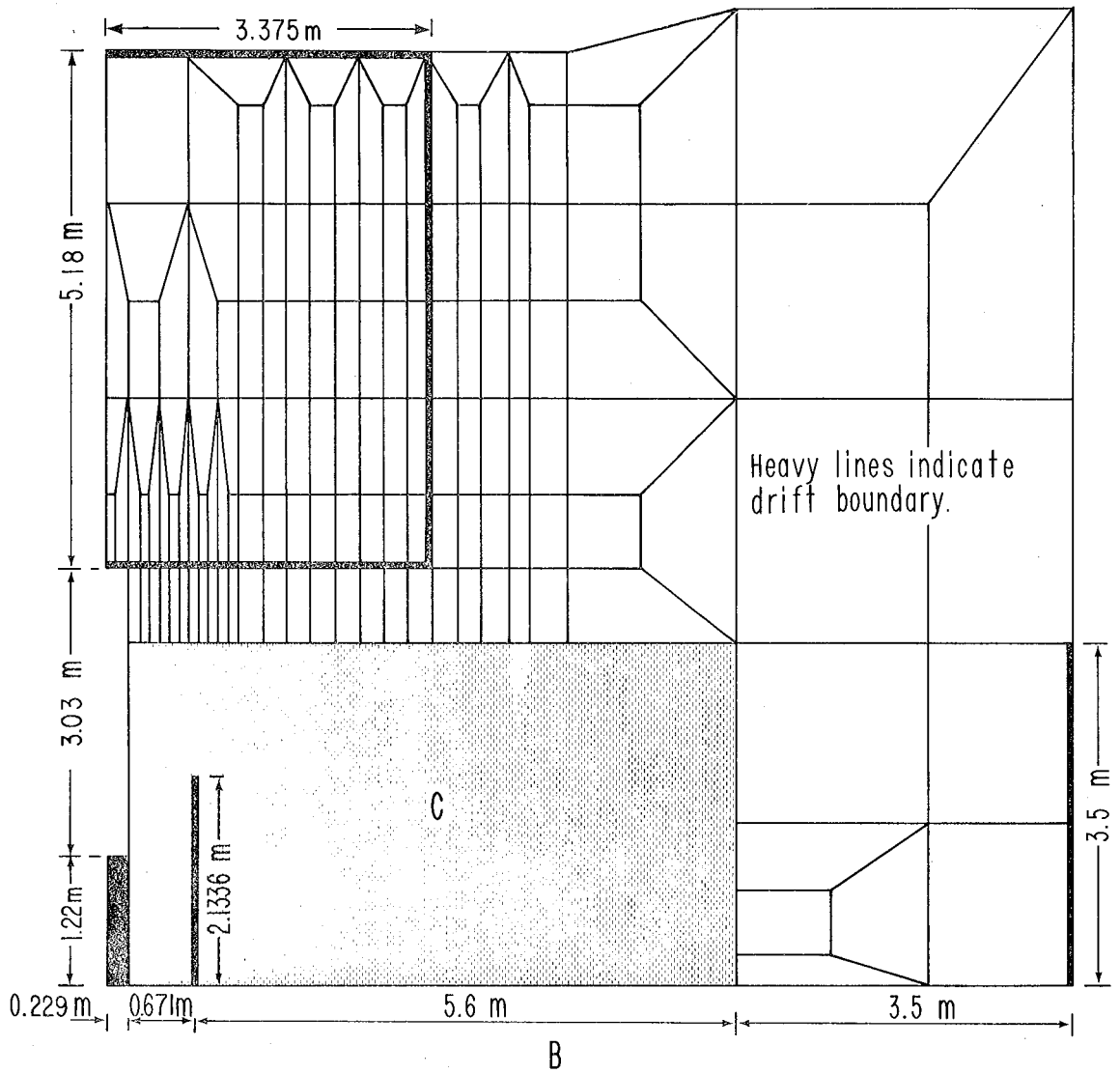
Figure D4



FINITE ELEMENT MESH AND BOUNDARY CONDITIONS FOR FULL SCALE HEATER
EXPERIMENT 2.

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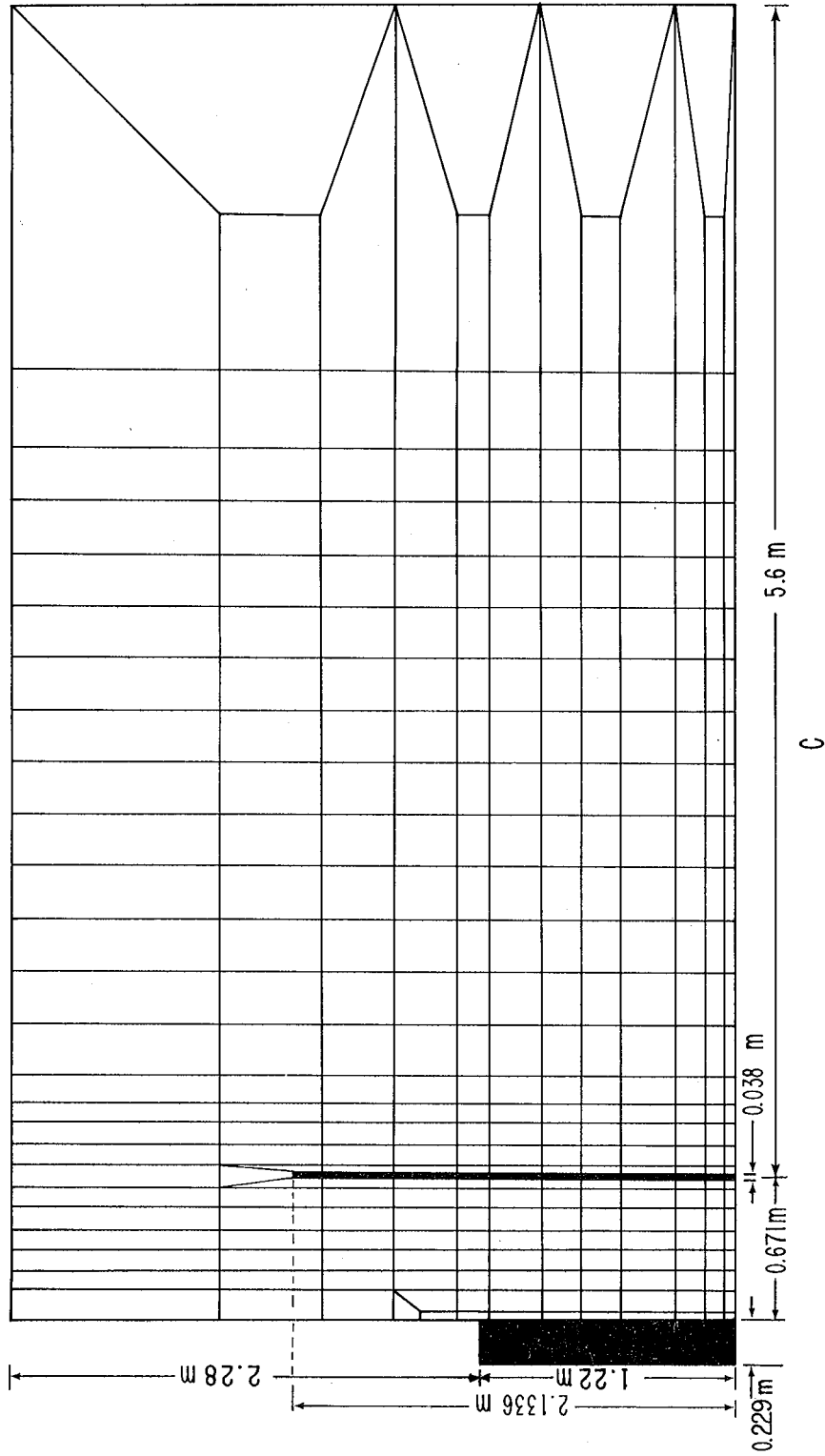
Figure D5a



DETAILS OF AREA "B" IN "A".

XBL 786-1964/B

Figure D5b

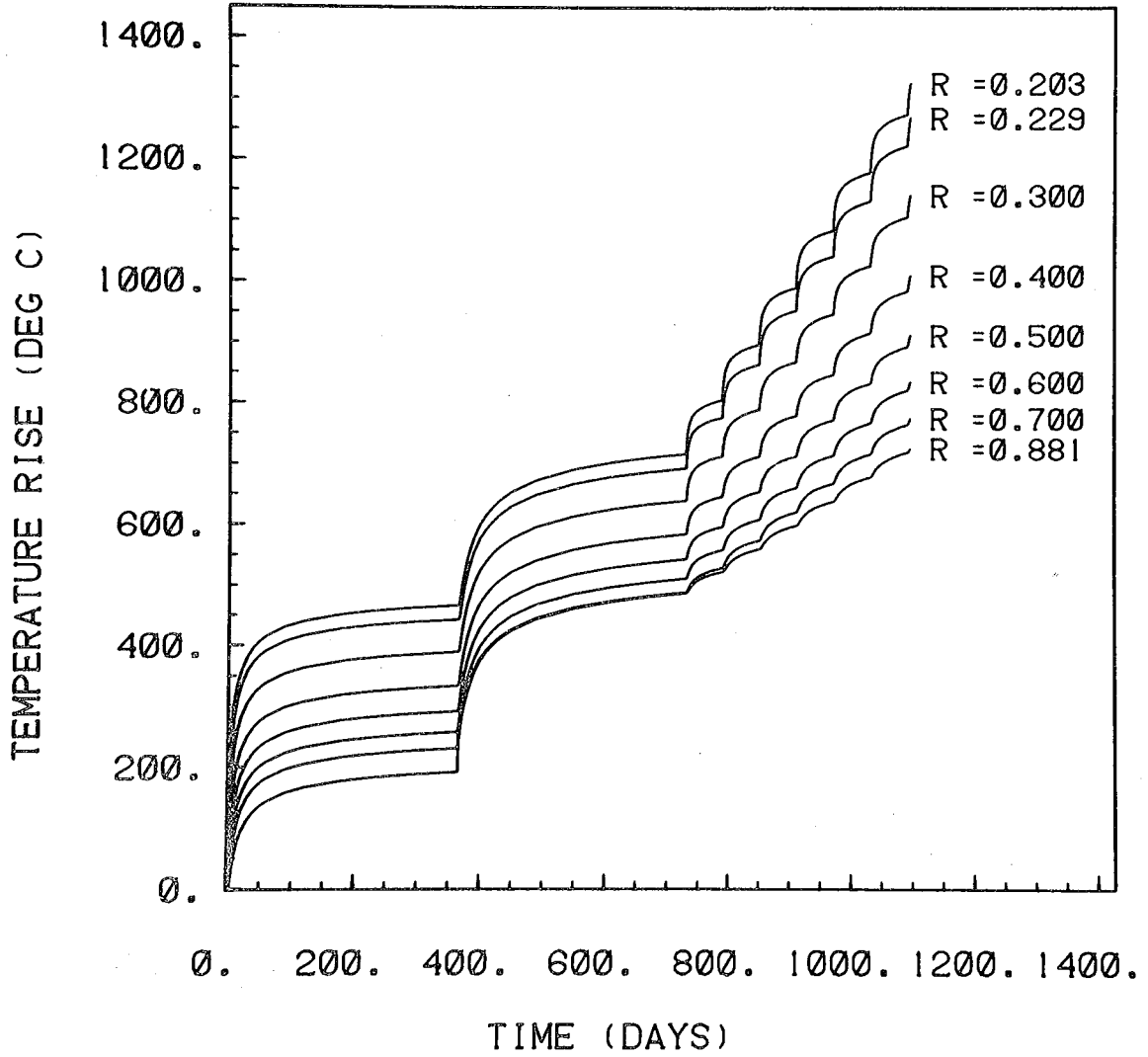


DETAILS OF AREA "C" IN "B":

Figure D5c

XBL 786-1965A/B

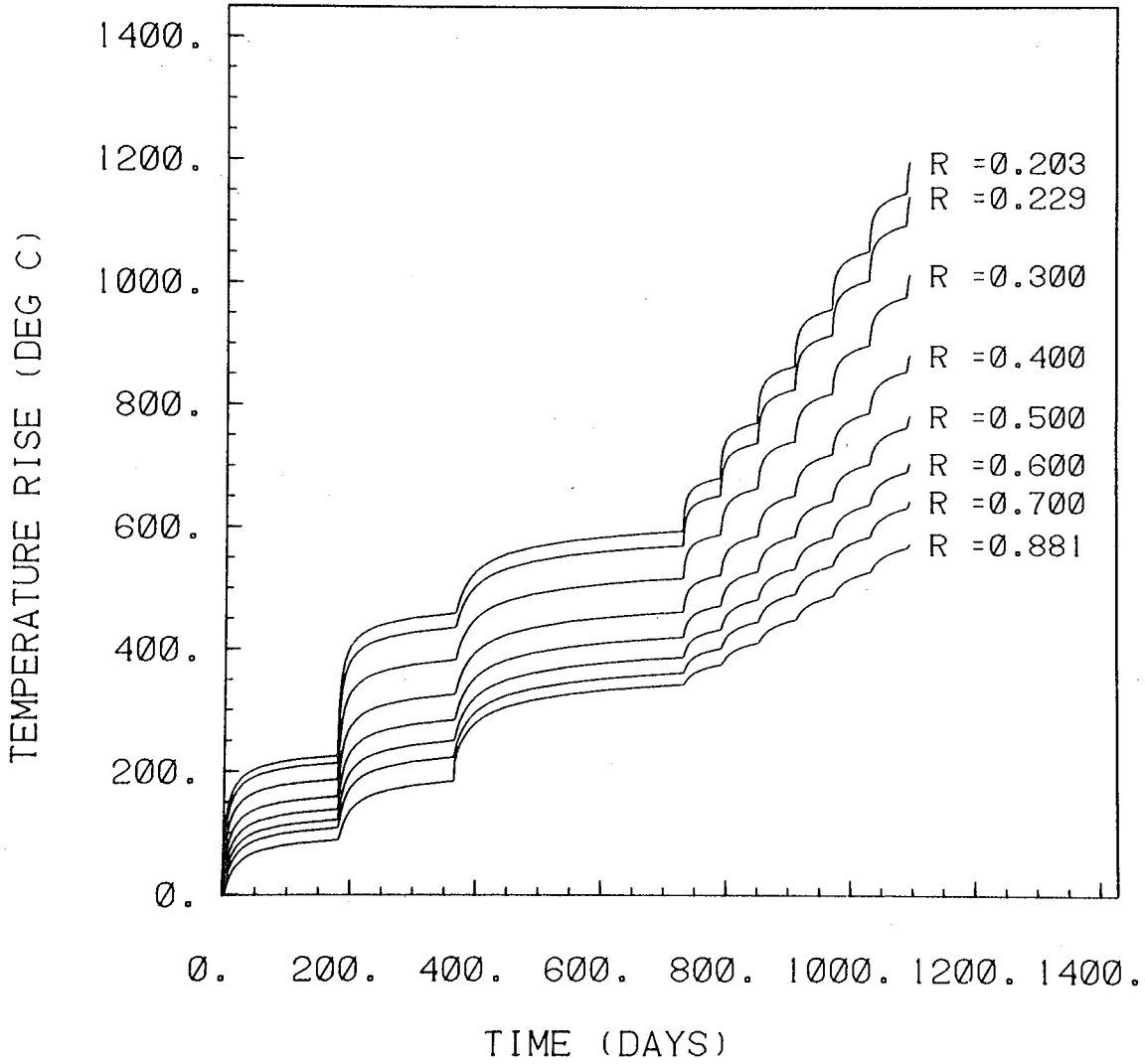
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 1A
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.203 TO 0.881 M



XBL 787-9847

Figure D6a

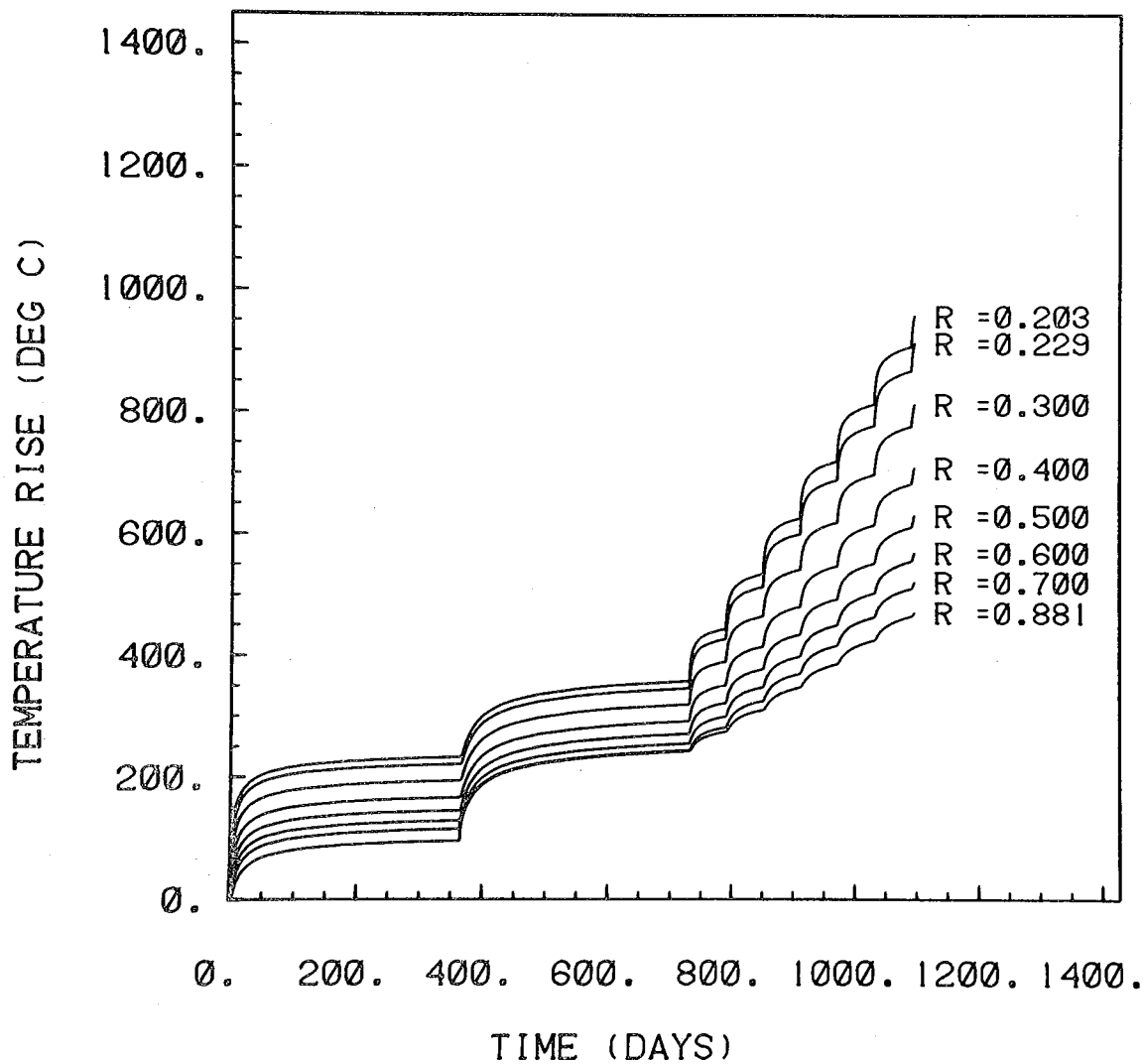
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 1B
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.203 TO 0.881 M



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Figure D6b

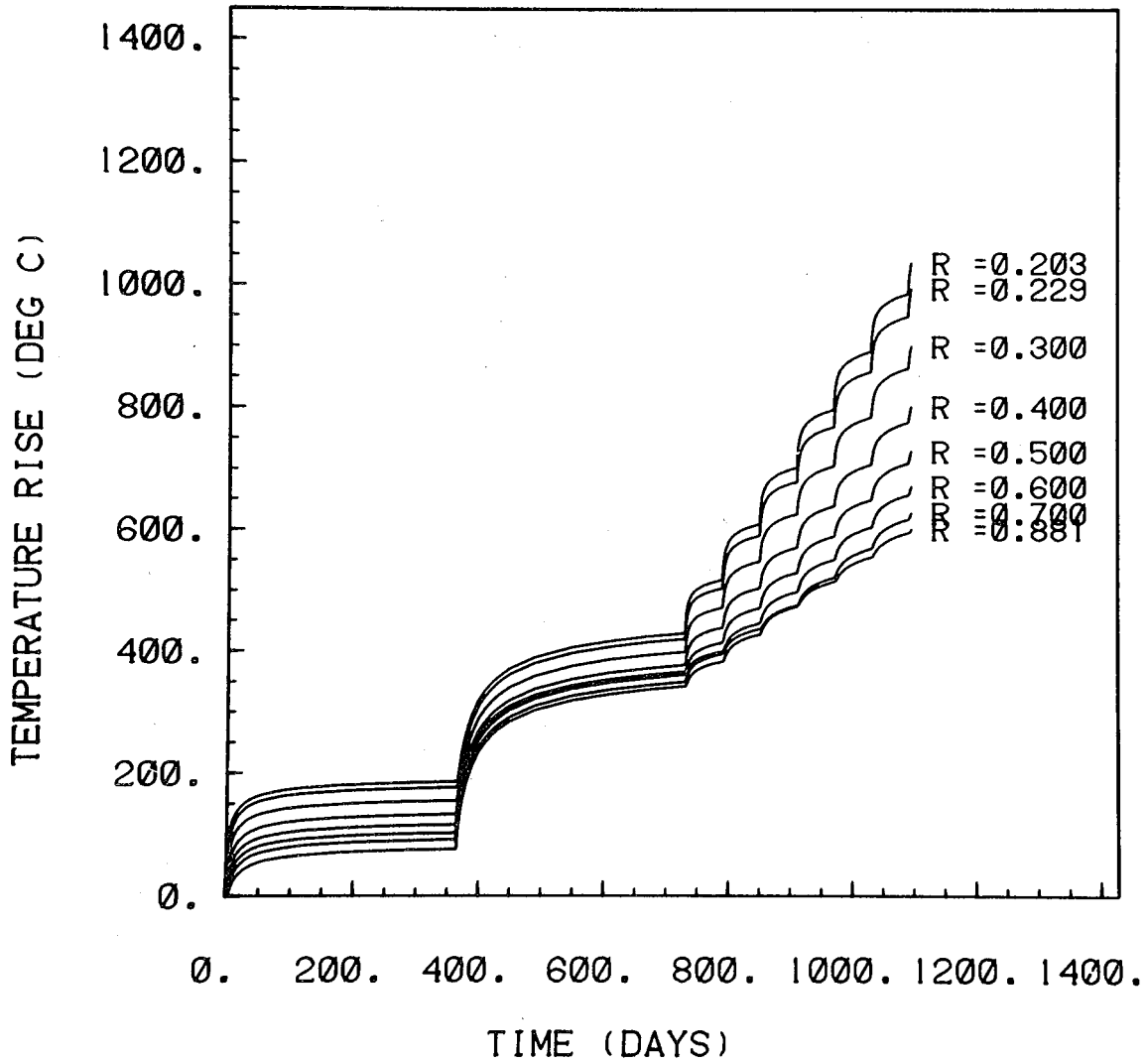
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 1C
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.203 TO 0.881 M



XBL 787-9845

Figure D6c

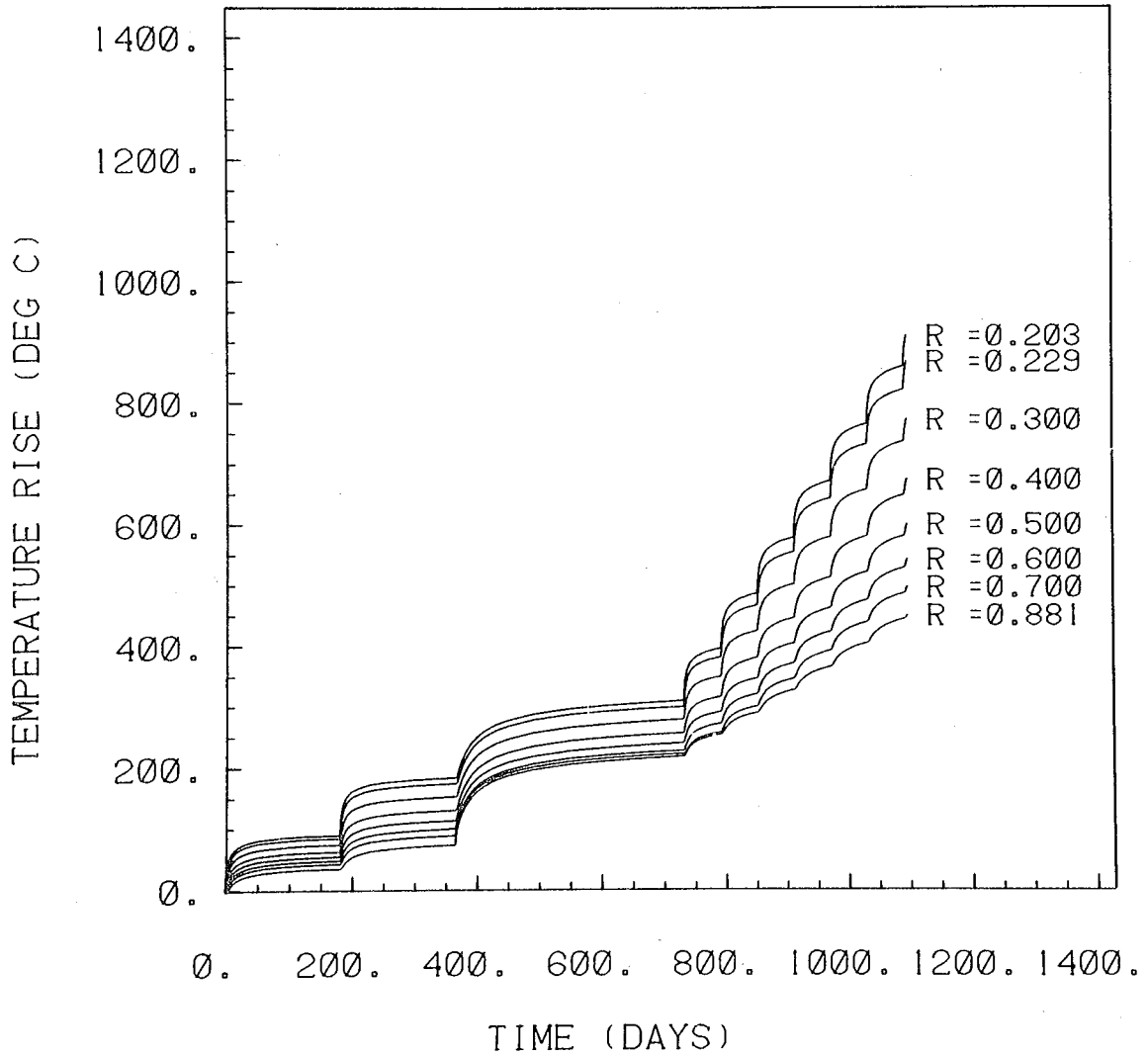
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2A
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.203 TO 0.881 M



XBL 787-9846

Figure D6d

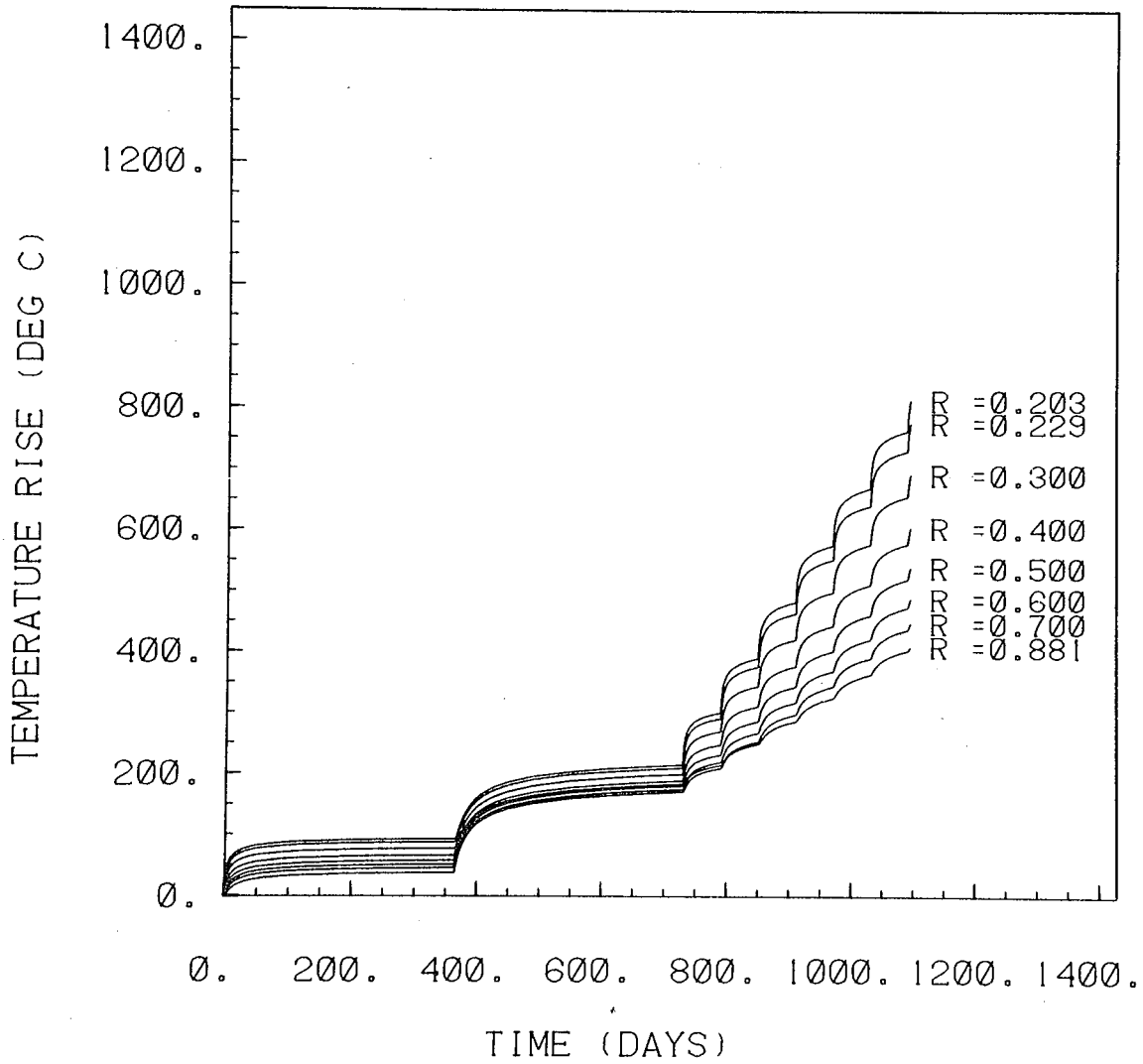
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2B
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.203 TO 0.881 M



XBL 787-9842

Figure D6e

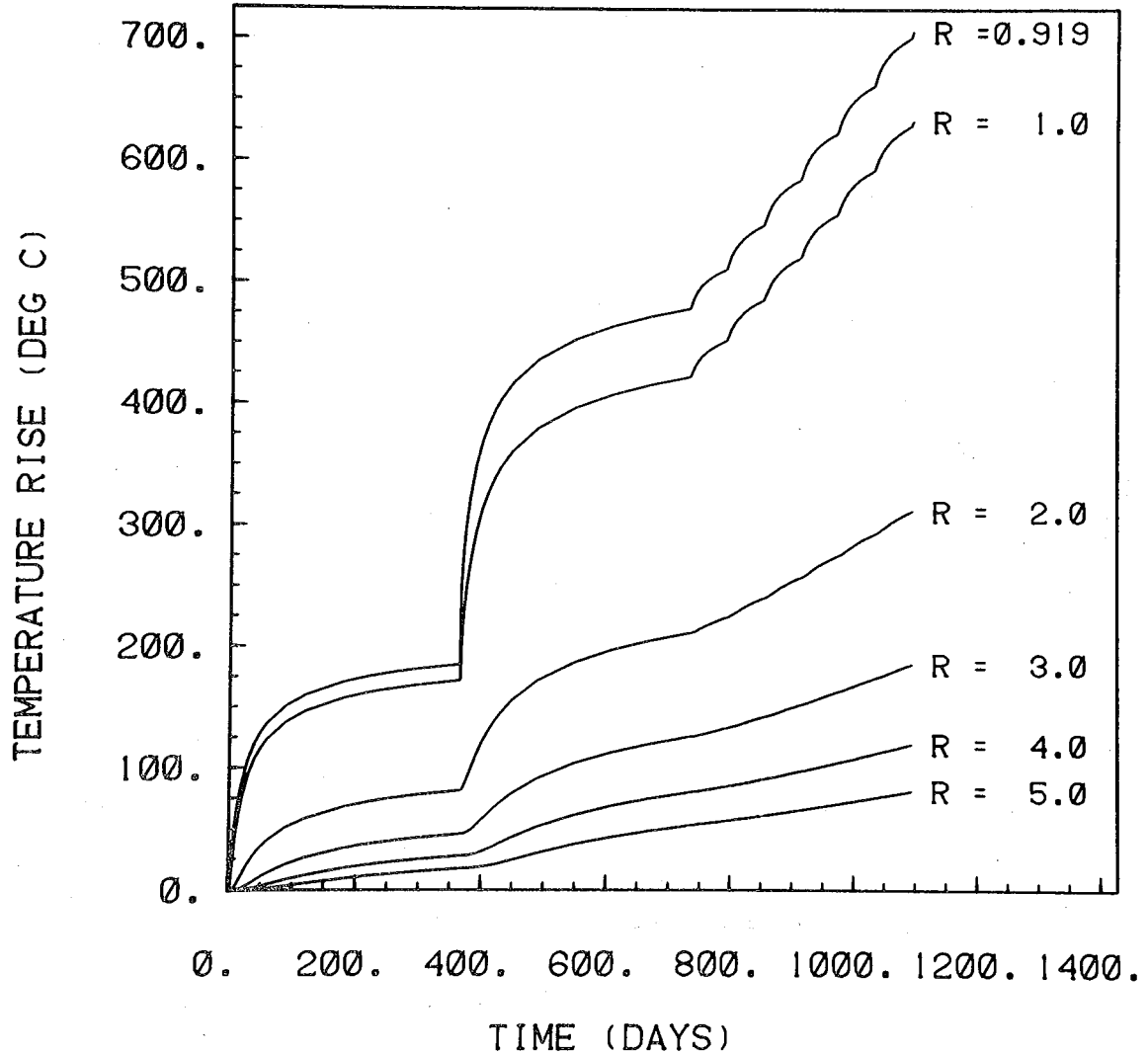
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2C
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.203 TO 0.881 M



XBL 787-9844

Figure D6f

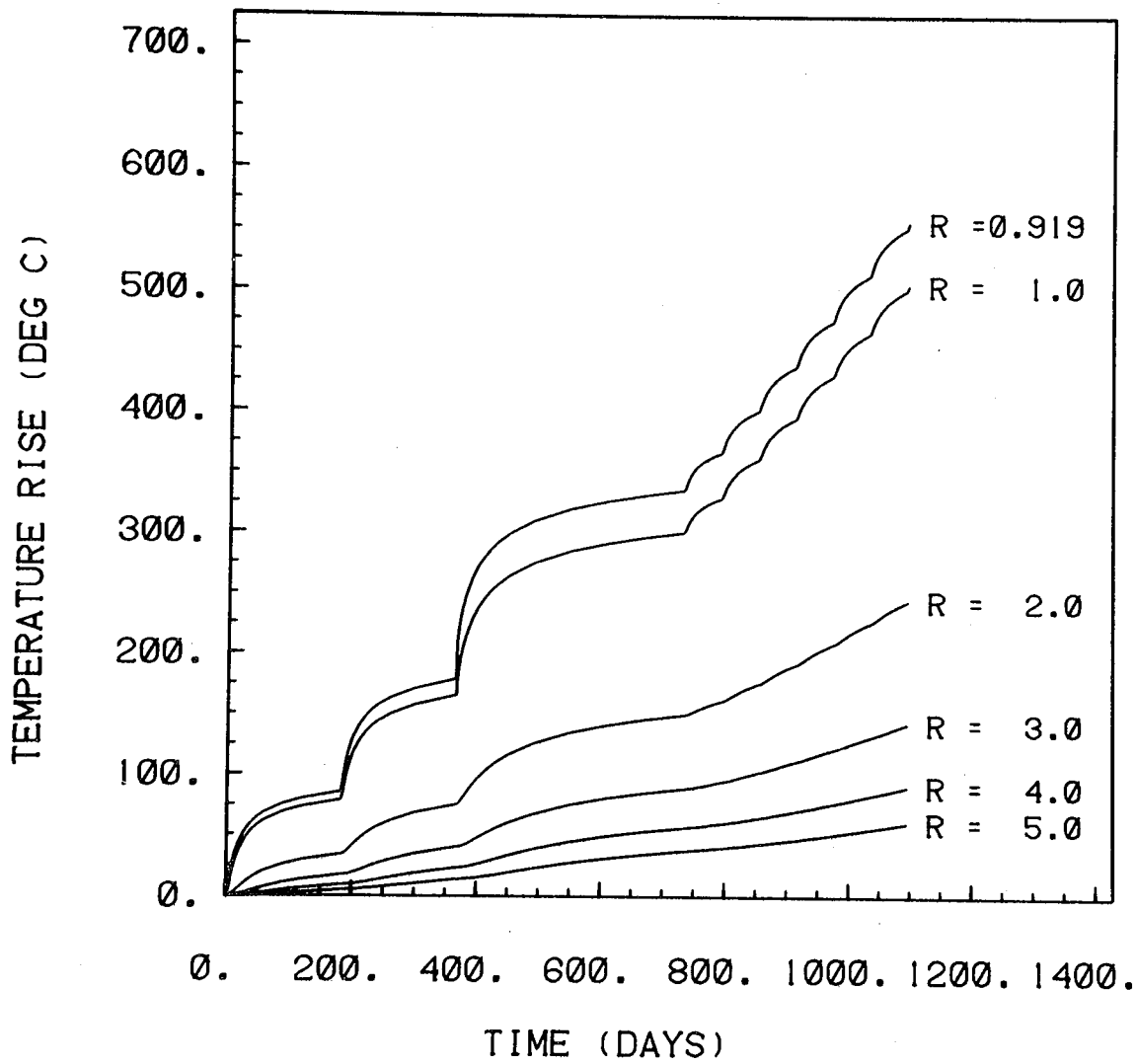
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 1A
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.919 TO 5.0 M



XBL 787-9852

Figure D7a

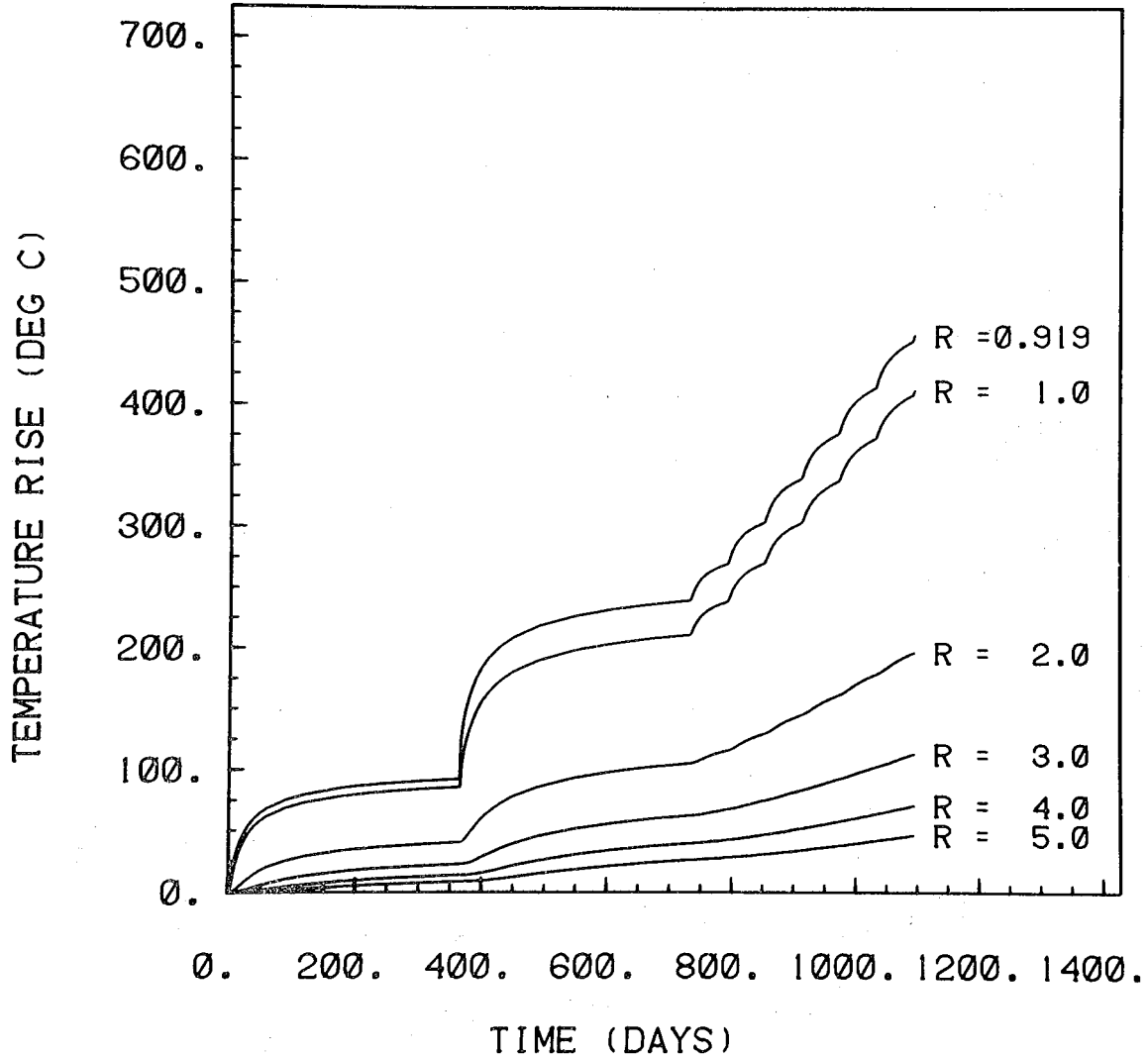
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 1B
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.919 TO 5.0 M



XBL 787-9849

Figure D7b

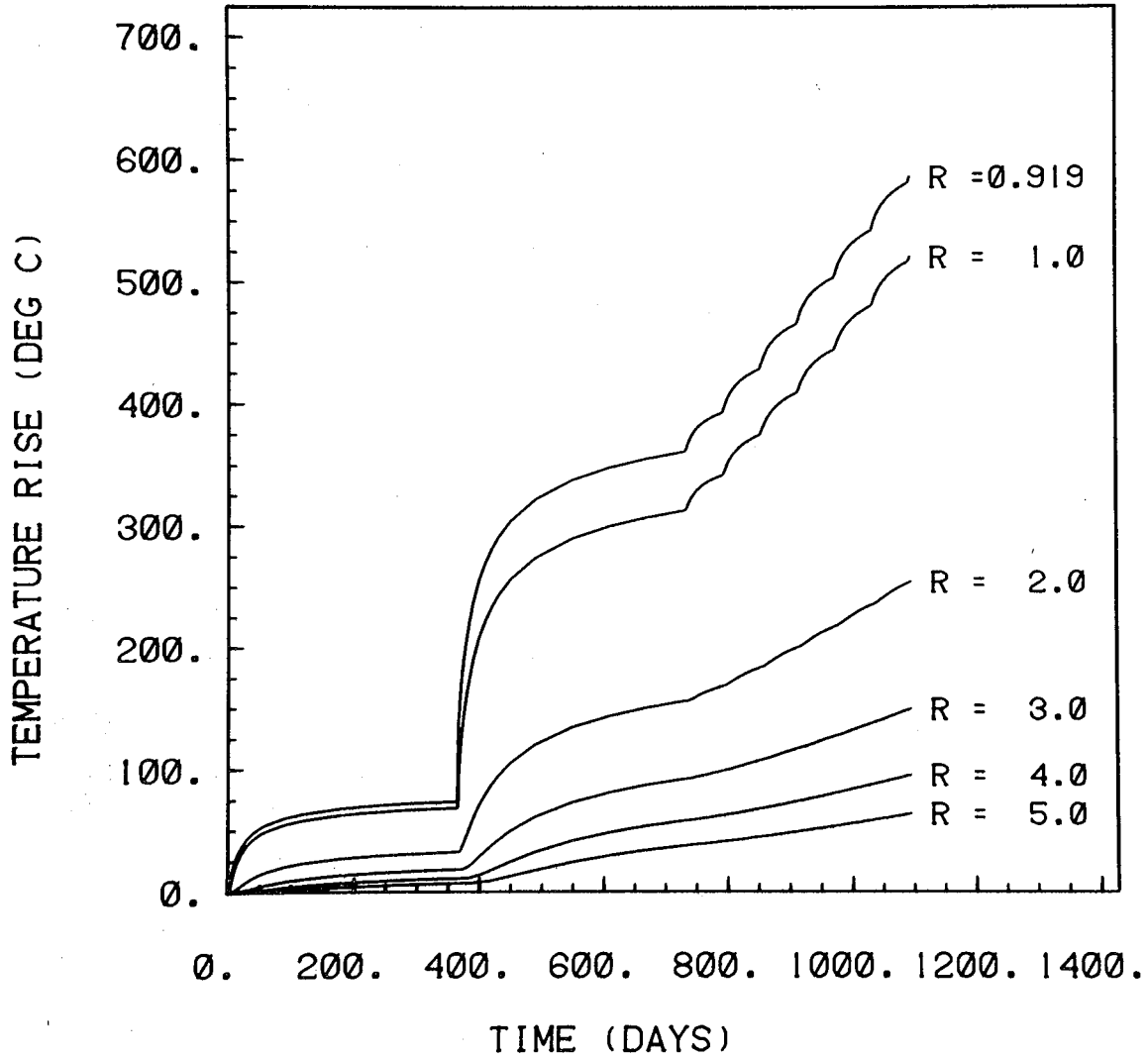
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 1C
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.919 TO 5.0 M



XBL 787-9850

Figure D7c

TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2A
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.919 TO 5.0 M



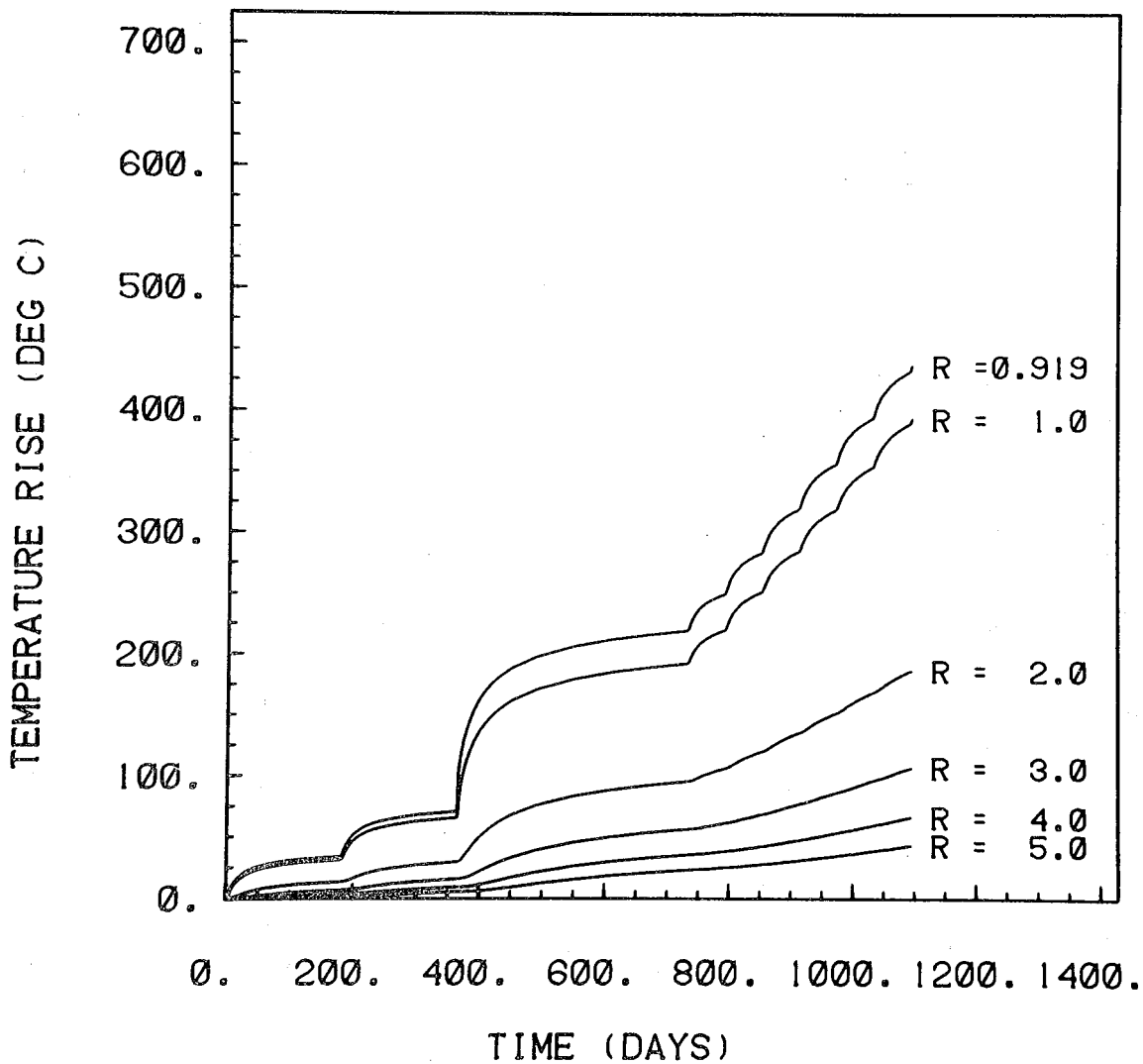
XBL 787-9853

Figure D7d

TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2B

Z = 0.0 M, THETA = 0.0 DEG.

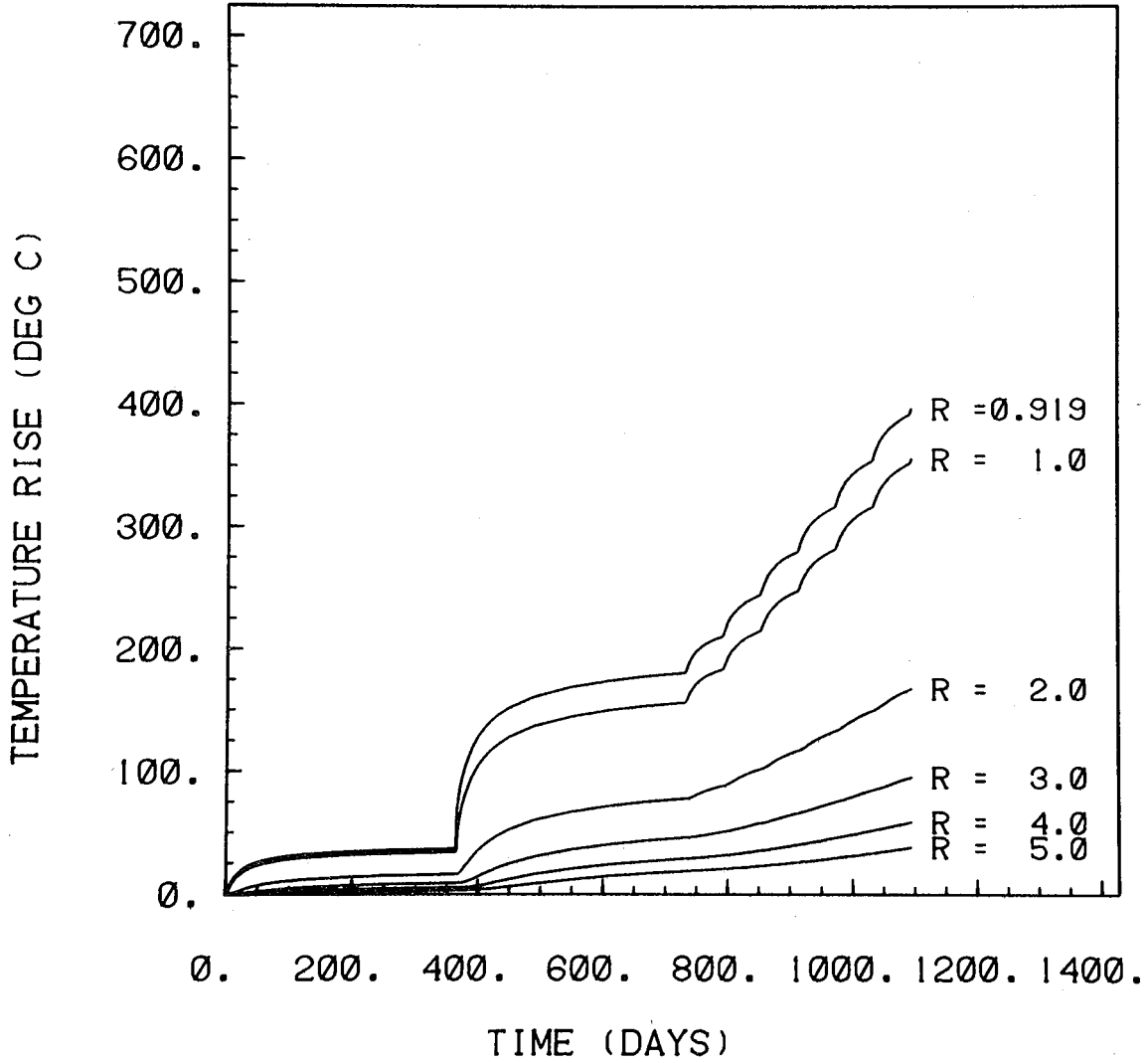
R = 0.919 TO 5.0 M



XBL 787-9848

Figure D7e

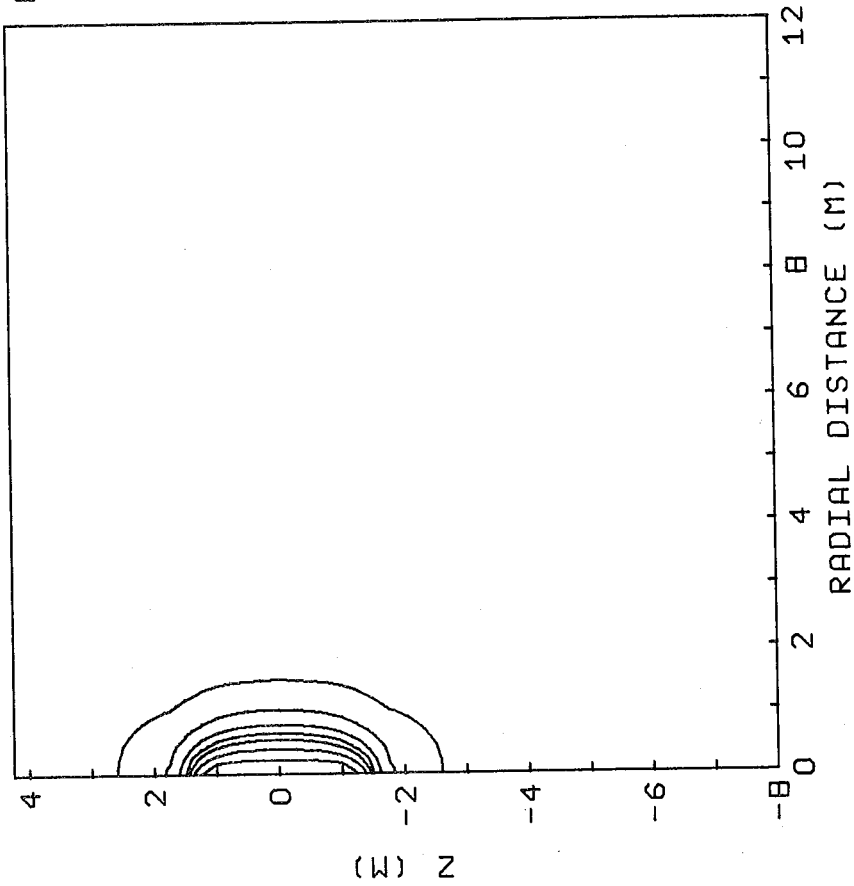
TEMPERATURE PROFILES FOR
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2C
Z = 0.0 M, THETA = 0.0 DEG.
R = 0.919 TO 5.0 M



XBL 787-9851

Figure D7f

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 7. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

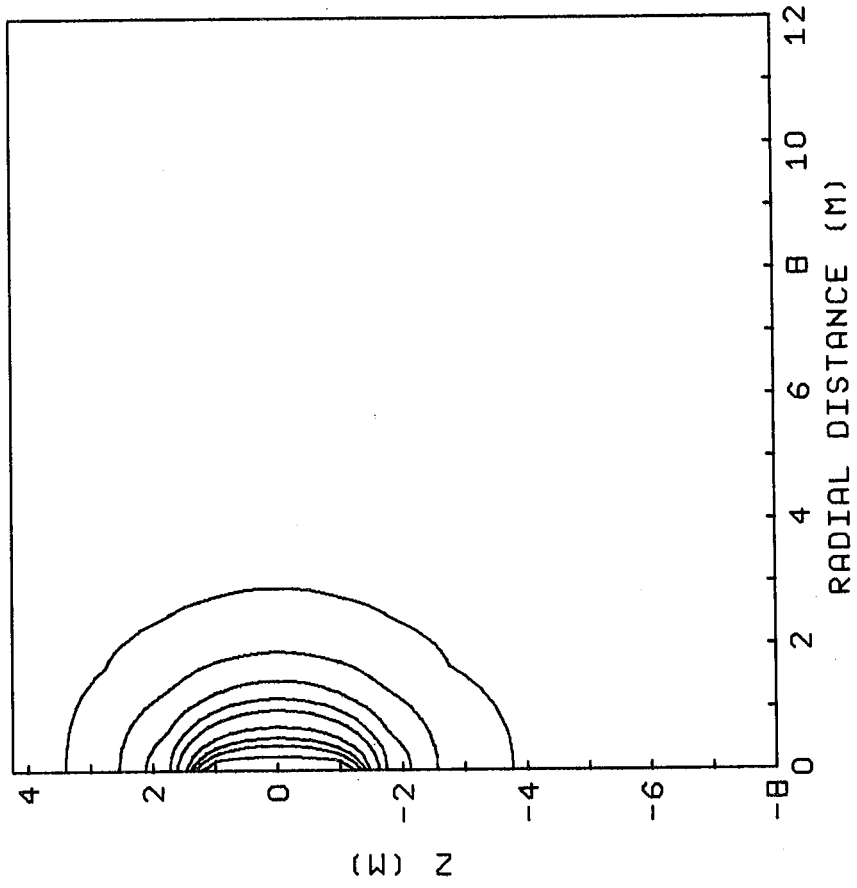
255. 150. 100. 75.

50. 25. 5.

XBL 787-9498

Figure D8a

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT

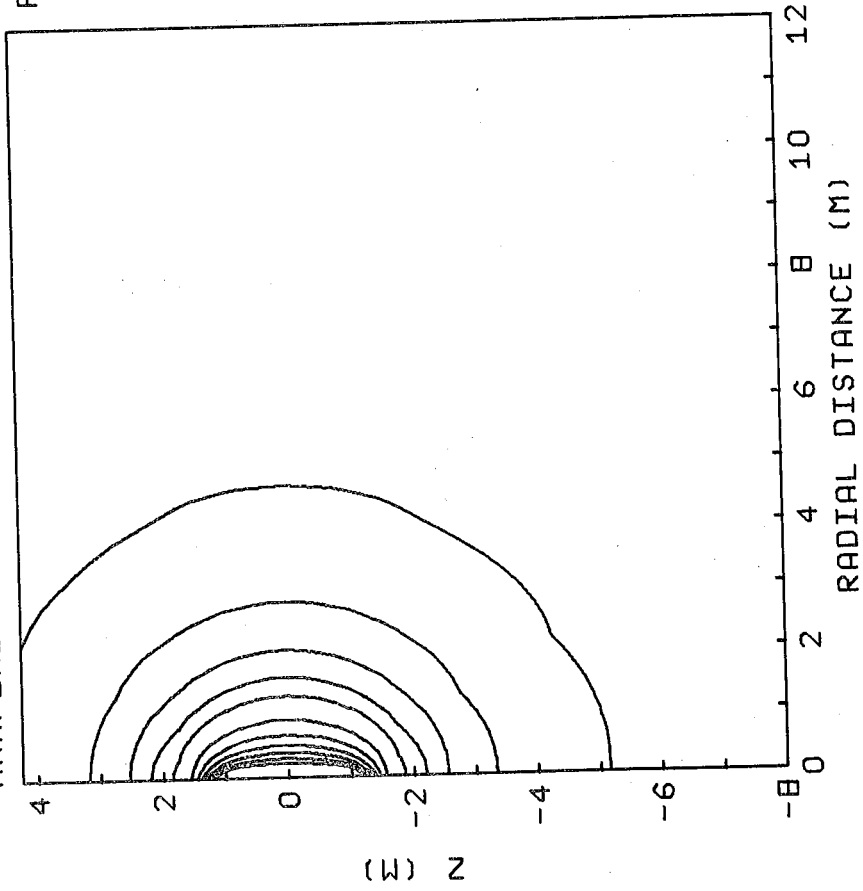


PLOT INFORMATION

TIME = 30. DAYS
THETA = 0.0 DEG.
INFINITE MEDIUM MODEL
MAIN HTR = 5.00 KW
PERIPHERAL HTR = 1.00 KW
CONTOURS (DEG.C.) PLOTTED -
360. 250. 200. 150.
100. 75. 50. 25.
5.

Figure D8b

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 90. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

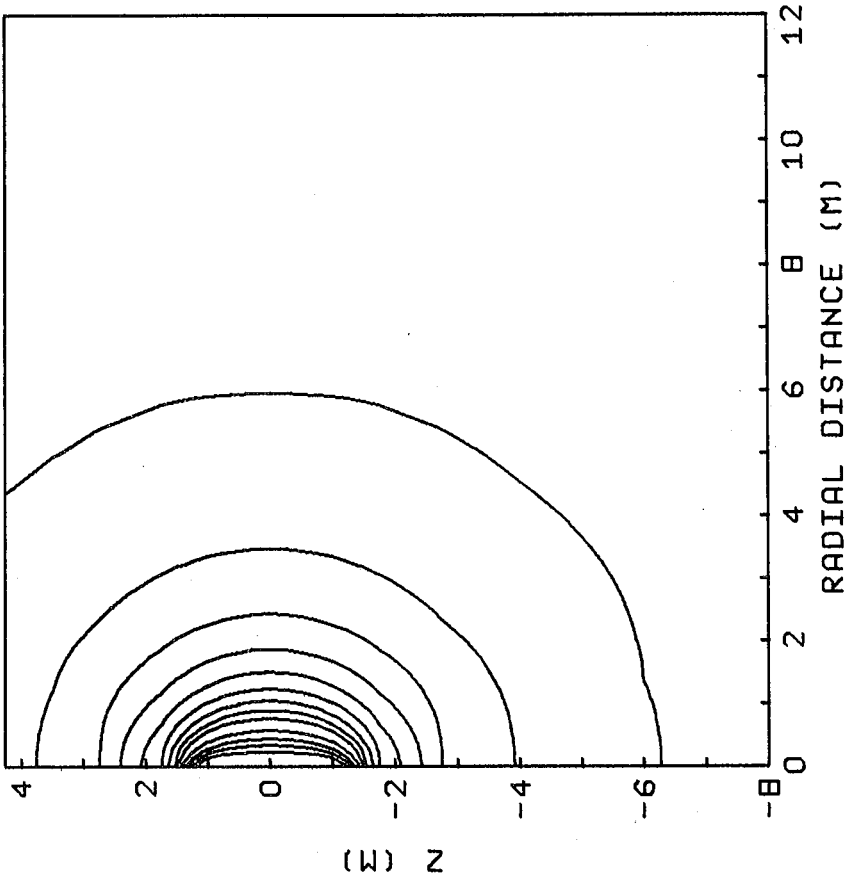
408. 350. 300. 250.

200. 150. 100. 75.

50. 25. 5.

Figure D8c

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 180. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

428. 350. 300. 250.

200. 175. 150. 125.

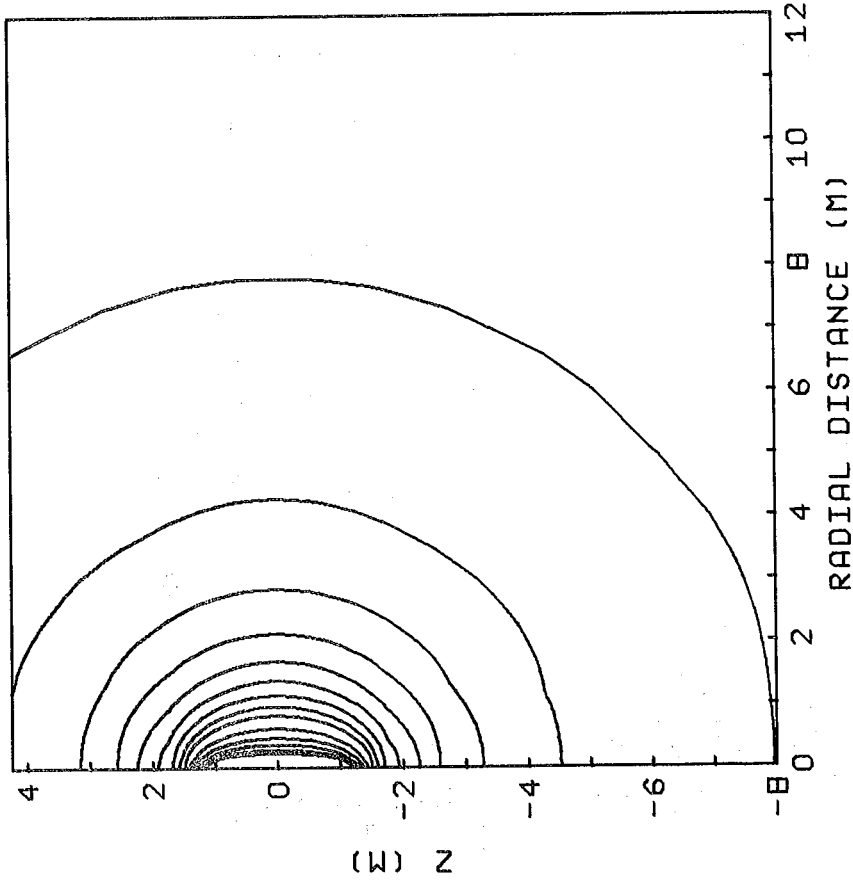
100. 75. 50. 25.

5.

XBL 787-9502

Figure D8d

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 365. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

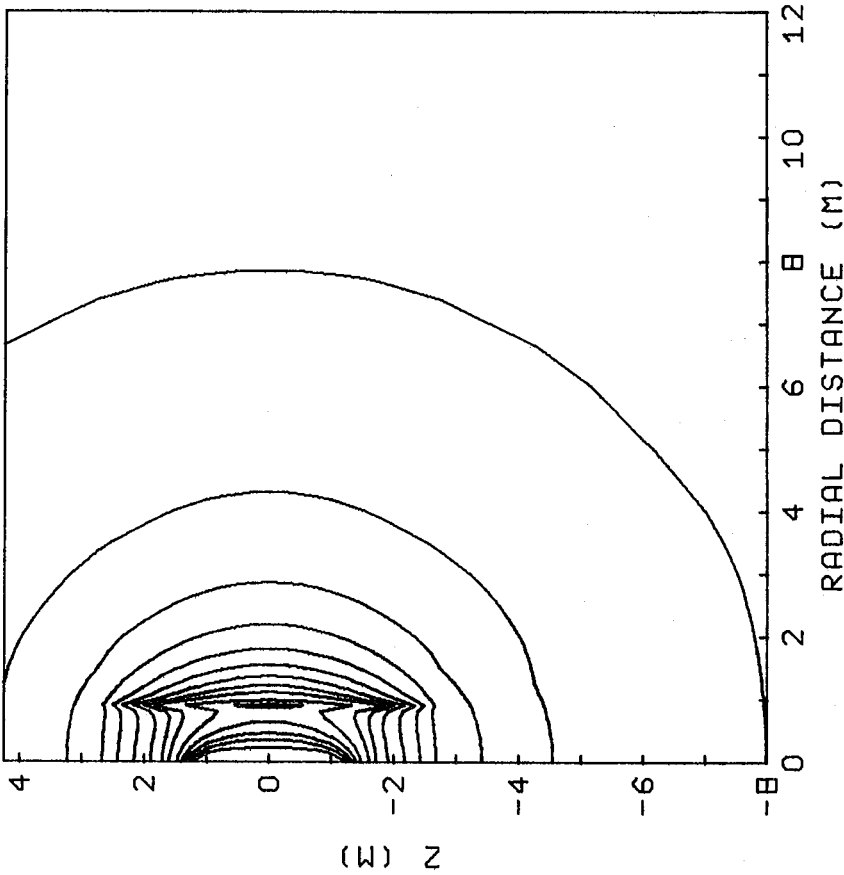
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

443. 400. 350. 300.
250. 200. 175. 150.
125. 100. 75. 50.
25. 5.

Figure D8e

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 372. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

481. 400. 350. 300.

250. 200. 175. 150.

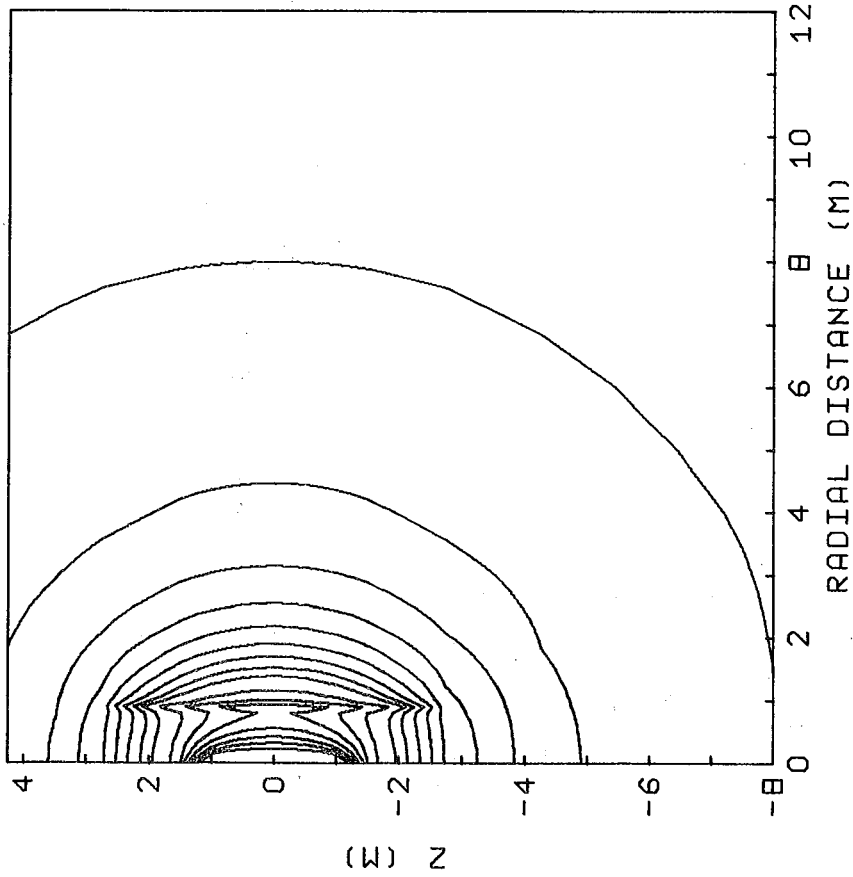
125. 100. 75. 50.

25. 5.

XBL 787-9510

Figure D8f

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 395. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

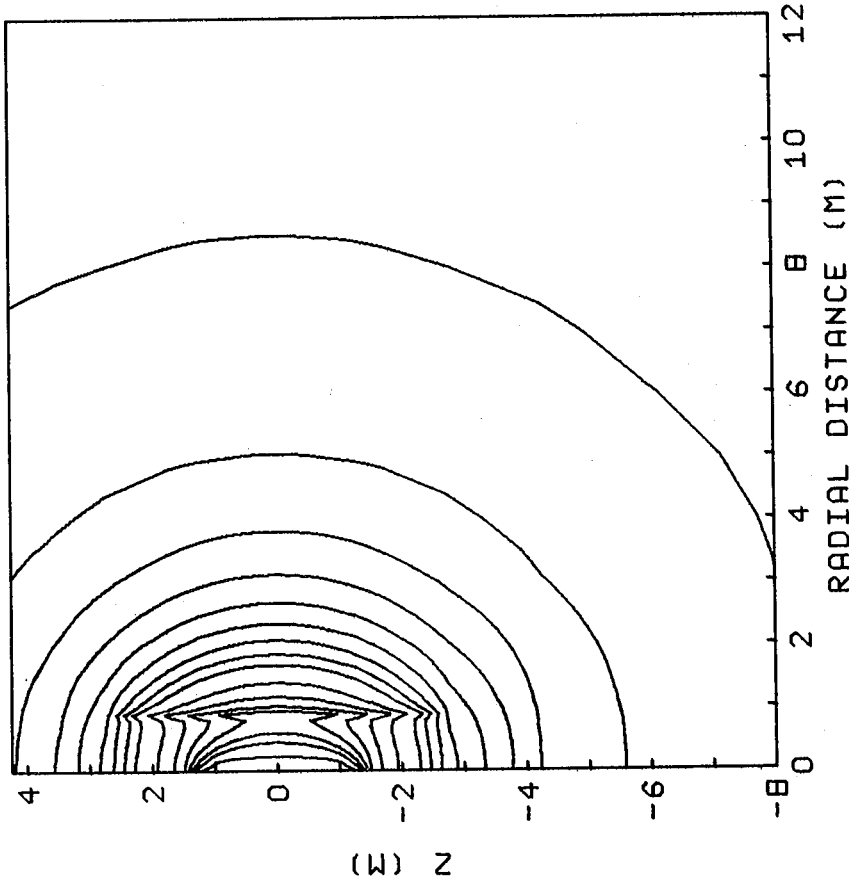
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
568. 500. 450. 400.
350. 300. 250. 200.
175. 150. 125. 100.
75. 50. 25. 5.

XBL 787-9509

Figure D8g

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 455. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

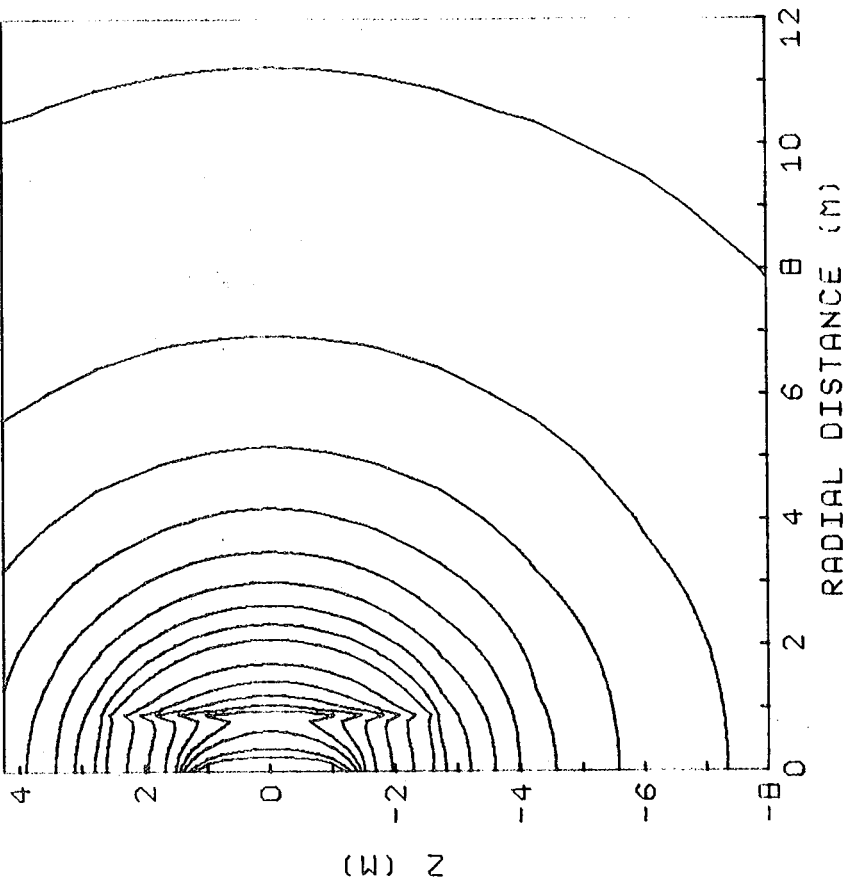
CONTOURS (DEG.C.) PLOTTED -

- 633. 500. 450. 400.
- 350. 300. 250. 200.
- 175. 150. 125. 100.
- 75. 50. 25. 5.

XBL 787-9508

Figure D8h

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 730. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

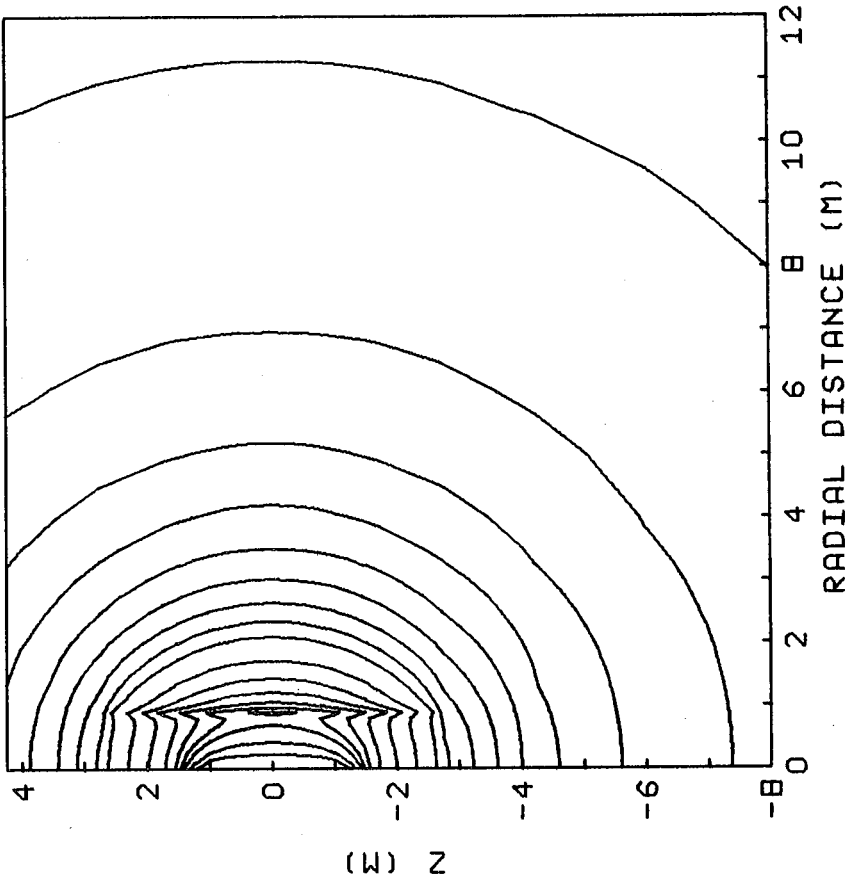
CONTOURS (DEG.C.) PLOTTED -

692.	600.	500.	450.
400.	350.	300.	250.
200.	175.	150.	125.
100.	75.	50.	25.
			5.

XBL 787-9507

Figure D8i

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 737. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

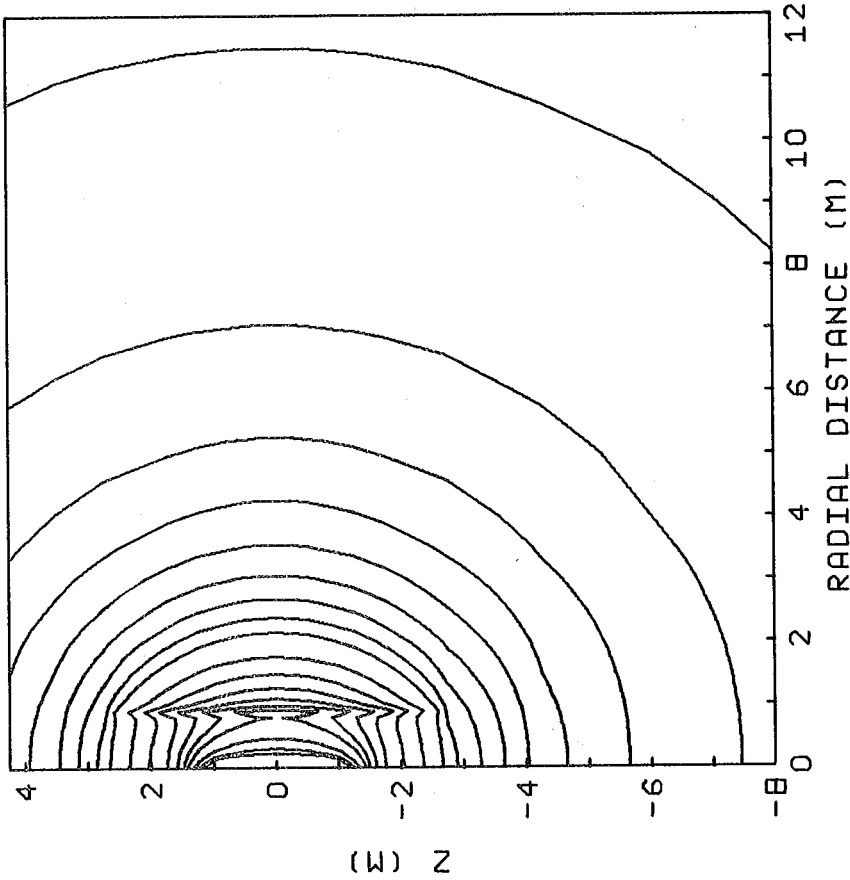
MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
744. 600. 500. 450.
400. 350. 300. 250.
200. 175. 150. 125.
100. 75. 50. 25.
5.

Figure D8j

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 760. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

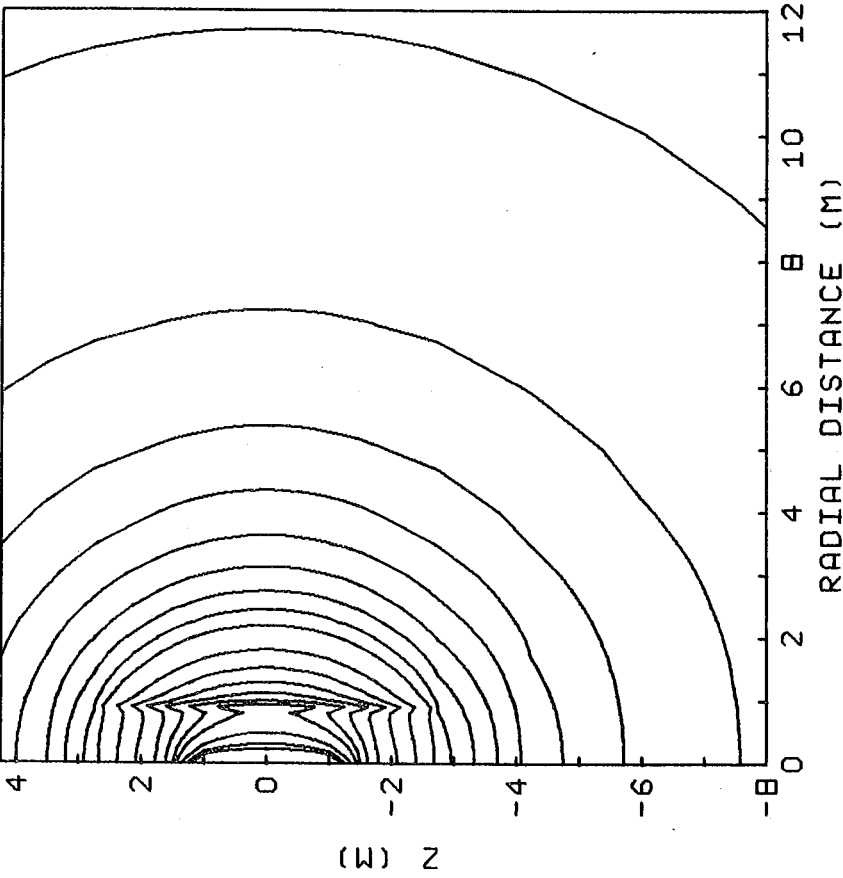
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
766. 700. 600. 500.
450. 400. 350. 300.
250. 200. 175. 150.
125. 100. 75. 50.
25. 5.

XBL 787-9505

Figure D8k

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 790. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

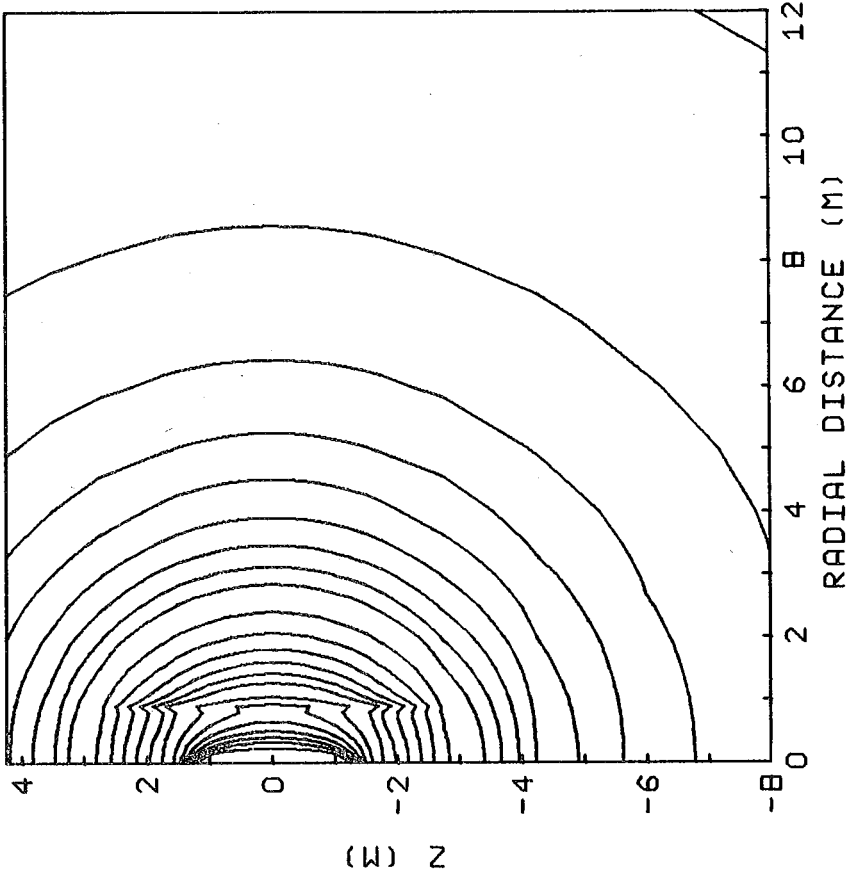
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
775. 700. 600. 500.
450. 400. 350. 300.
250. 200. 175. 150.
125. 100. 75. 50.
25. 5.

XBL 787-9504

Figure D81

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 1095. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

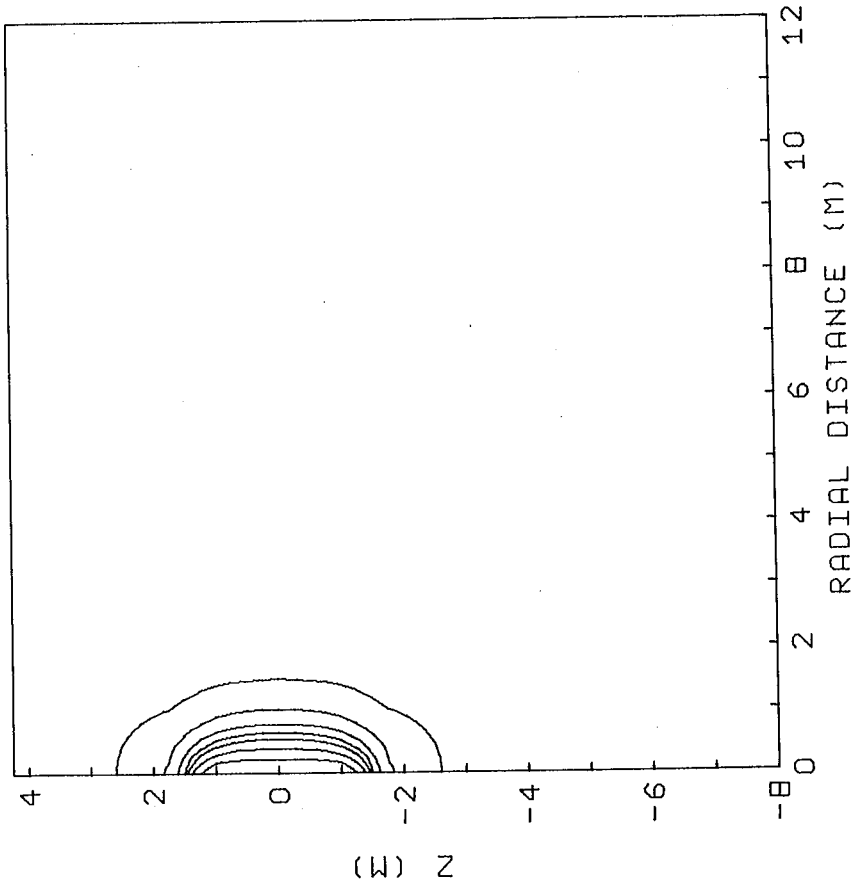
CONTOURS (DEG. C.) PLOTTED -

1269.	1100.	1000.	900.
800.	700.	600.	500.
450.	400.	350.	300.
250.	200.	175.	150.
125.	100.	75.	50.
25.		5.	

XBL 787-9503

Figure D8m

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 7. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

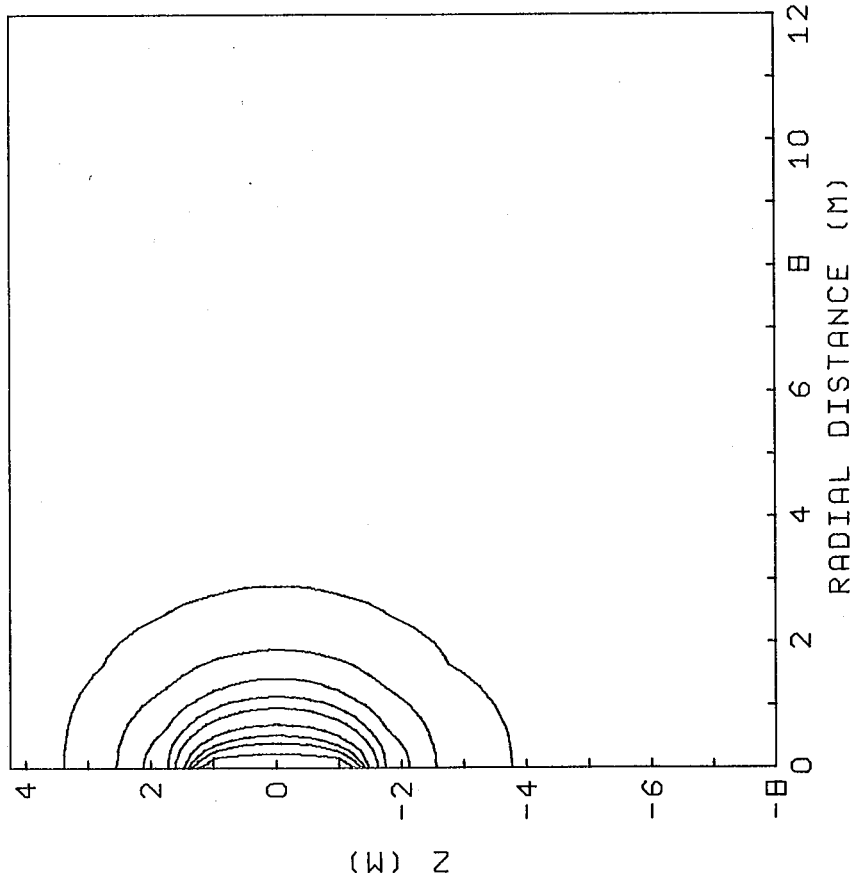
CONTOURS (DEG.C.) PLOTTED -

255. 150. 100. 75.

50. 25. 5.

Figure D9a

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 30. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

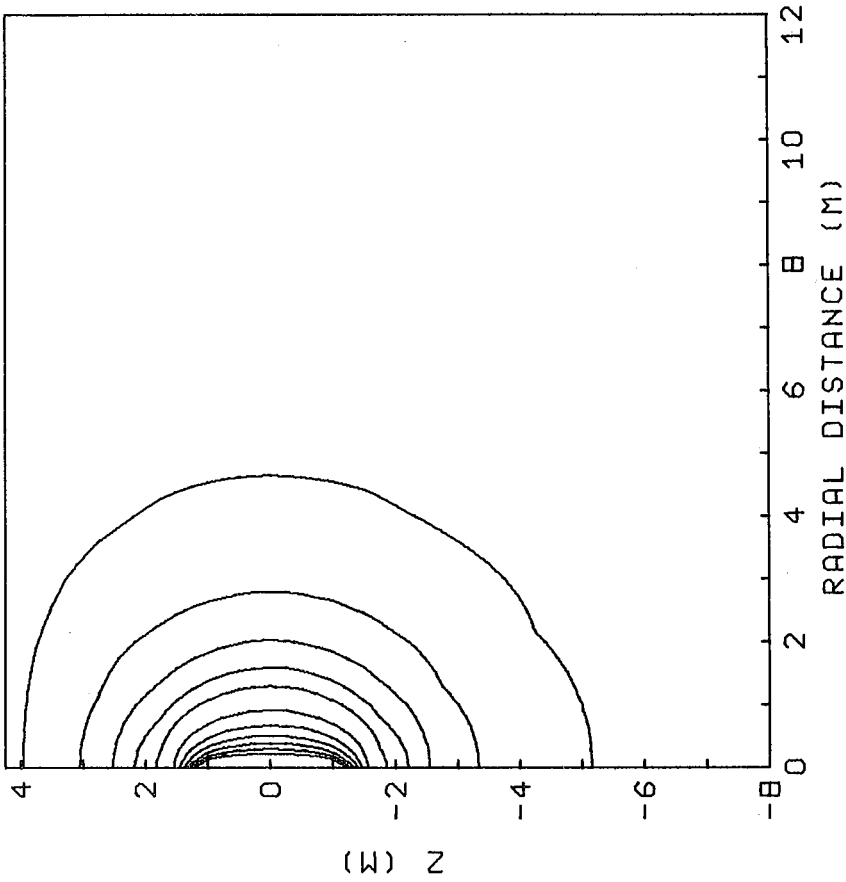
360. 250. 200. 150.

100. 75. 50. 25.

5.

Figure D9b

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 90. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

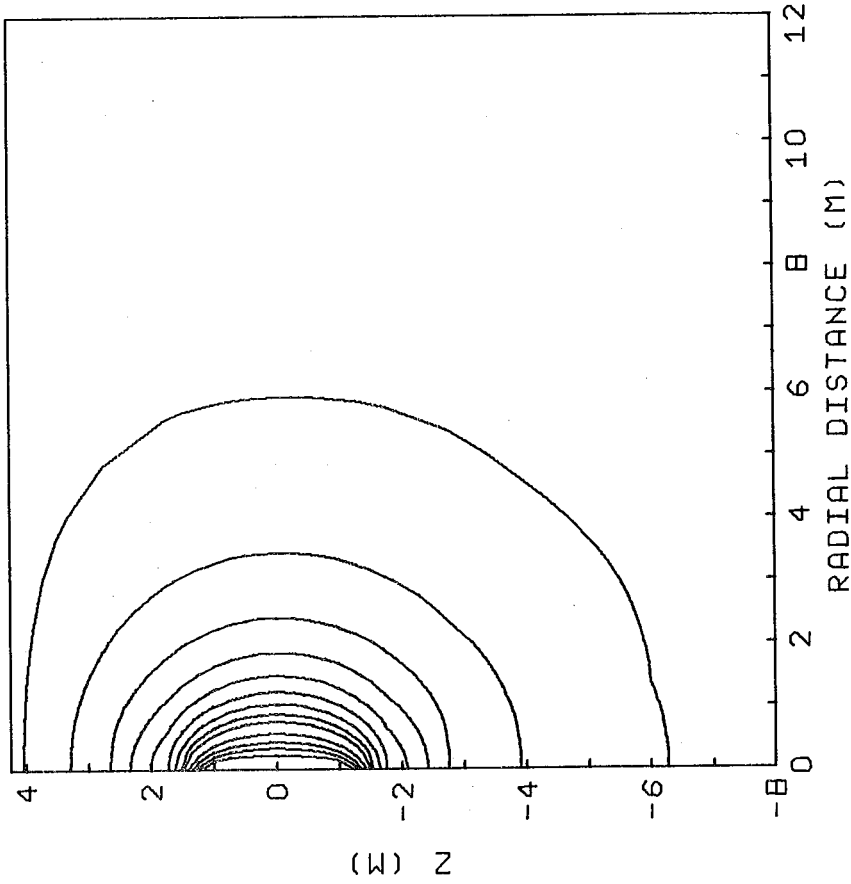
408. 350. 300. 250.

200. 150. 100. 75.

50. 25. 5.

Figure D9c

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 180. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

427. 350. 300. 250.

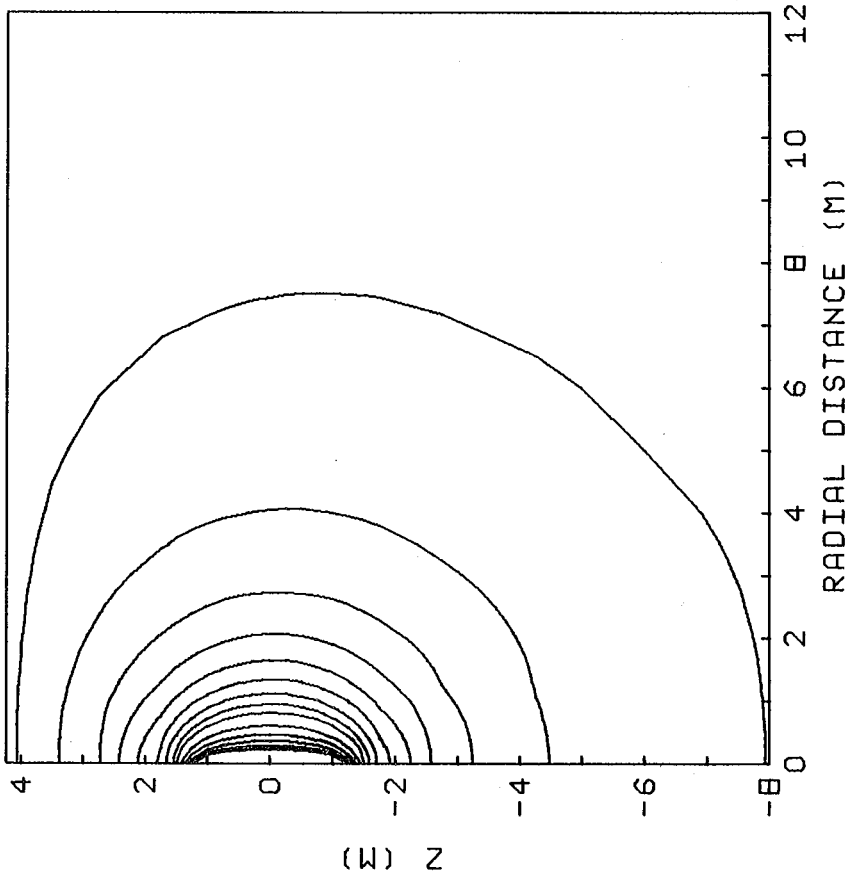
200. 175. 150. 125.

100. 75. 50. 25.

5.

Figure D9d

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 365. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

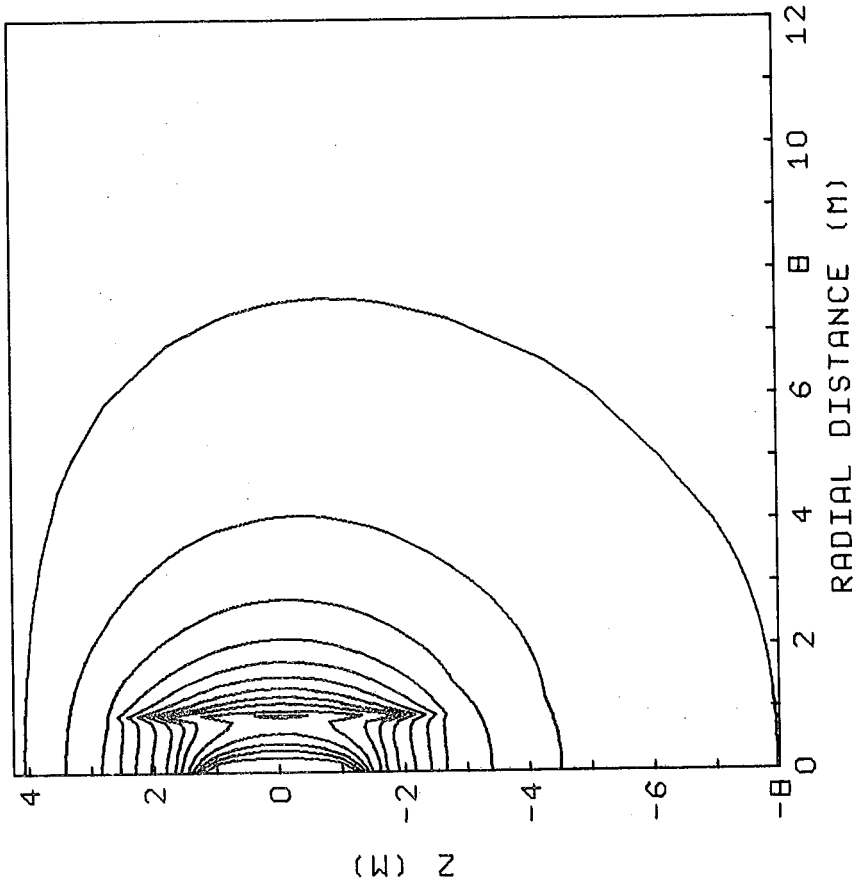
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

440.	400.	350.	300.
250.	200.	175.	150.
125.	100.	75.	50.
25.			

Figure D9e

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 372. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

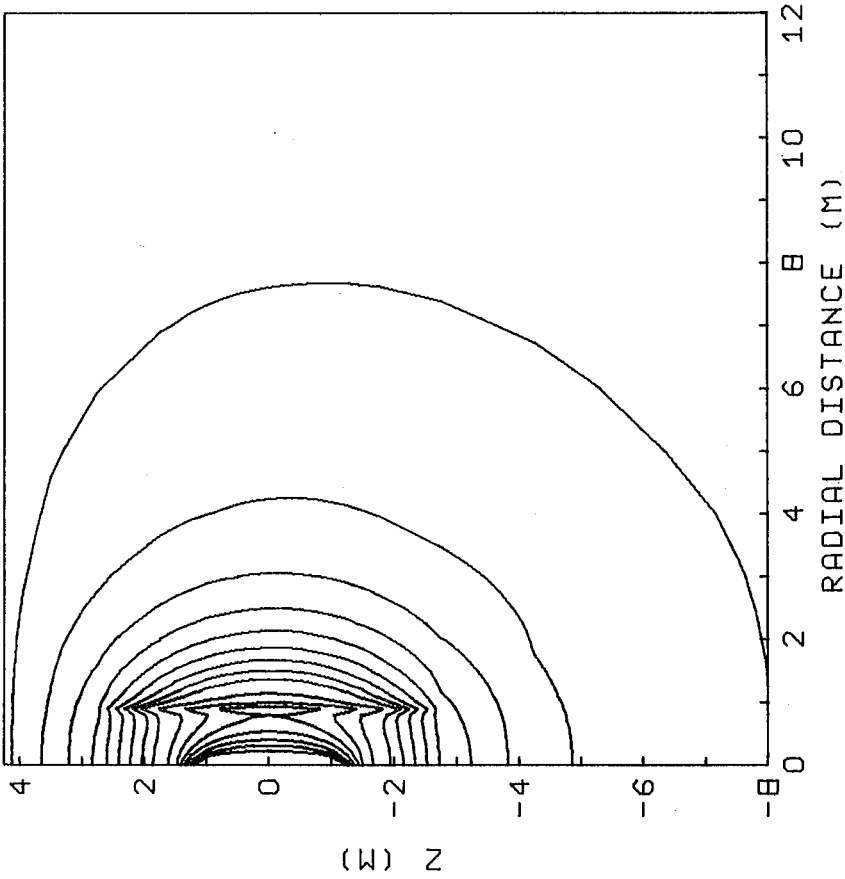
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

477.	400.	350.	300.
250.	200.	175.	150.
125.	100.	75.	50.
25.			5.

Figure D9f

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 395. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

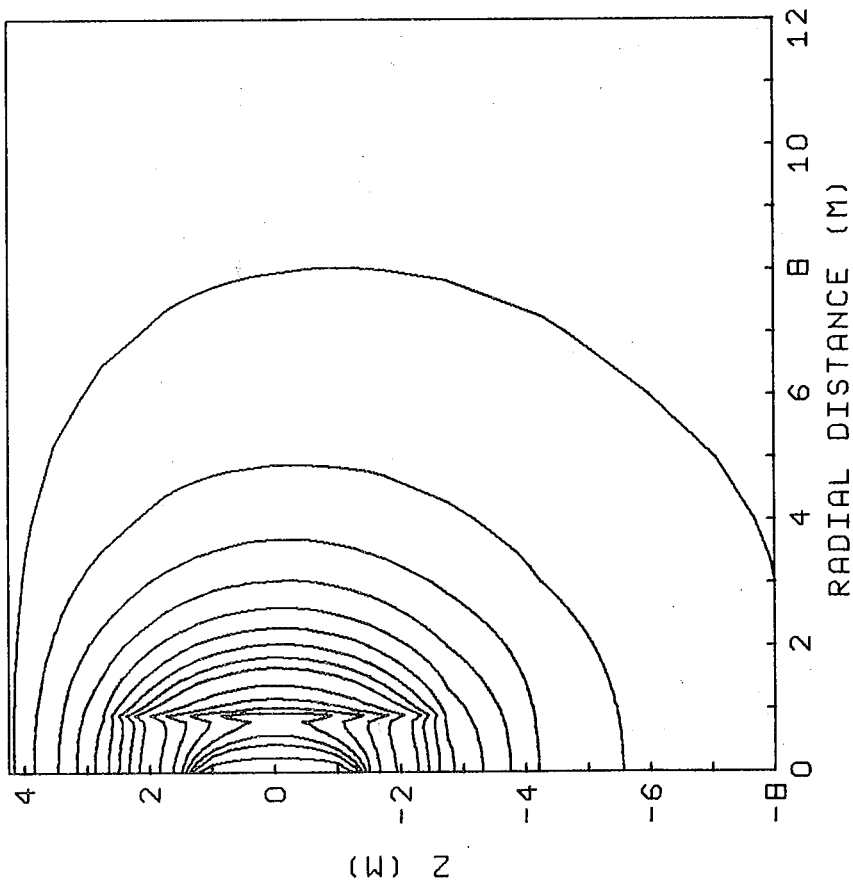
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

563.	500.	450.	400.
350.	300.	250.	200.
175.	150.	125.	100.
75.	50.	25.	5.

Figure D9g

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 455. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

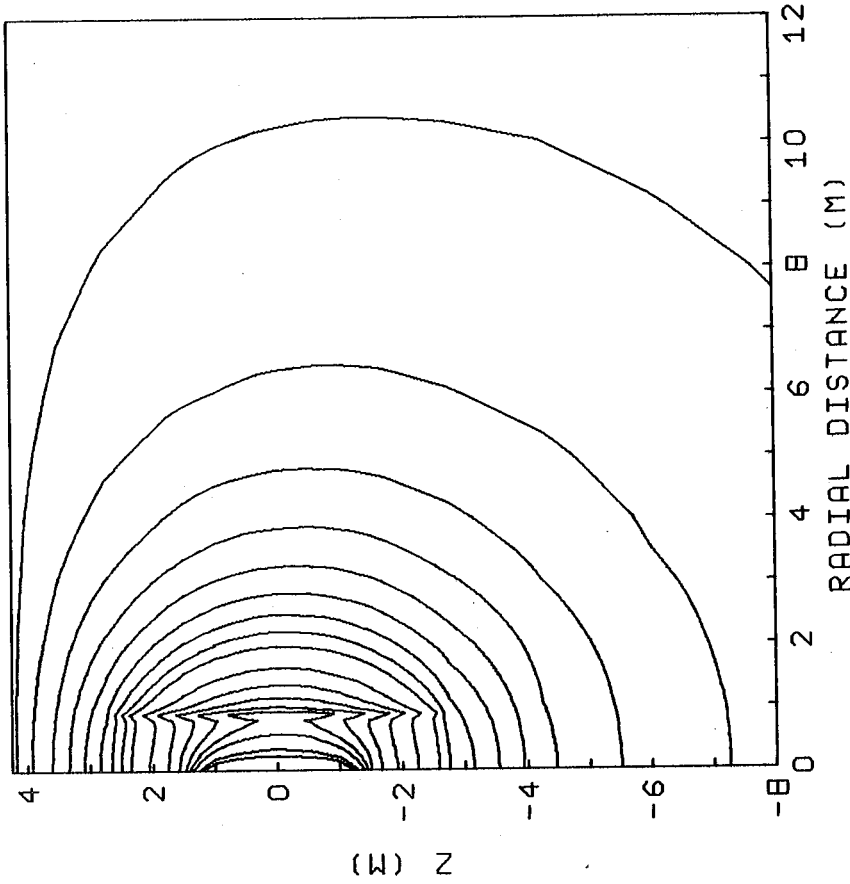
CONTOURS (DEG.C.) PLOTTED -

628. 500. 450. 400.
350. 300. 250. 200.
175. 150. 125. 100.
75. 50. 25. 5.

XBL 787-9476

Figure D9h

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 730. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

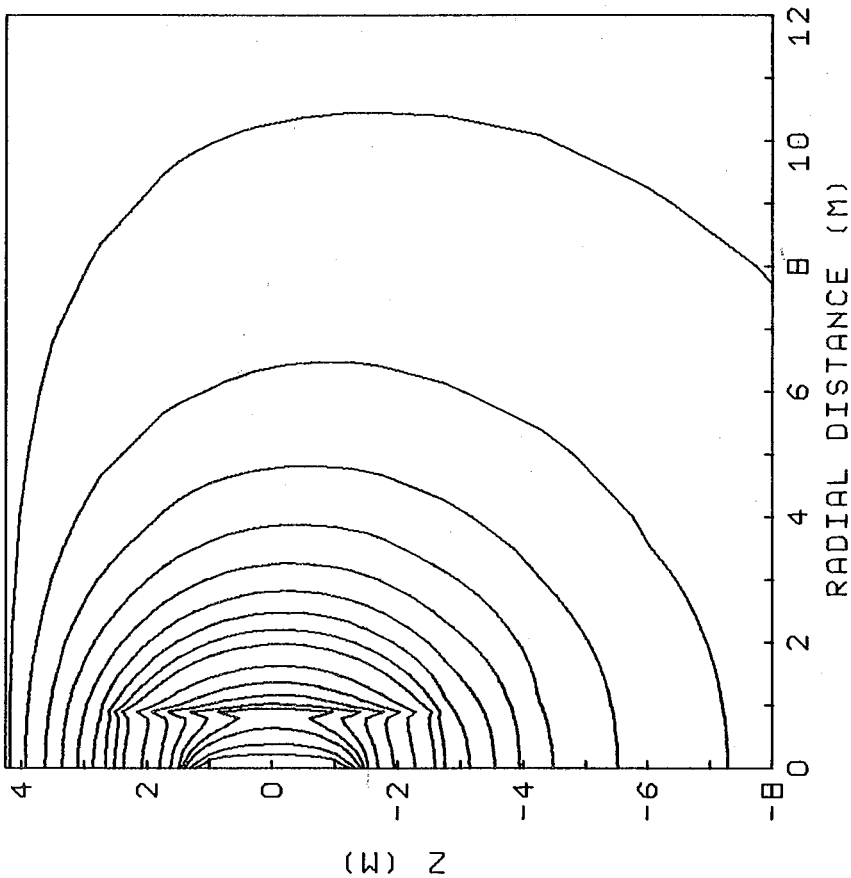
CONTOURS (DEG.C.) PLOTTED -

- 677. 600. 500. 450.
- 400. 350. 300. 250.
- 200. 175. 150. 125.
- 100. 75. 50. 25.

XBL 787-9472

Figure D9i

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 737. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

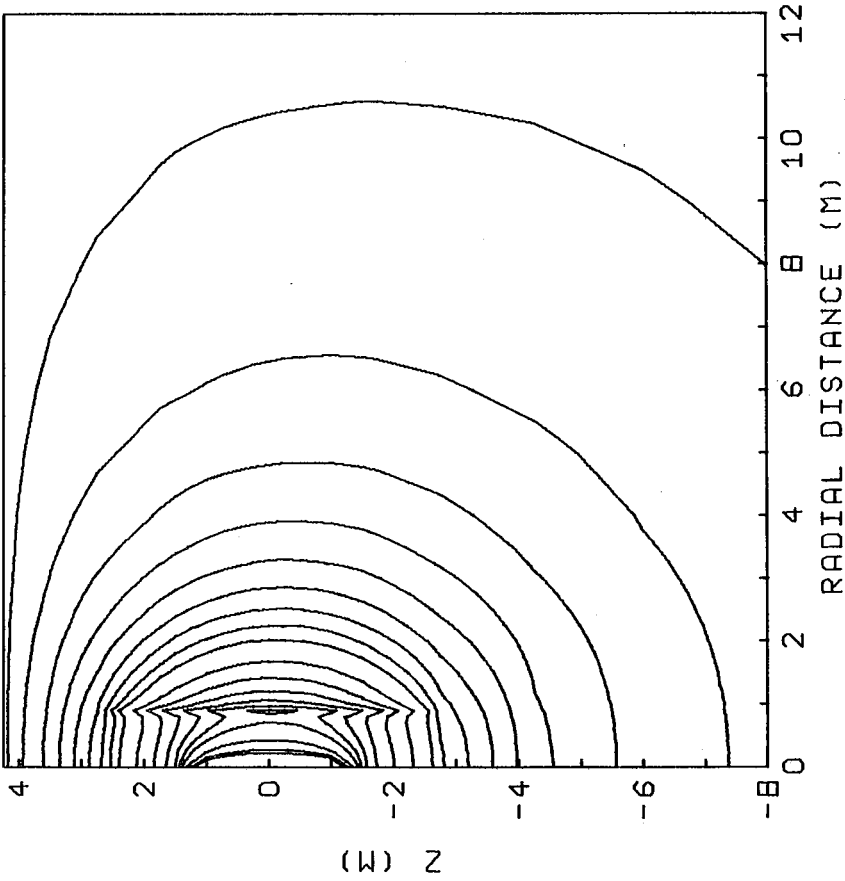
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
729. 600. 500. 450.
400. 350. 300. 250.
200. 175. 150. 125.
100. 75. 50. 25.
5.

XBL 787-9468

Figure D9j

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 760. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

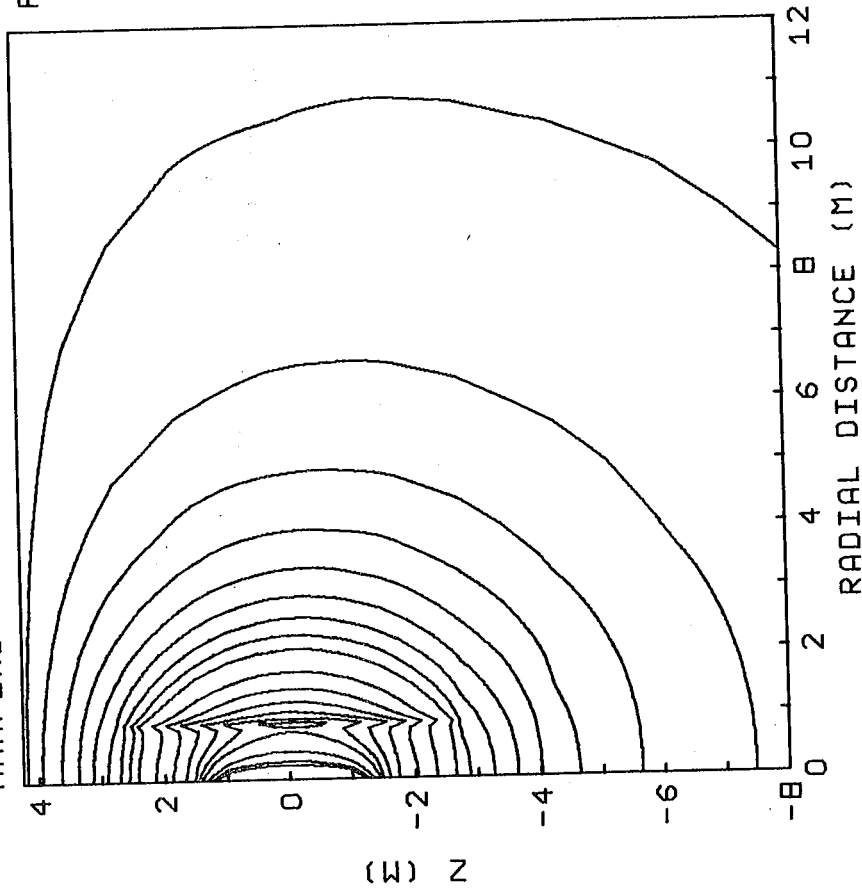
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
751. 700. 600. 500.
450. 400. 350. 300.
250. 200. 175. 150.
125. 100. 75. 50.
25. 5.

XBL 787-9467

Figure D9k

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 790. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

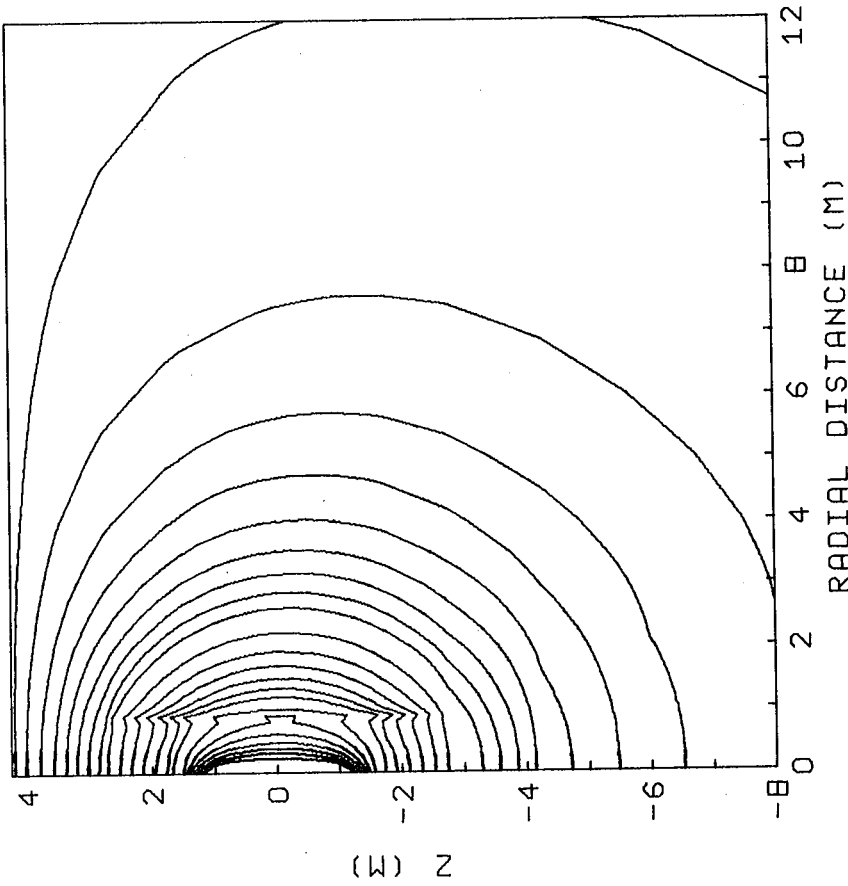
CONTOURS (DEG.C.) PLOTTED -

- 759. 700. 600. 500.
- 450. 400. 350. 300.
- 250. 200. 175. 150.
- 125. 100. 75. 50.
- 25. 5.

XBL 787-9466

Figure D9I

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 1095. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 5.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

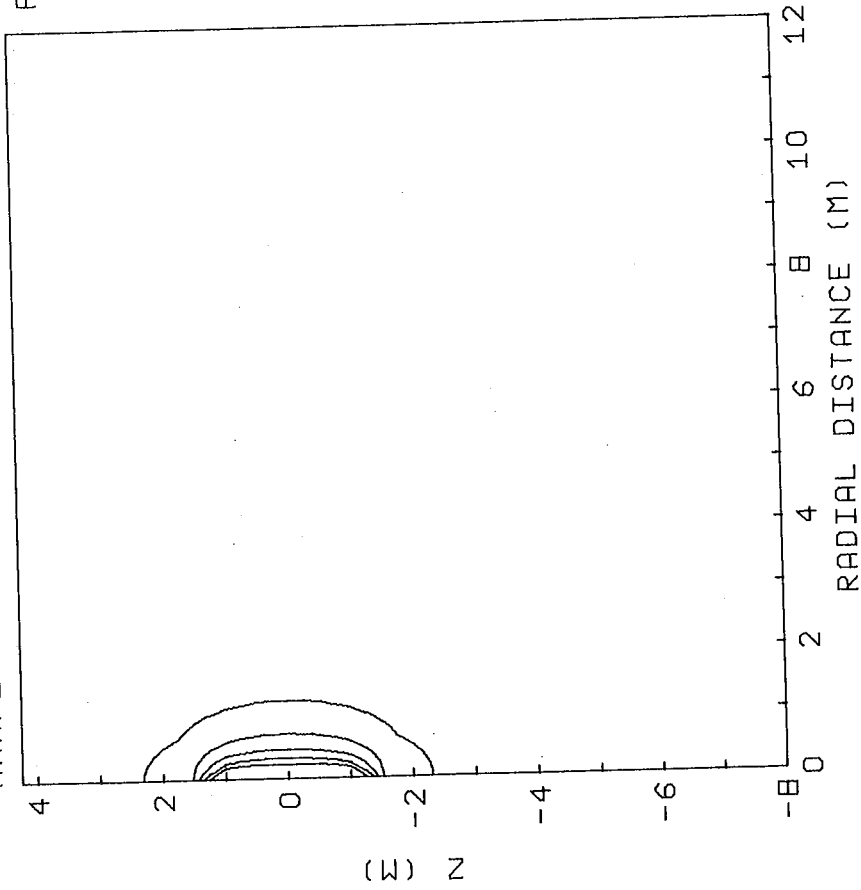
- 1242. 1100. 1000. 900.
- 800. 700. 600. 500.
- 450. 400. 350. 300.
- 250. 200. 175. 150.
- 125. 100. 75. 50.
- 25. 5.

XBL 787-9465

Figure D9m

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT

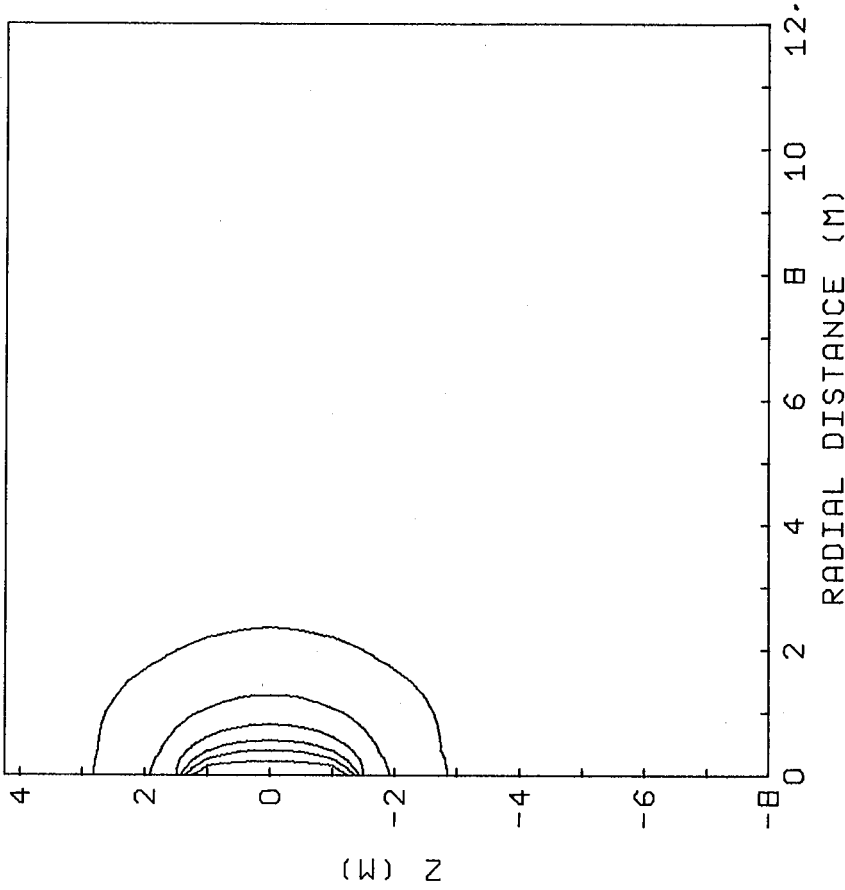
PLOT INFORMATION
TIME = 7. DAYS
THETA = 0.0 DEG.
INFINITE MEDIUM MODEL
MAIN HTR = 2.00 KW
PERIPHERAL HTR = 1.00 KW
CONTOURS (DEG.C.) PLOTTED -
102. 75. 50. 25.
5.



XBL 786-9452

Figure D10a

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 30. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

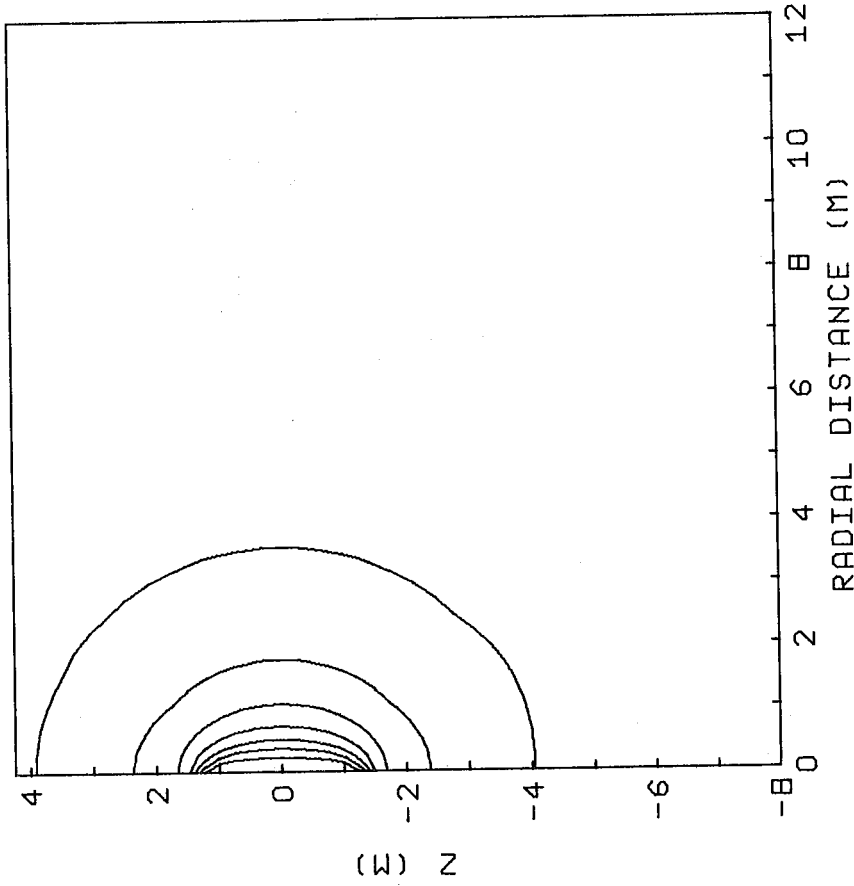
144. 100. 75. 50.

25. 5.

XBL 787-9456

Figure D10b

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 90. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

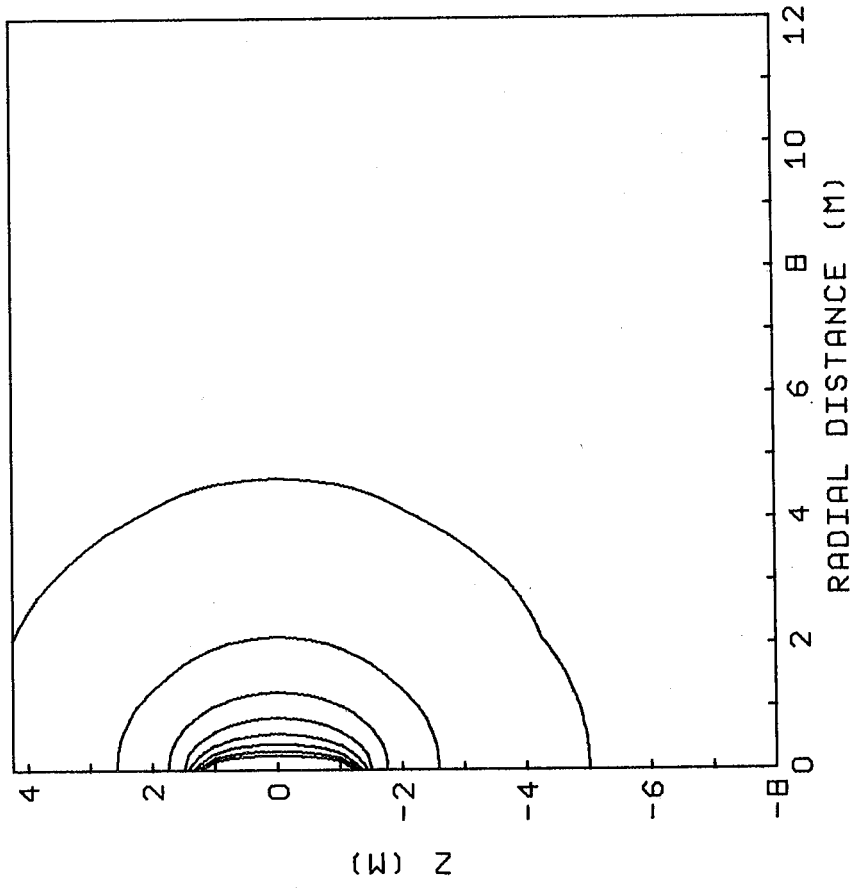
CONTOURS (DEG.C.) PLOTTED -

163. 125. 100. 75.

50. 25. 5.

Figure D10c

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 180. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

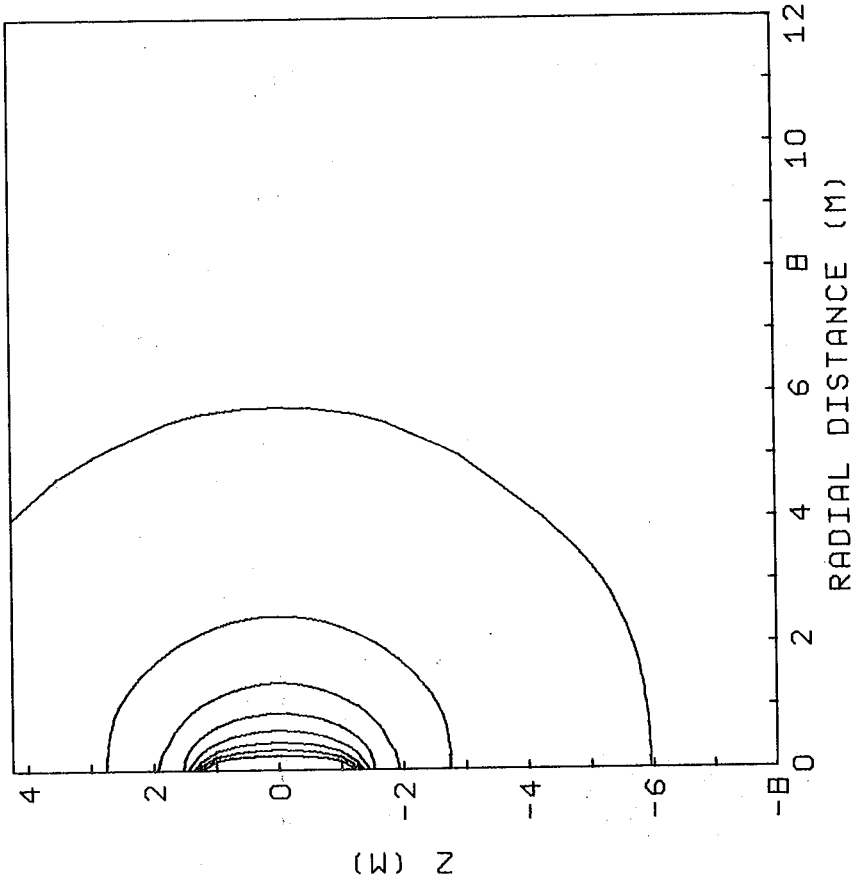
CONTOURS (DEG.C.) PLOTTED -

171. 150. 125. 100.

75. 50. 25. 5.

Figure D10d

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 365. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

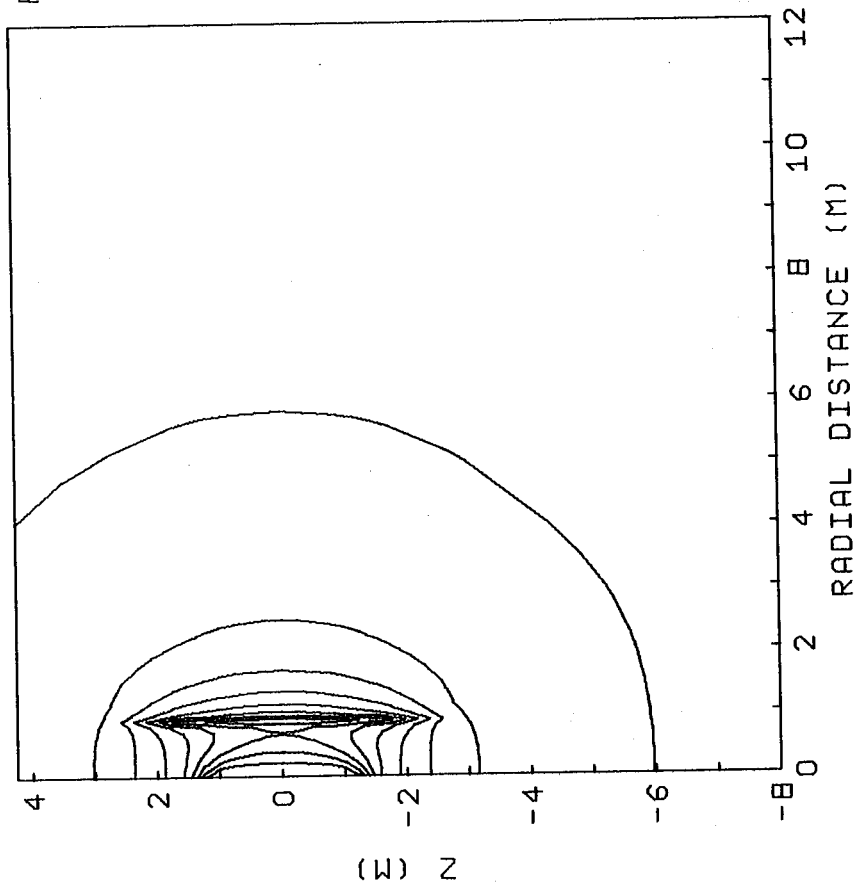
177. 150. 125. 100.

75. 50. 25. 5.

XBL 787-9461

Figure D10e

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 372. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

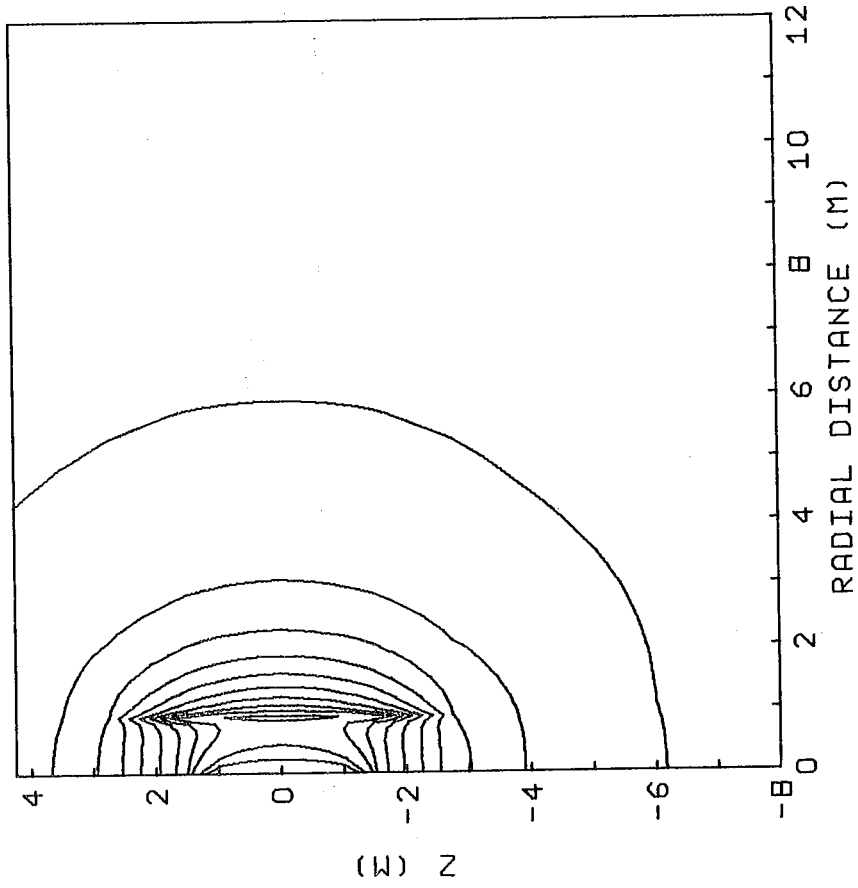
215. 175. 150. 125.

100. 75. 50. 25.

5.

Figure D10f

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 395. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

301: 250: 200: 175:

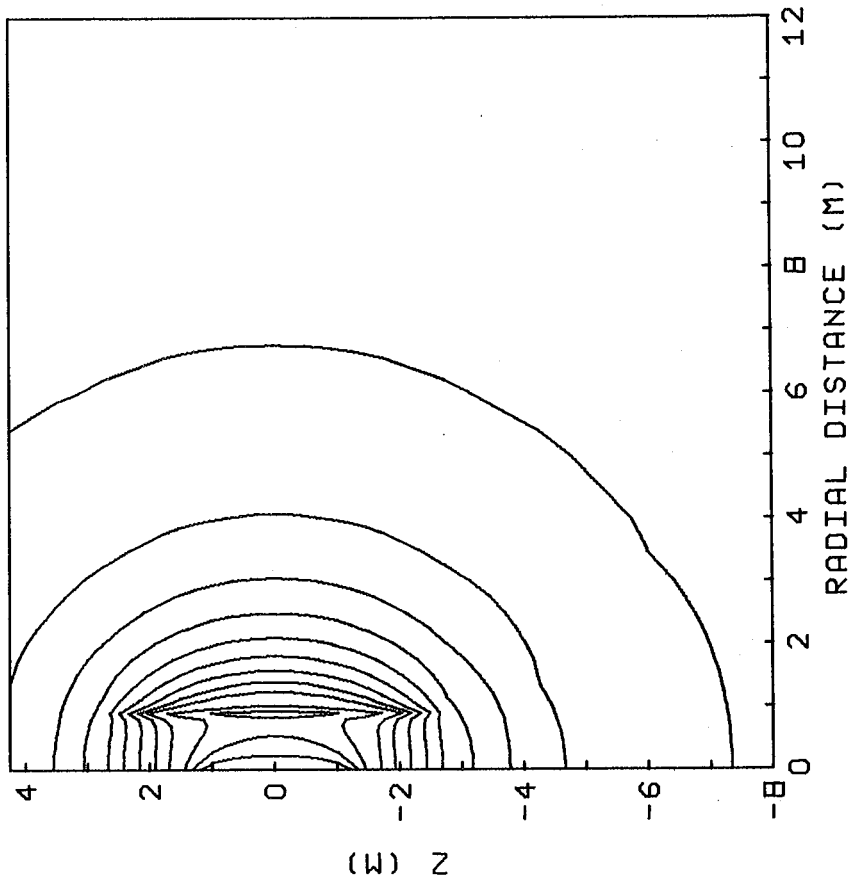
150: 125: 100: 75:

50: 25: 5:

XBL 787-9464

Figure D10g

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 455. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

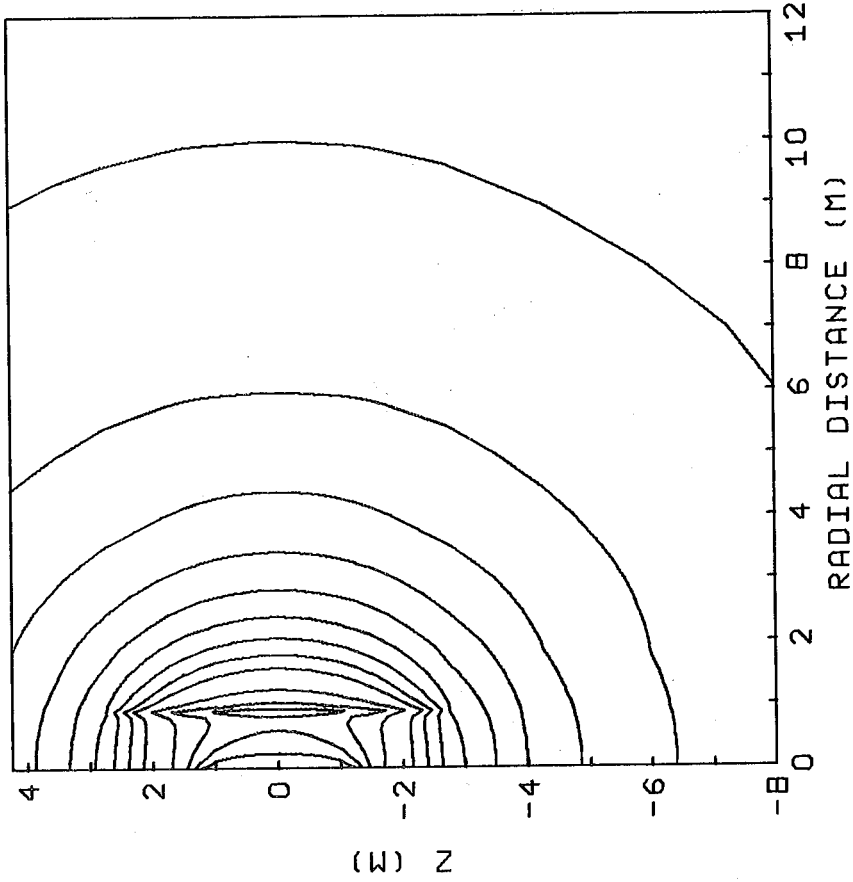
365. 300. 250. 200.

175. 150. 125. 100.

75. 50. 25. 5.

Figure D10h

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 730. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

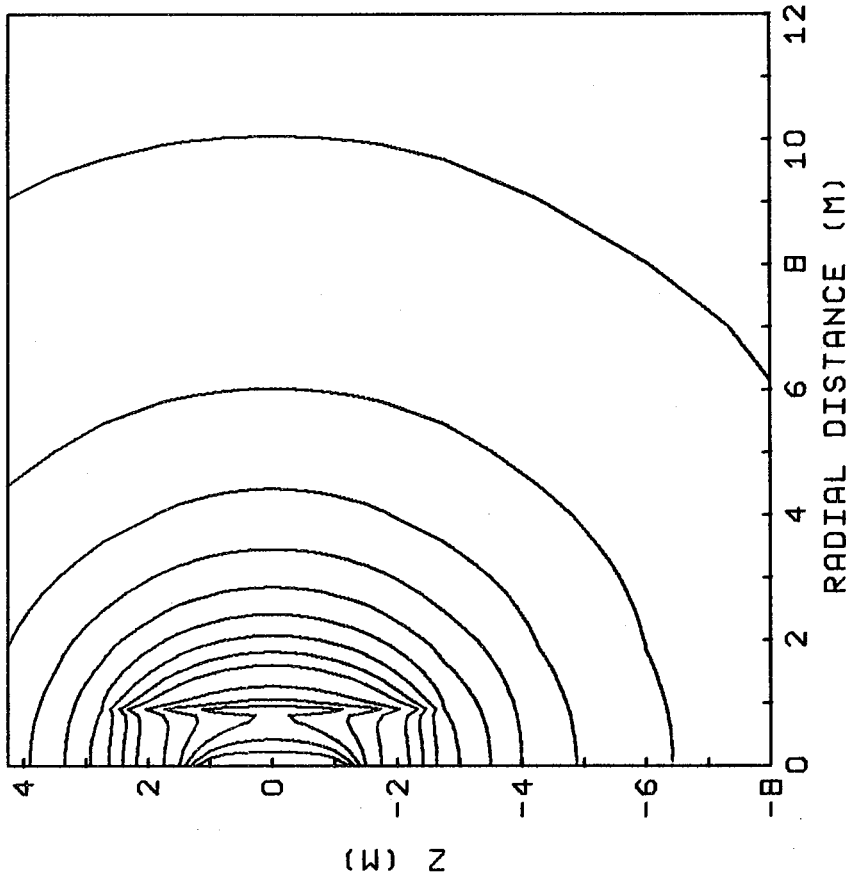
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

420.	350.	300.	250.
200.	175.	150.	125.
100.	75.	50.	25.
			5.

Figure D10i

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 737. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

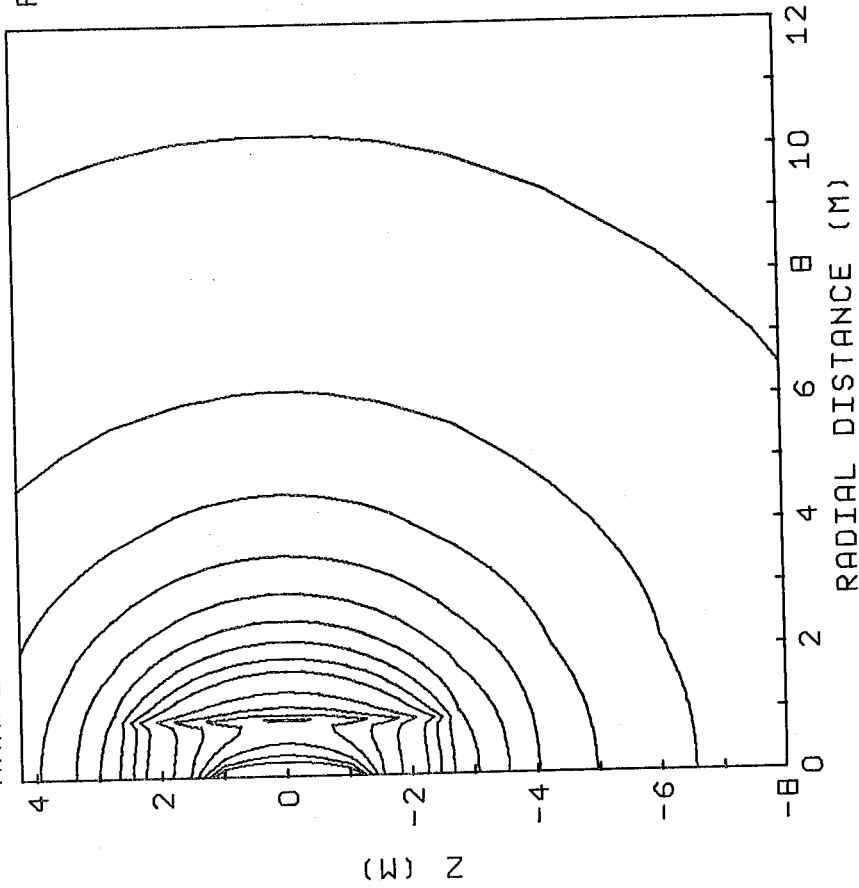
CONTOURS (DEG.C.) PLOTTED -

472. 400. 350. 300.
250. 200. 175. 150.
125. 100. 75. 50.
25. 5.

XBL 787-9459

Figure D10j

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 760. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

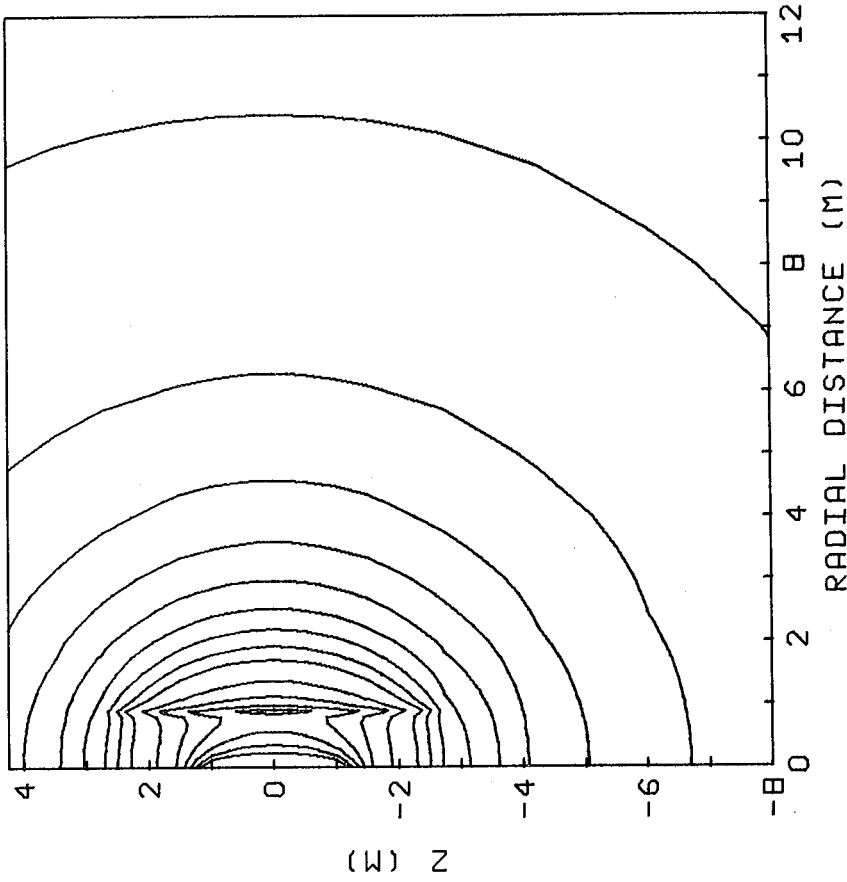
CONTOURS (DEG.C.) PLOTTED -

- 494. 450. 400. 350.
- 300. 250. 200. 175.
- 150. 125. 100. 75.
- 50. 25. 5.

XBL 787-9455

Figure D10k

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 790. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

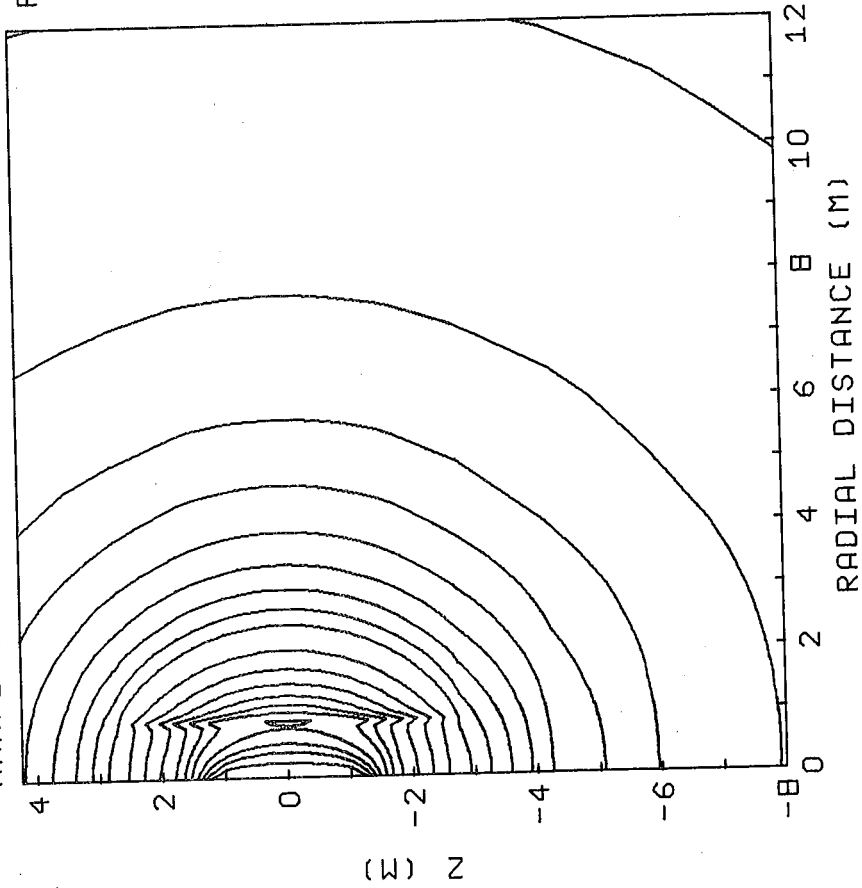
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
503. 450. 400. 350.
300. 250. 200. 175.
150. 125. 100. 75.
50. 25. 5.

XBL 787-9454

Figure D101

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 1095. DAYS

THETA = 0.0 DEG.

INFINITE MEDIUM MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

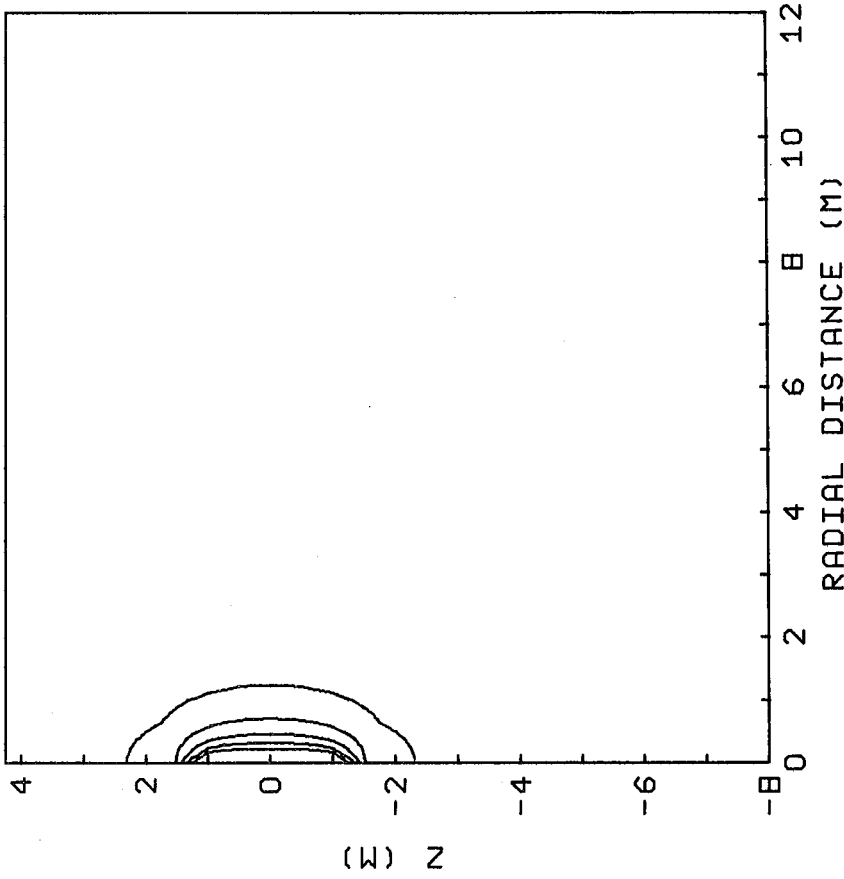
CONTOURS (DEG.C.) PLOTTED -

- 994. 800. 700. 600.
- 500. 450. 400. 350.
- 300. 250. 200. 175.
- 150. 125. 100. 75.
- 50. 25. 5.

XBL 786-9453

Figure D10m

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 7. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

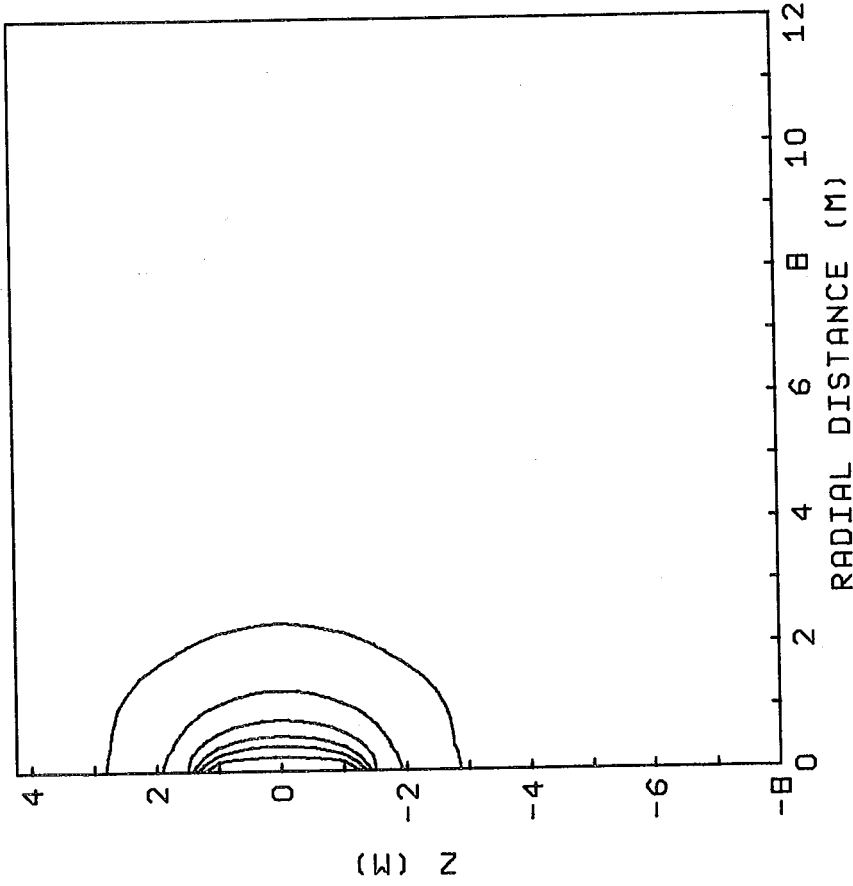
MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
102. 75. 50. 25.
5.

Figure D11a

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 30. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

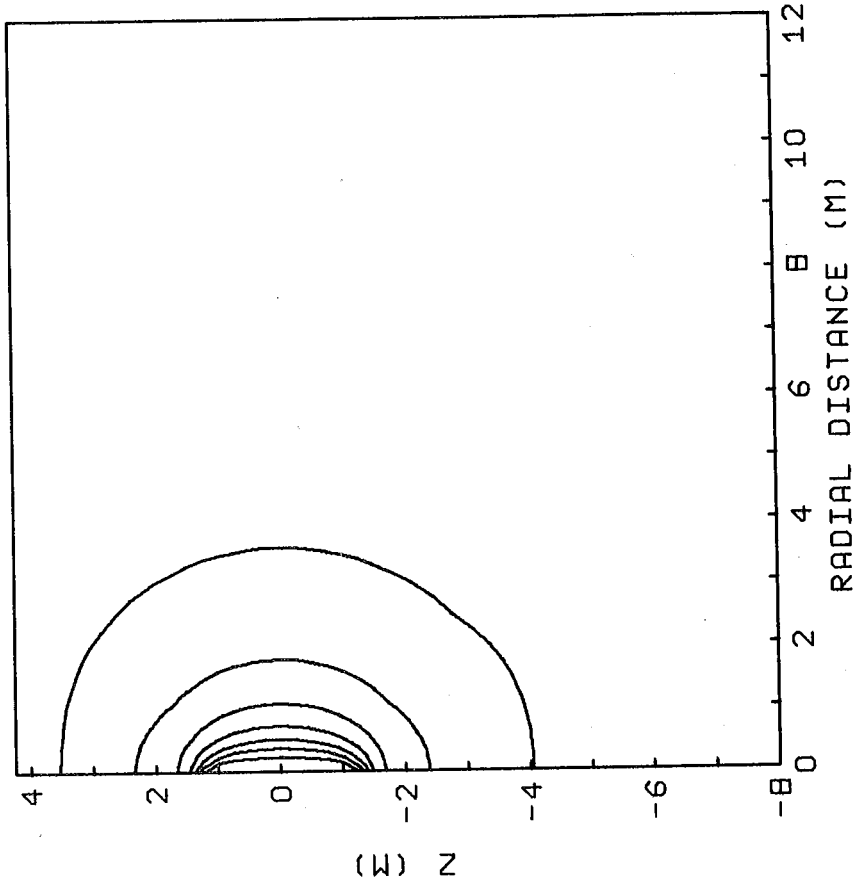
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
143. 100. 75. 50.
25. 5.

XBL 787-9490

Figure D11b

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 90. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

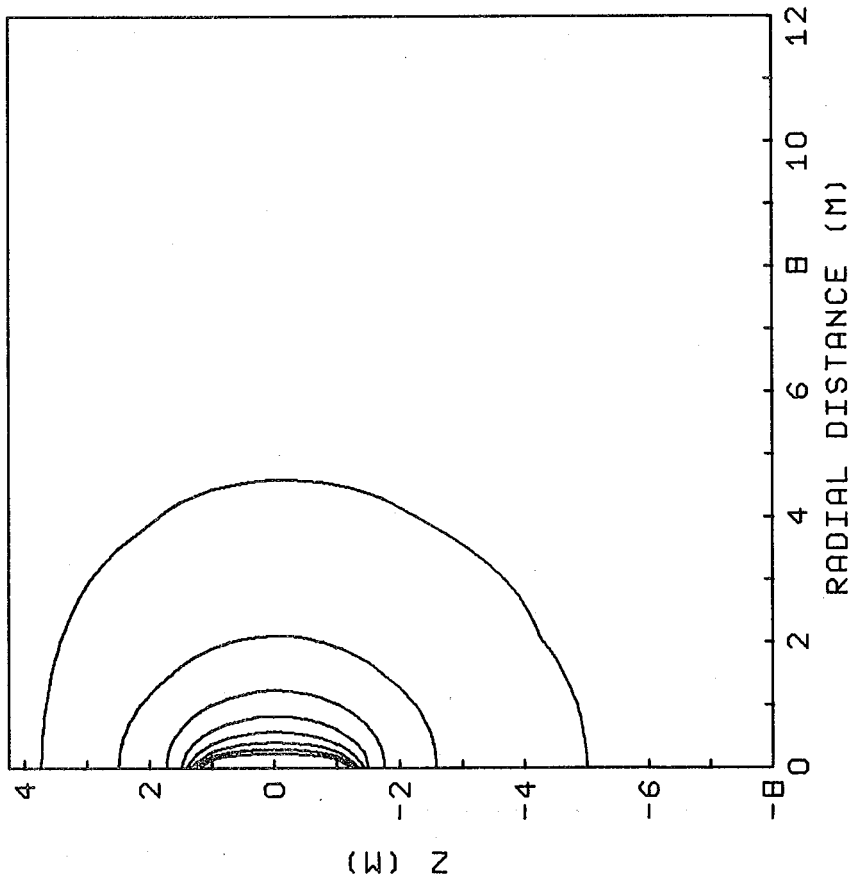
163. 125. 100. 75.

50. 25. 5.

XBL 787-9491

Figure D11c

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 180. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

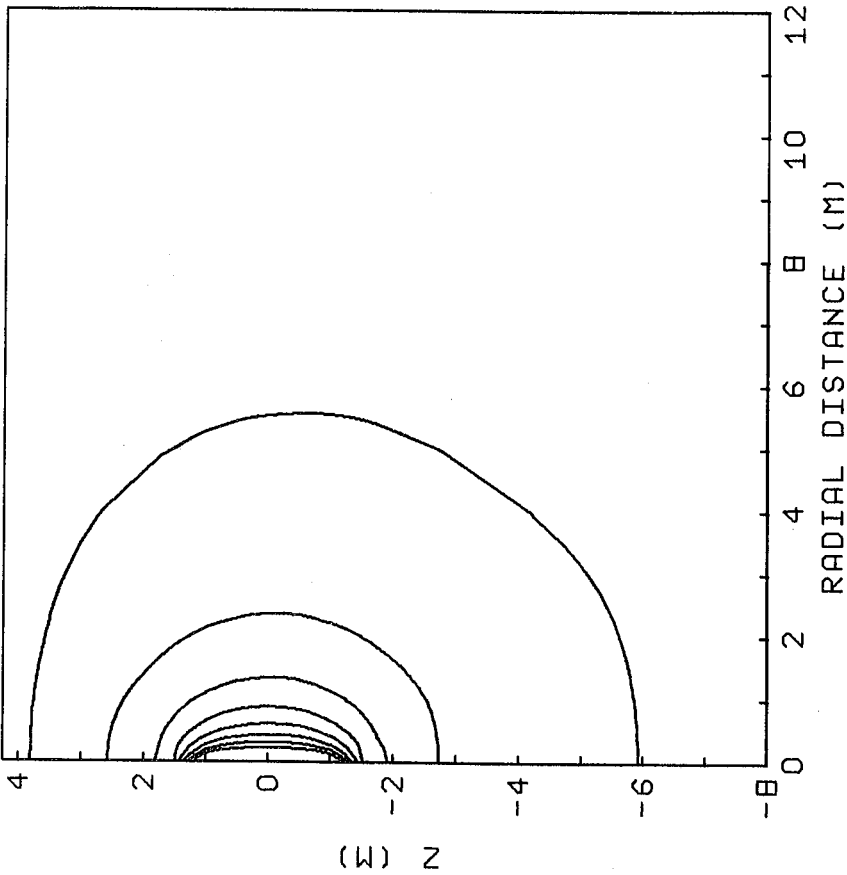
CONTOURS (DEG.C.) PLOTTED -

171. 150. 125. 100.

75. 50. 25. 5.

Figure D11d

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 365. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

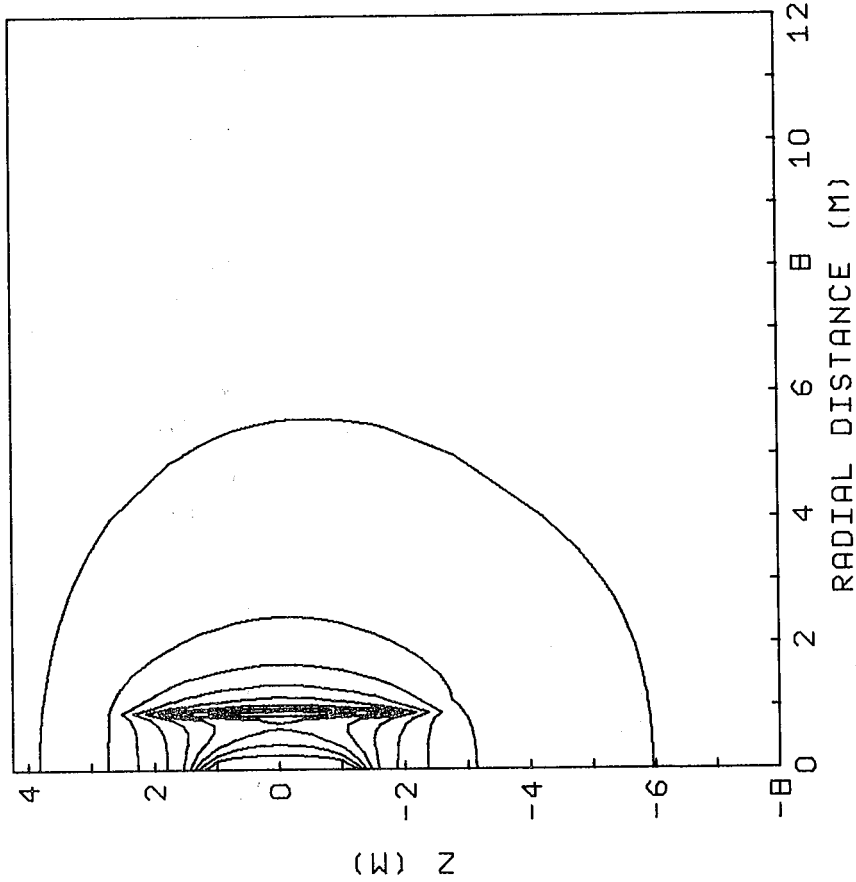
176. 150. 125. 100.

75. 50. 25. 5.

XBL 787-9487

Figure D11e

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 372. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

213. 175. 150. 125.

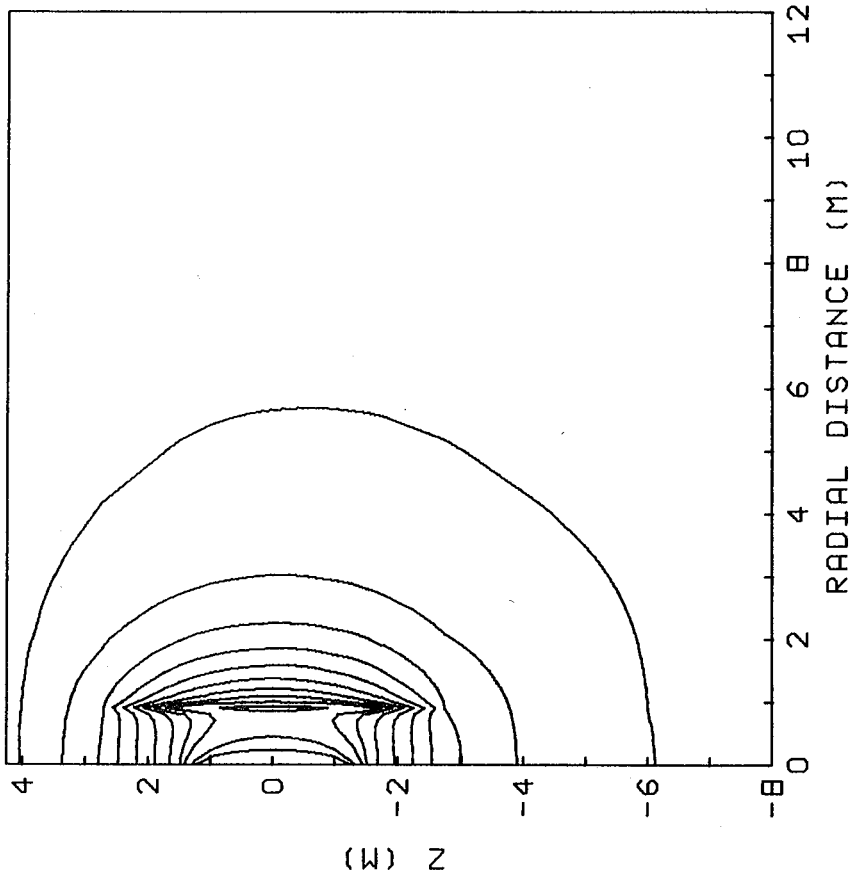
100. 75. 50. 25.

5.

XBL 787-9486

Figure D11f

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 395. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

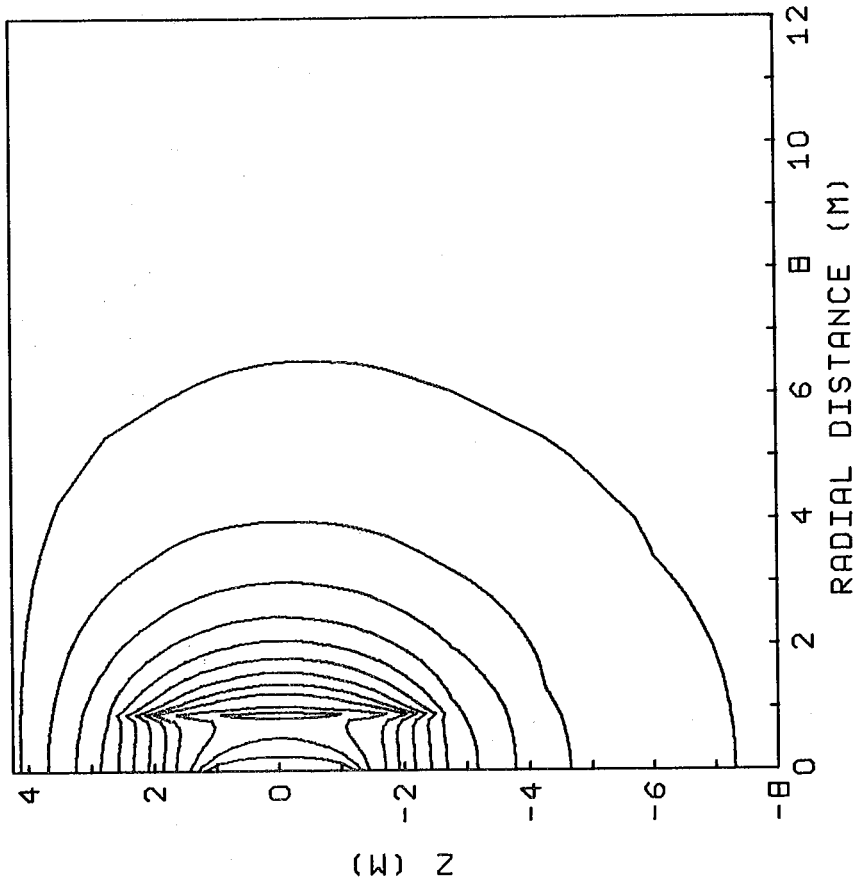
299. 250. 200. 175.

150. 125. 100. 75.

50. 25. 5.

Figure D11g

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 455. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

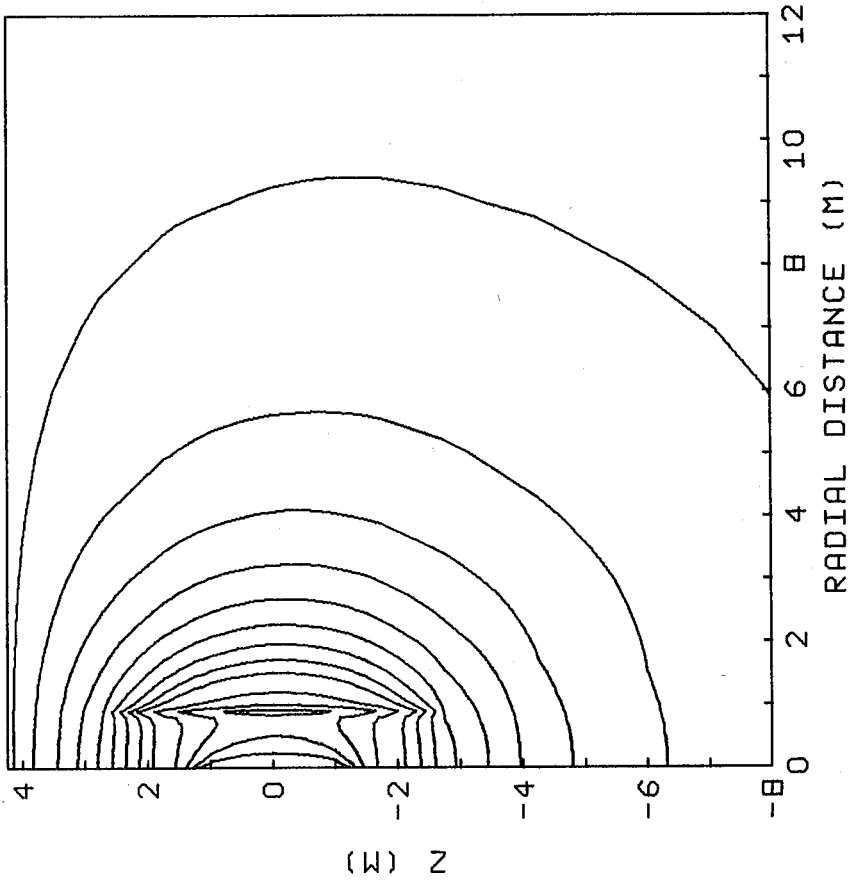
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -
363. 300. 250. 200.
175. 150. 125. 100.
75. 50. 25. 5.

XBL 787-9484

Figure D11h

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 730. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

410. 350. 300. 250.

200. 175. 150. 125.

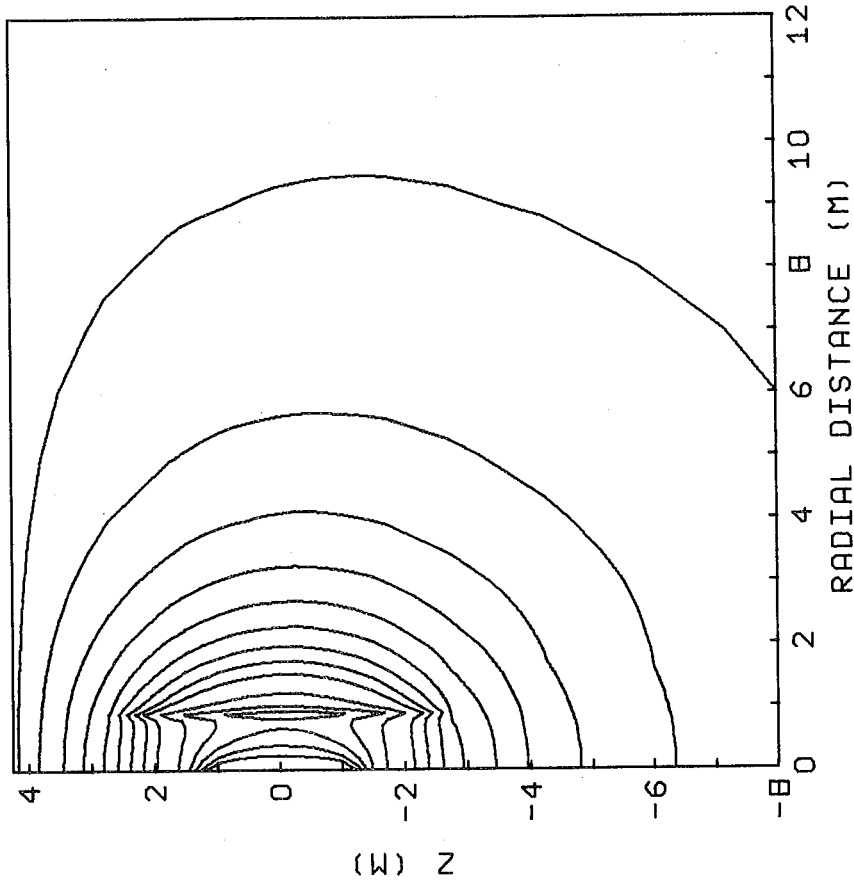
100. 75. 50. 25.

5.

XBL 787-9483

Figure D11i

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 737. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

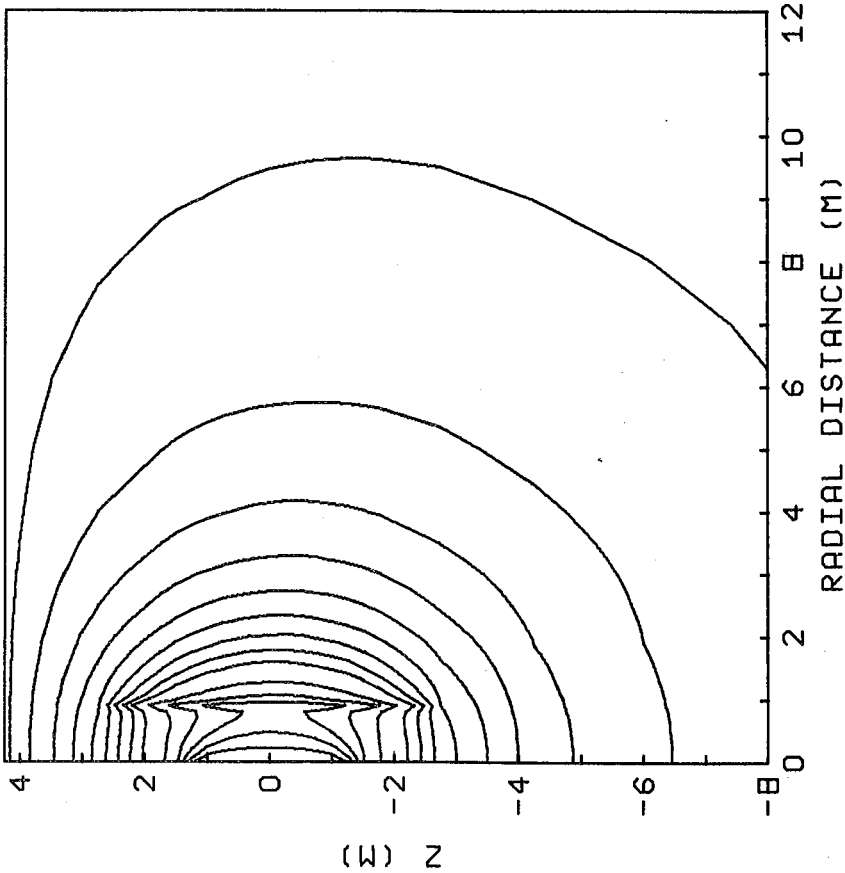
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

461. 400. 350. 300.
250. 200. 175. 150.
125. 100. 75. 50.
25. 5.

Figure D11j

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 760. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

484. 400. 350. 300.

250. 200. 175. 150.

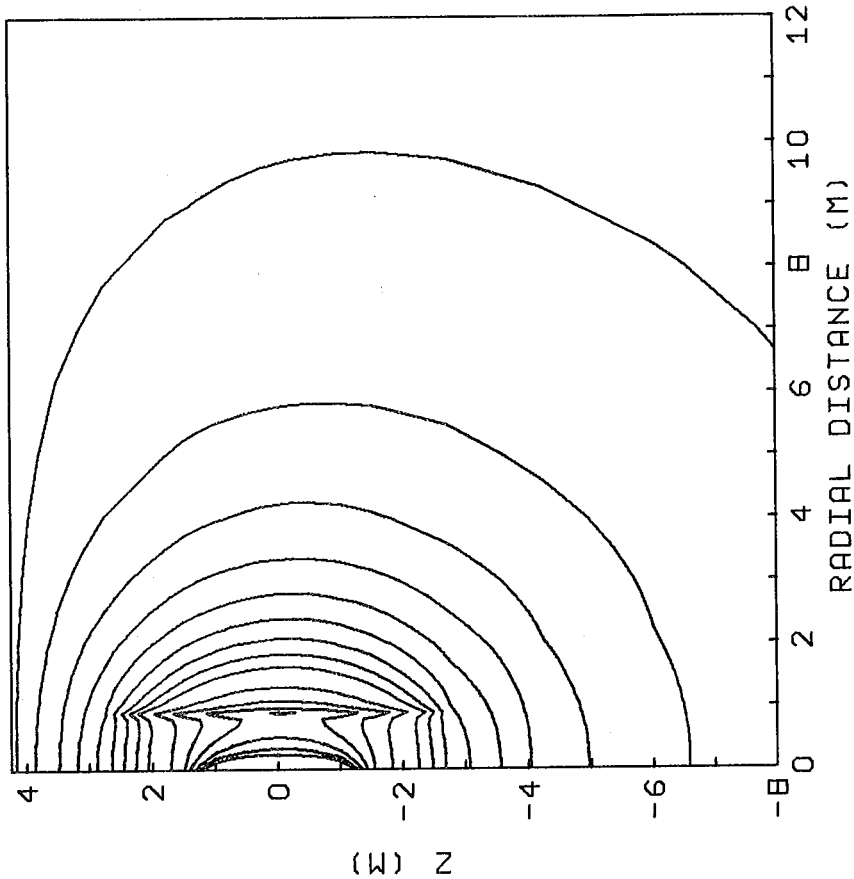
125. 100. 75. 50.

25. 5.

XBL 787-9481

Figure D11k

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 790. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

PERIPHERAL HTR = 1.00 KW

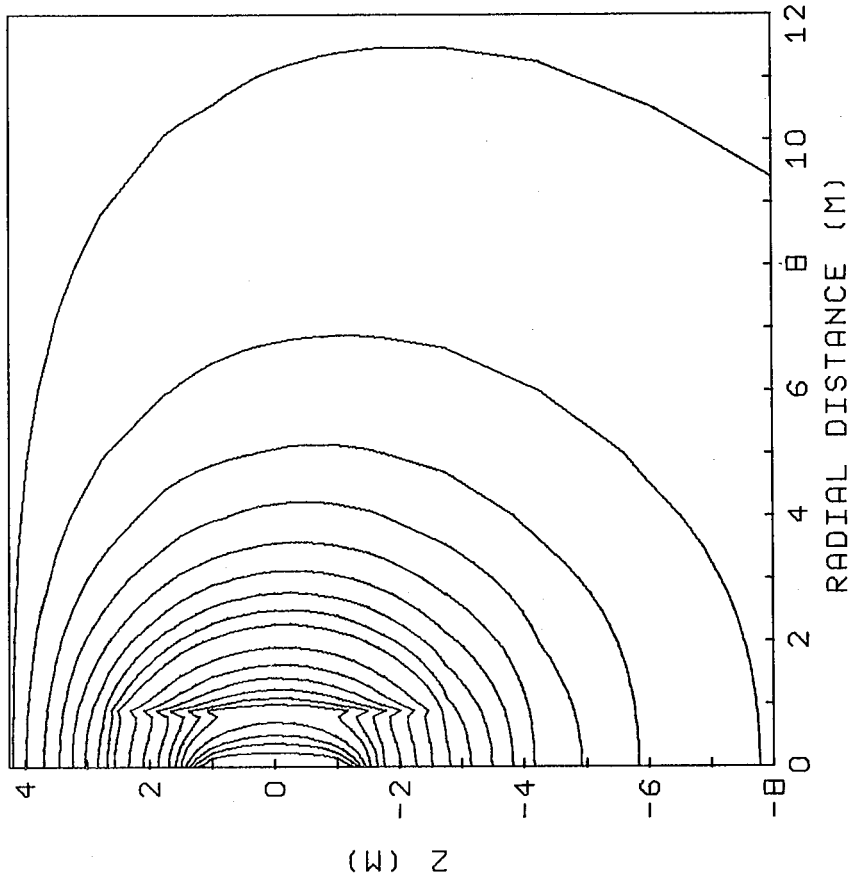
CONTOURS (DEG.C.) PLOTTED -

- 491. 450. 400. 350.
- 300. 250. 200. 175.
- 150. 125. 100. 75.
- 50. 25. 5.

XBL 787-9480

Figure D111

ISOTHERMS IN VERTICAL PLANE
HANFORD FULL-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 1095. DAYS

THETA = 0.0 DEG.

ISOTHERMAL BOUNDARY MODEL

MAIN HTR = 2.00 KW

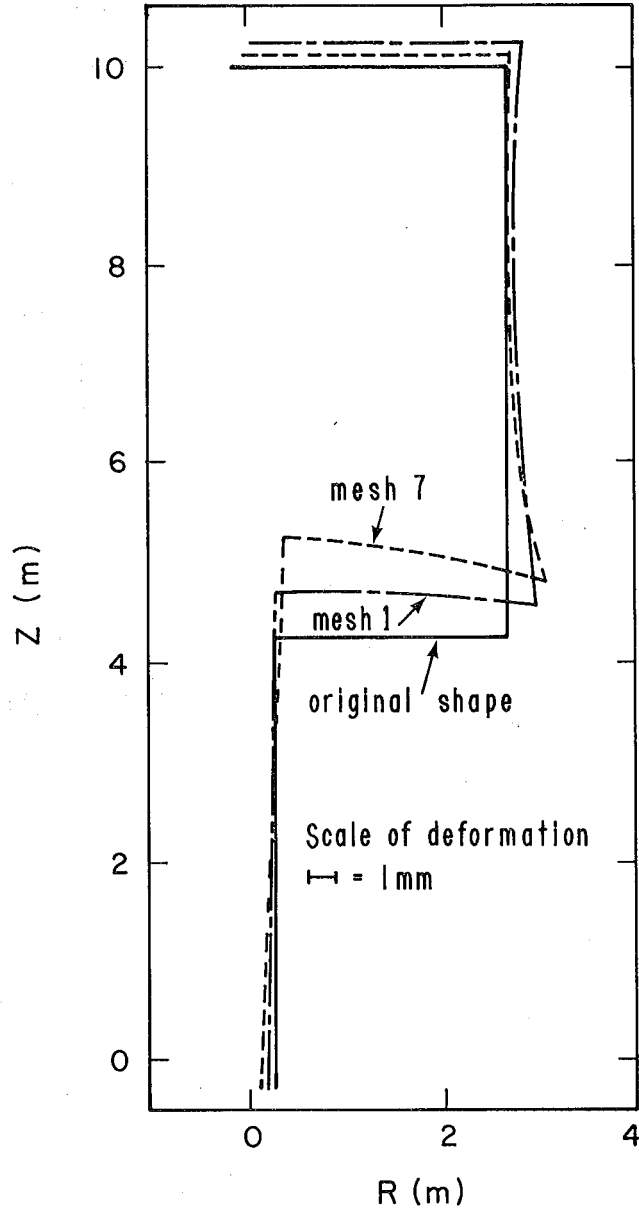
PERIPHERAL HTR = 1.00 KW

CONTOURS (DEG.C.) PLOTTED -

974.	800.	700.	600.
500.	450.	400.	350.
300.	250.	200.	175.
150.	125.	100.	75.
50.	25.	5.	

Figure D11m

HANFORD FULL-SCALE EXPERIMENT
Power schedule 1A
Deformation drift and borehole
730 days



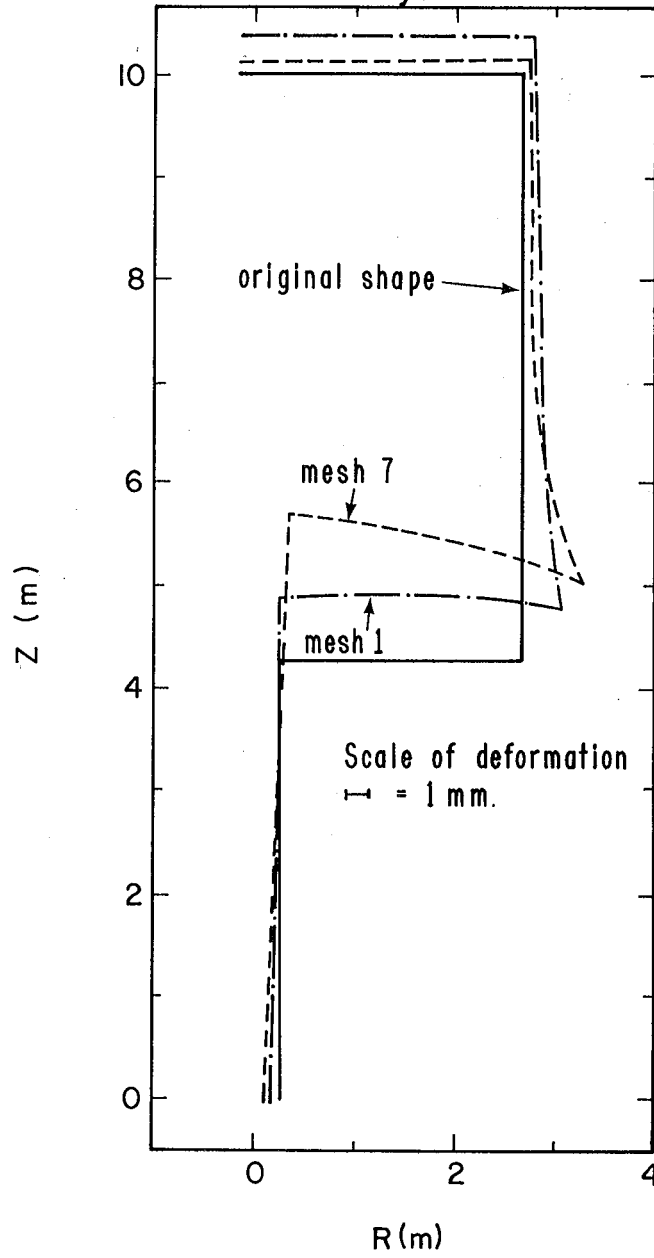
XBL 787-1989 A

Figure D12a

HANFORD FULL-SCALE EXPERIMENT

Power schedule 1A

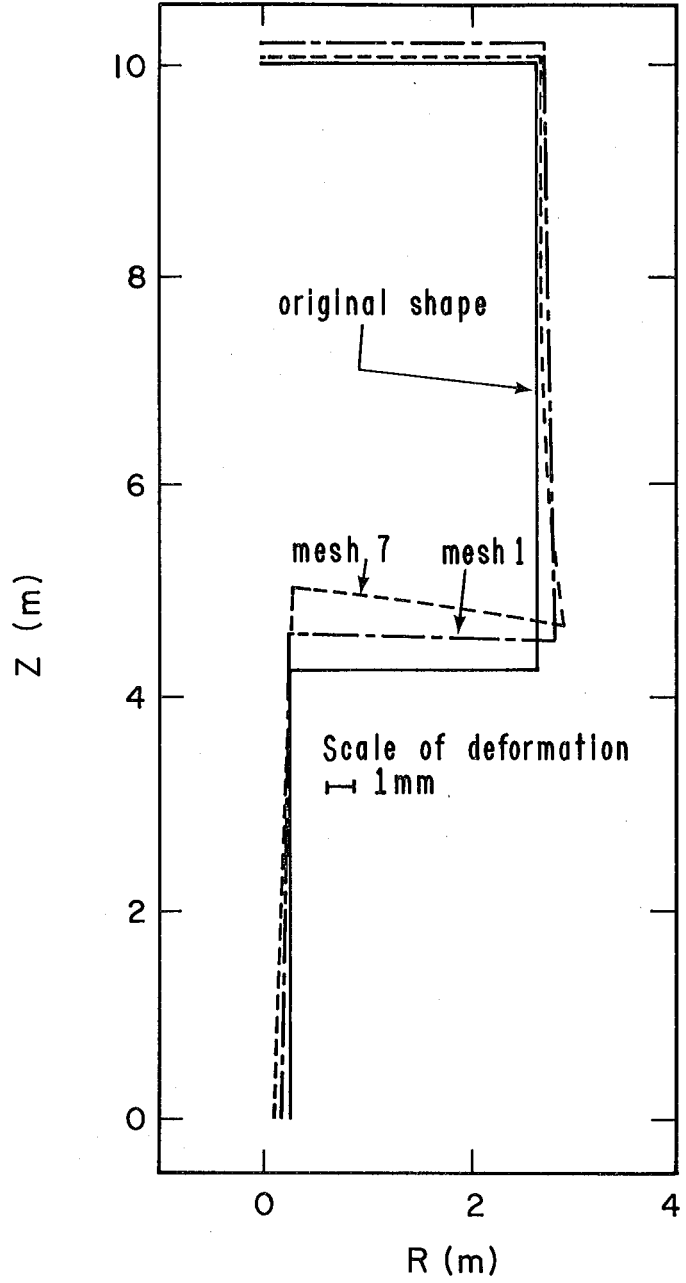
Deformation of heater drift and
borehole 1095 days



XBL 787-1990 A

Figure D12b

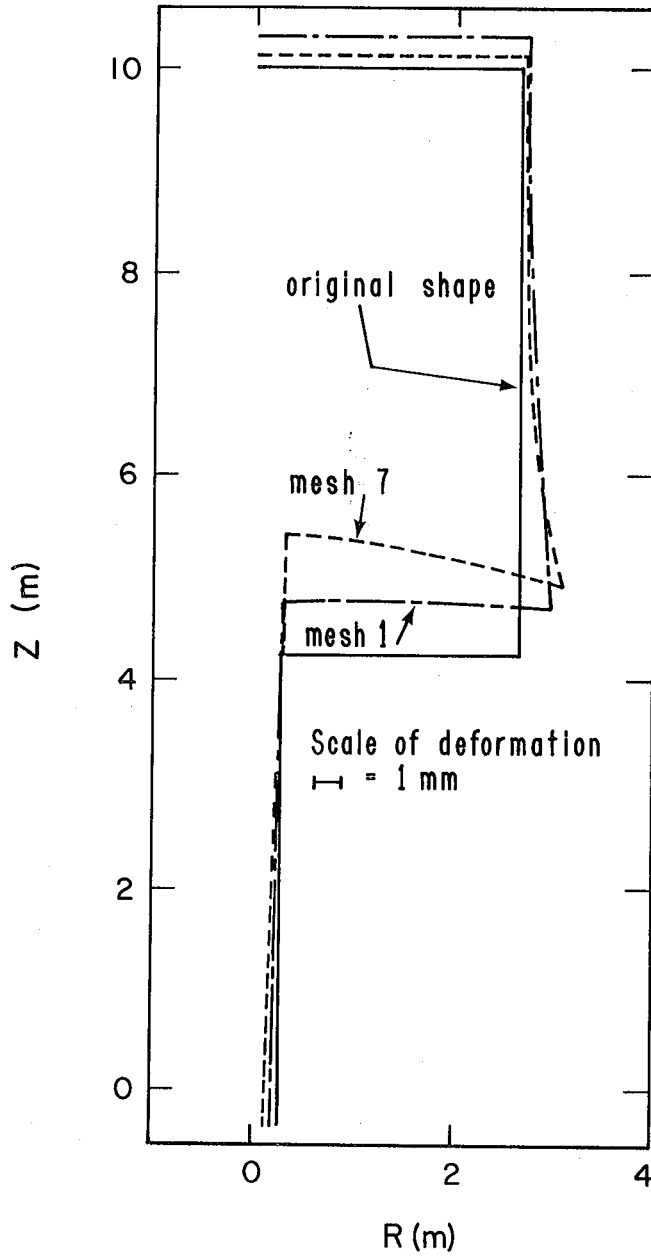
HANFORD FULL-SCALE EXPERIMENT
POWER SCHEDULE 2A
Deformation of heater drift and
borehole 730 days



XBL 787-1991 A

Figure D13a

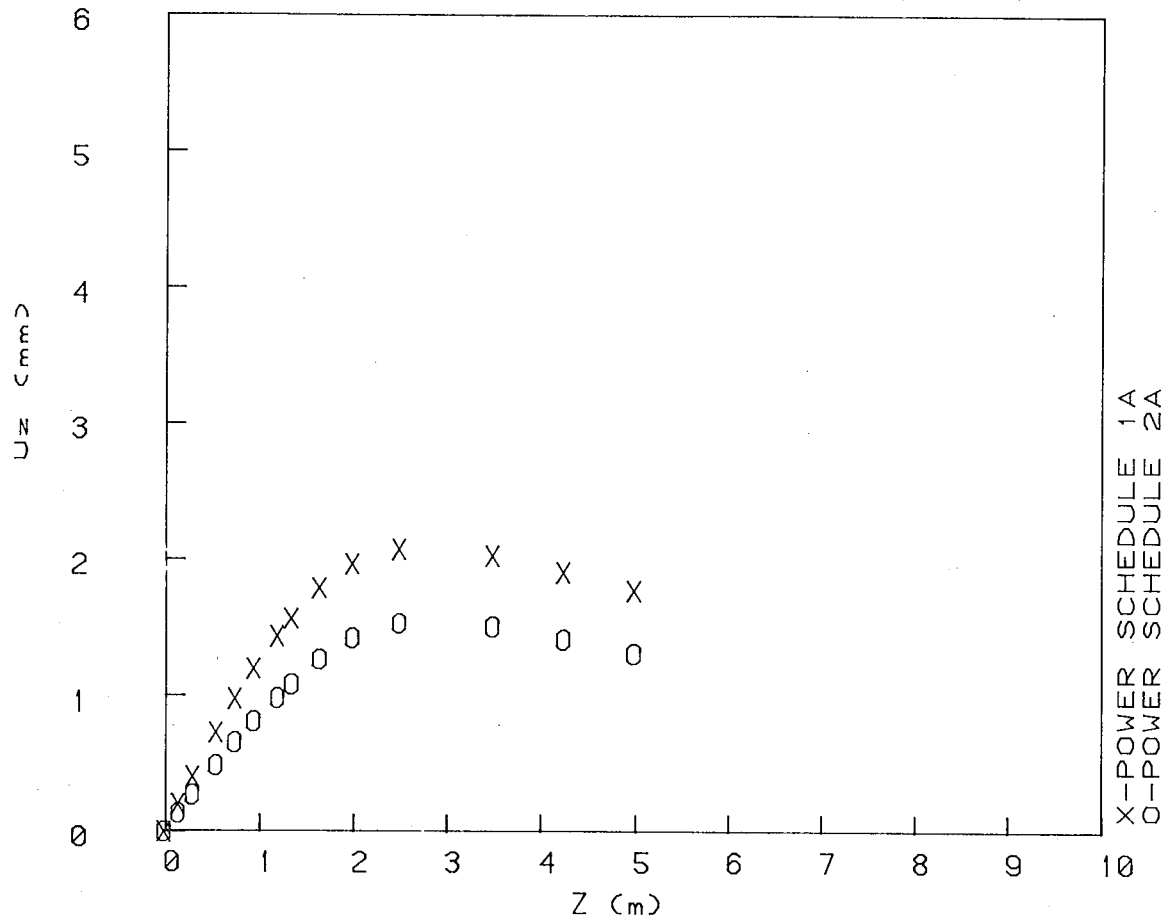
HANFORD FULL-SCALE EXPERIMENT
Power schedule 2A
Deformation of heater drift and
borehole 1095 days



XBL 789-1992 A

Figure D13b

HANFORD FULL-SCALE EXPERIMENT
Displacement(U_z) profiles at $R=0.45m$, $\theta=0$ deg.
Mesh 1, 730 days



XBL 788-10441

Figure D14a

HANFORD FULL-SCALE EXPERIMENT
Displacement (Uz) profiles at R=0.45m, THETA=0 deg.
Mesh 1, 1095 days

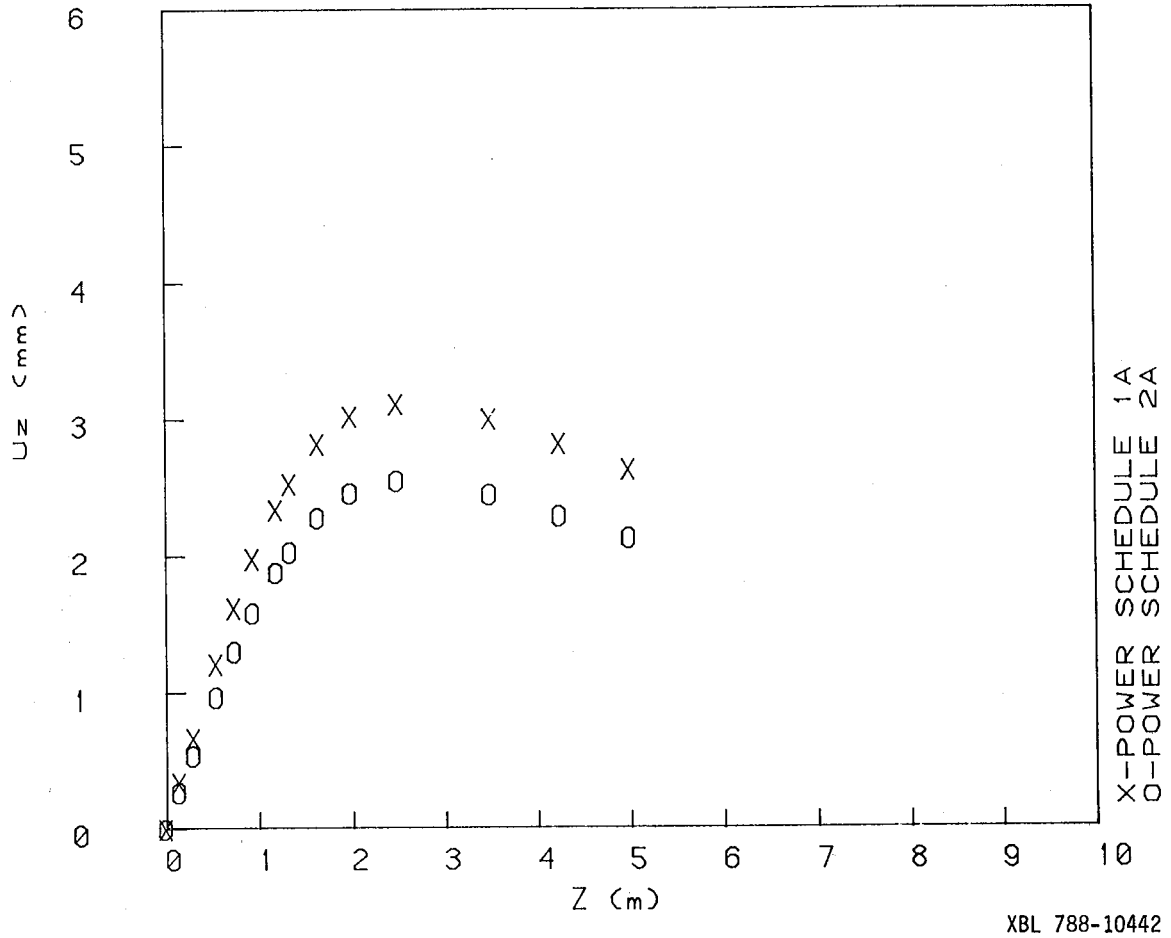
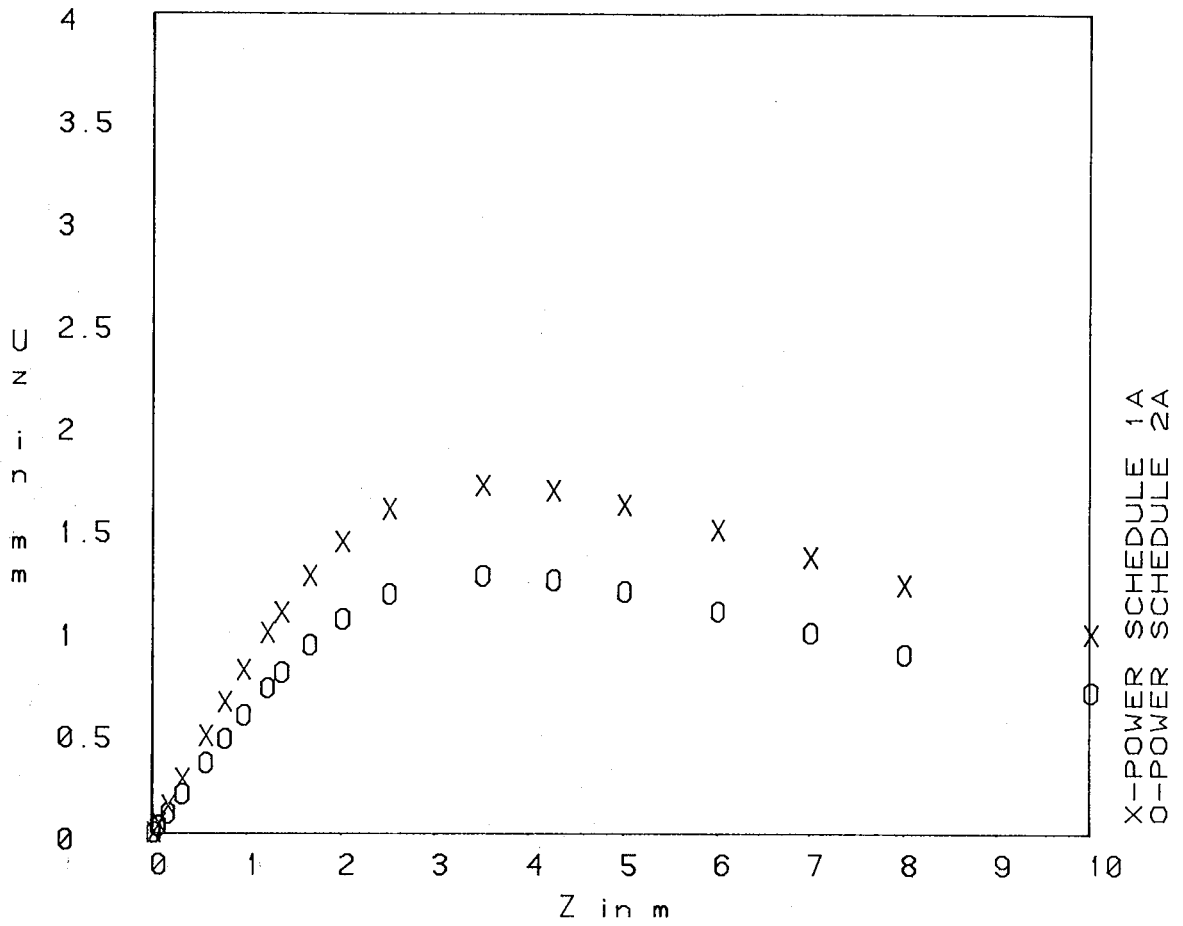


Figure D14b

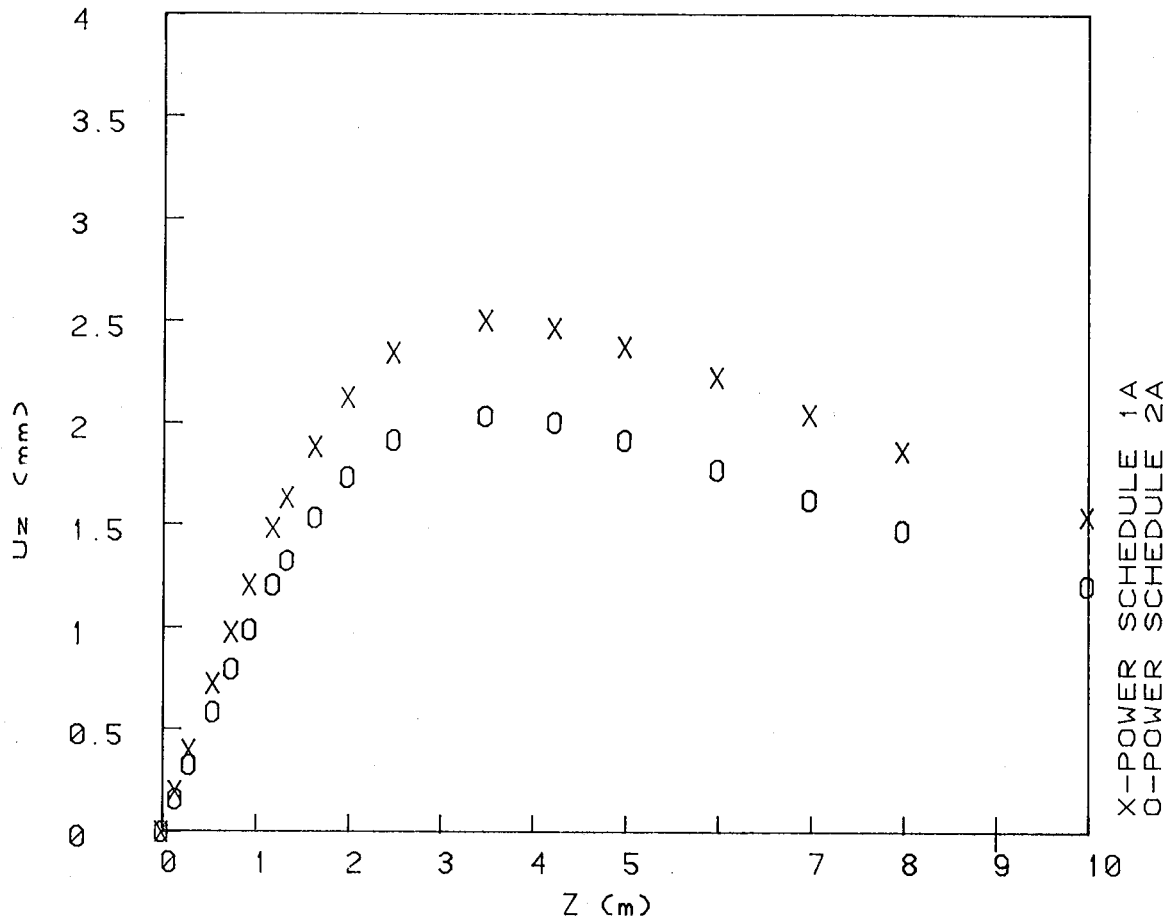
HANFORD FULL-SCALE EXPERIMENT
Displacement(U_z) profiles at $R=1.875m$, $\theta=0$ deg.
Mesh1, 730 days



XBL 788-10443

Figure D15a

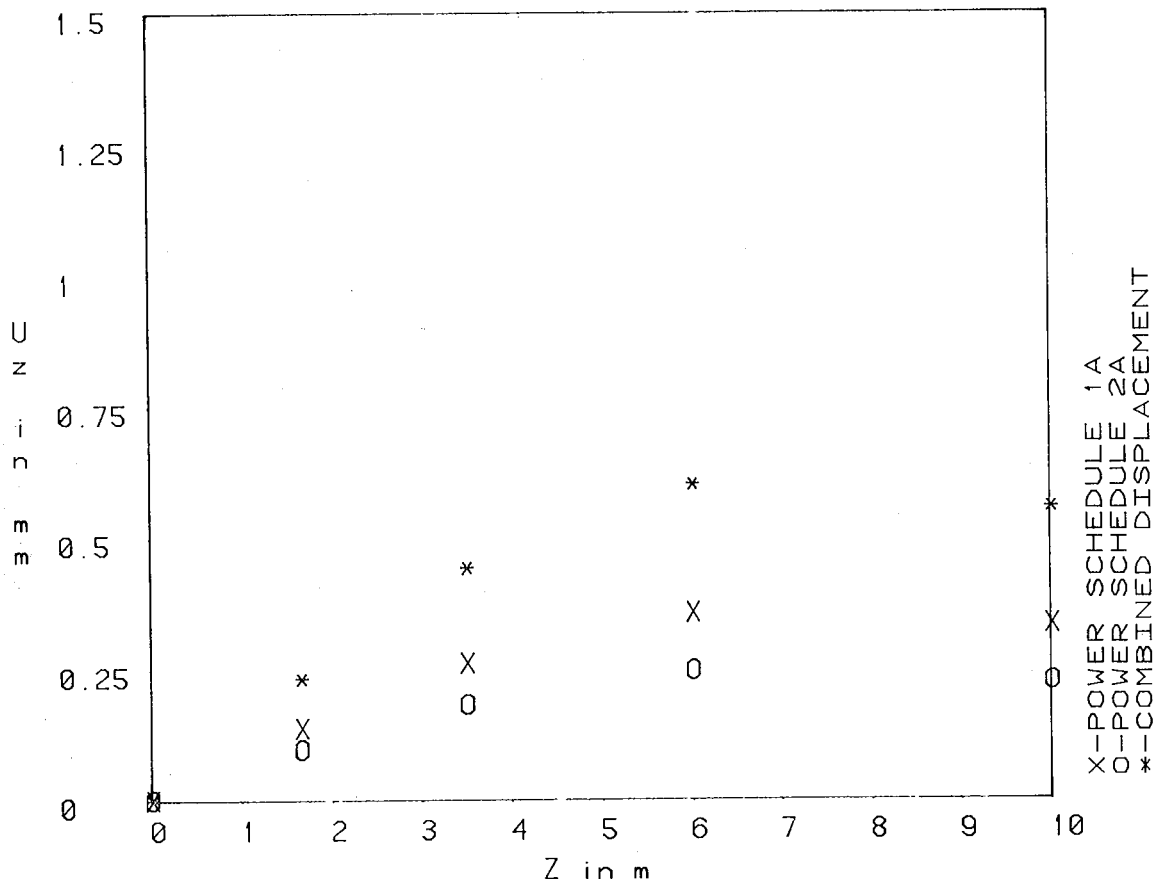
HANFORD FULL-SCALE EXPERIMENT
Displacement (U_z) profiles at $R=1.875m$, $\theta=0$ deg.
Mesh 1, 1095 days



XBL 788-10444

Figure D15b

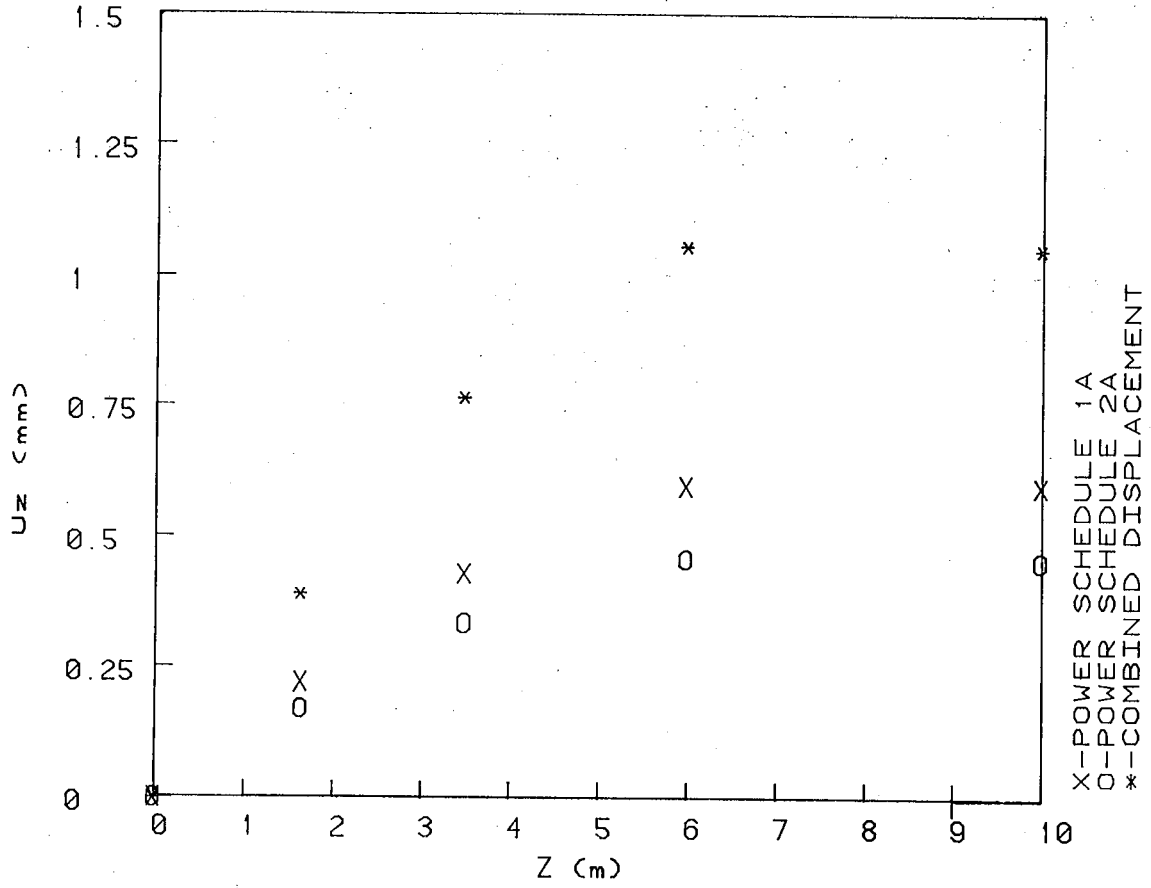
HANFORD FULL-SCALE EXPERIMENT
Displacement(U_z) profiles at $R=10.5m$, $\theta=0$ deg.
Mesh1, 730 days



XBL 788-10445

Figure D16a

HANFORD FULL-SCALE EXPERIMENT
Displacement (Uz) profiles at R=10.5m, THETA=0 deg.
Mesh 1, 1095 days



XBL 788-10446

Figure D16b

HANFORD FULL-SCALE EXPERIMENT

Displacement (U_z) profiles at $R = 0.45$ m., $\text{THETA} = 0$ deg.
Mesh 7, 730 days

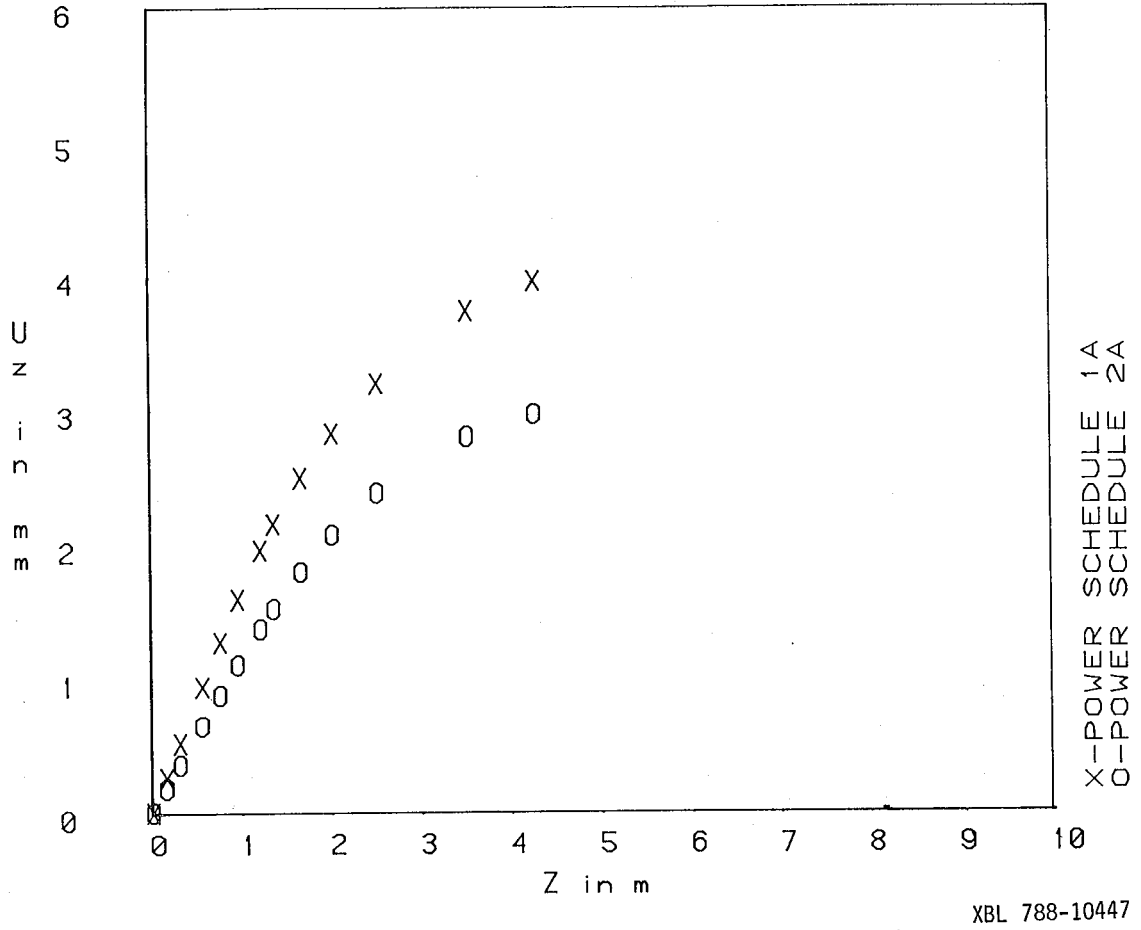
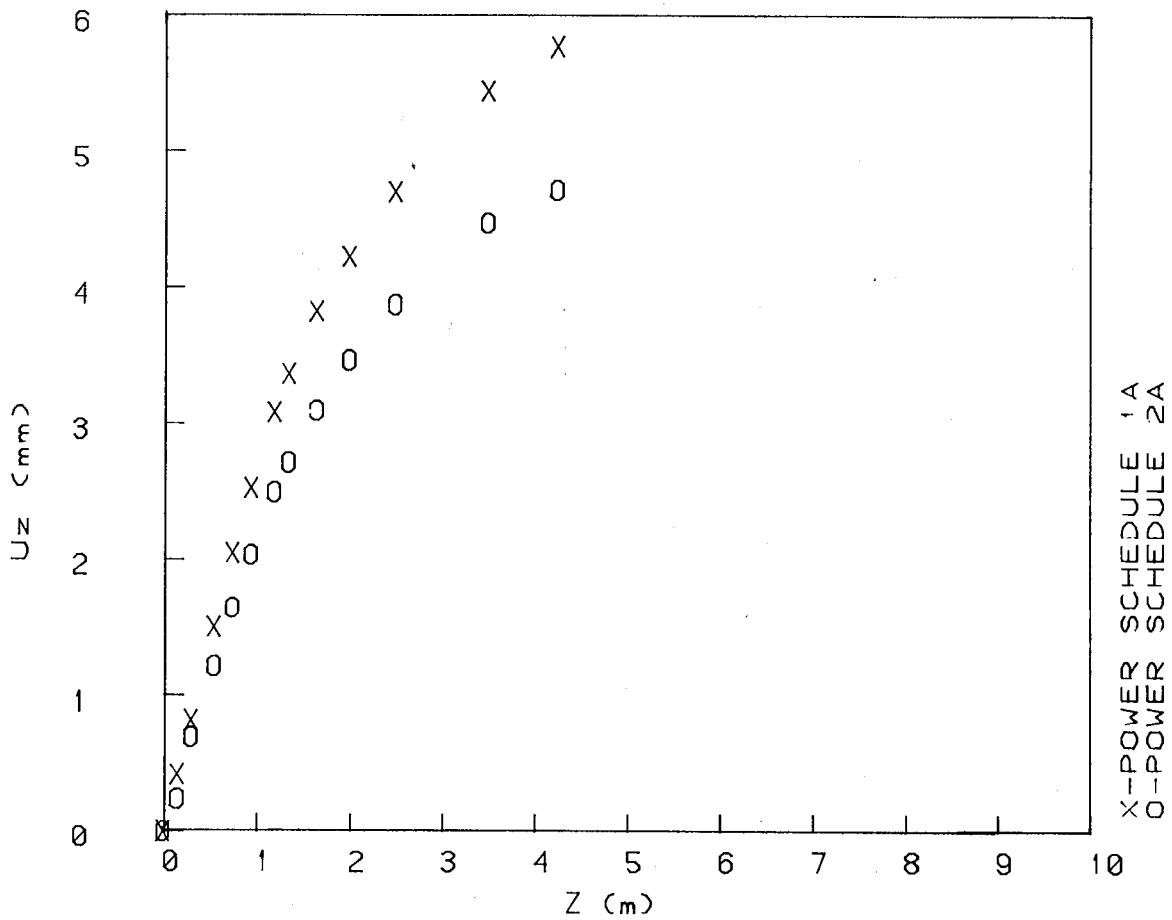


Figure D17a

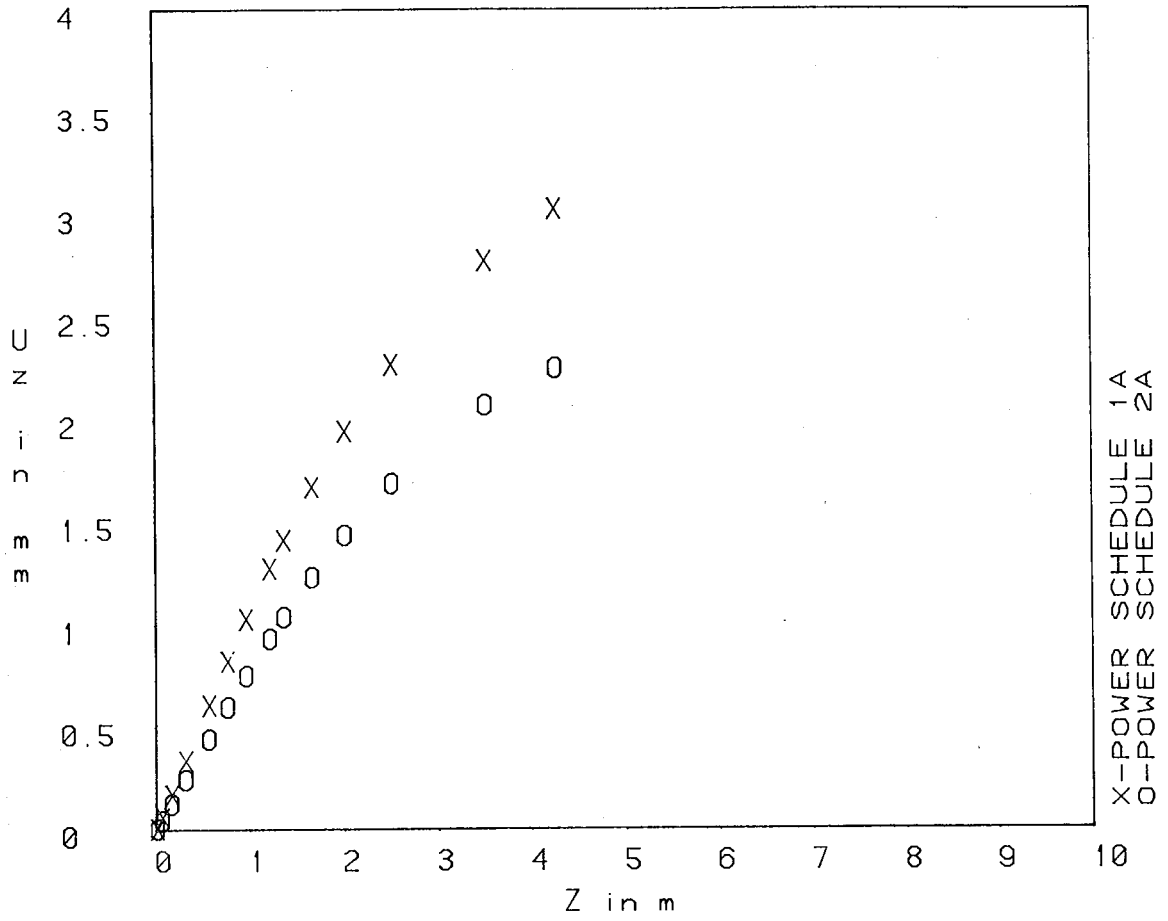
HANFORD FULL-SCALE EXPERIMENT
Displacement (U_z) profiles at $R=0.15m$, $\theta=0$ deg.
Mesh 7, 1095 days



XBL 788-10448

Figure D17b

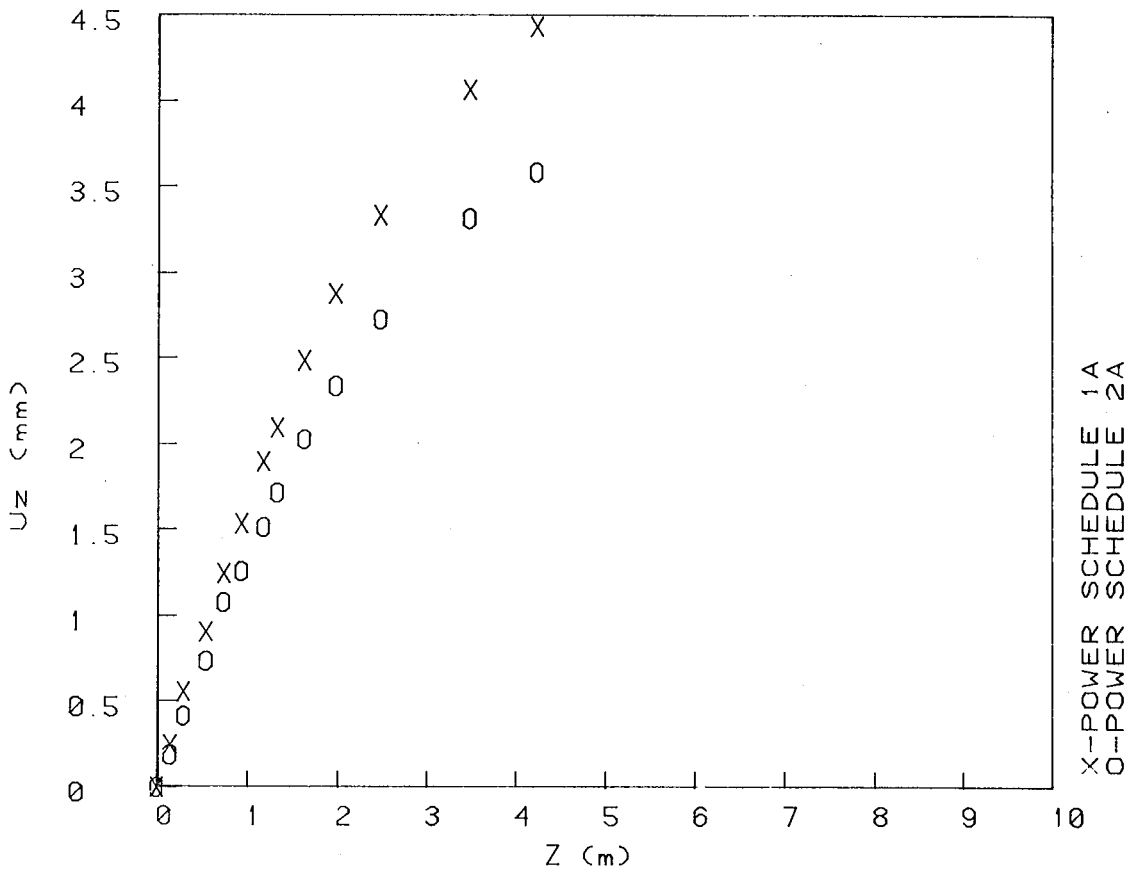
HANFORD FULL-SCALE EXPERIMENT
Displacement(U_z) profiles at $R=1.875m$, $\theta=0$ deg.
Mesh7, 730 days



XBL 788-10449

Figure D18a

HANFORD FULL-SCALE EXPERIMENT
Displacement (U_z) profiles at $R=1.875m$, $\theta=0$ deg.
Mesh 7, 1095 days



XBL 788-10450

Figure D18b

HANFORD FULL-SCALE EXPERIMENT
Displacement (Uz) profiles at R=10.5m, THETA=0 deg.
Mesh 7, 730 days

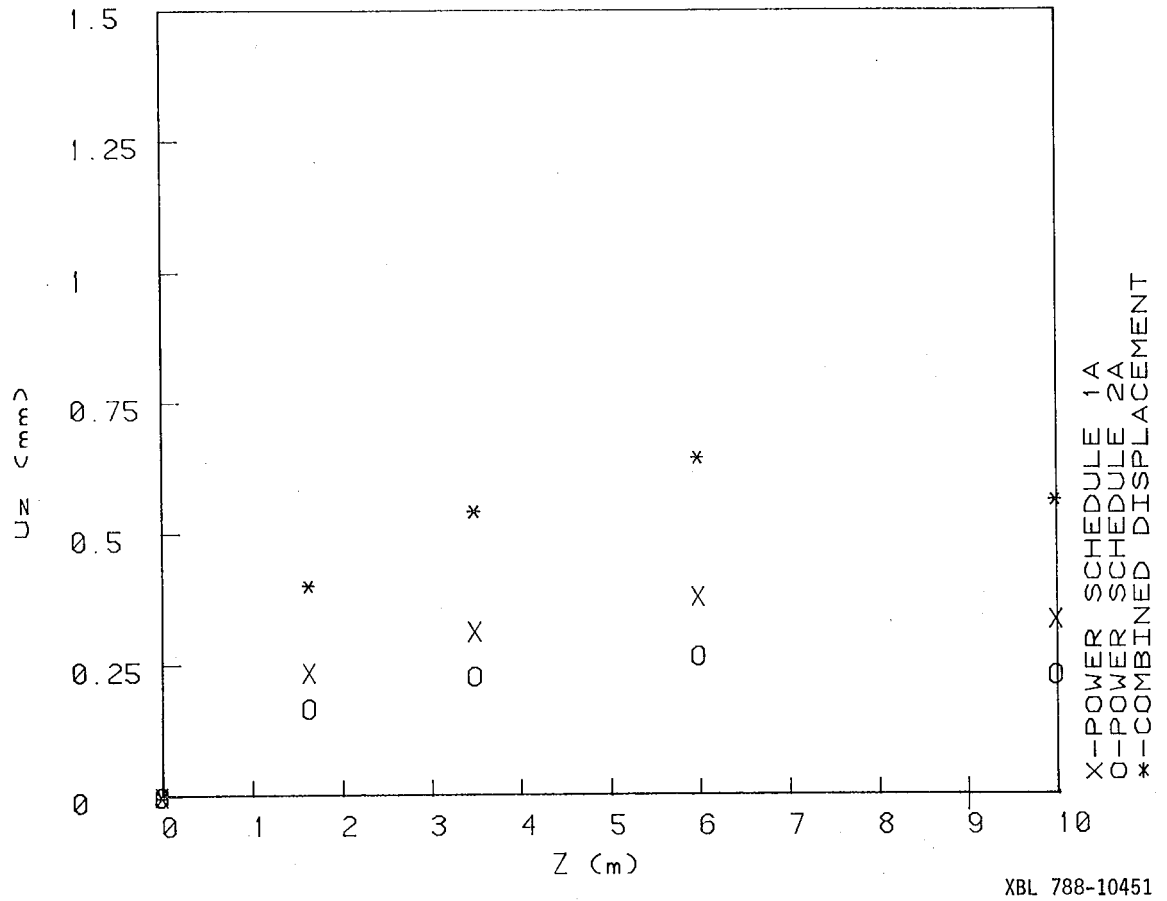


Figure D19a

HANFORD FULL-SCALE EXPERIMENT
Displacement (U_z) profiles at $R=10.5m$, $\theta=0$ deg.
Mesh 7, 1095 days

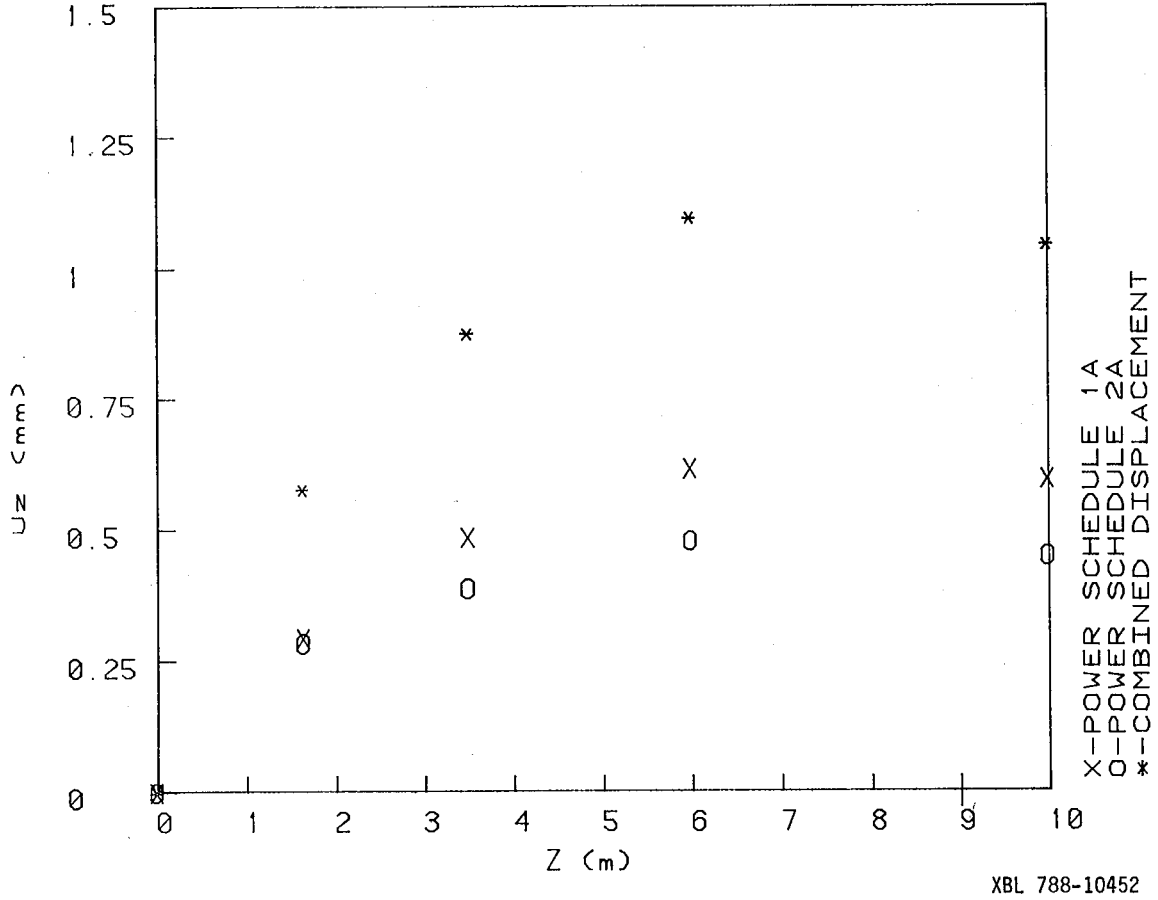
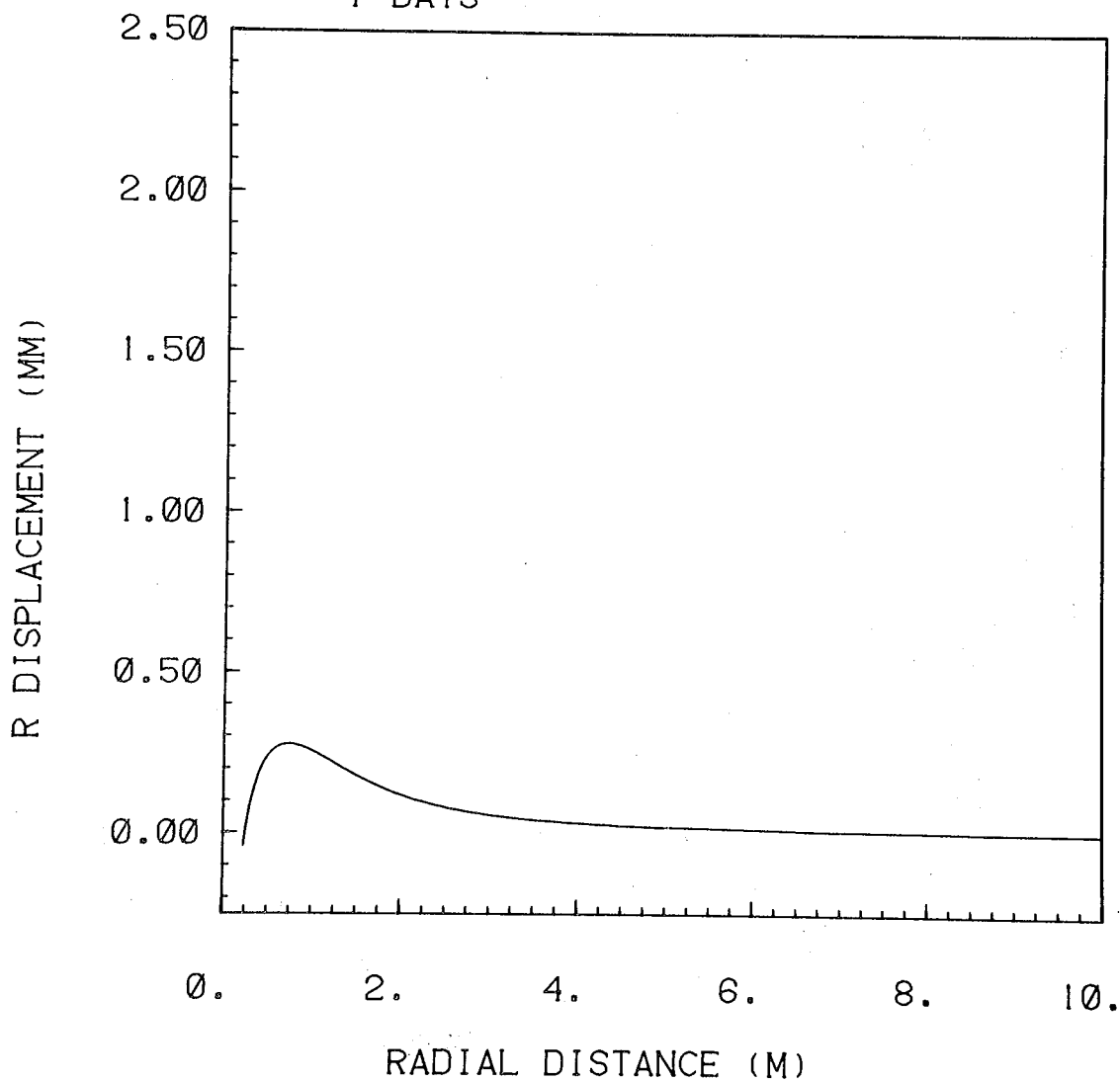


Figure D19b

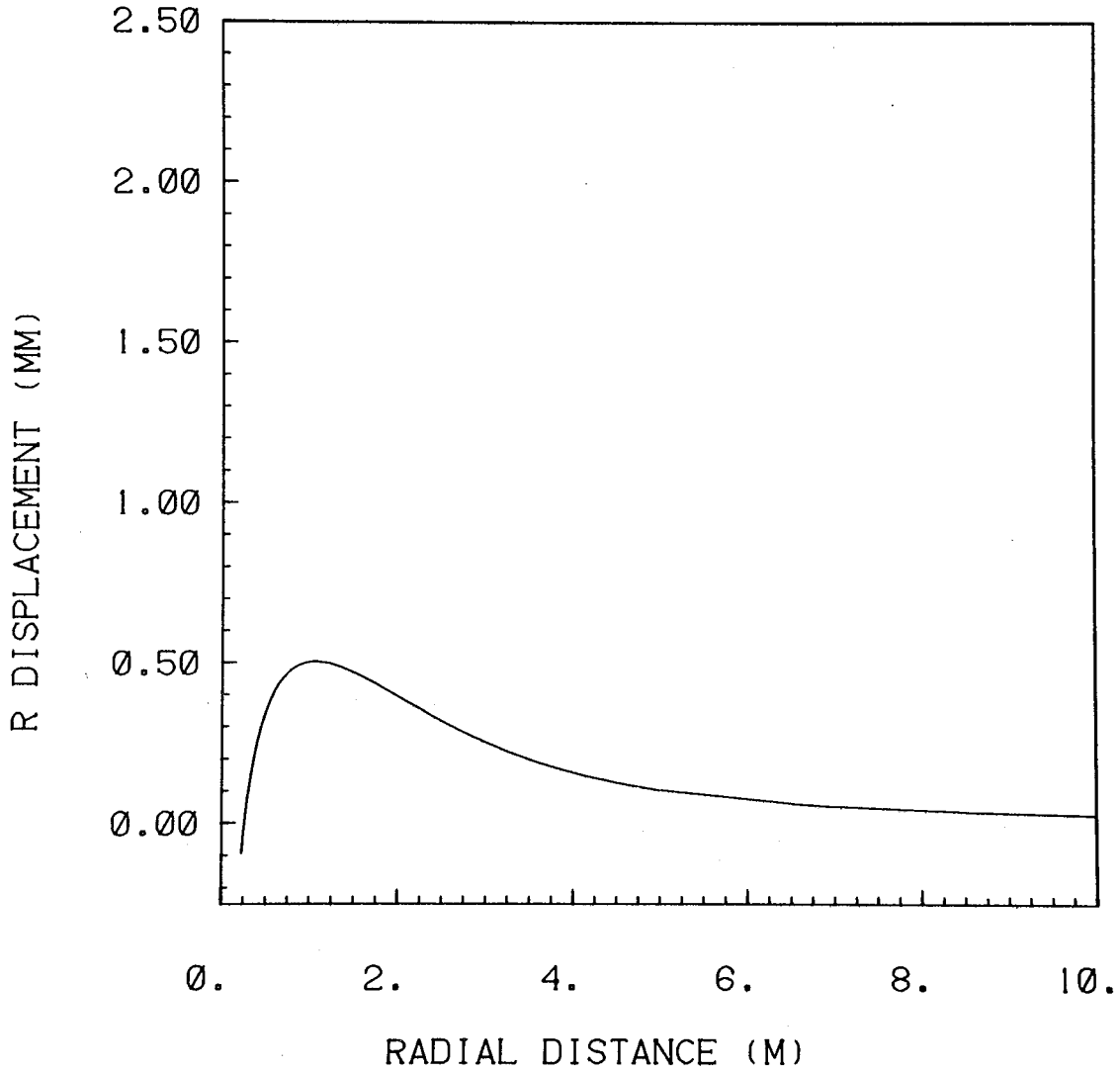
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
7 DAYS



XBL 787-9748

Figure D20a

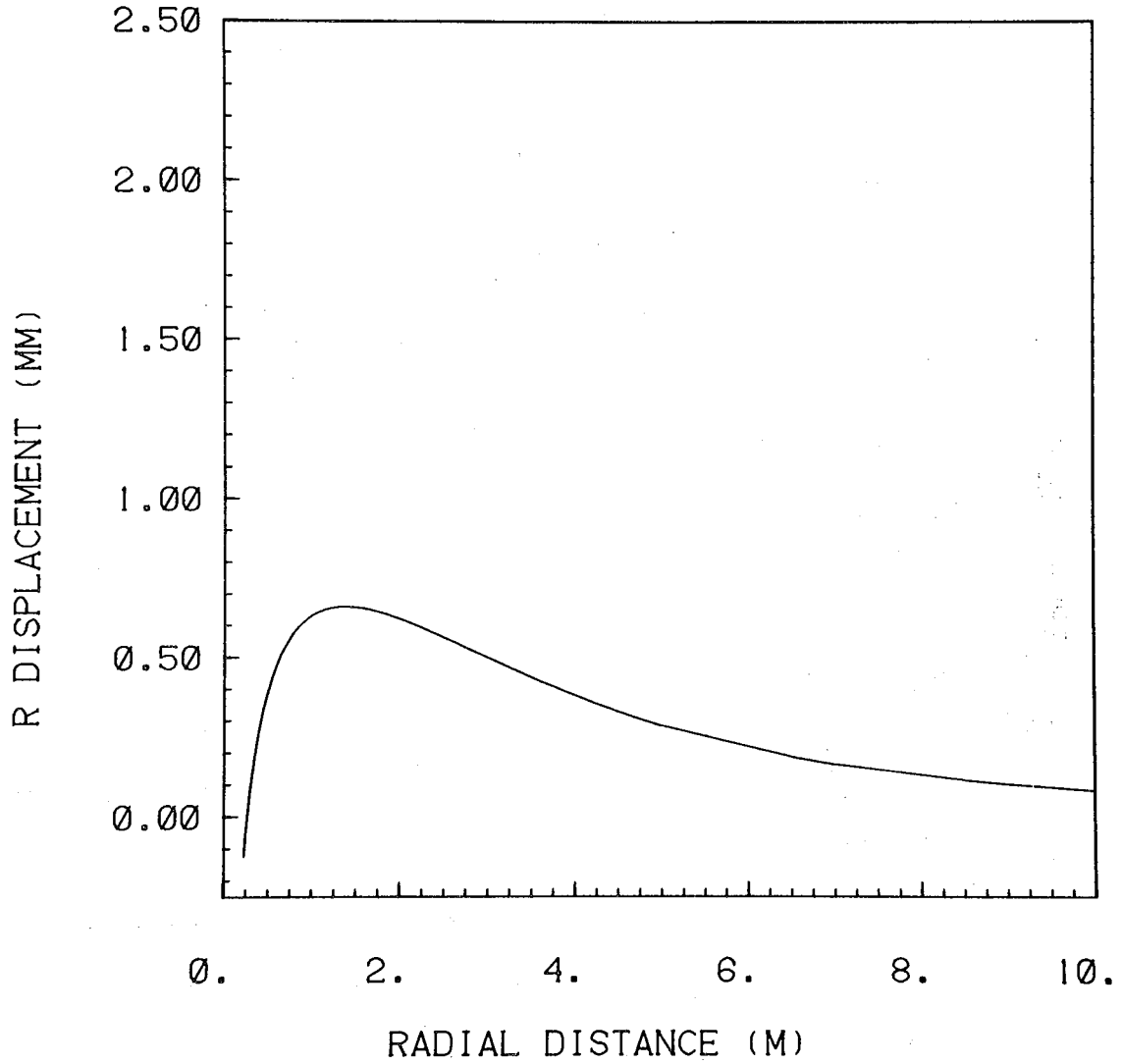
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
30 DAYS



XBL 787-9749

Figure D20b

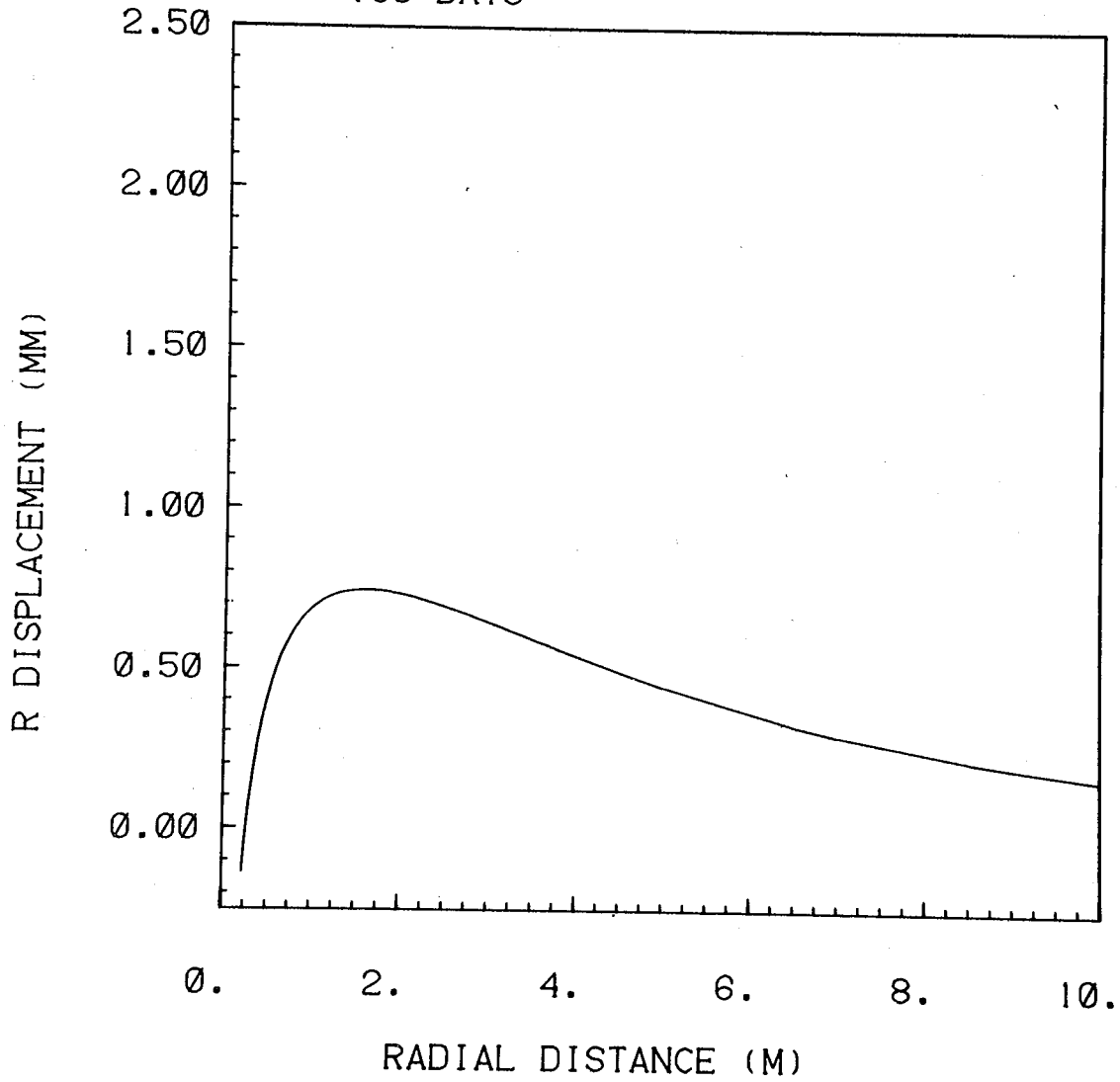
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
90 DAYS



XBL 787-9747

Figure D20c

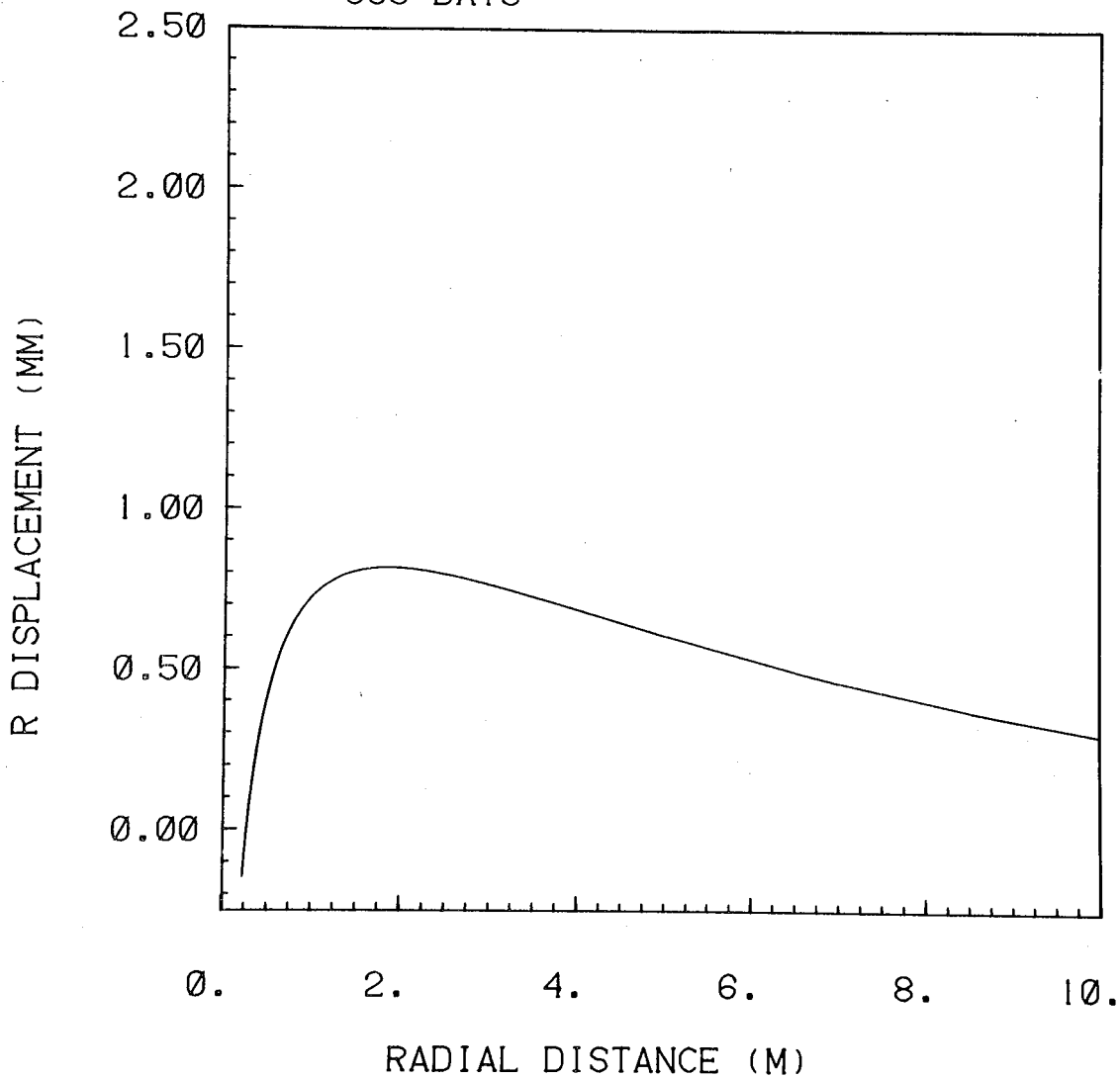
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
180 DAYS



XBL 787-9746

Figure D20d

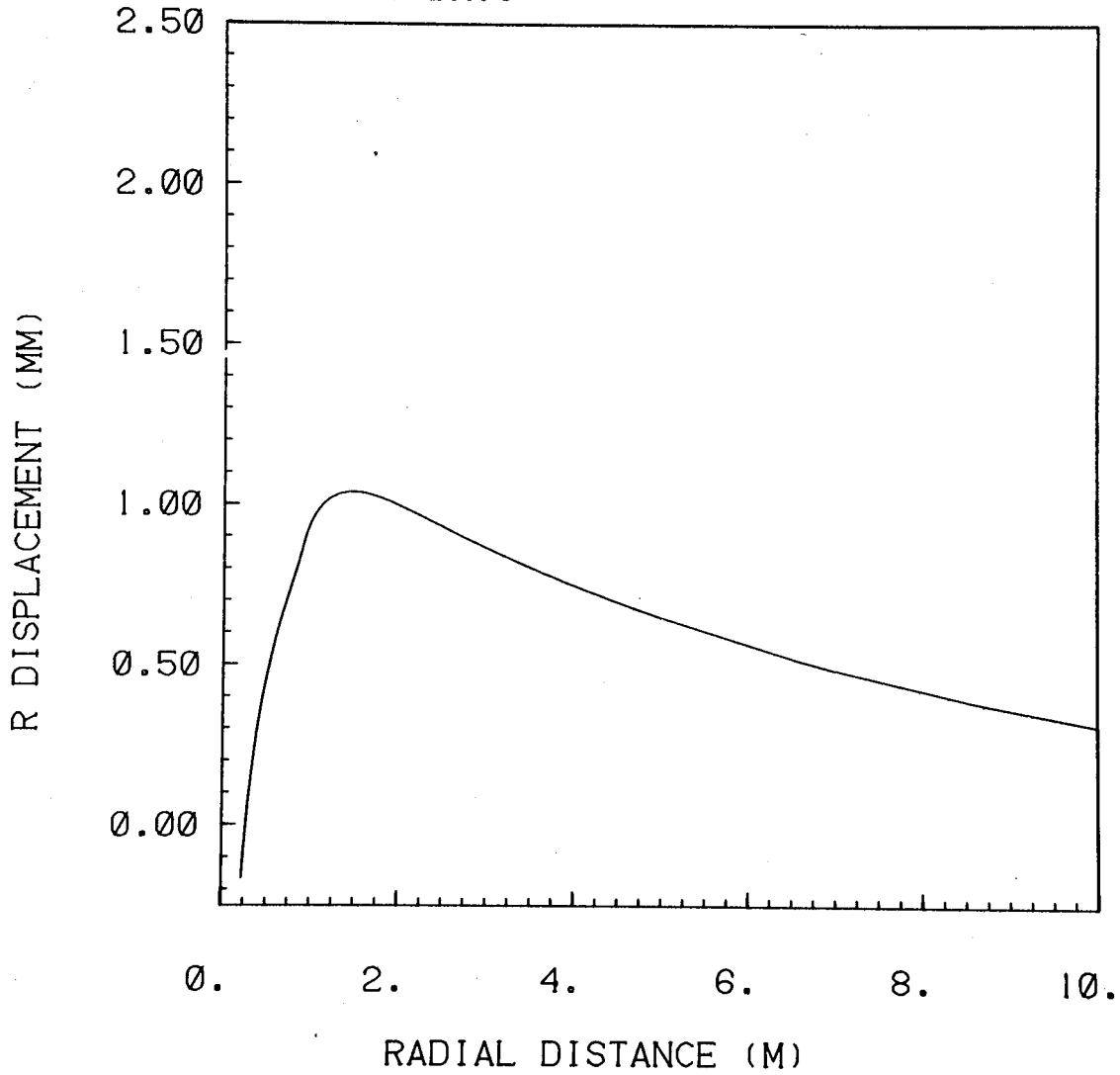
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
365 DAYS



XBL 787-9745

Figure D20e

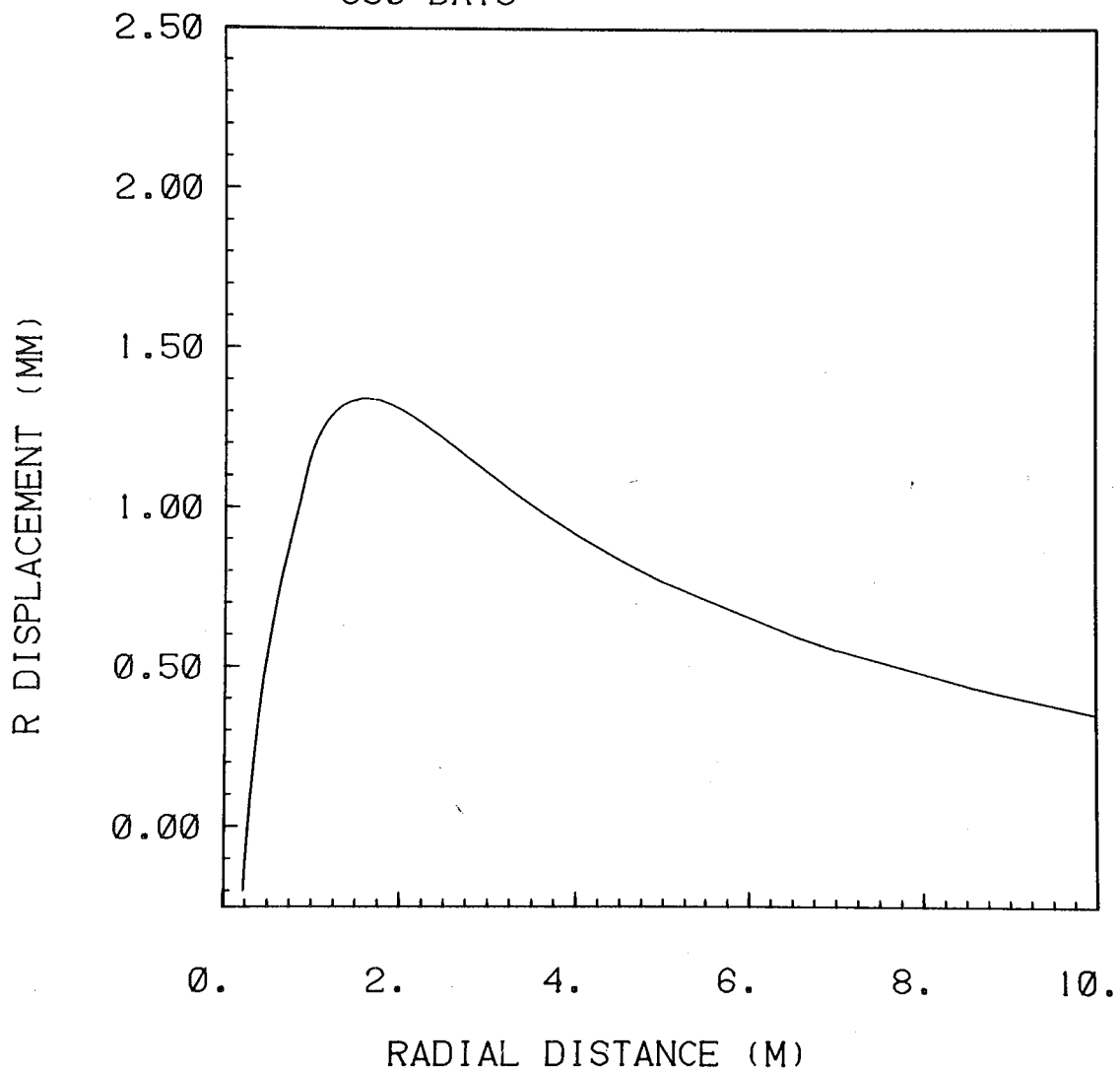
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
371 DAYS



XBL 787-9744

Figure D20f

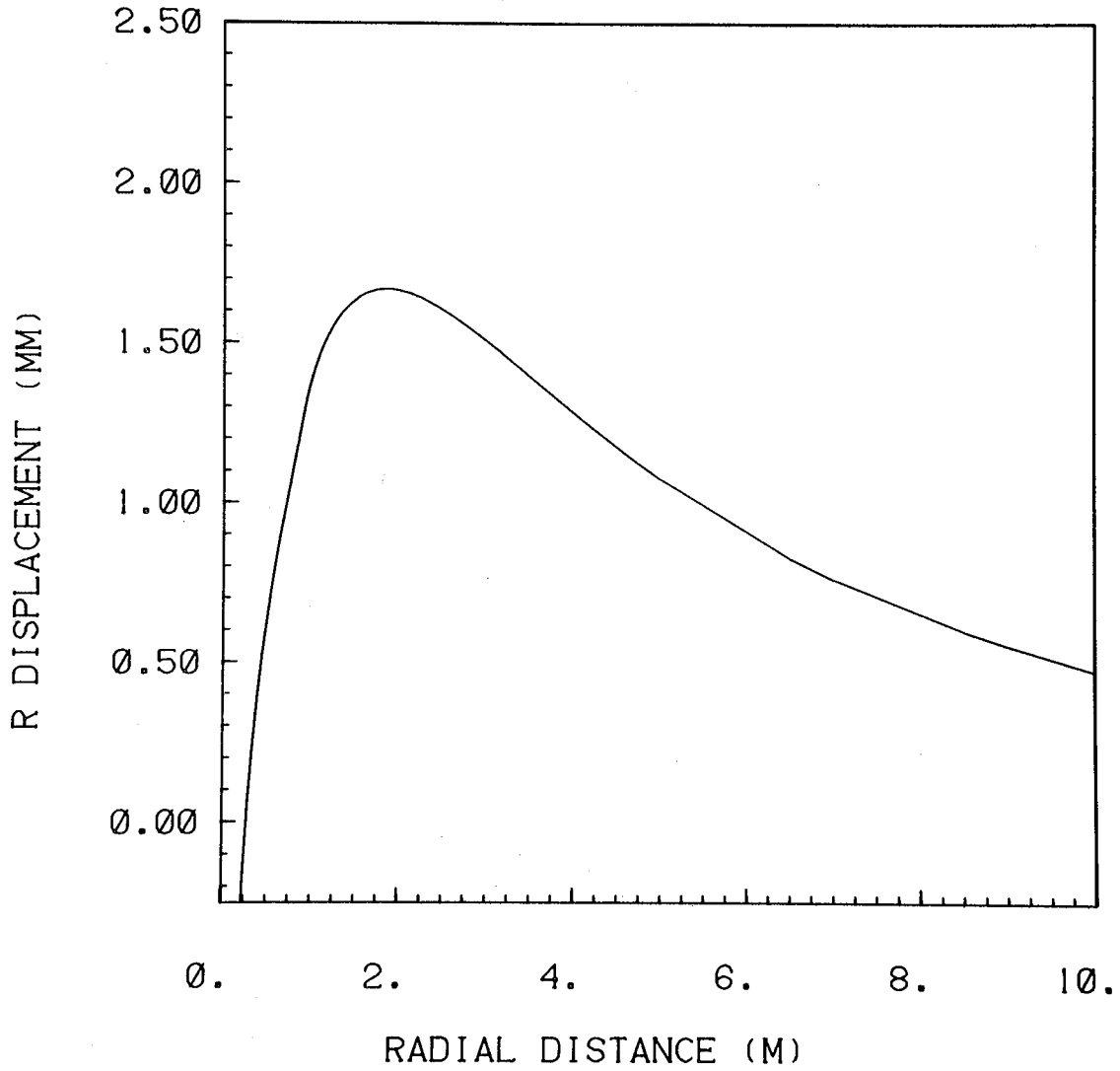
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
390 DAYS



XBL 787-9743

Figure D20g

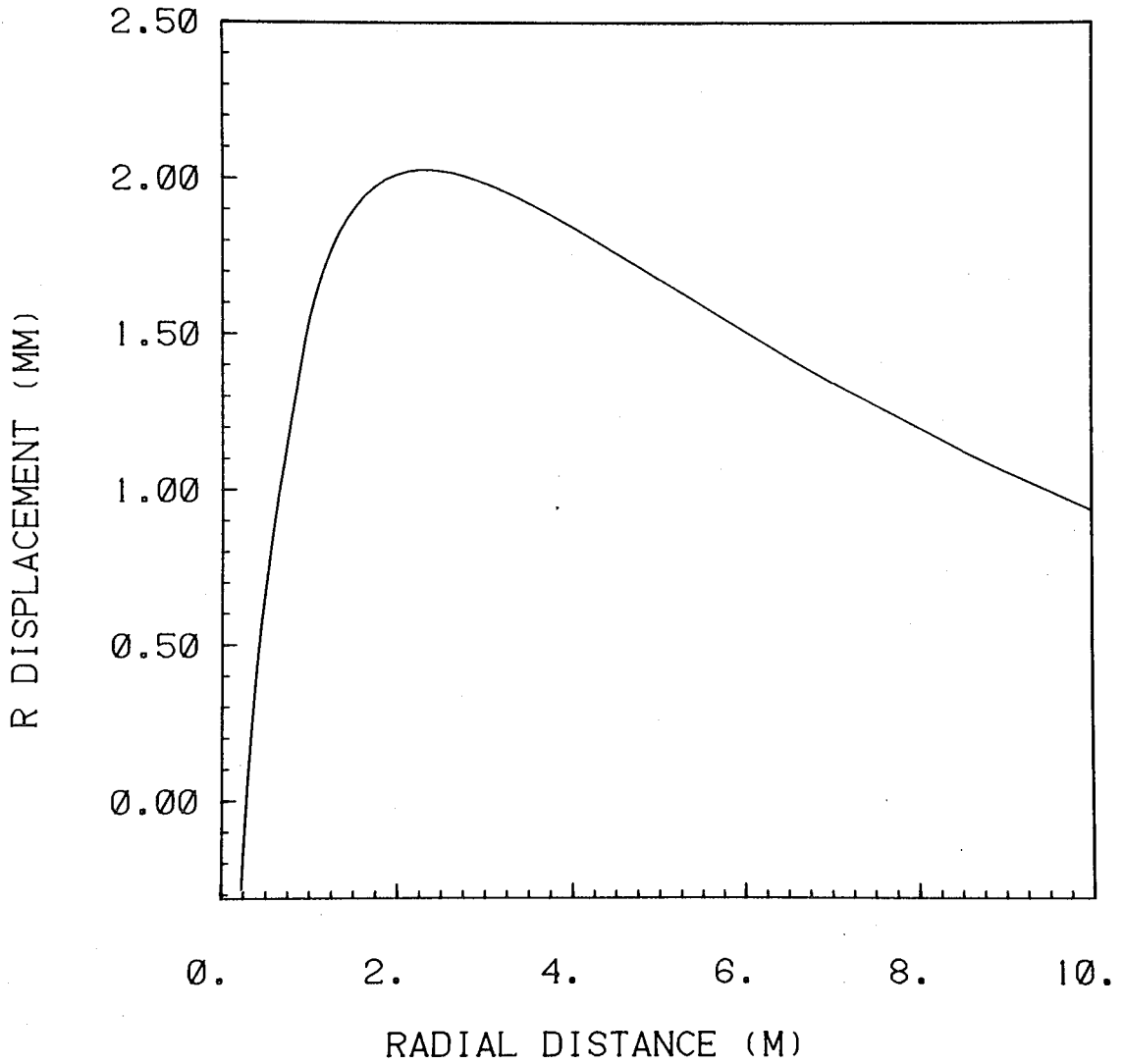
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
450 DAYS



XBL 787-9742

Figure D20h

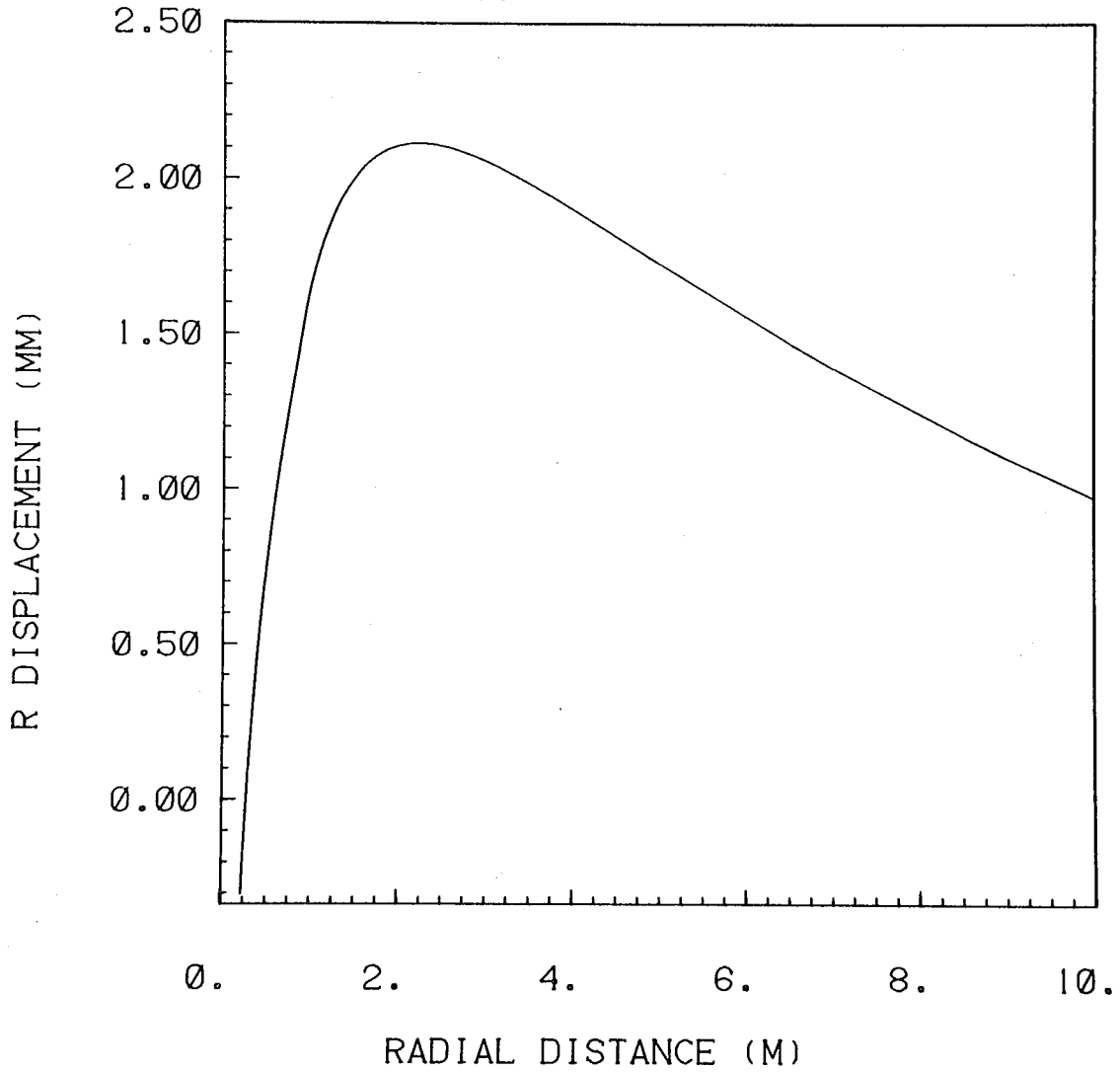
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
730 DAYS



XBL 787-9741

Figure D20i

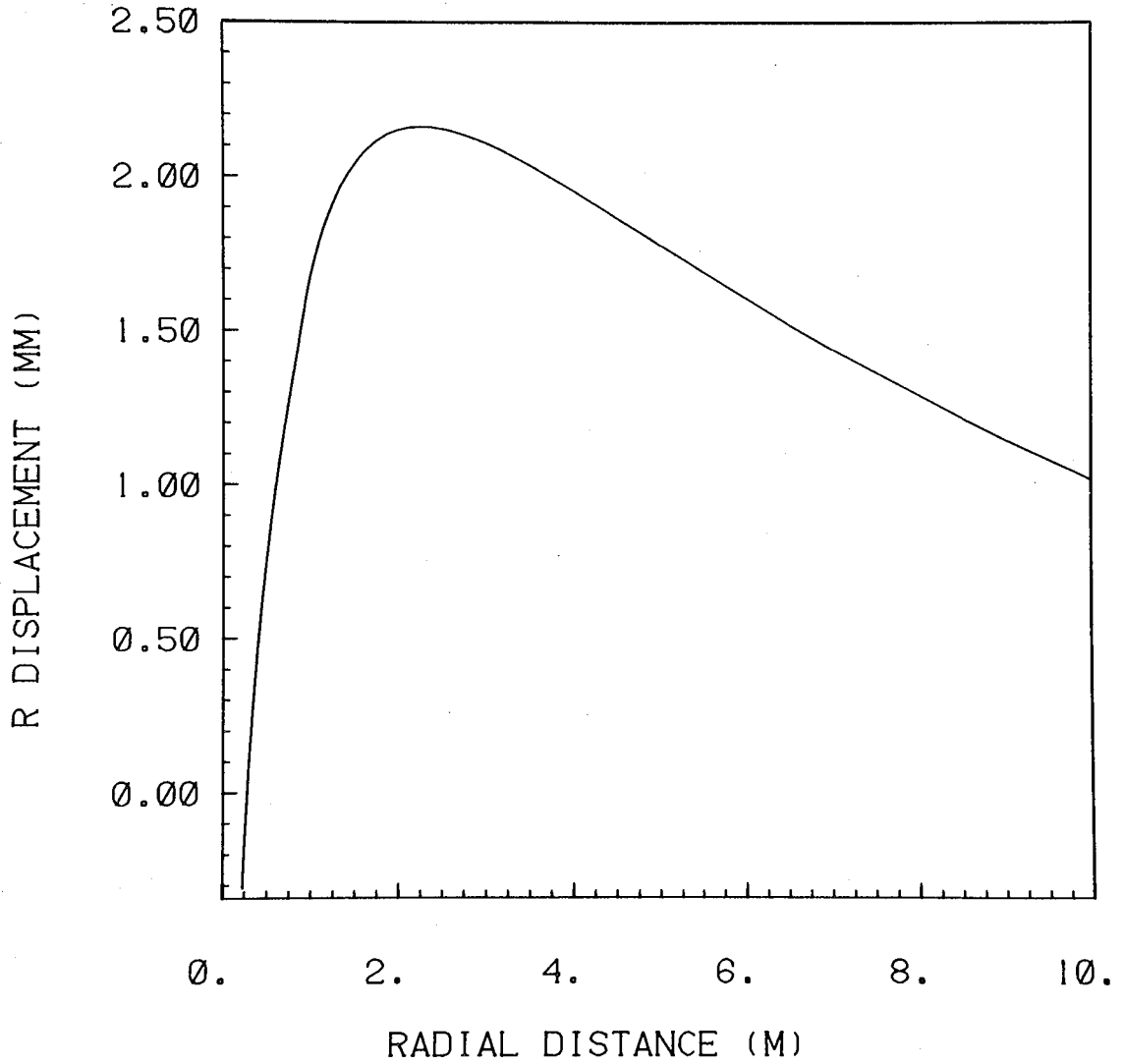
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
760 DAYS



XBL 787-9740

Figure D20j

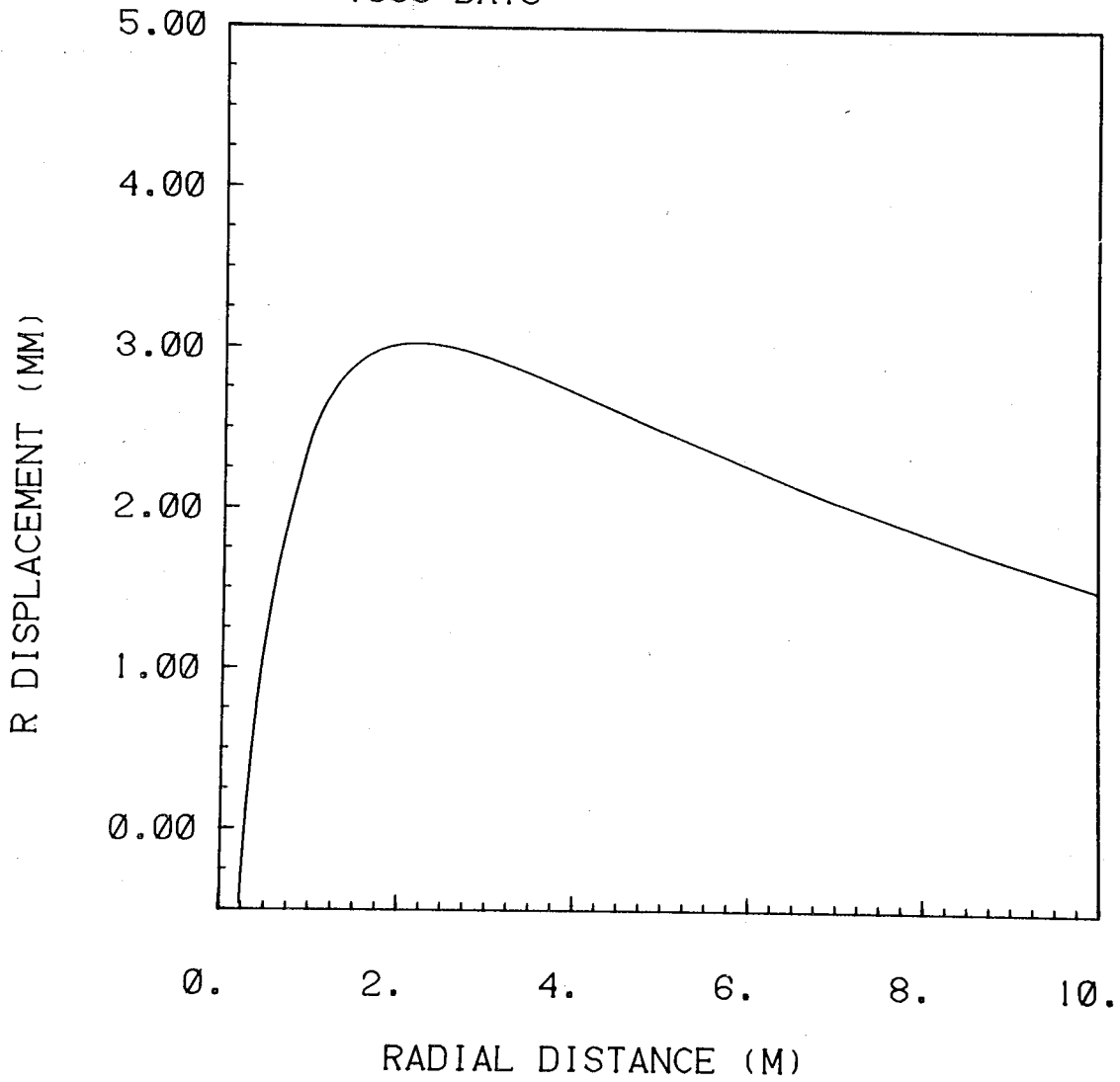
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
790 DAYS



XBL 787-9739

Figure D20k

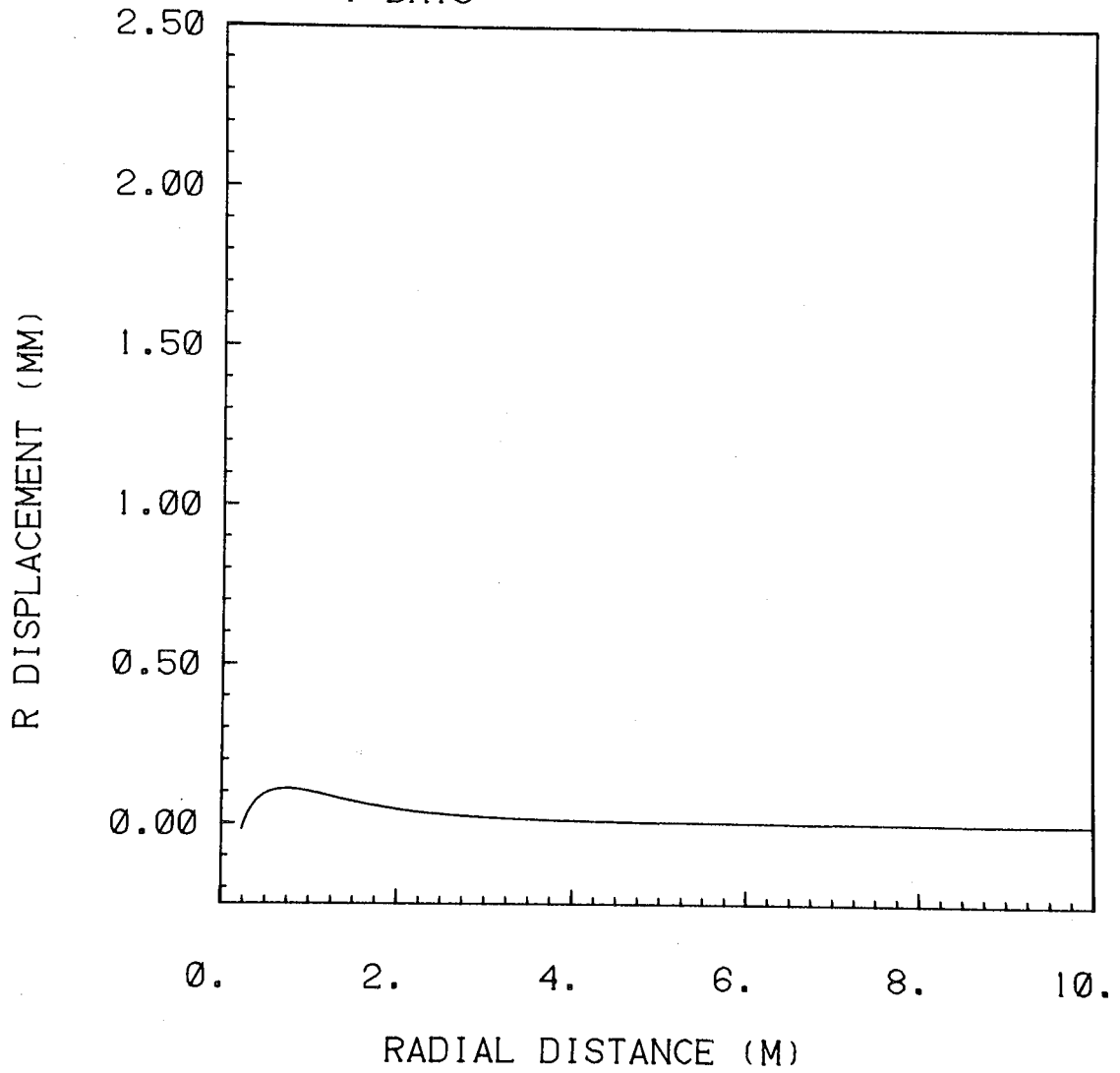
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
1095 DAYS



XBL 787-9738

Figure D201

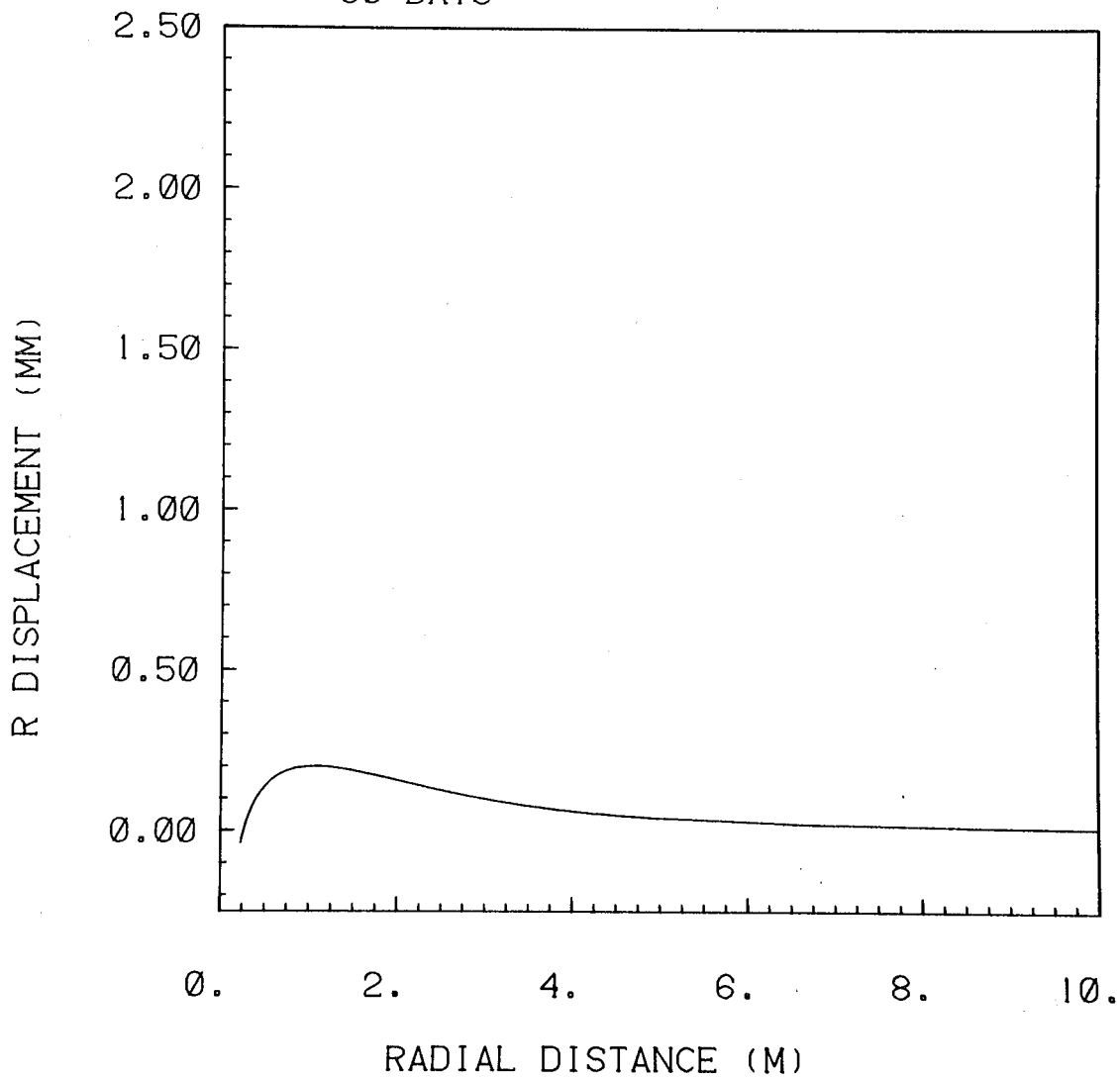
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
7 DAYS



XBL 787-9716

Figure D21a

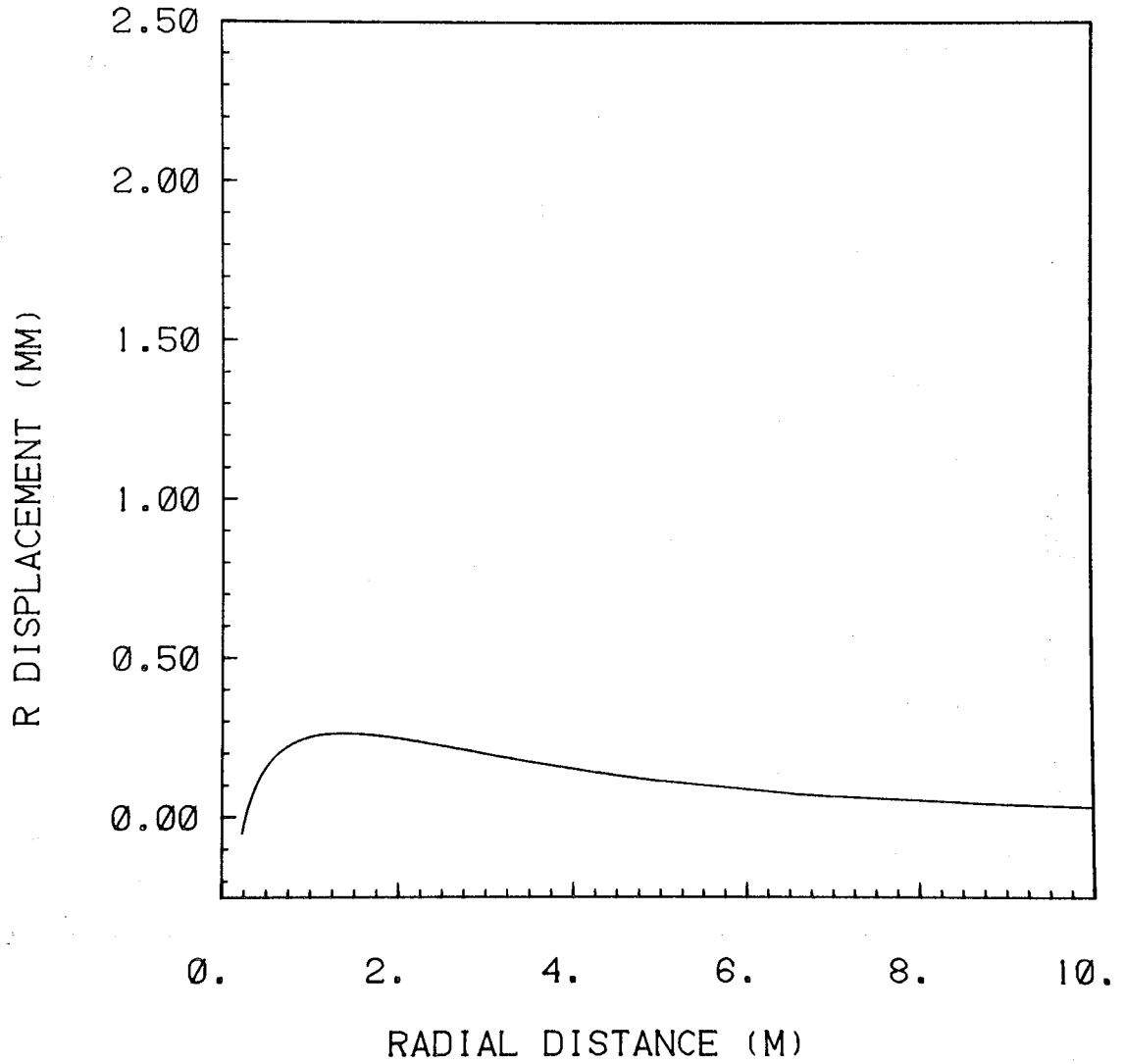
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
30 DAYS



XBL 787-9715

Figure D21b

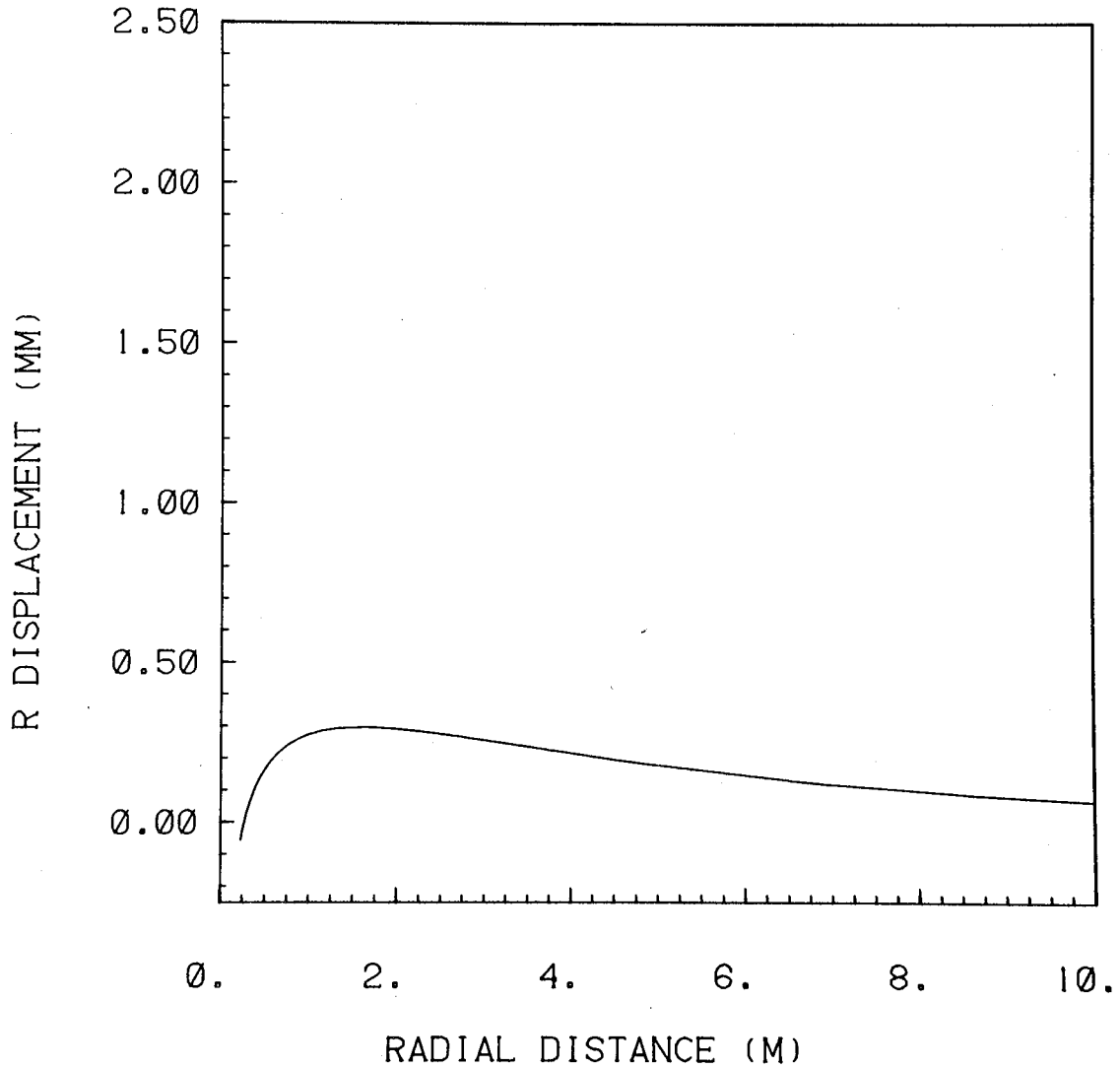
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
90 DAYS



XBL 787-9714

Figure D21c

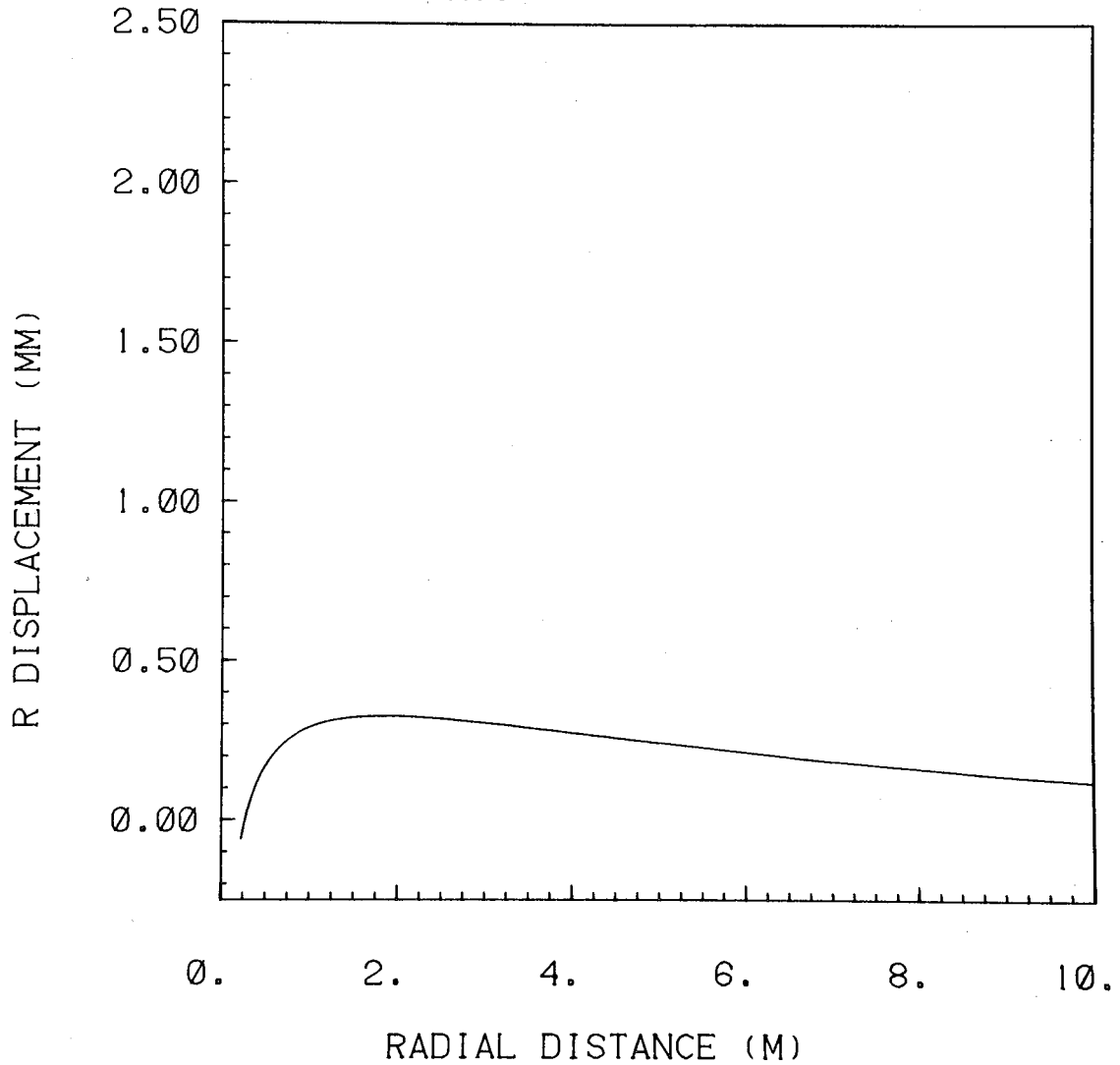
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
180 DAYS



XBL 787-9713

Figure D21d

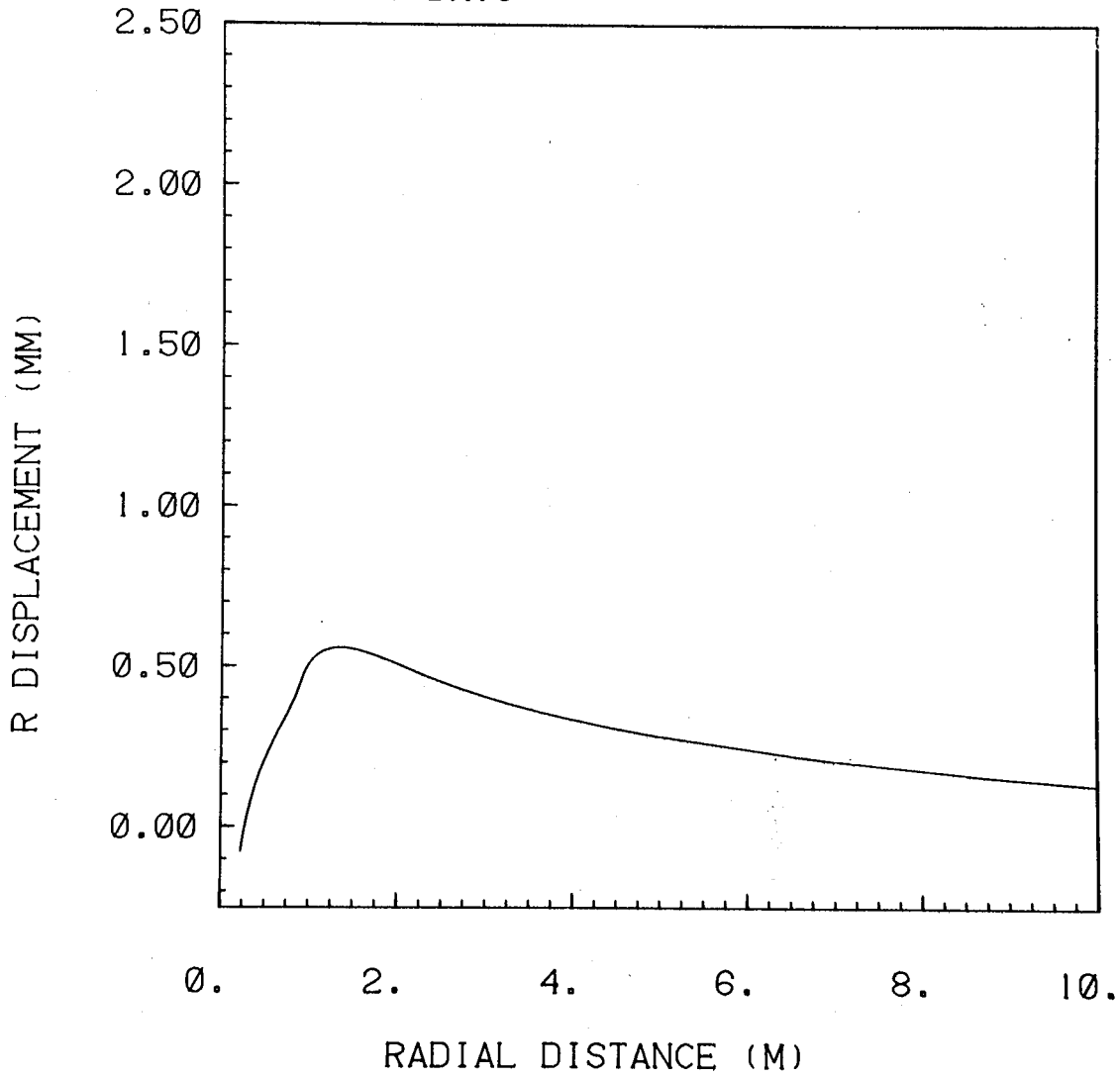
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
365 DAYS



XBL 787-9712

Figure D21e

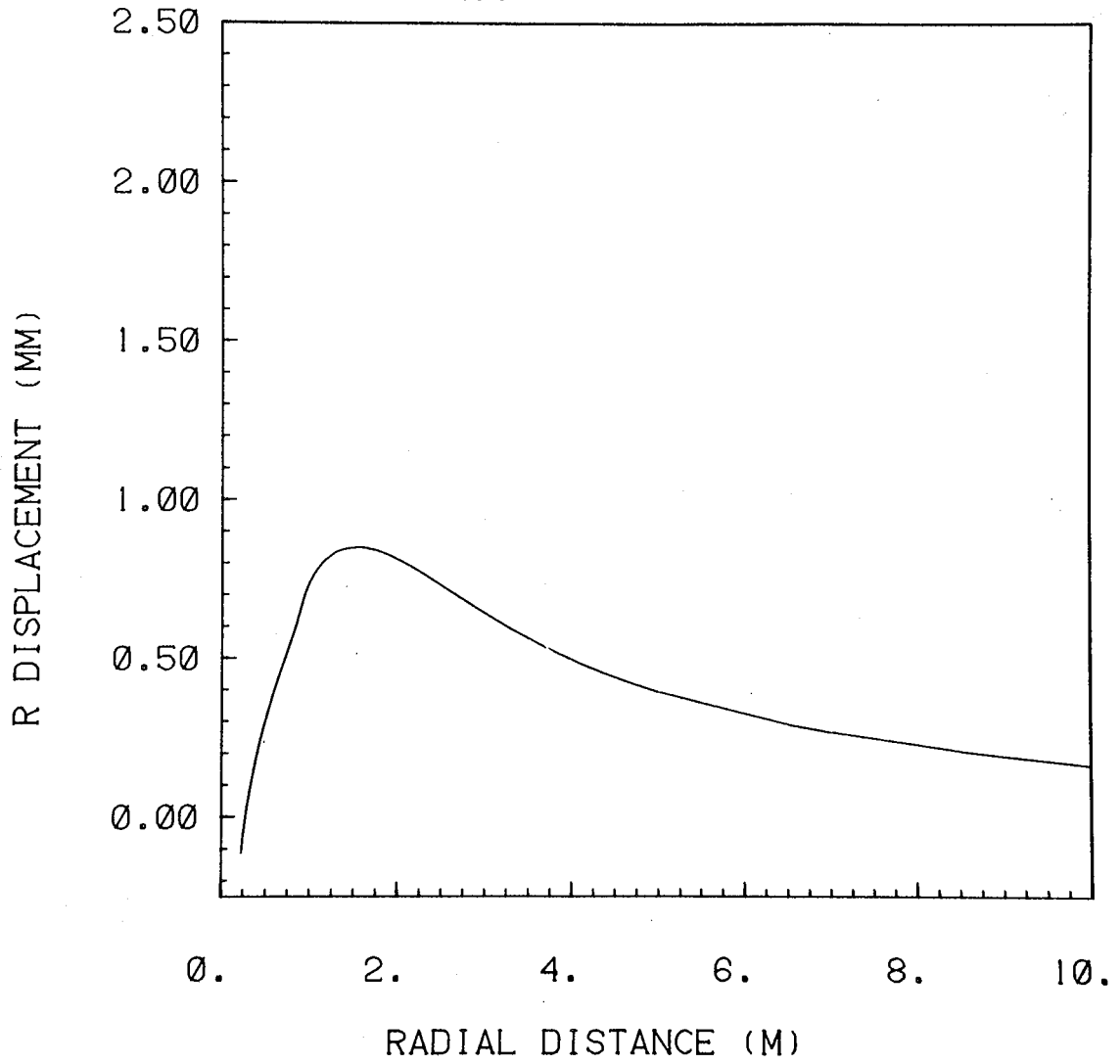
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
371 DAYS



XBL 787-9711

Figure D21f

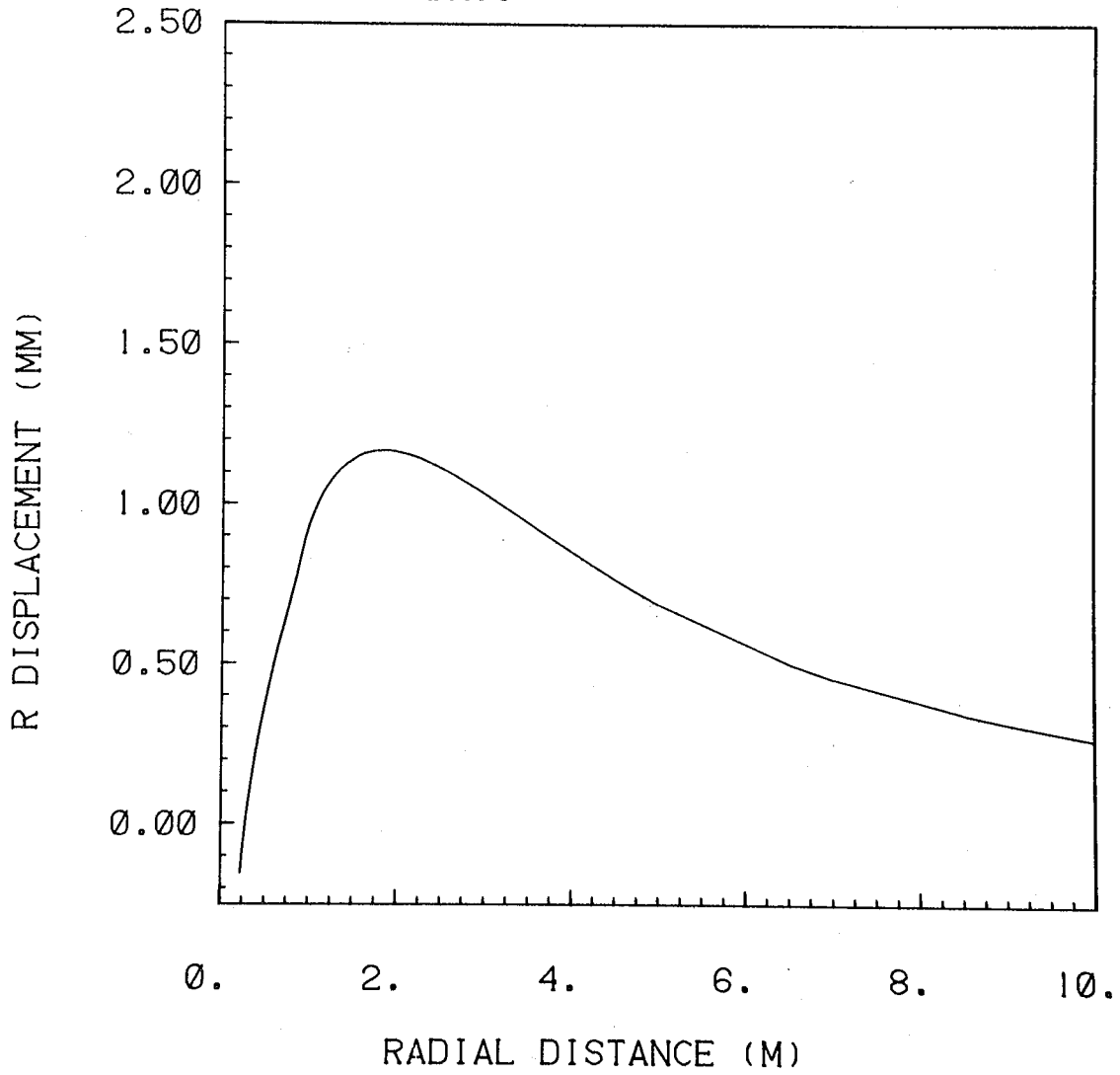
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
390 DAYS



XBL 787-9710

Figure D21g

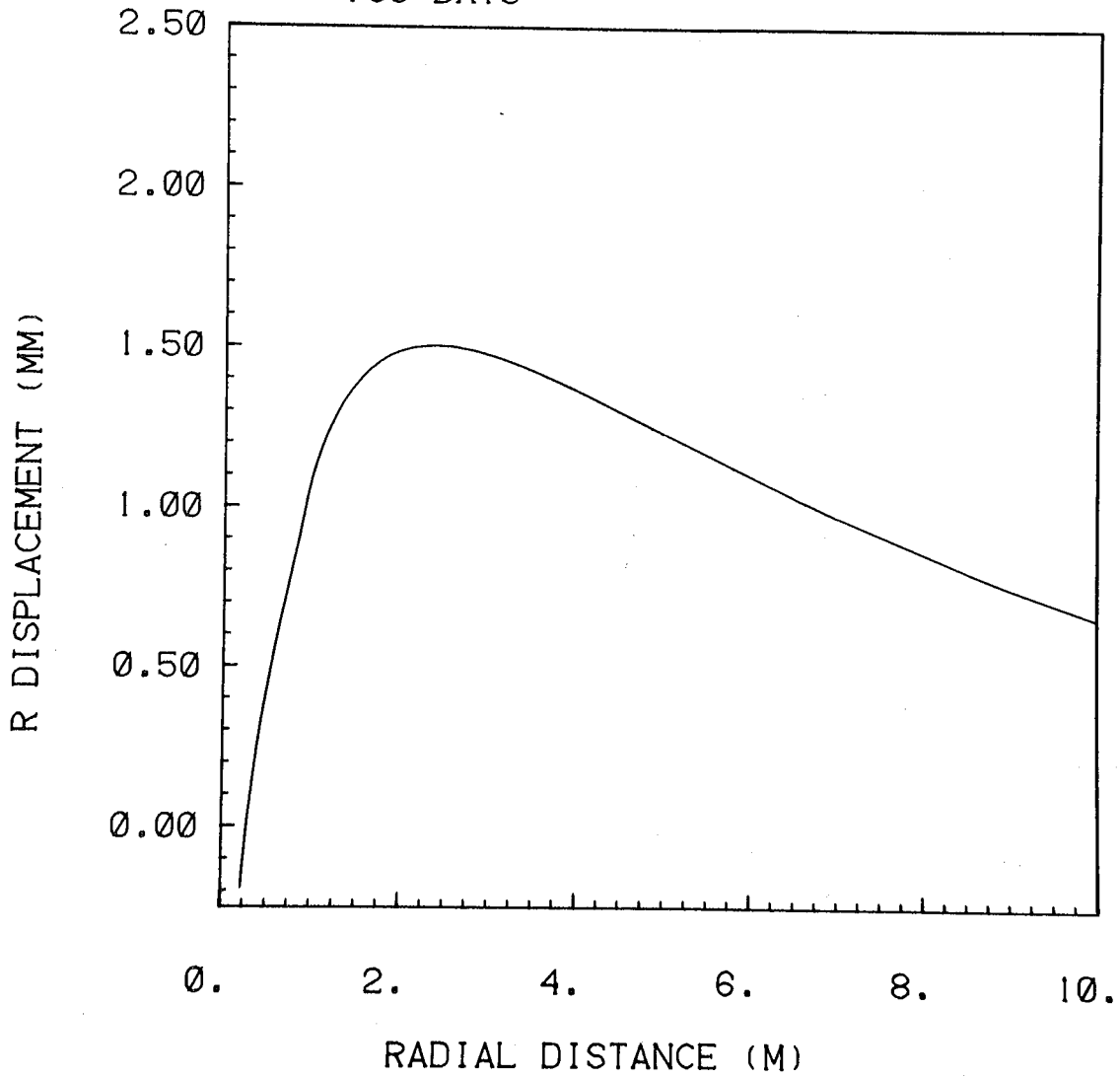
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
450 DAYS



XBL 787-9709

Figure D21h

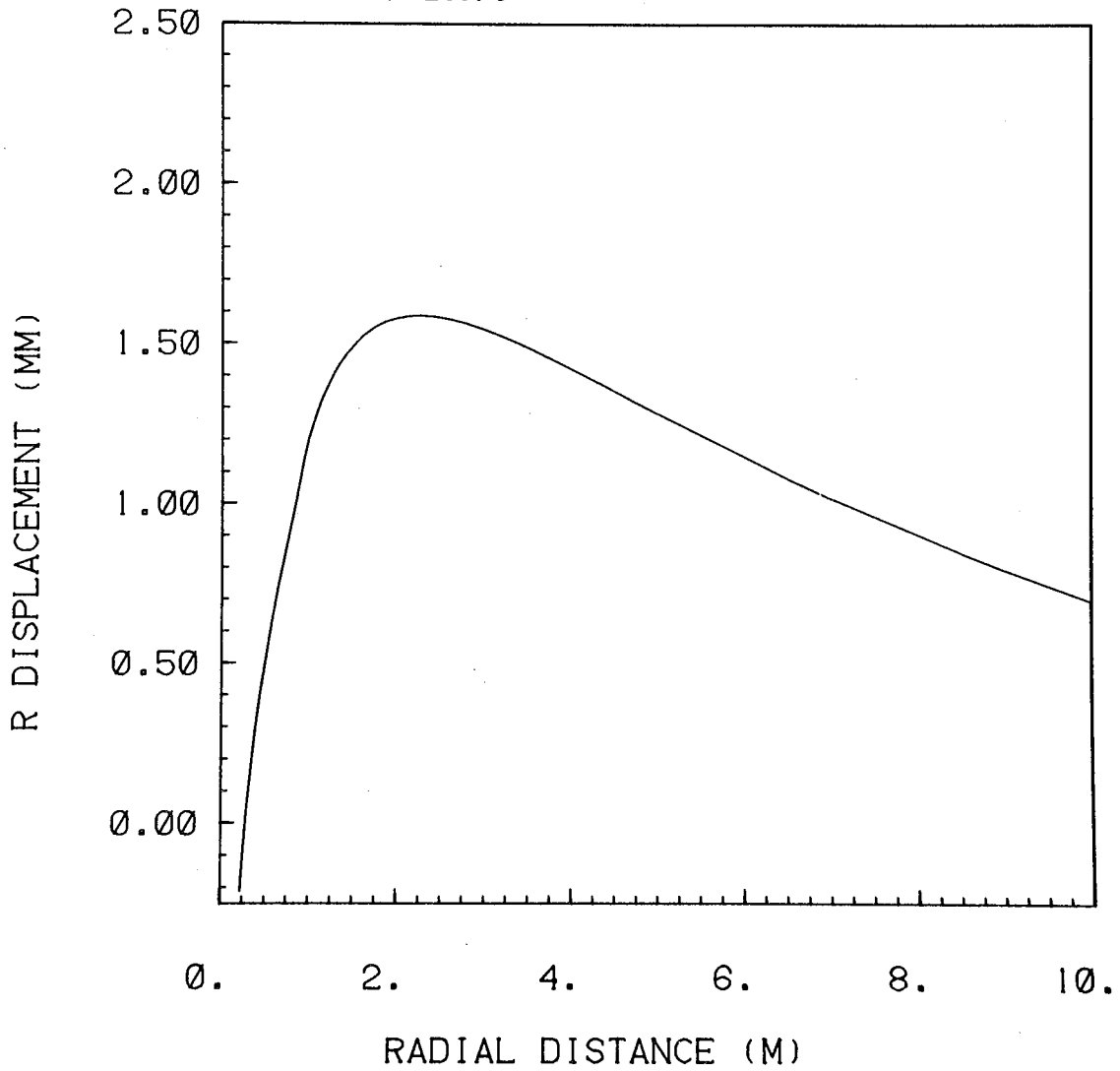
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
730 DAYS



XBL 787-9708

Figure D21i

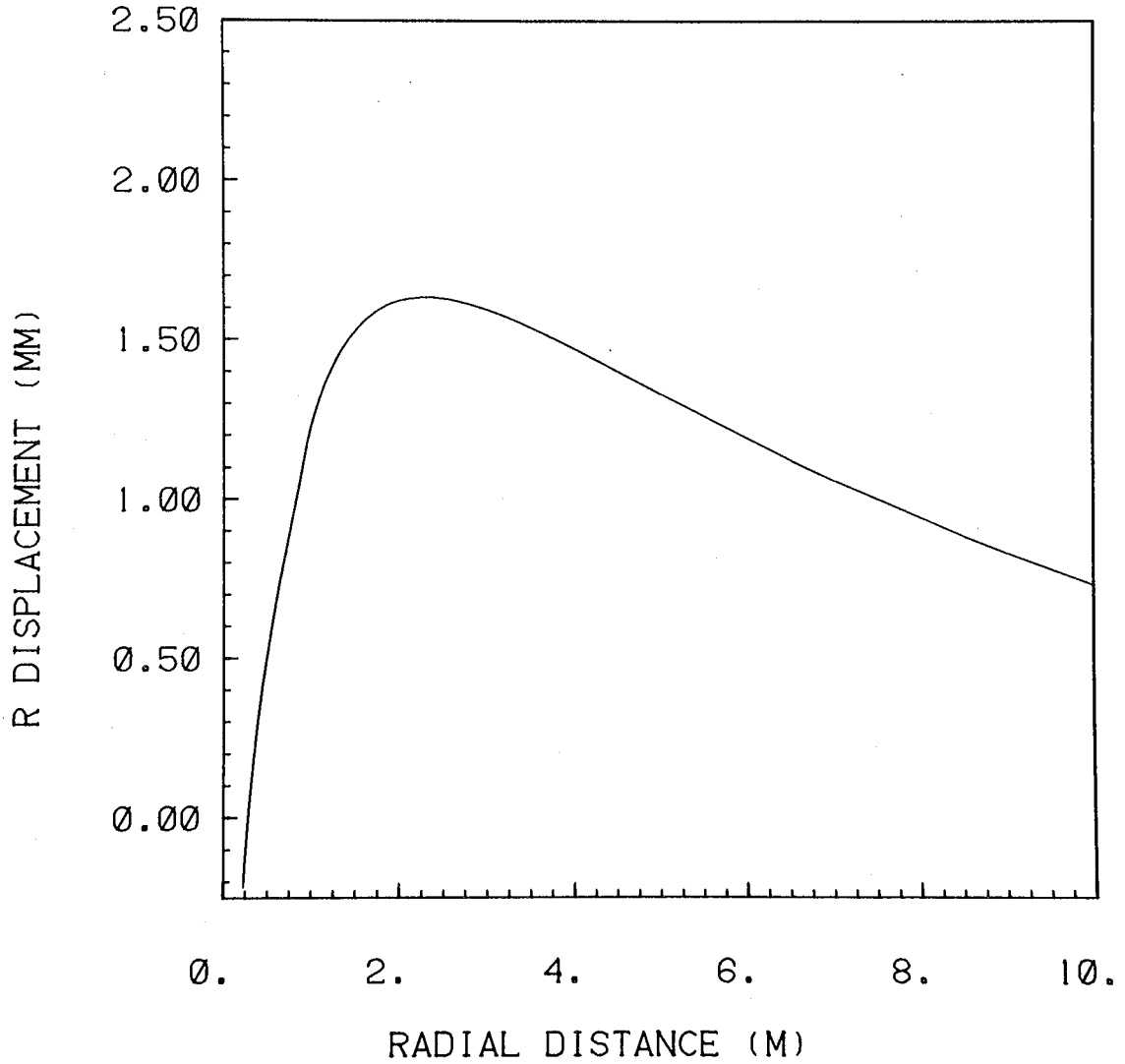
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
760 DAYS



XBL 787-9707

Figure D21j

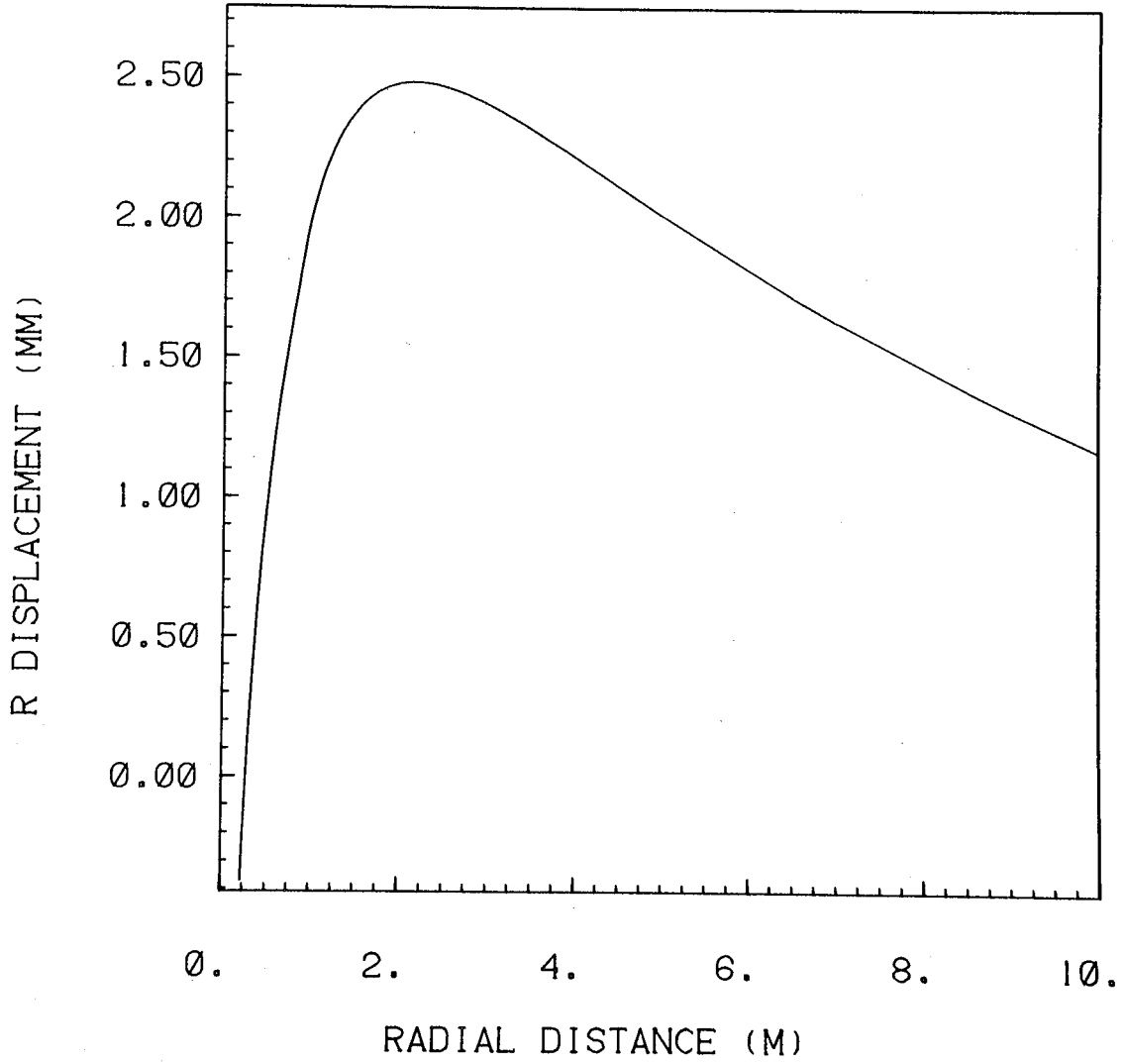
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
790 DAYS



XBL 787-9706

Figure D21k

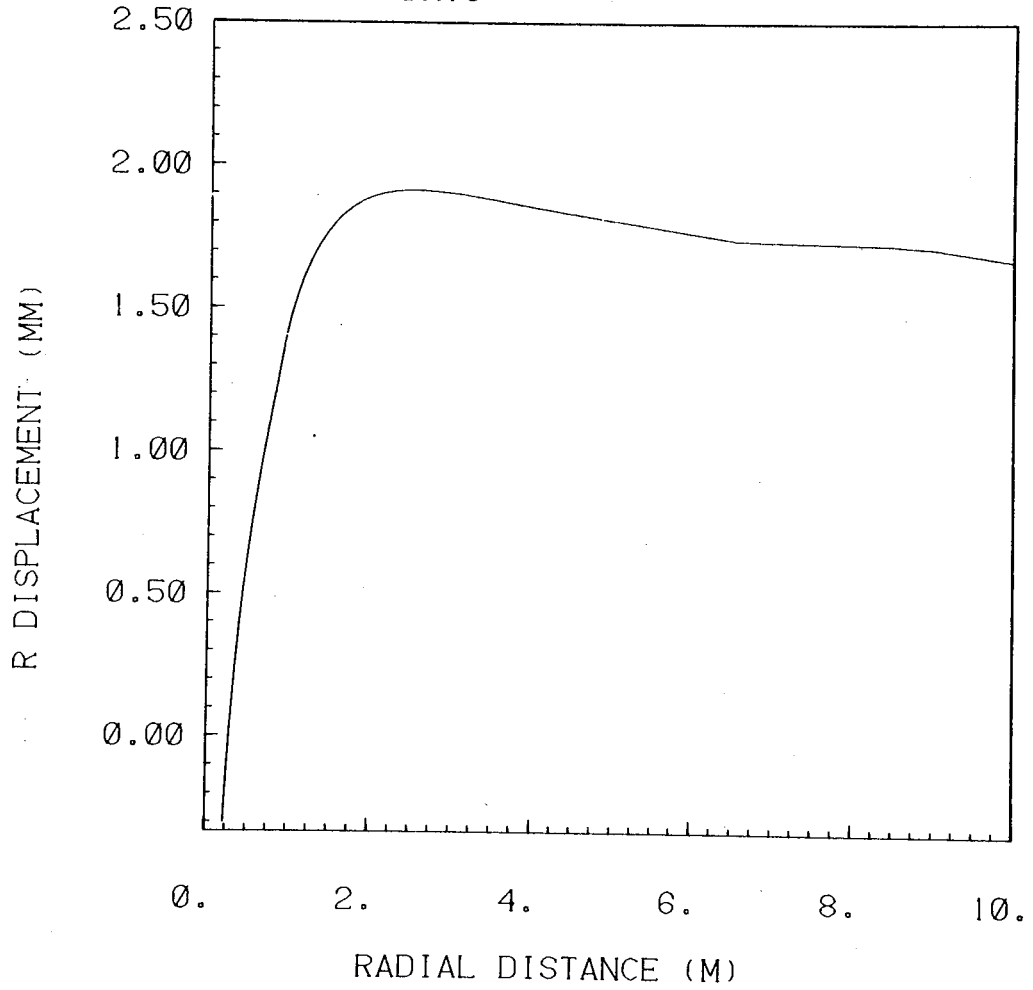
DISPLACEMENT PROFILE FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
1095 DAYS



XBL 787-9705

Figure D211

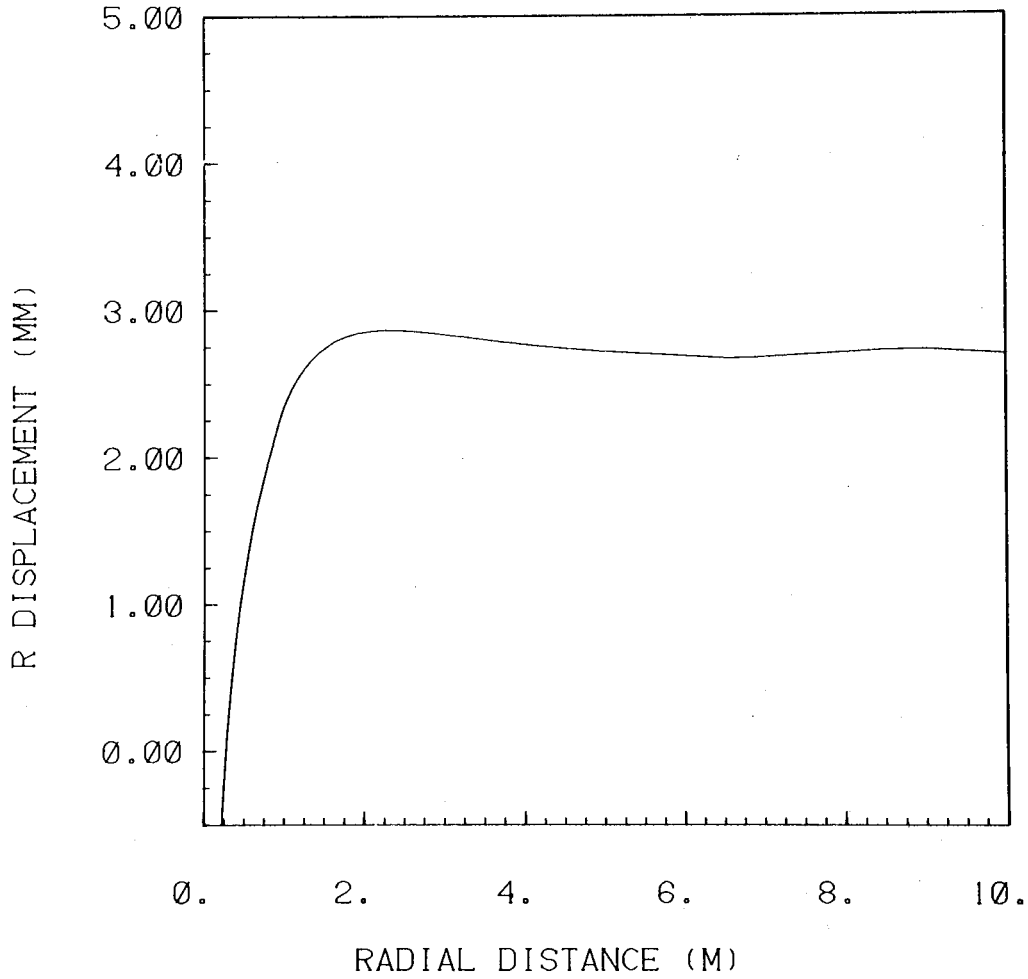
DISPLACEMENT PROFILE FOR MESH 7
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
730 DAYS



XBL 788-10467

Figure D22a

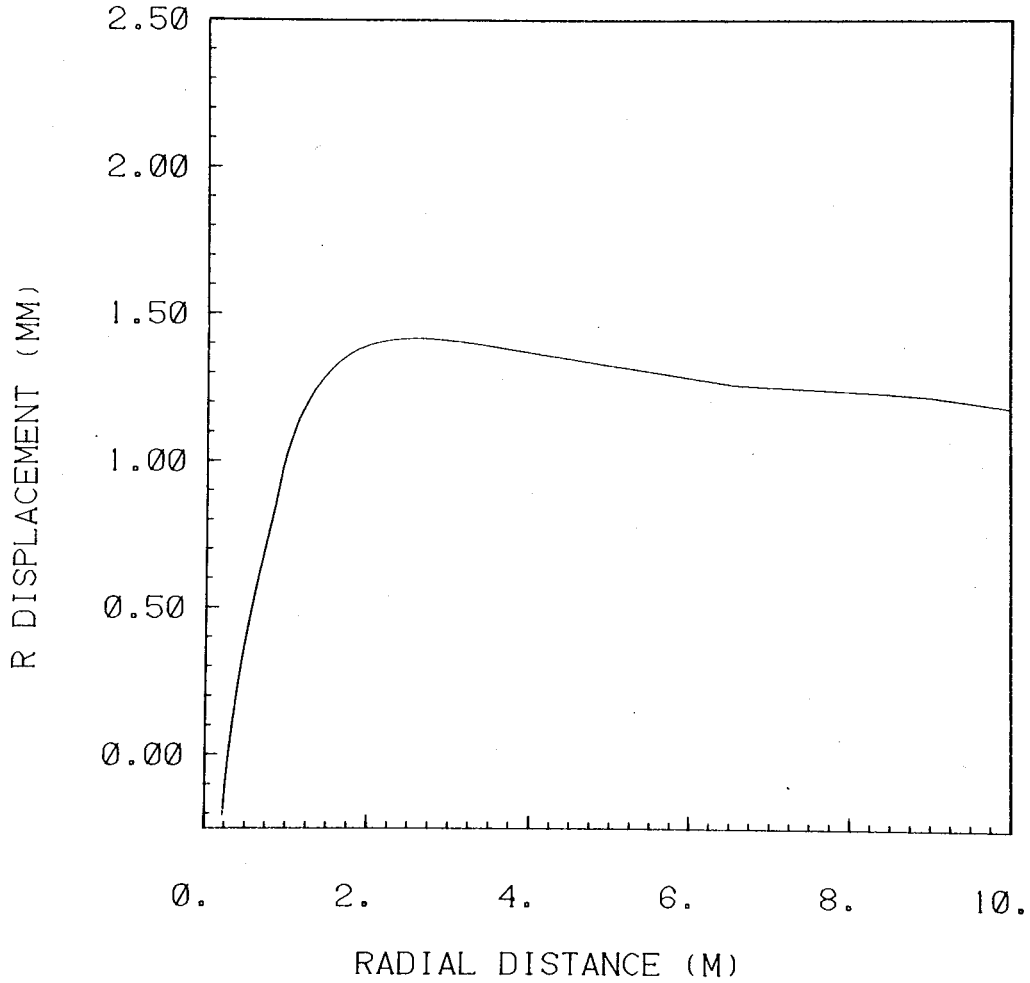
DISPLACEMENT PROFILE FOR MESH 7
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
1095 DAYS



XBL 788-10468

Figure D22b

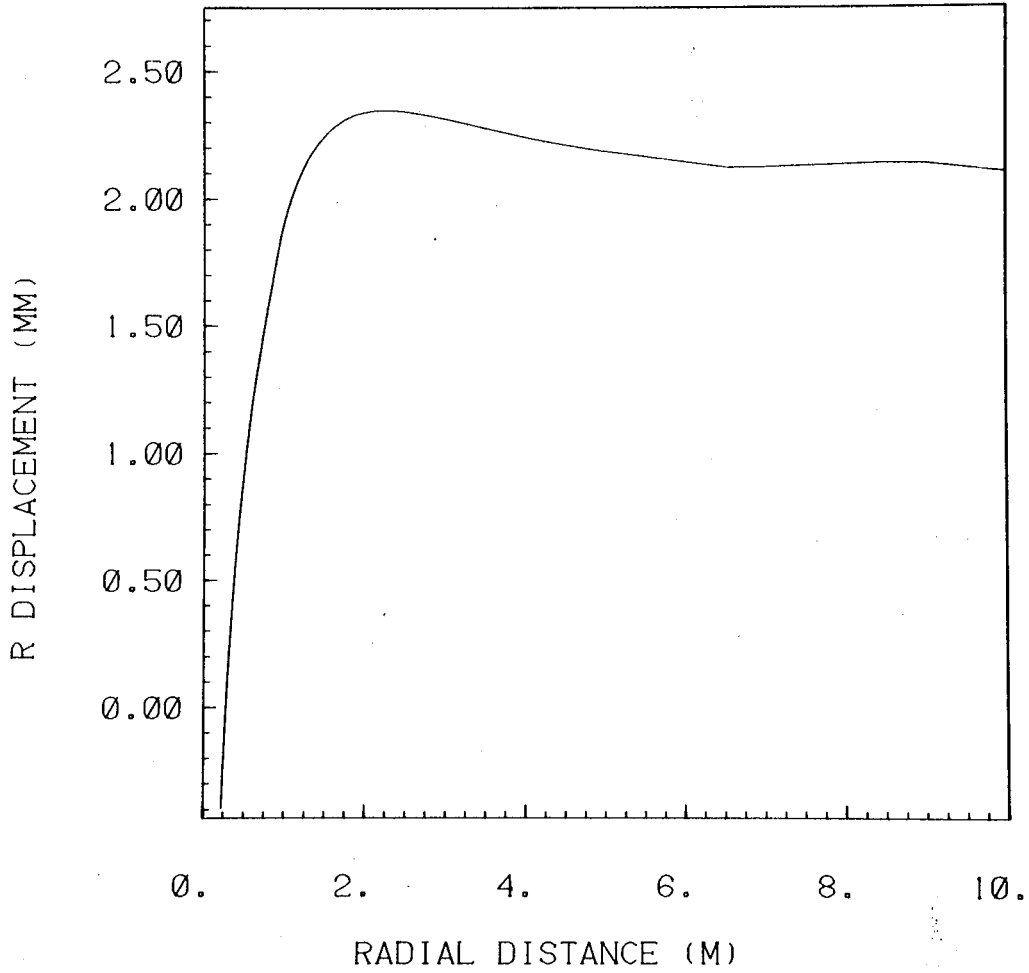
DISPLACEMENT PROFILE FOR MESH 7
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
730 DAYS



XBL 788-10470

Figure D23a

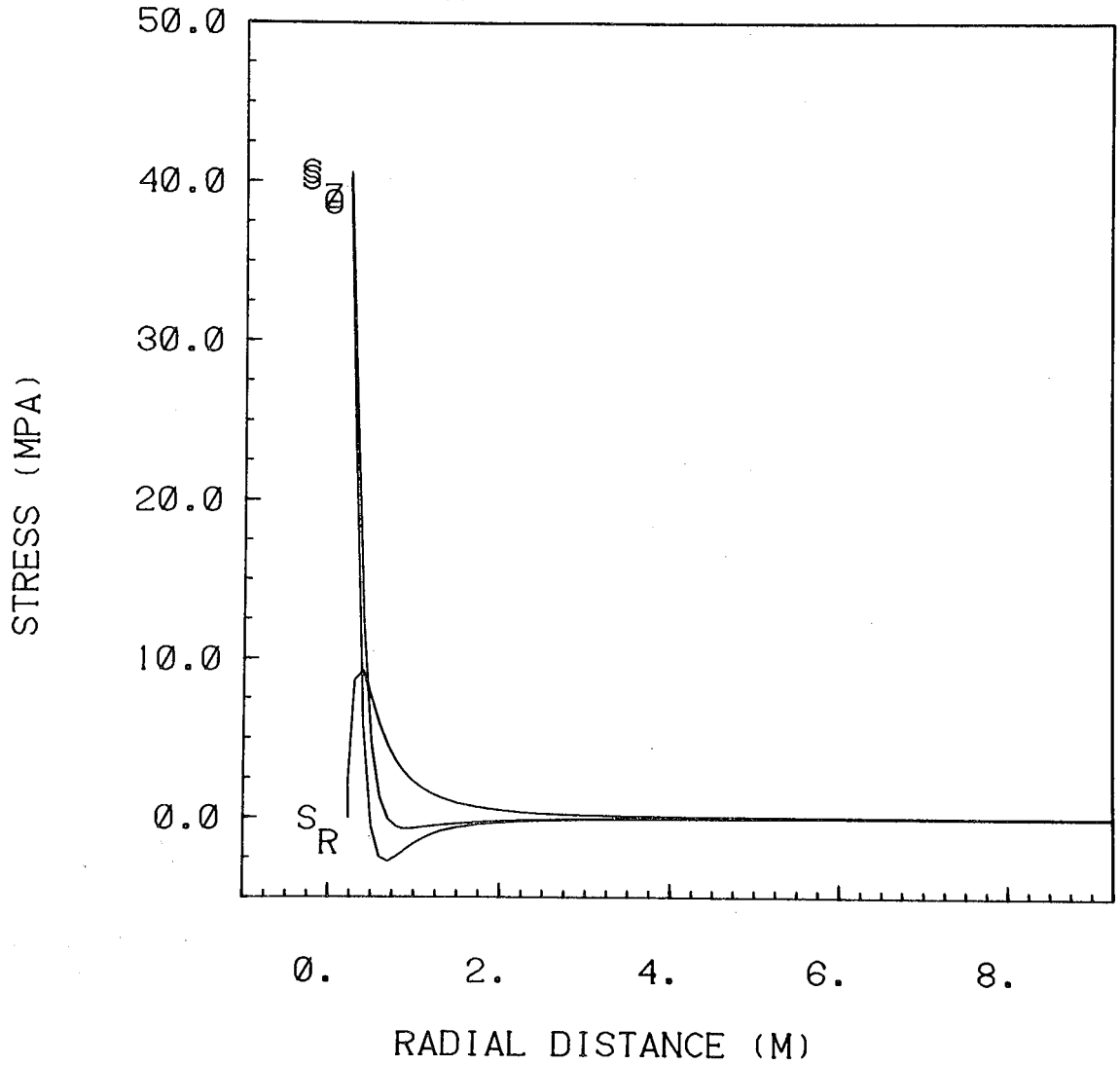
DISPLACEMENT PROFILE FOR MESH 7
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
1095 DAYS



XBL 788-10469

Figure D23b

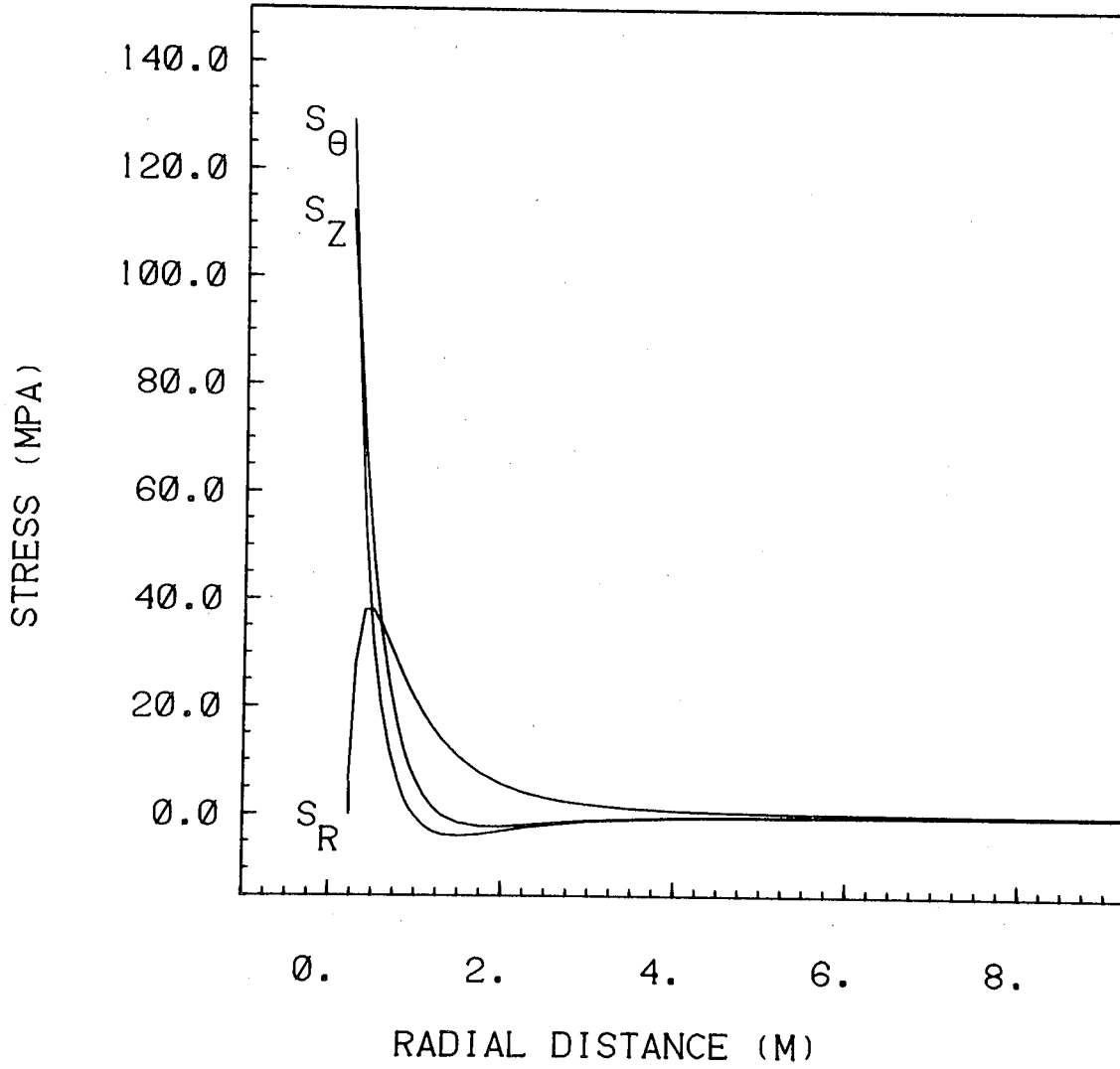
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
1 DAY



XBL 788-9862

Figure D24a

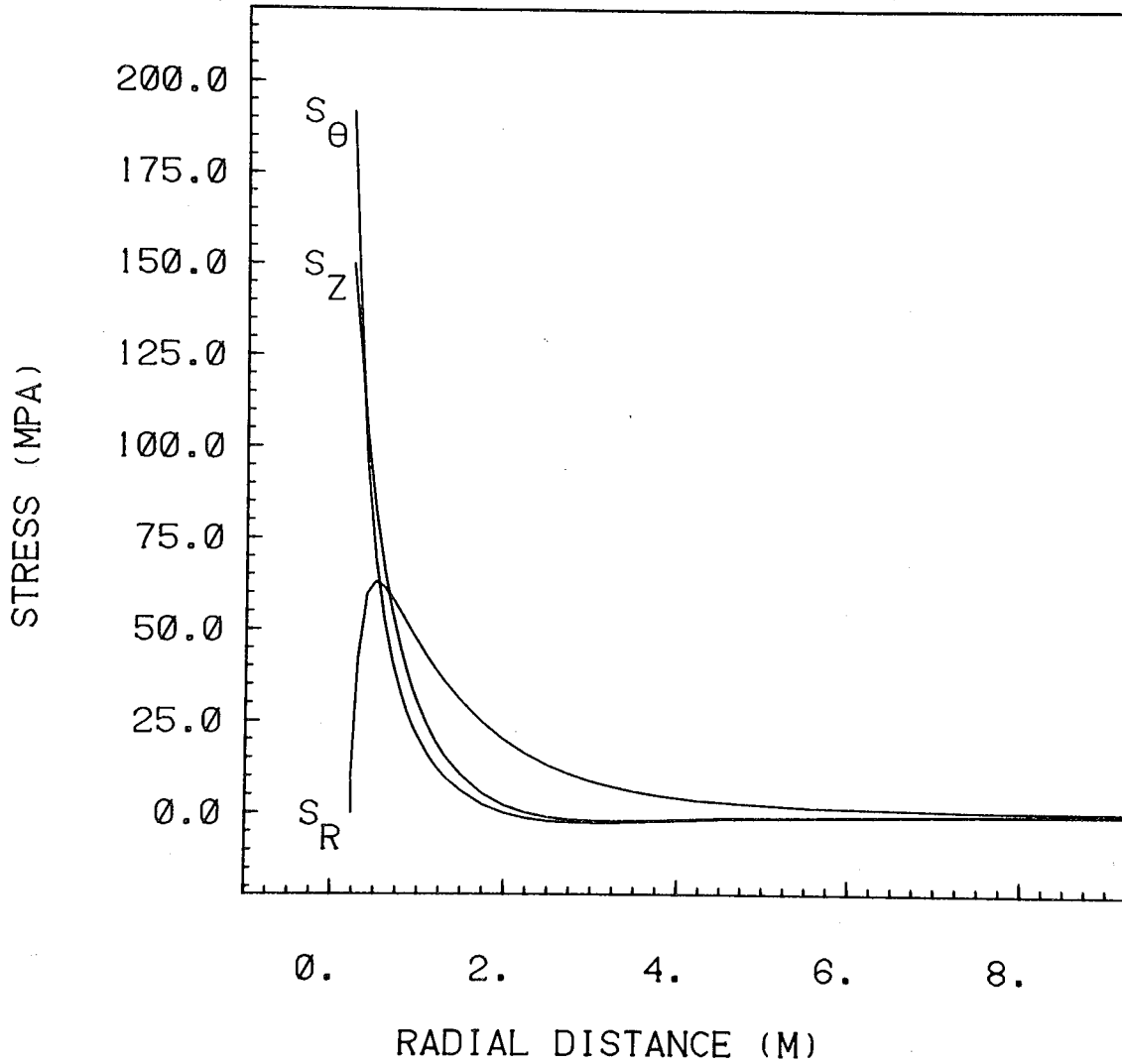
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
7 DAYS



XBL 787-9737

Figure D24b

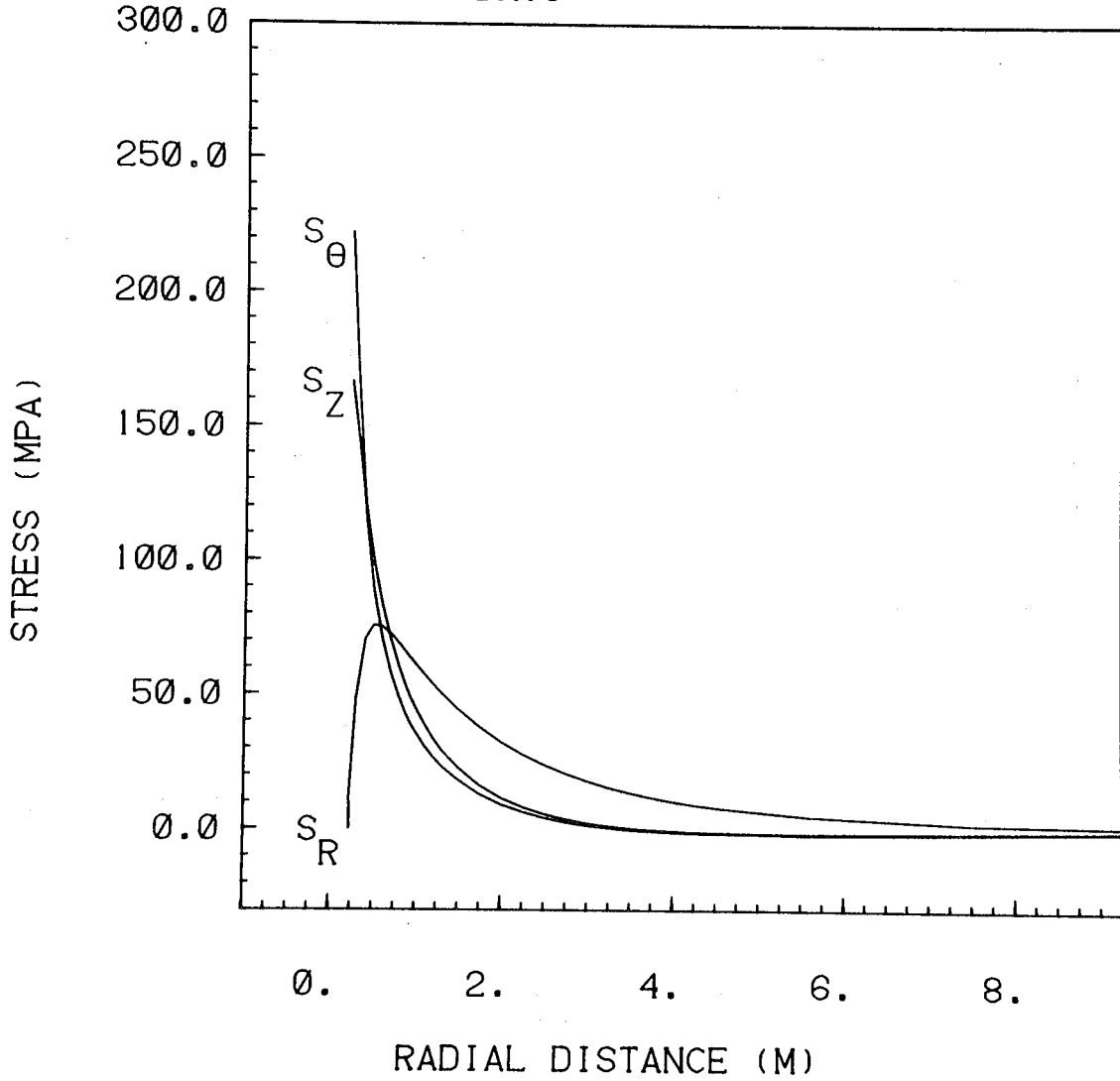
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
30 DAYS



XBL 787-9736

Figure D24c

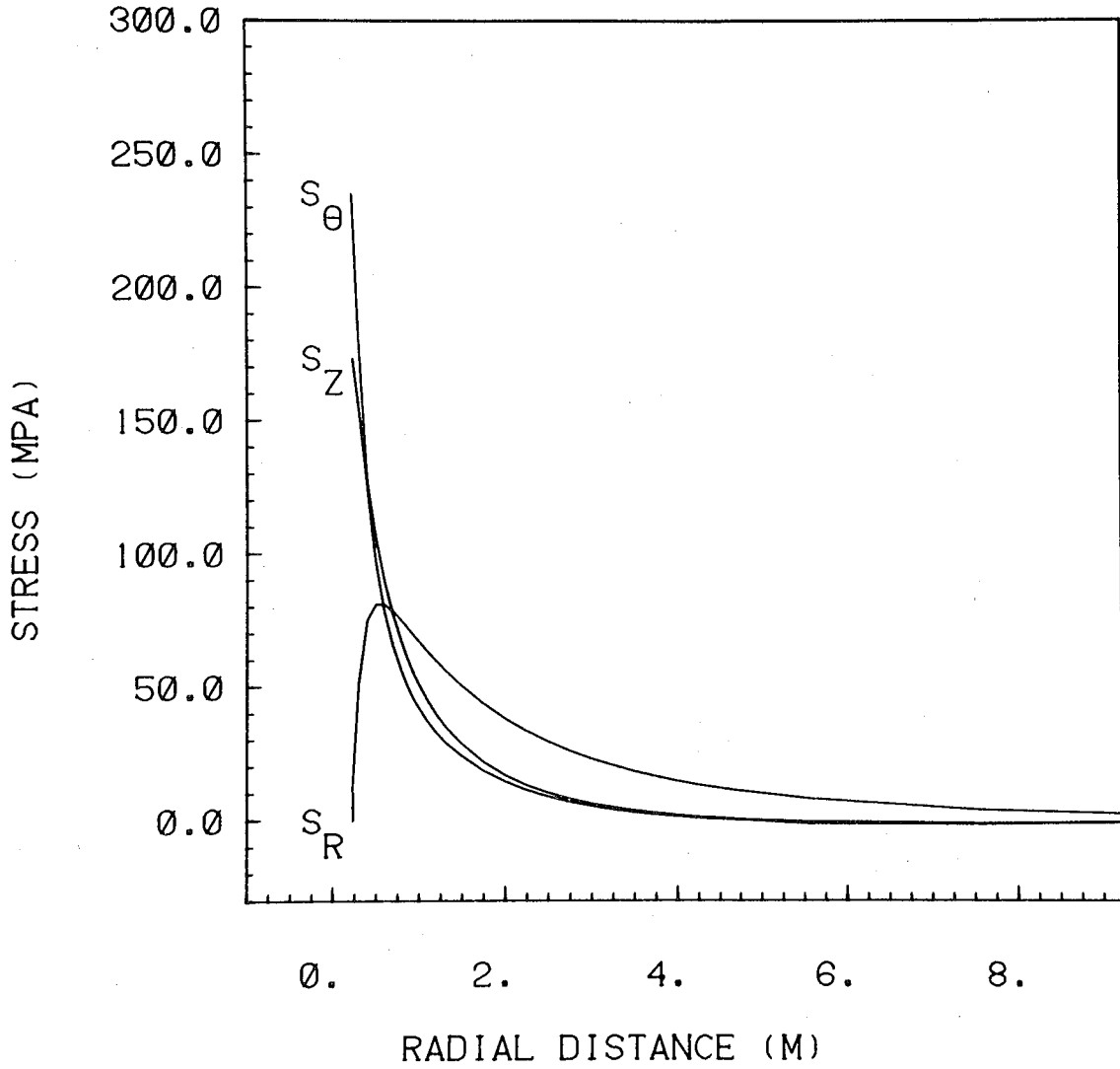
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
90 = DAYS



XBL 787-9735

Figure D24d

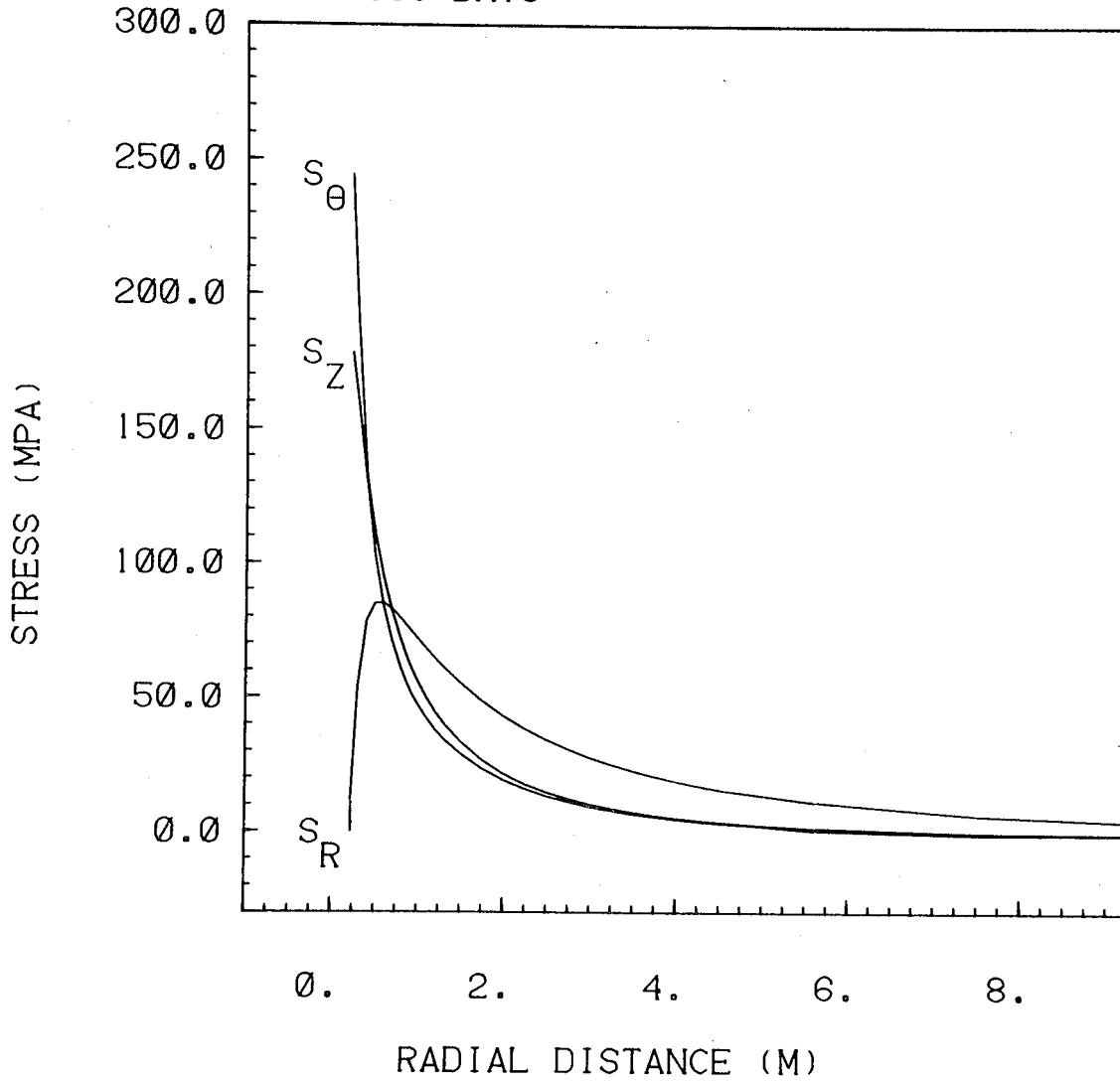
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
180 DAYS



XBL 787-9734

Figure D24e

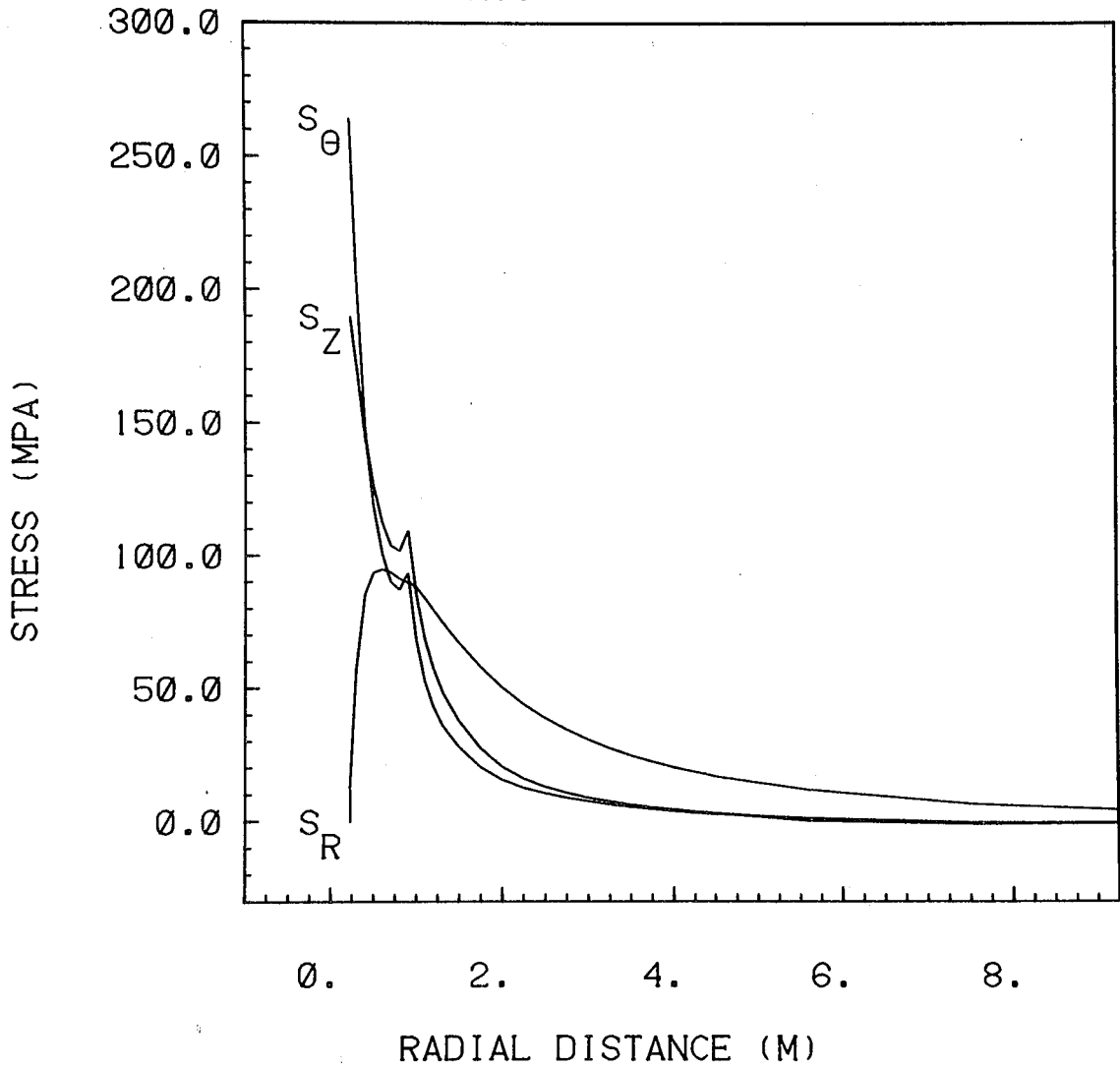
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
365 DAYS



XBL 787-9697

Figure D24f

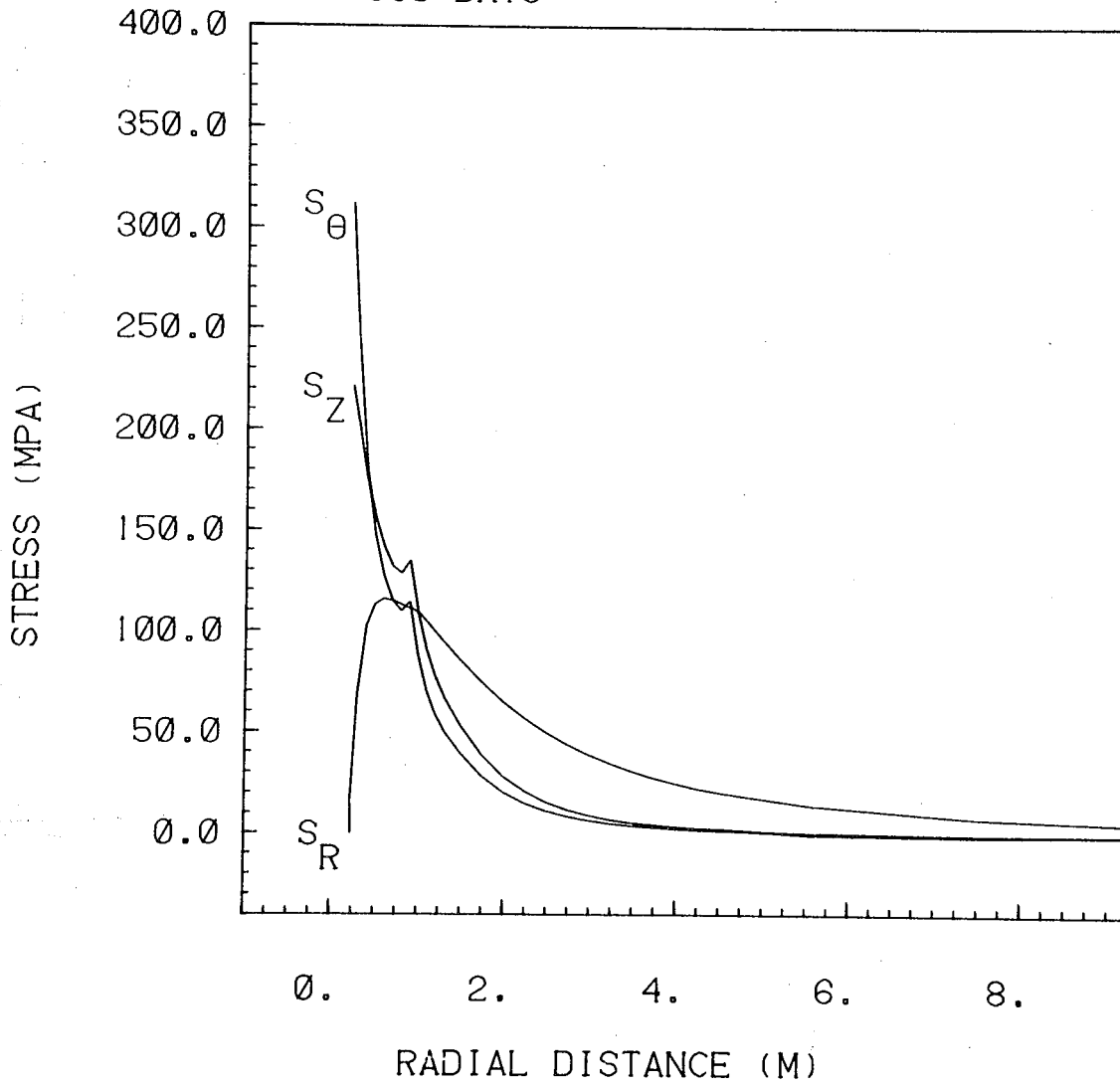
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
371 DAYS



XBL 787-9698

Figure D24g

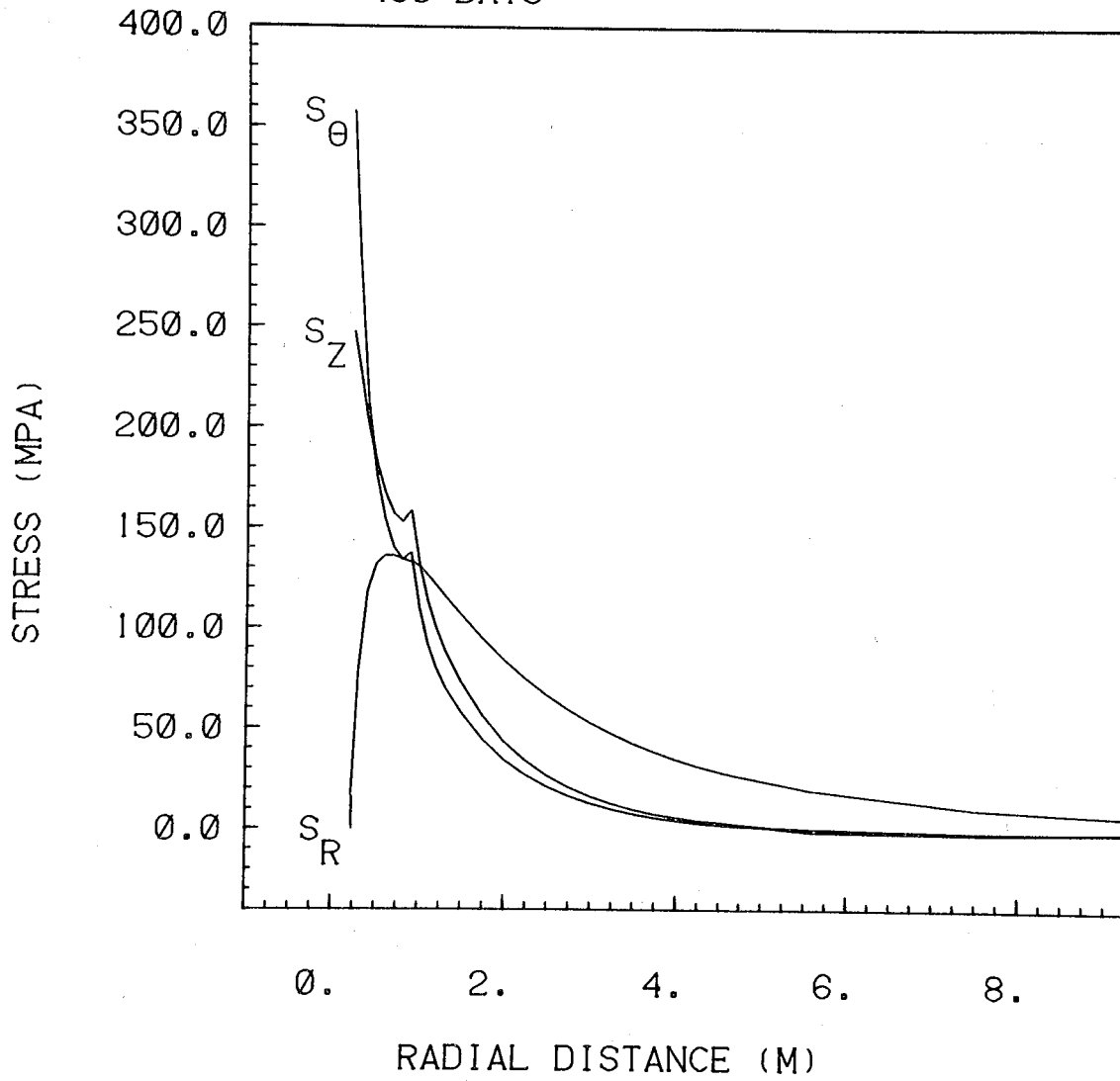
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
390 DAYS



XBL 787-9699

Figure D24h

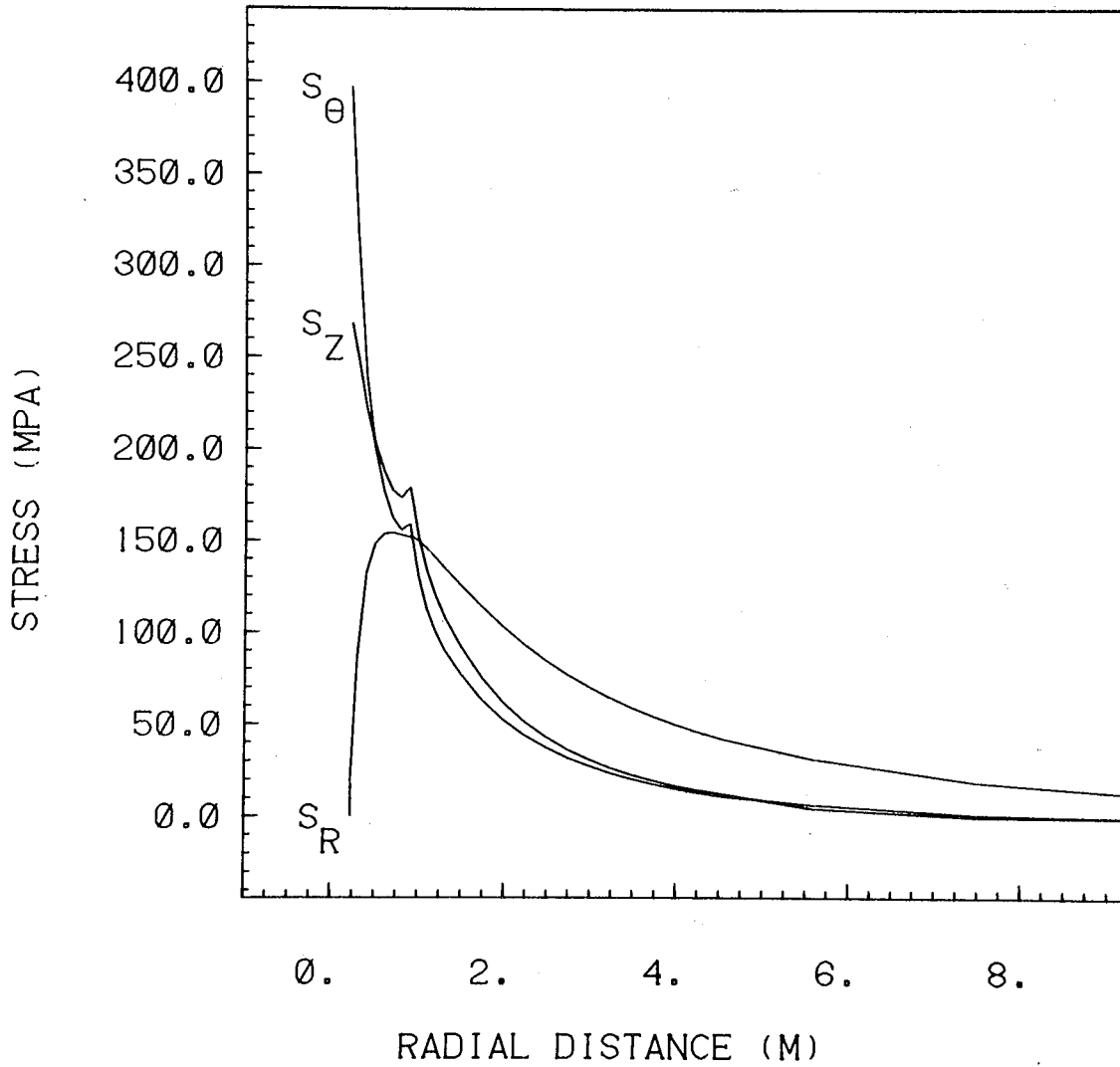
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
450 DAYS



XBL 787-9700

Figure D24i

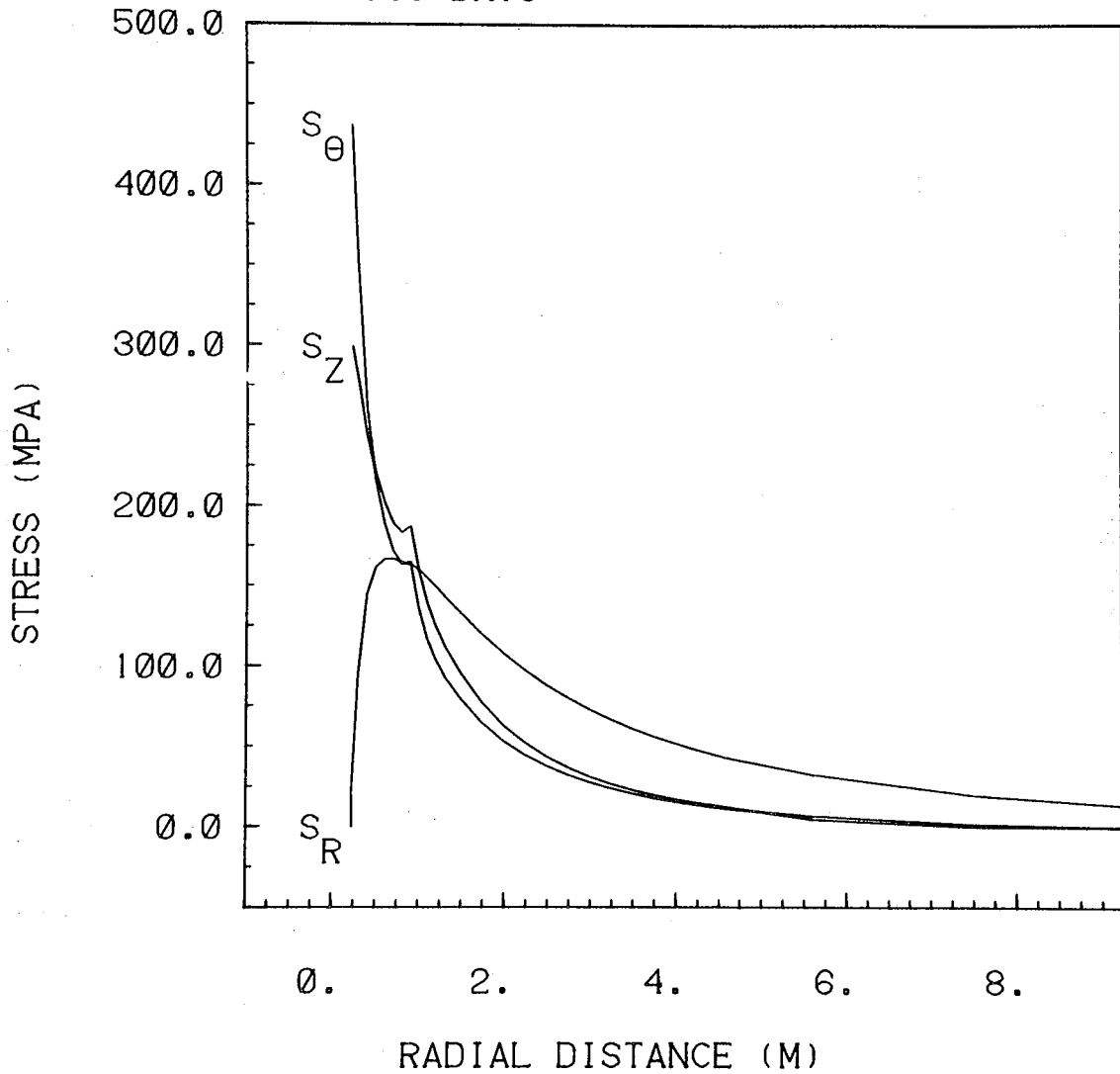
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
730 DAYS



XBL 787-9701

Figure D24j

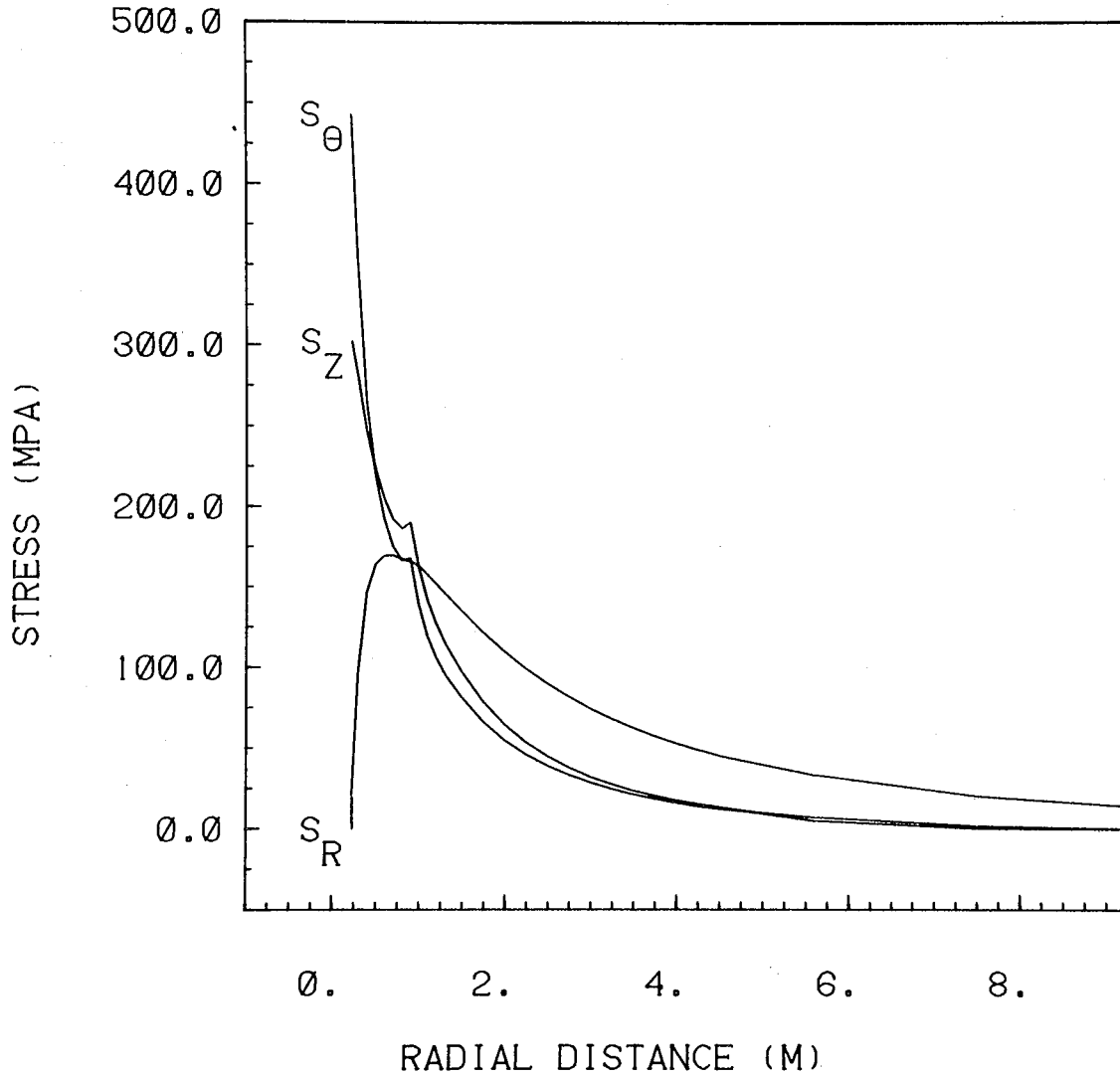
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
760 DAYS



XBL 787-9702

Figure D24k

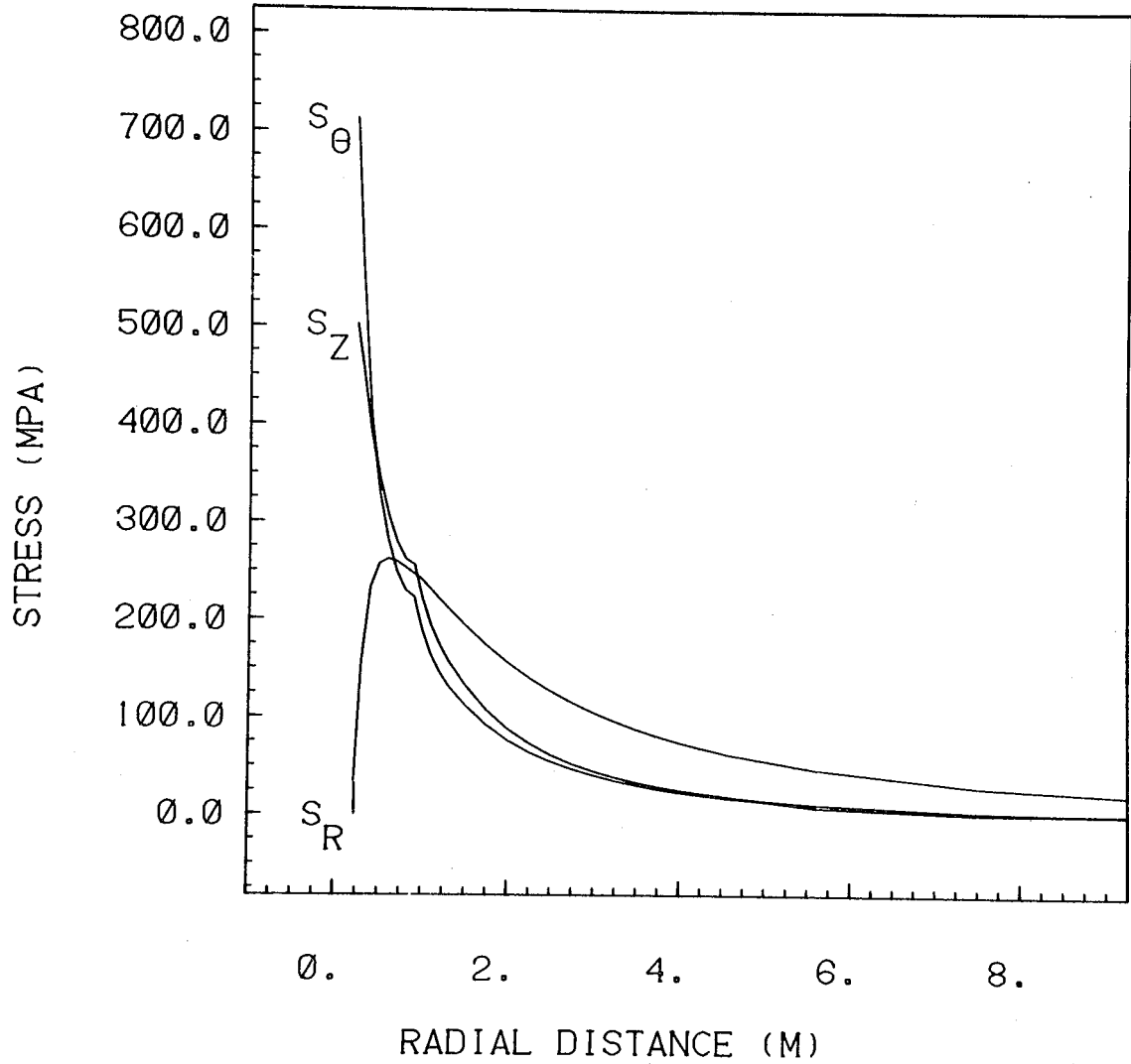
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
790 DAYS



XBL 787-9703

Figure D241

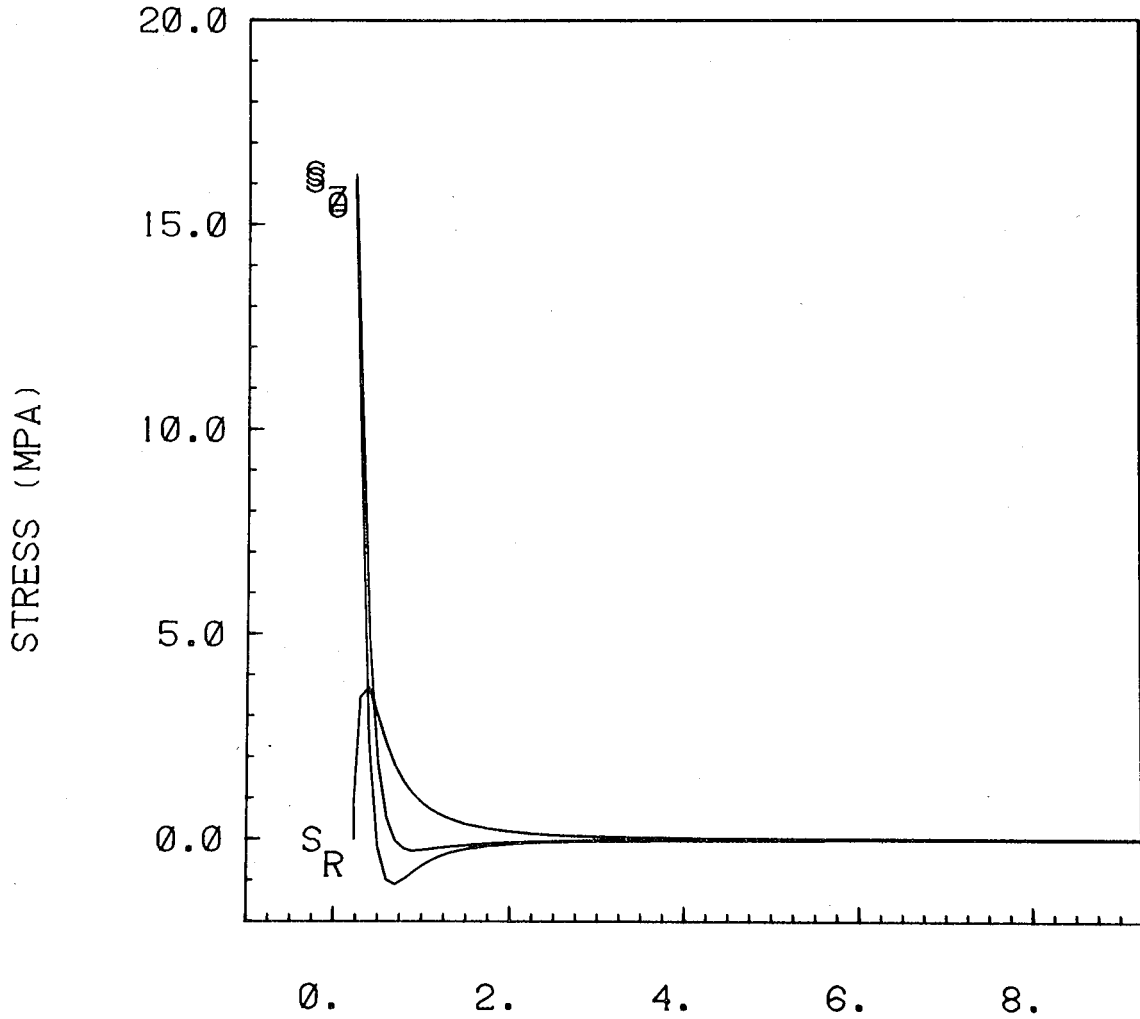
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 5 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
1095 DAYS



XBL 787-9704

Figure D24m

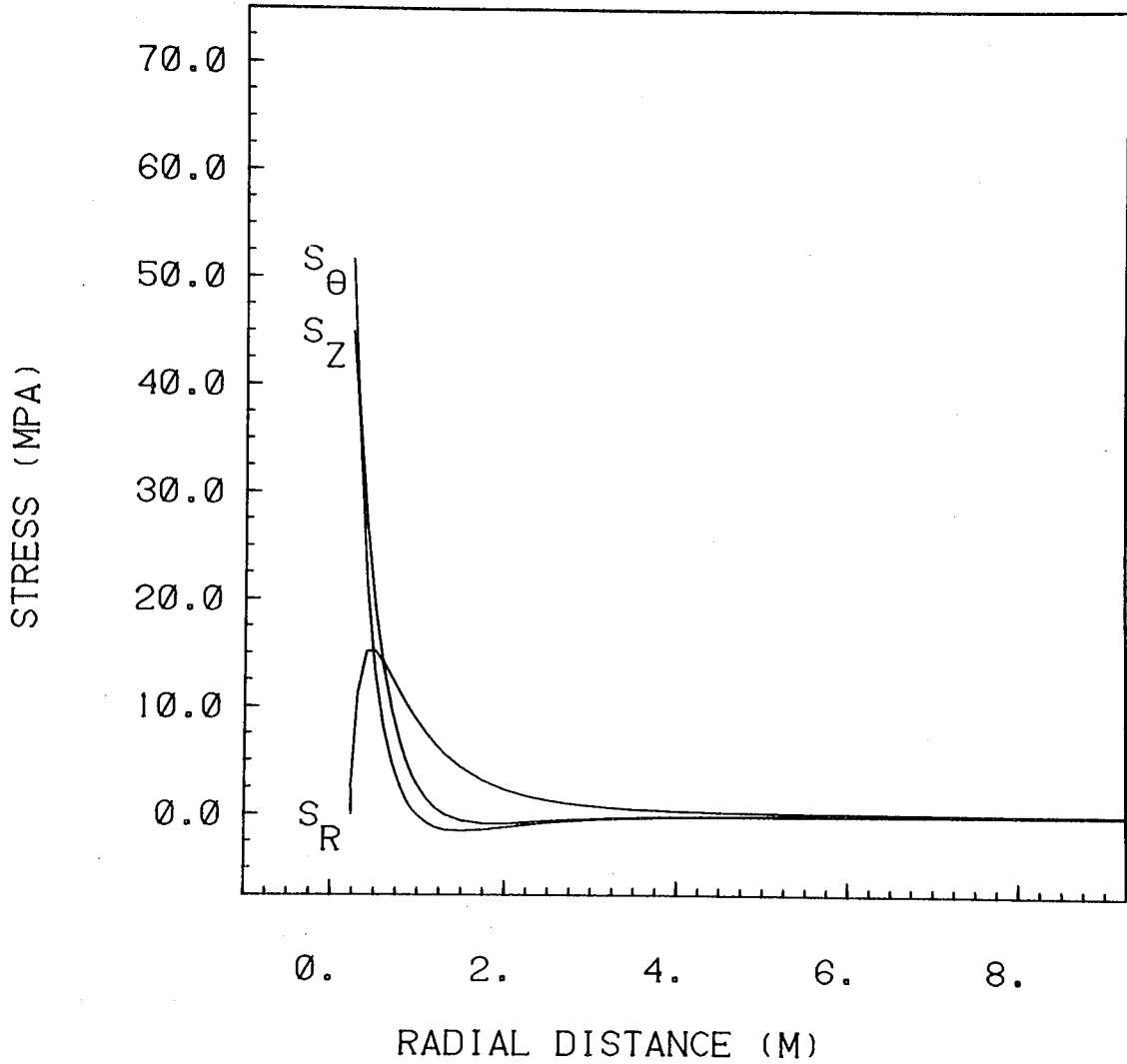
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
1 DAY



XBL 788-9864

Figure D25a

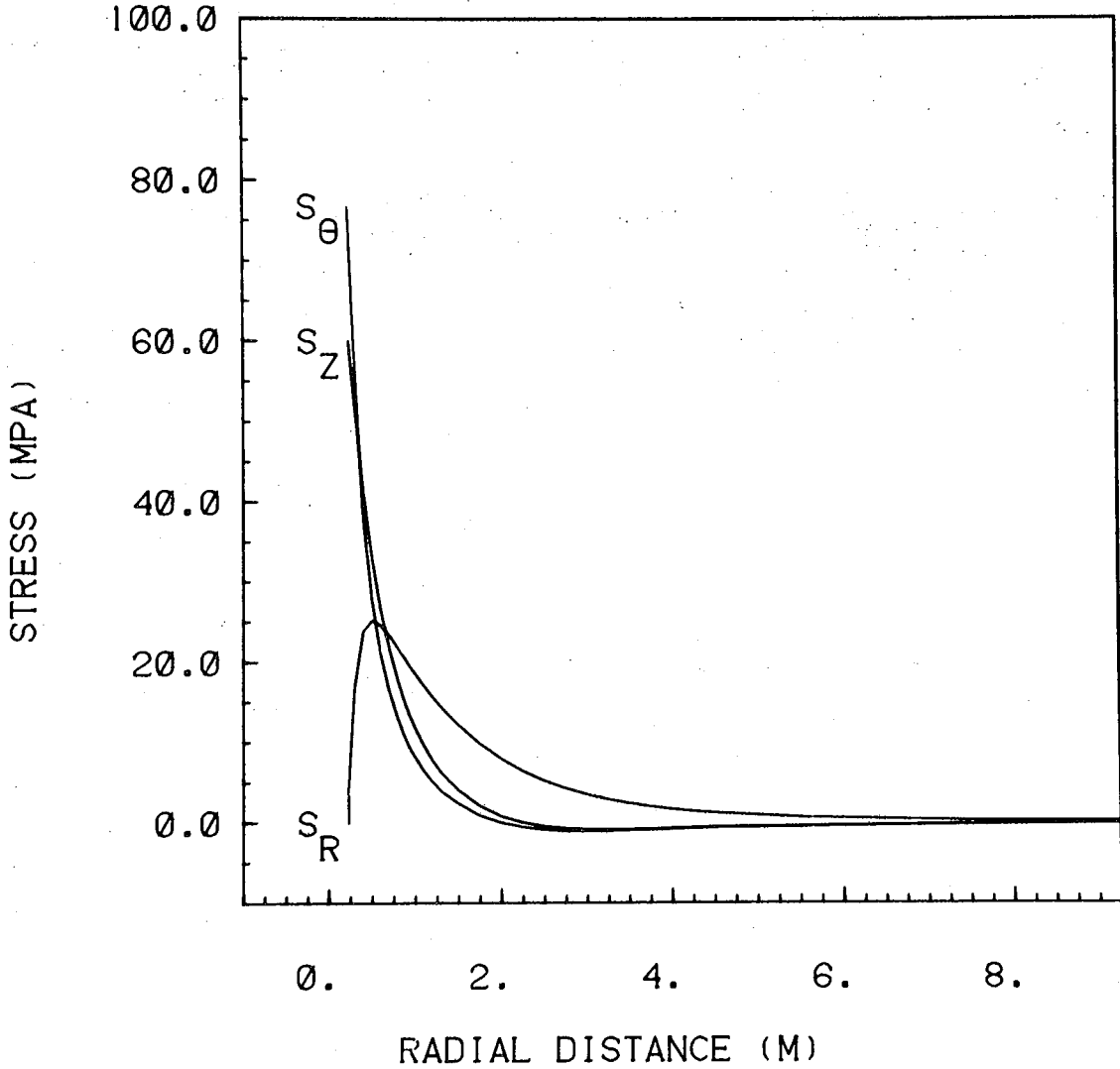
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
7 DAYS



XBL 787-9717

Figure D25b

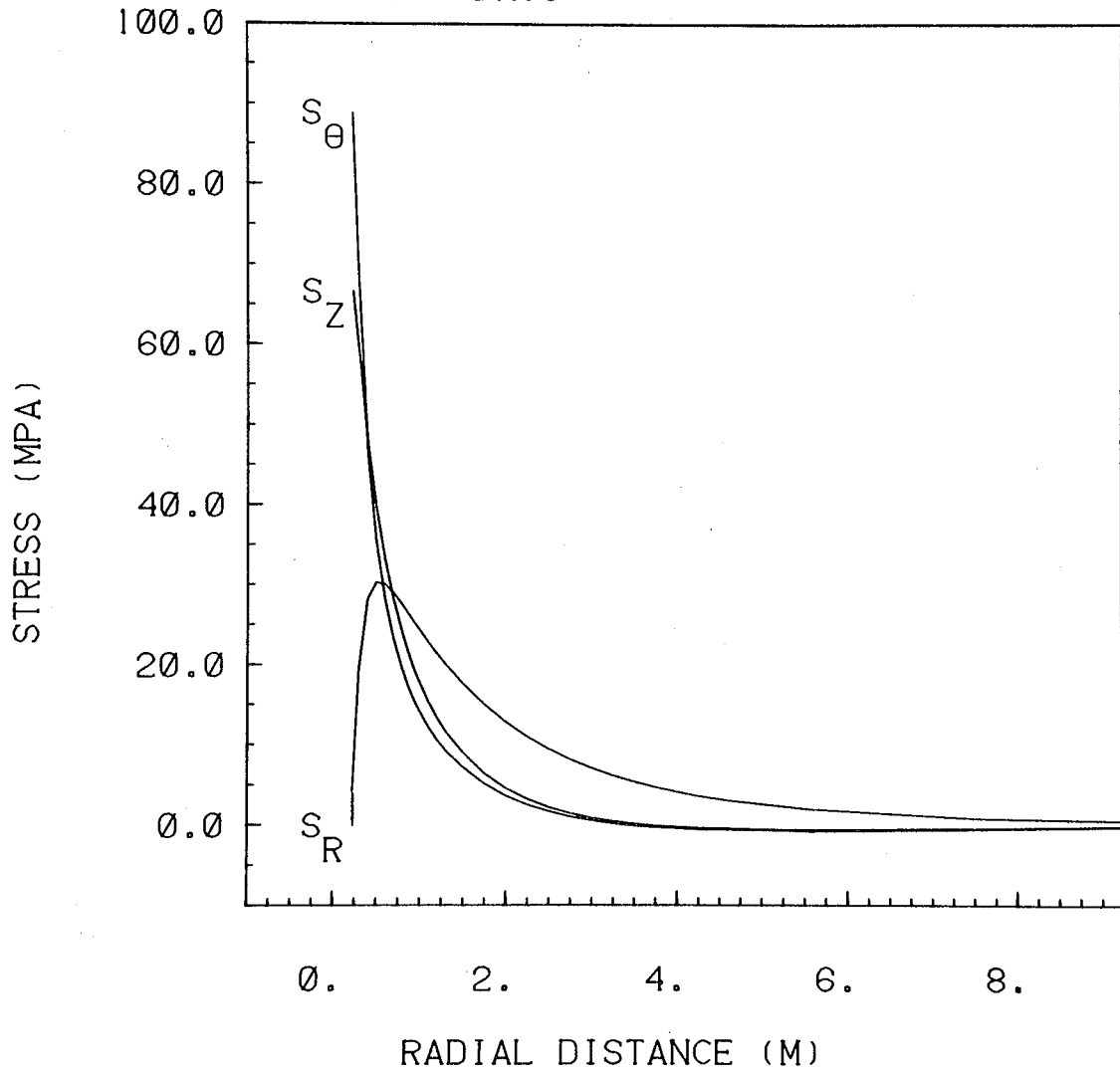
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
30 DAYS



XBL 787-9718

Figure D25c

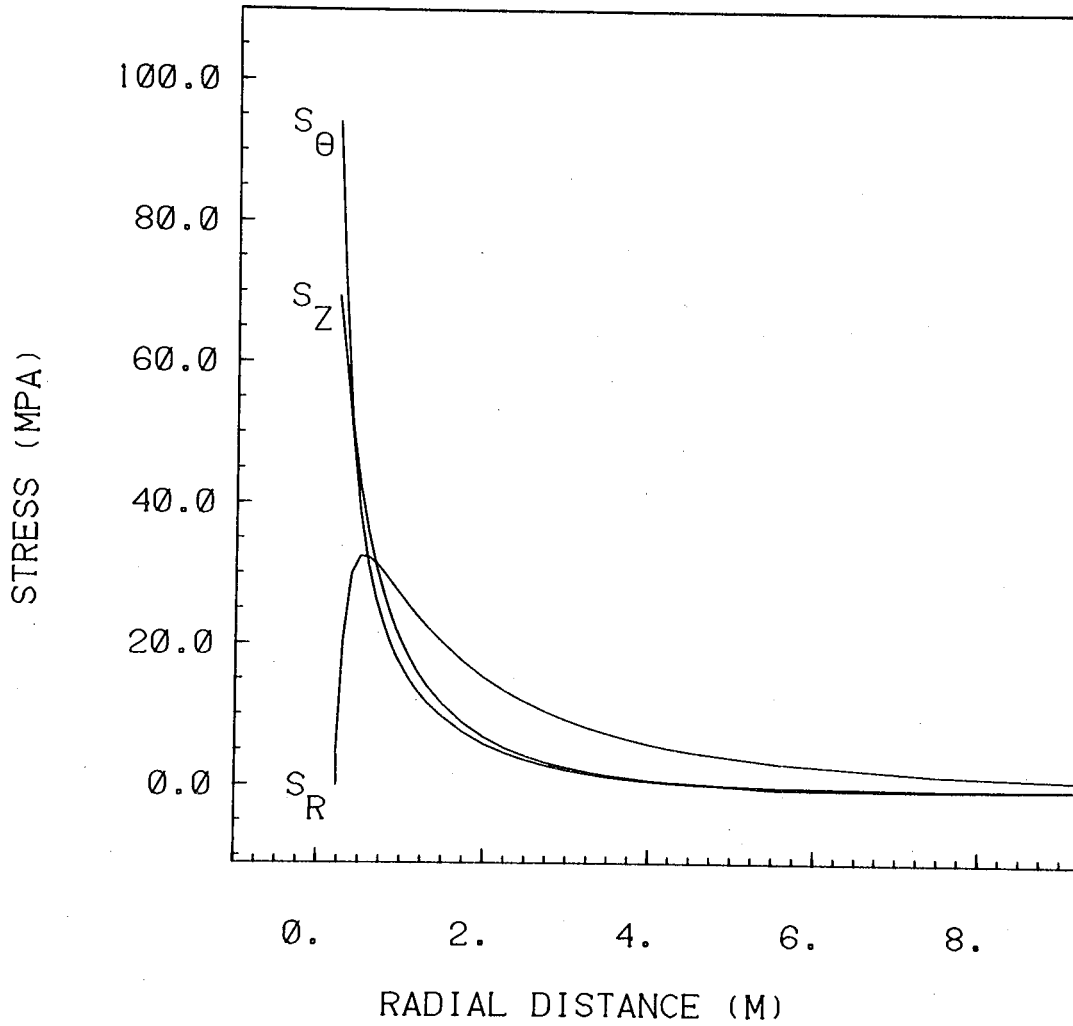
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
90 = DAYS



XBL 787-9719

Figure D25d

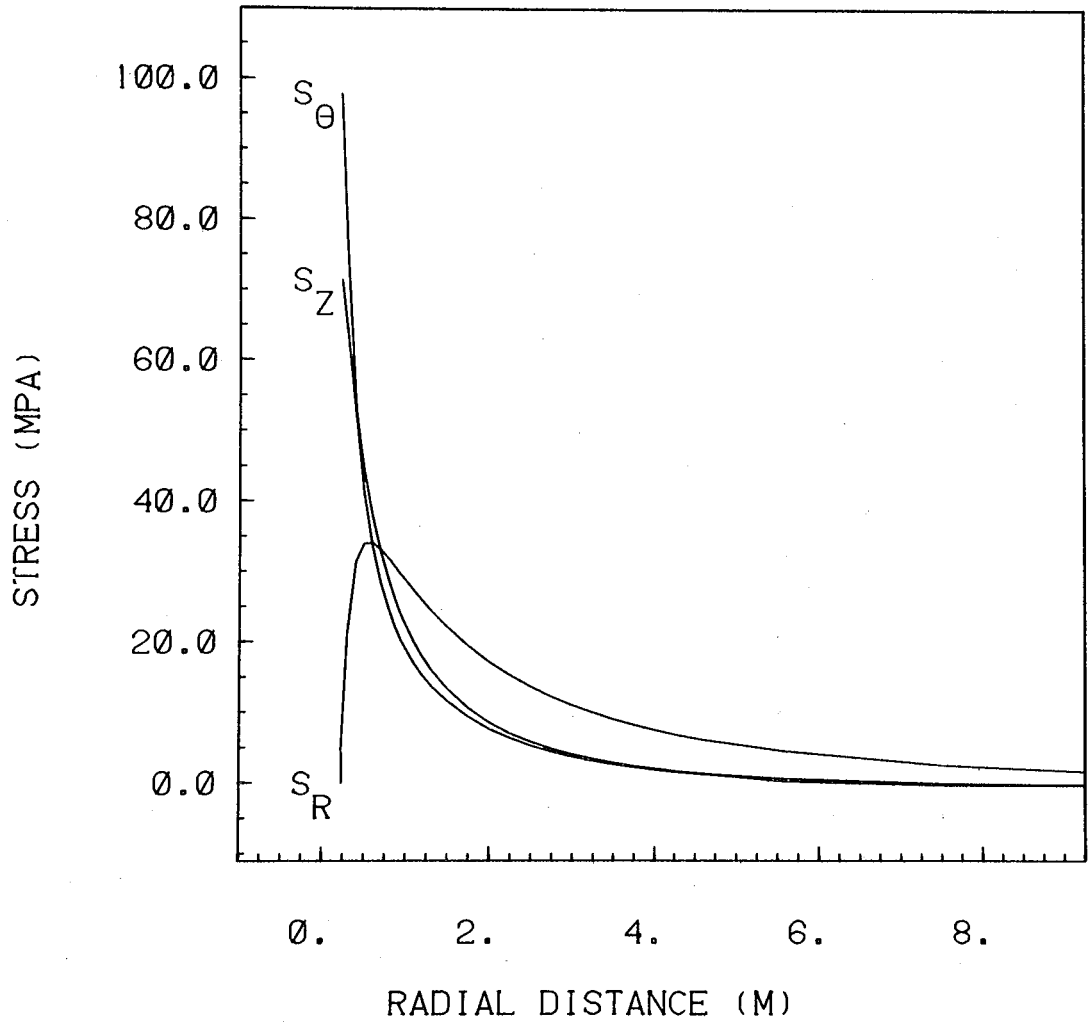
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
180 DAYS



XBL 787-9720

Figure D25e

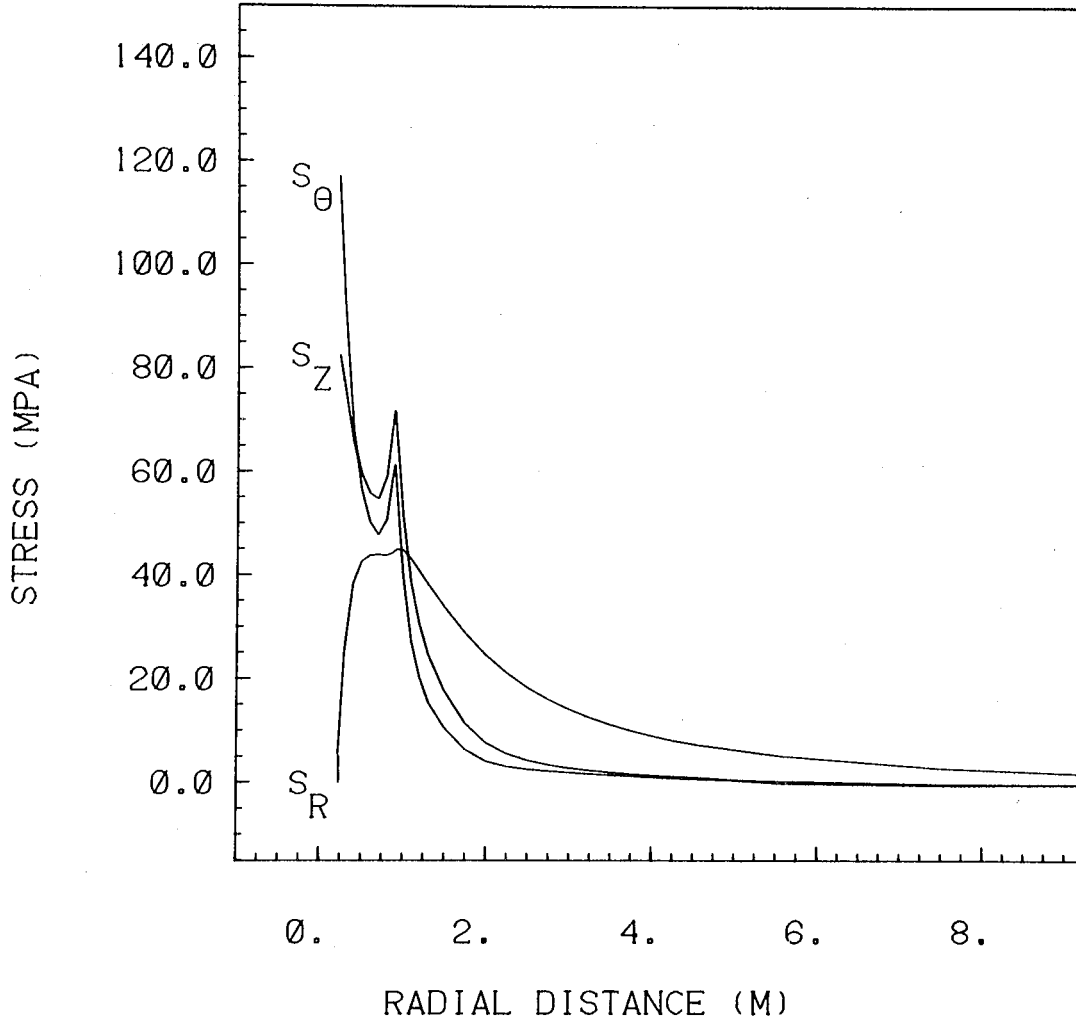
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
365 DAYS



XBL 787-9721

Figure D25f

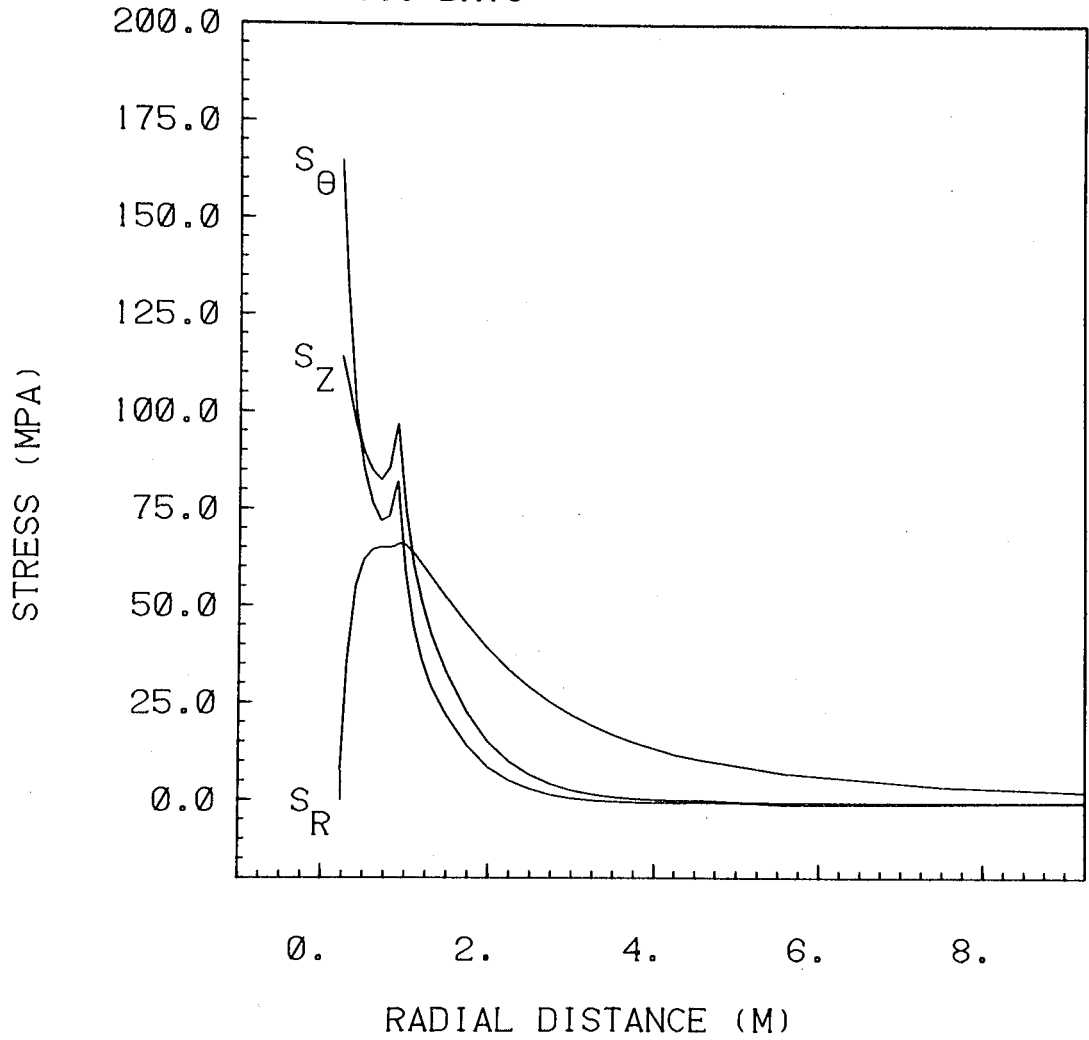
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
371 DAYS



XBL 787-9722

Figure D25g

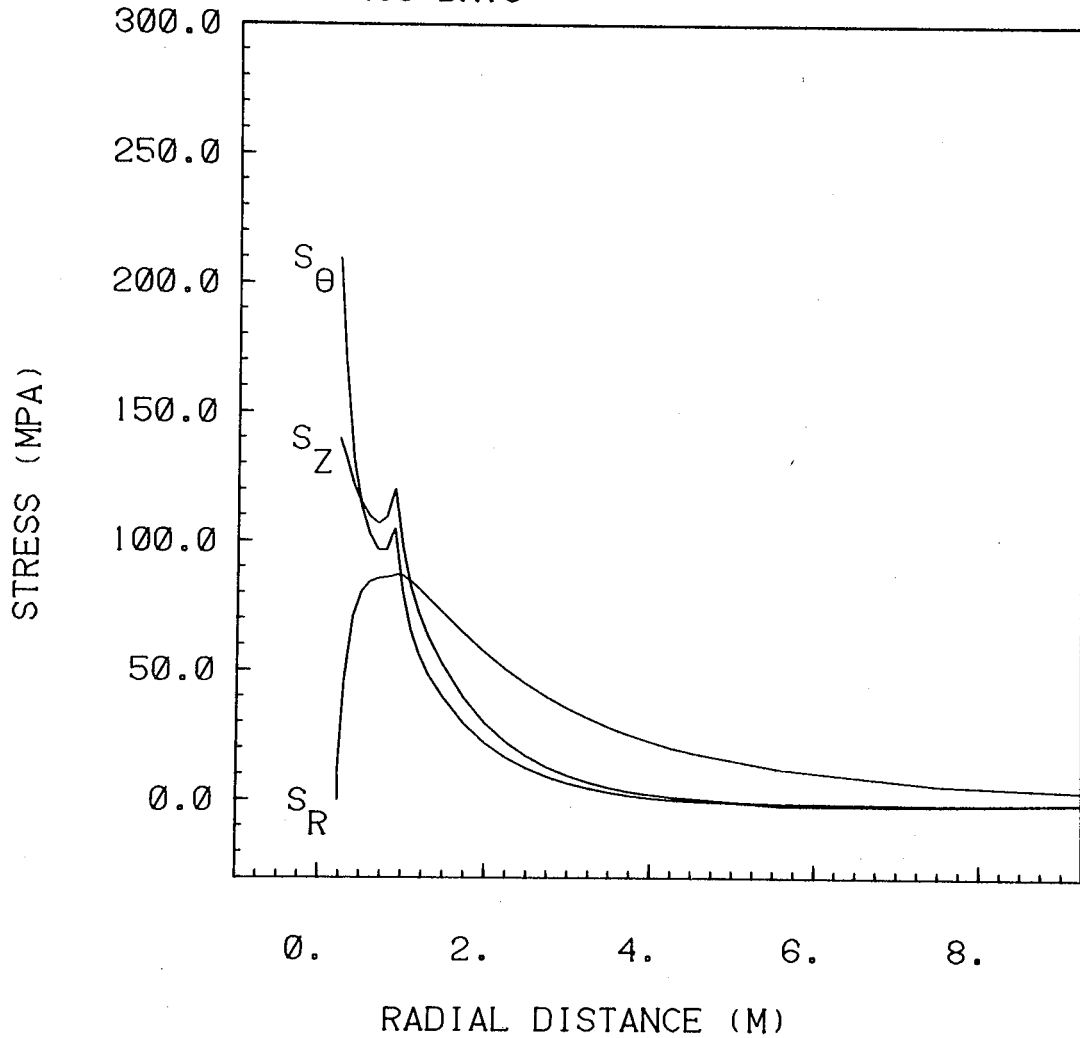
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
390 DAYS



XBL 787-9723

Figure D25h

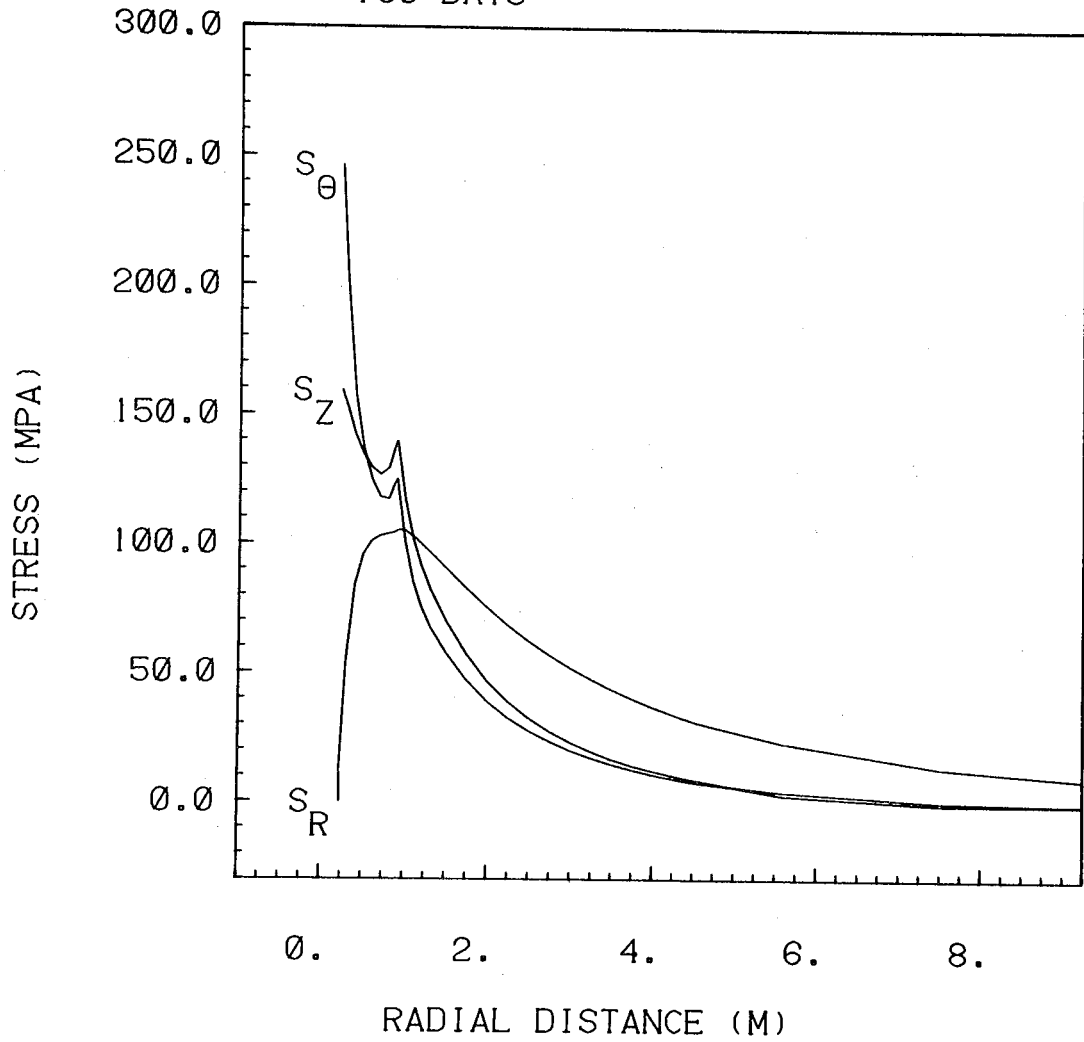
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
450 DAYS



XBL 787-9724

Figure D25i

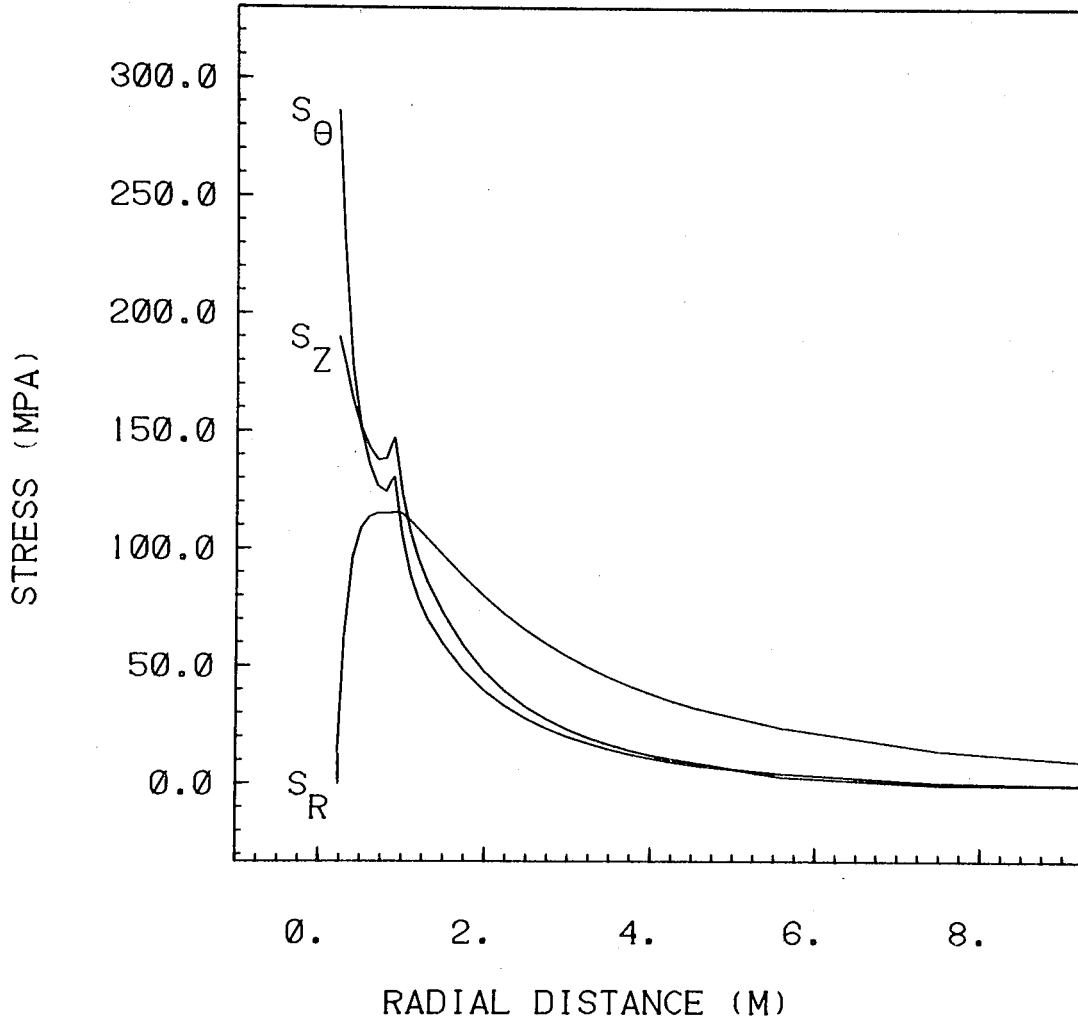
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
730 DAYS



XBL 787-9725

Figure D25j

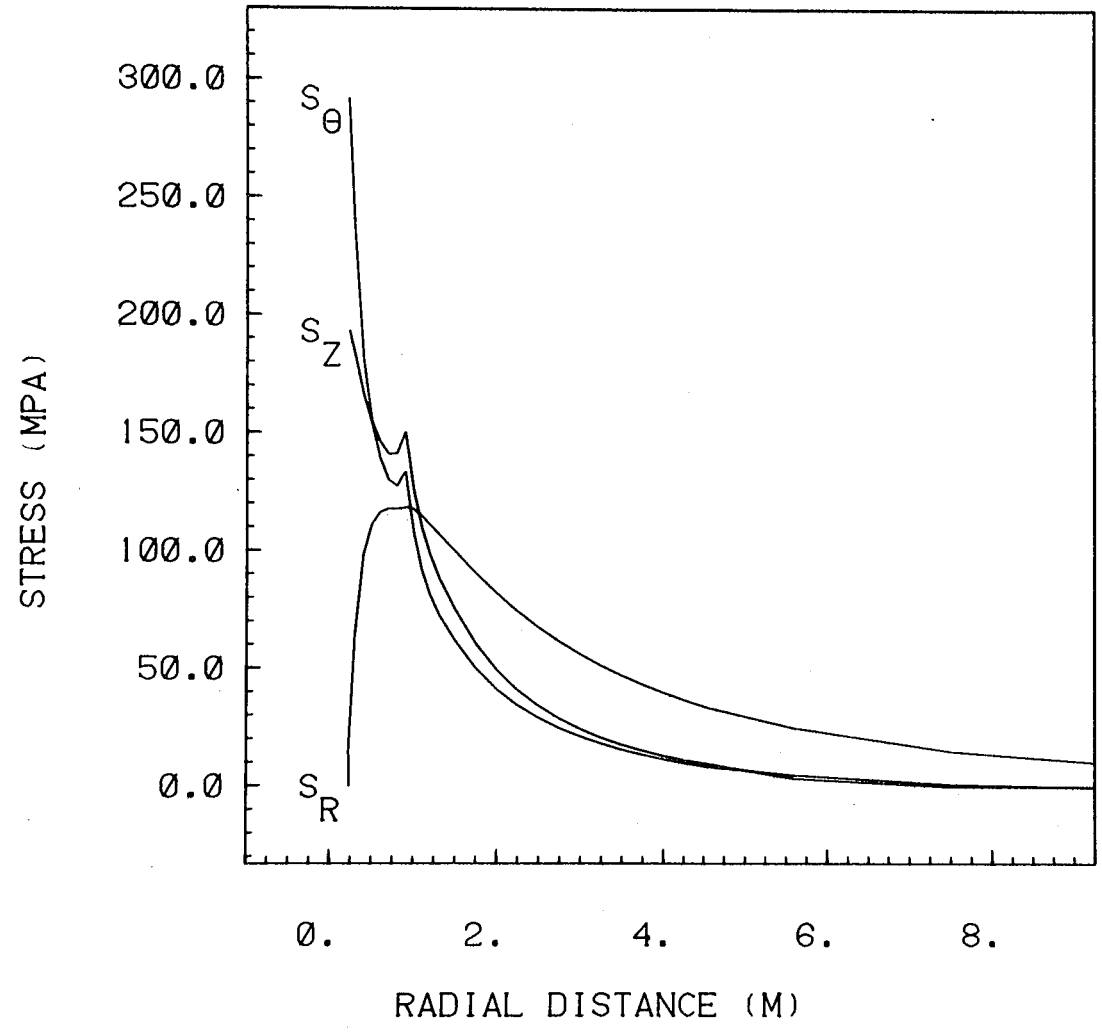
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
760 DAYS



XBL 787-9726

Figure D25k

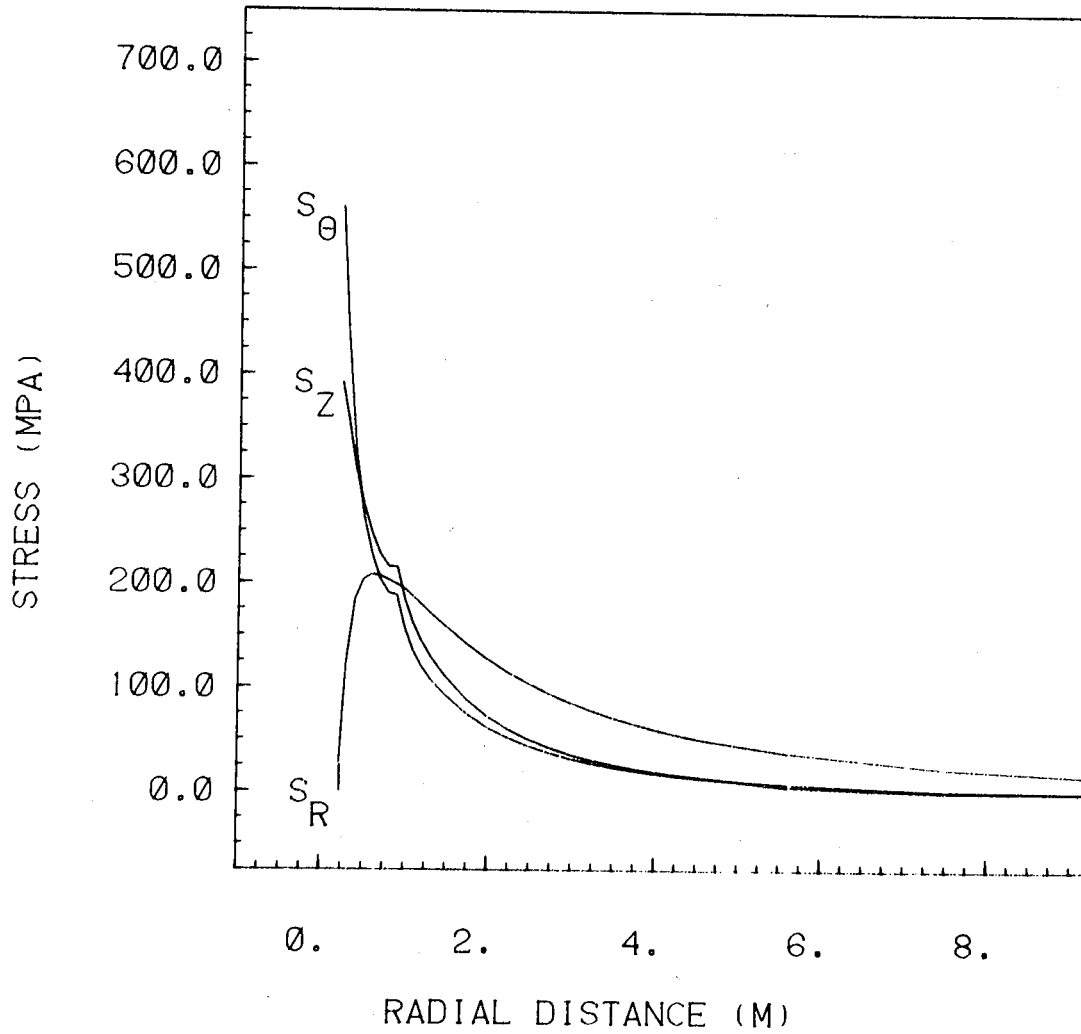
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
790 DAYS



XBL 787-9727

Figure D251

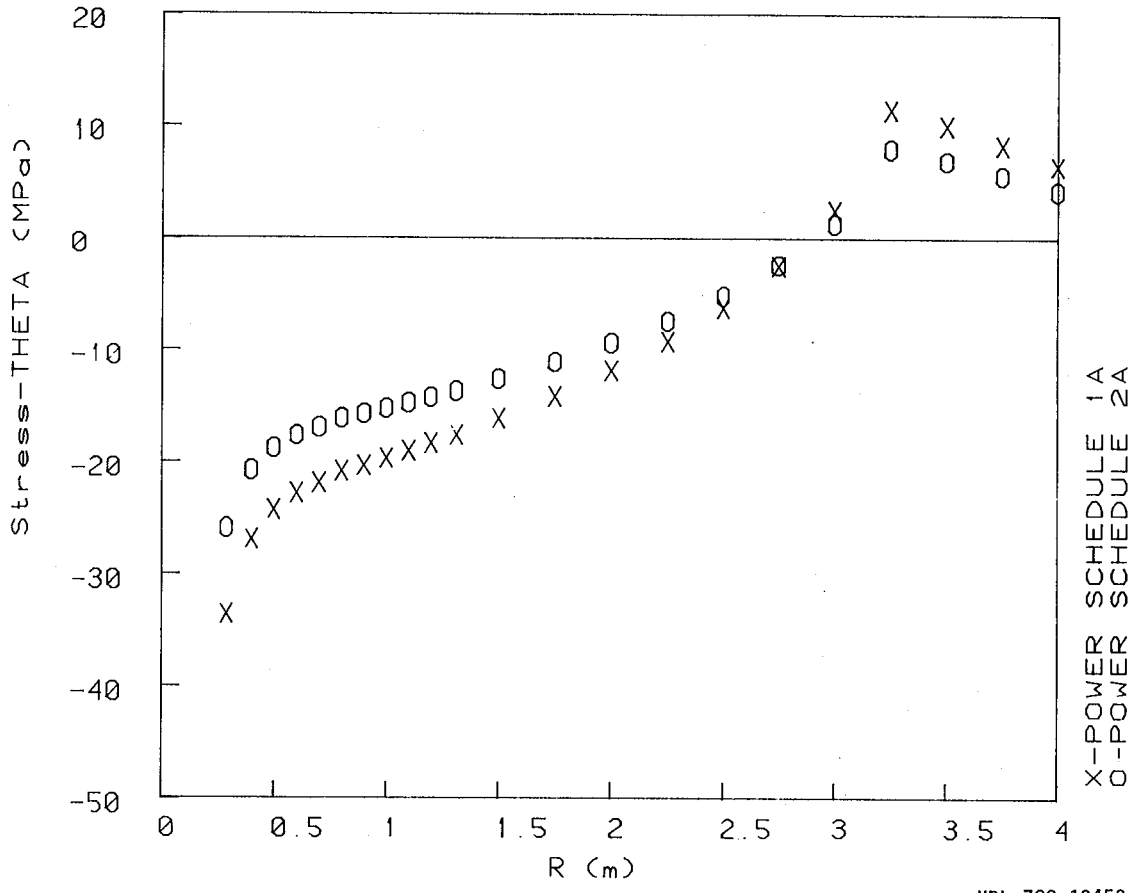
STRESS PROFILES FOR MESH 1
HANFORD FULL-SCALE EXPERIMENT
MAIN HEATER = 2 KW
PERIPHERAL HEATER = 1 KW
Z = 0.0 M, THETA = 0.0 DEG.
1095 DAYS



XBL 787-9728

Figure D25m

HANFORD FULL-SCALE EXPERIMENT
Stress-THETA along floor of drift, Z=3.875 m
Mesh 7, 730 days



XBL 788-10453

Figure D26a

HANFORD FULL-SCALE EXPERIMENT
Stress-THETA along floor of drift, Z=3.875m
Mesh 7, 1095 days

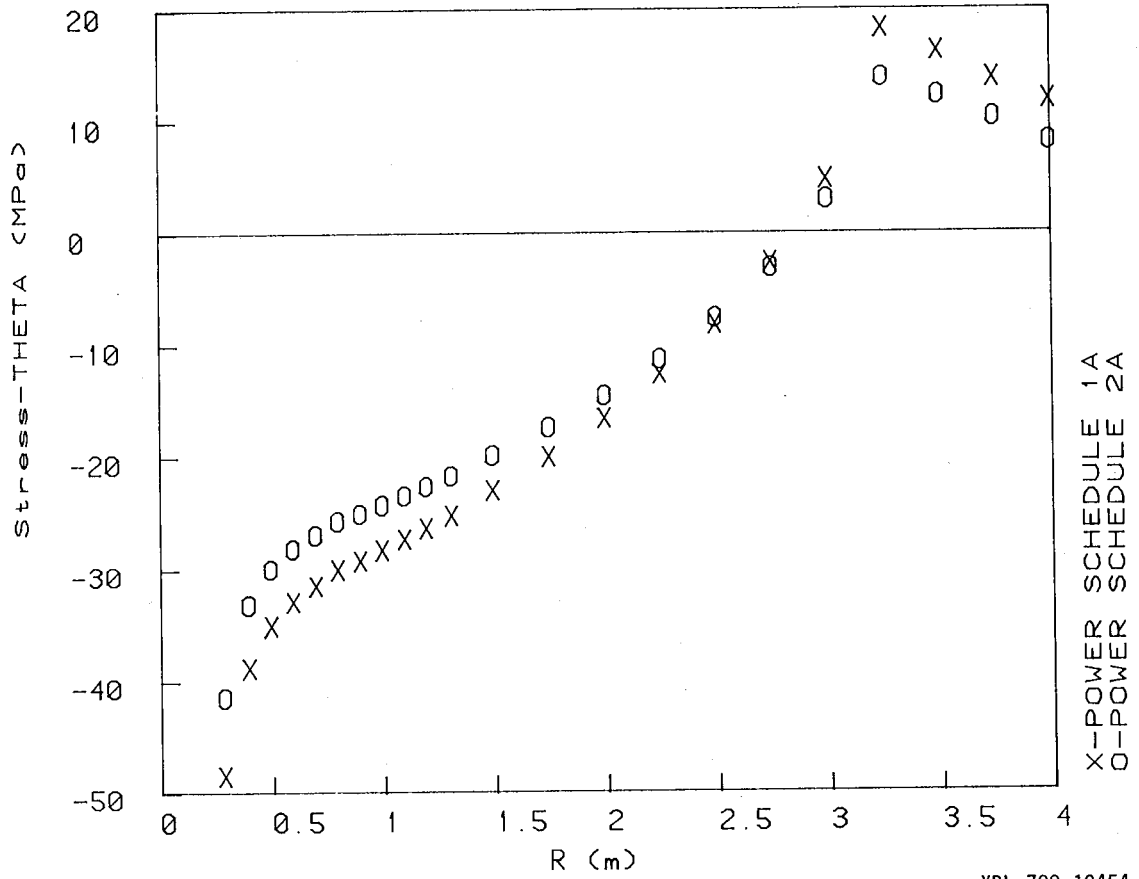
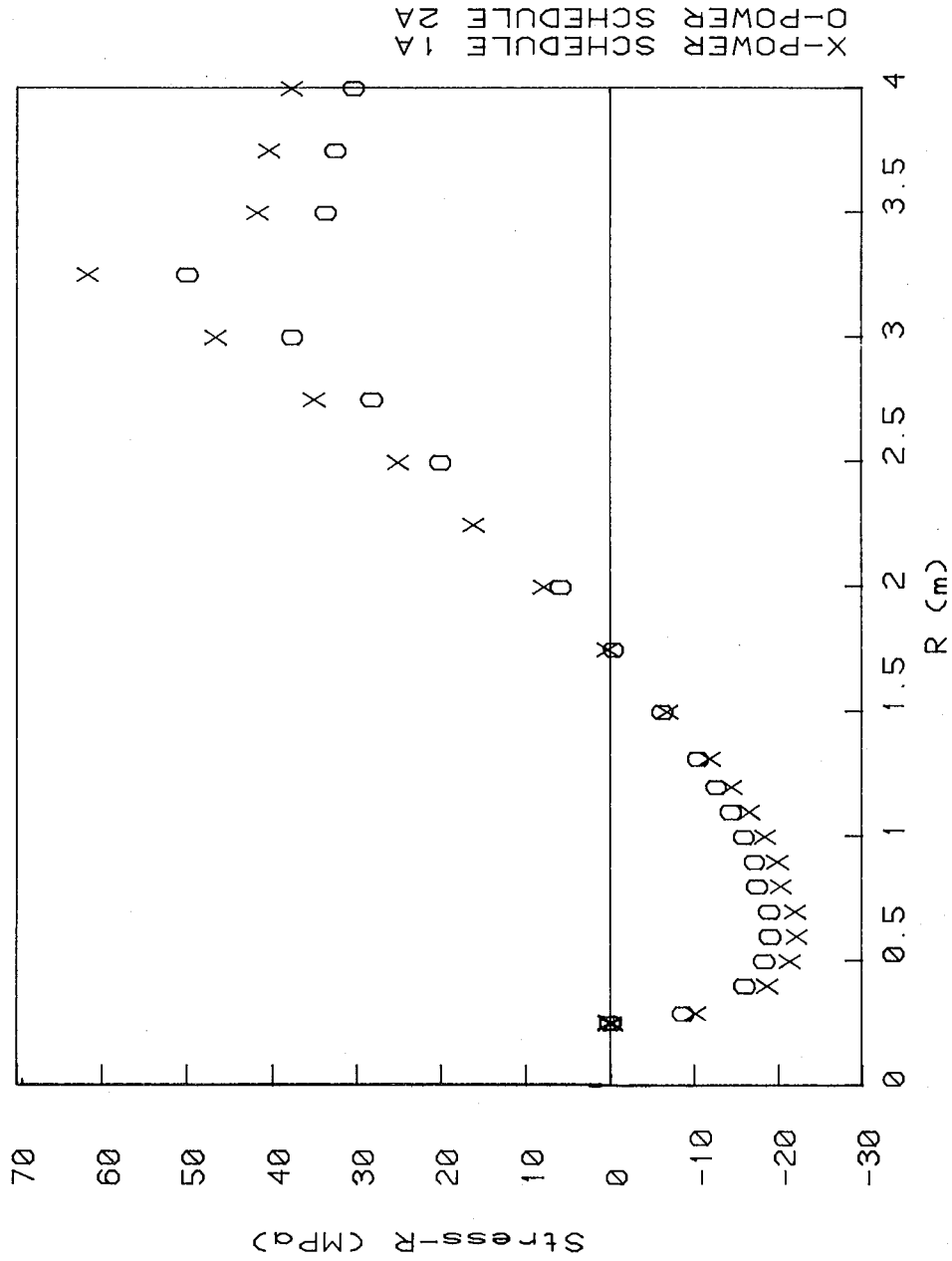


Figure D26b

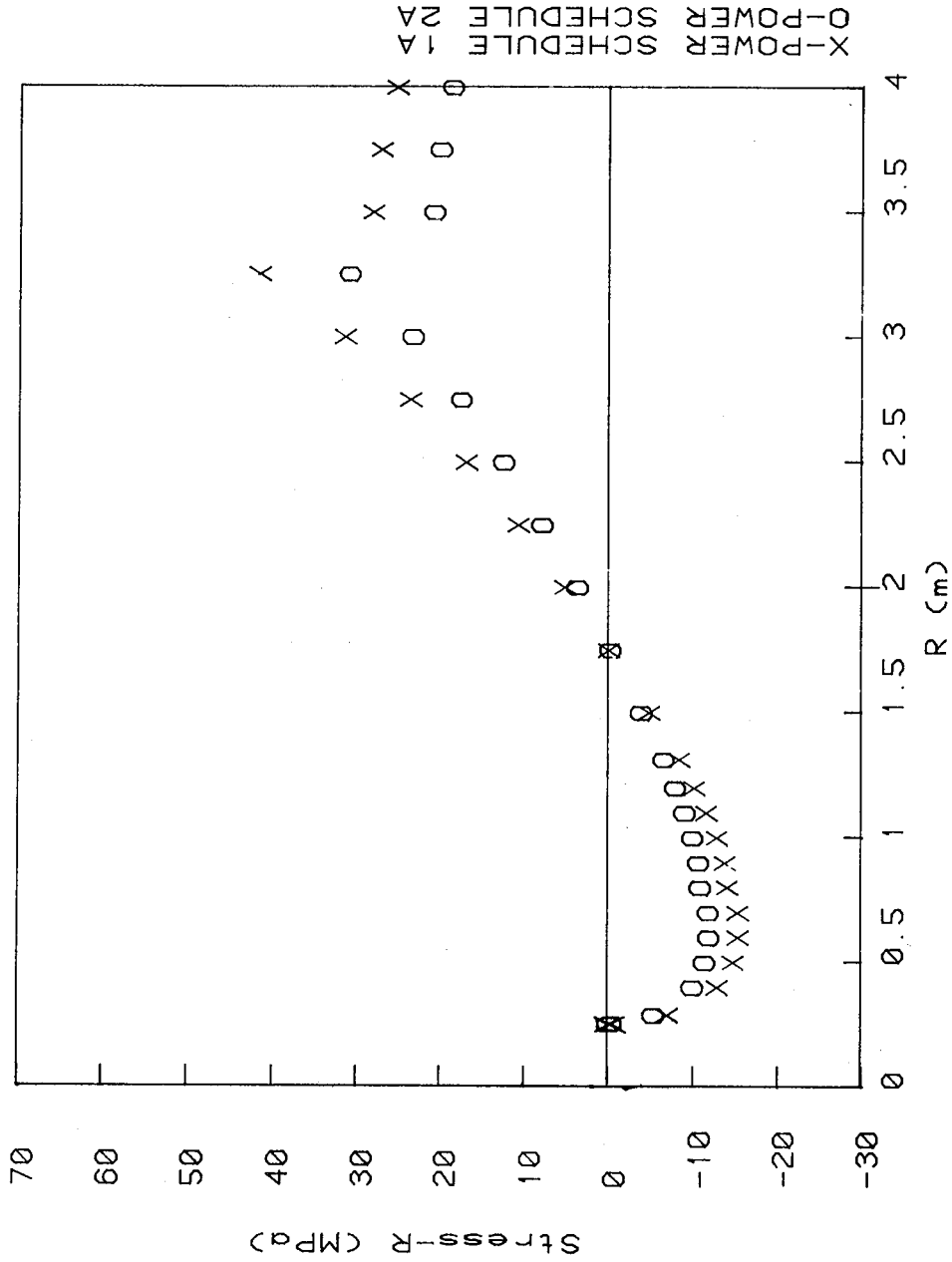
HANFORD FULL-SCALE EXPERIMENT
Stress-R along floor of heater drift, Z=3.875m
Mesh 7, 1095 days



XBL 7810-11829

Figure D27a

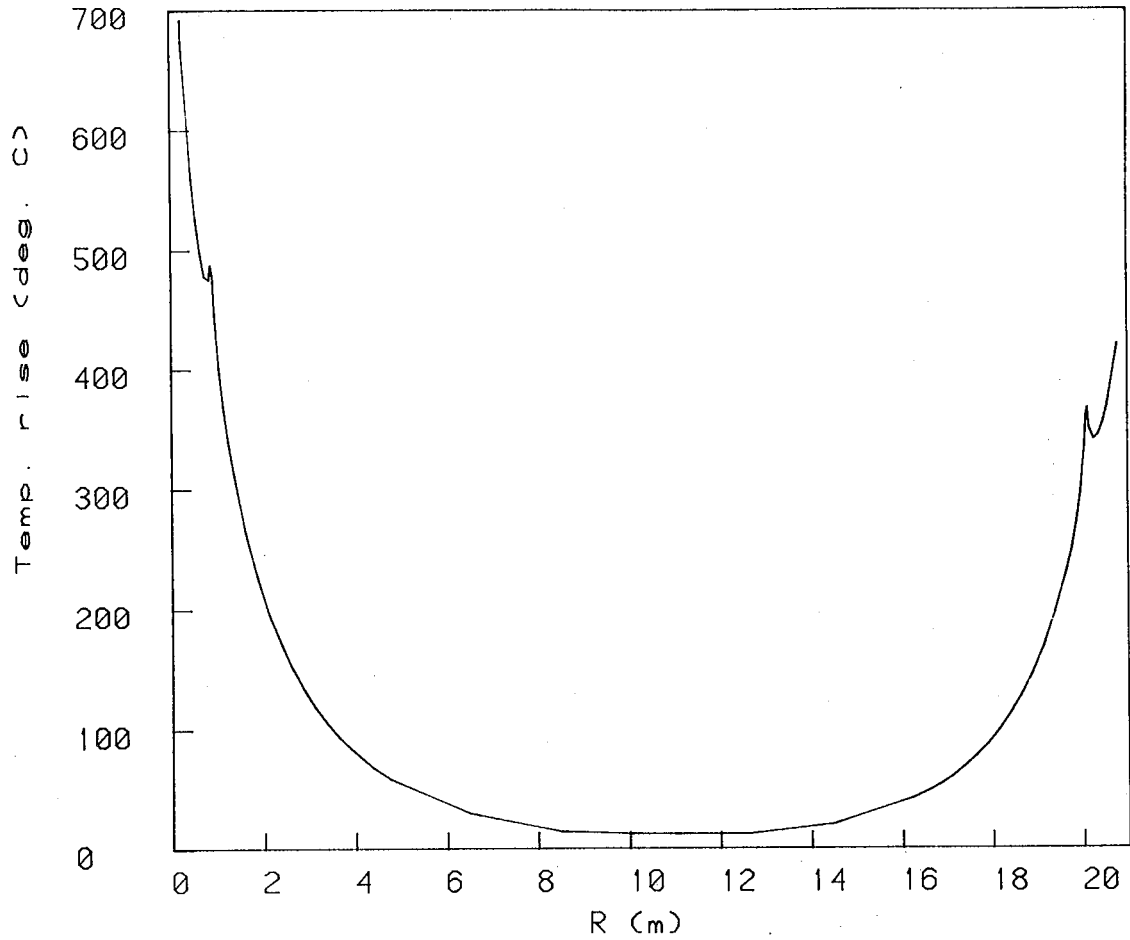
HANFORD FULL-SCALE EXPERIMENT
Stress-R along floor of heater drift, Z=3.875m
Mesh 7, 730 days



XBL 7810-11828

Figure D27b

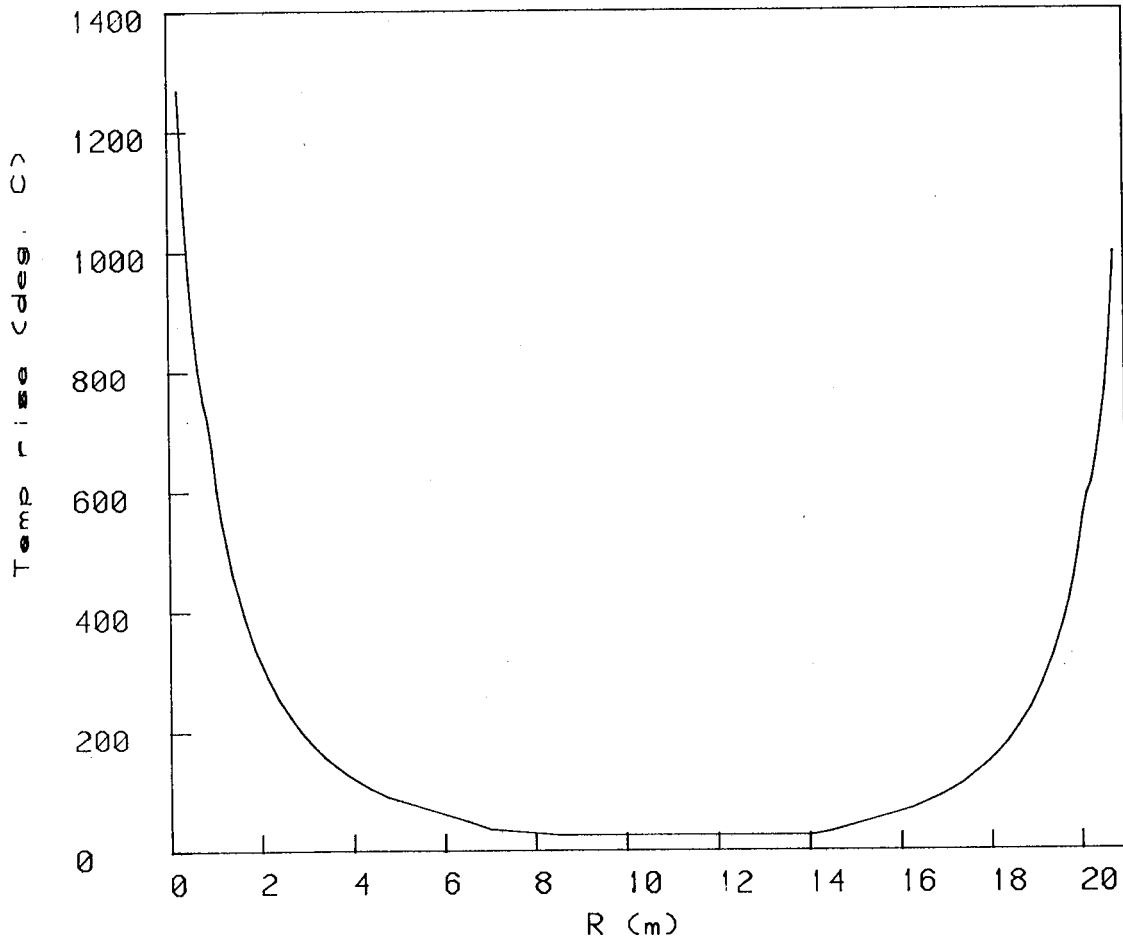
INTERFERENCE BETWEEN THE TWO FULL-SCALE EXPERIMENTS
Combined temperature profile at $Z=0$ m, $\text{THETA}=0$ deg.
Infinite Medium Model, 730 days



XBL 788-10457

Figure D28a

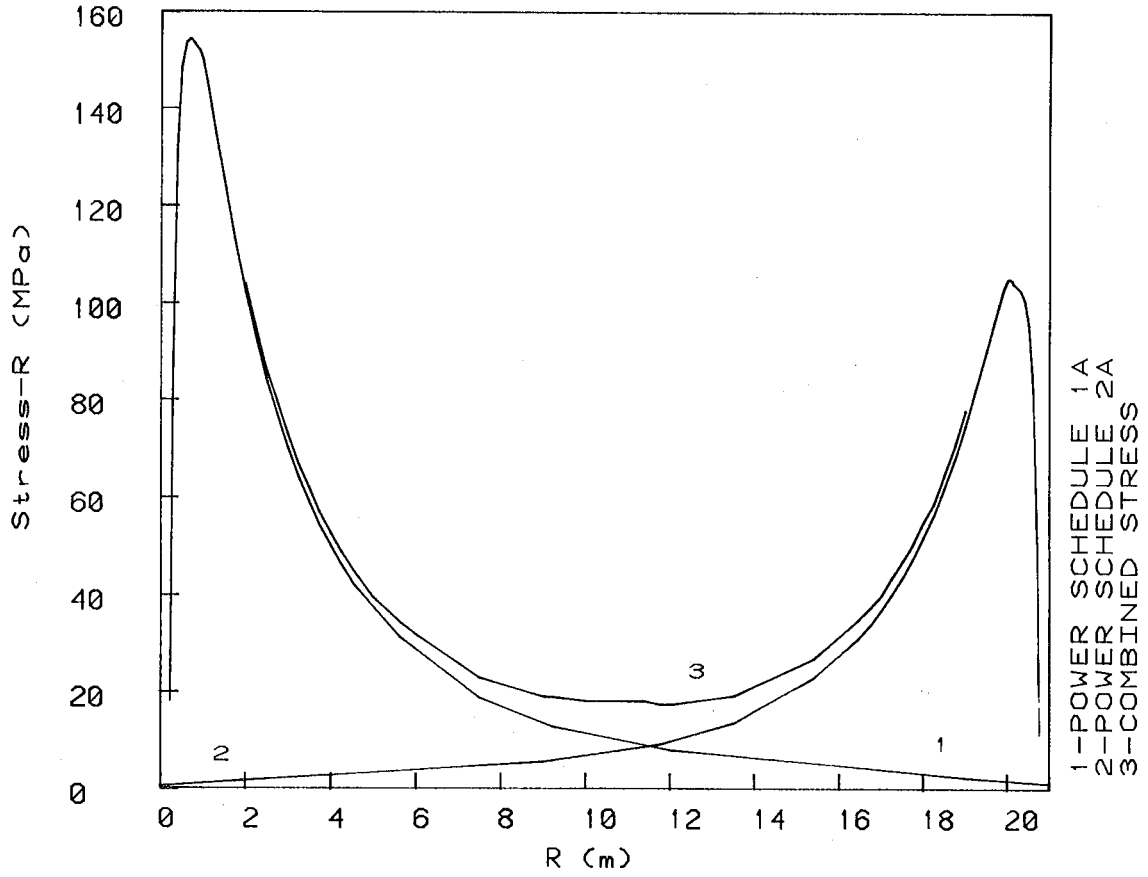
INTERFERENCE BETWEEN THE TWO FULL-SCALE EXPERIMENTS
Combined temperature profile at $Z=0$ m, $\text{THETA}=0$ deg.
Infinite Medium Model, 1095 days



XBL 788-10458

Figure D28b

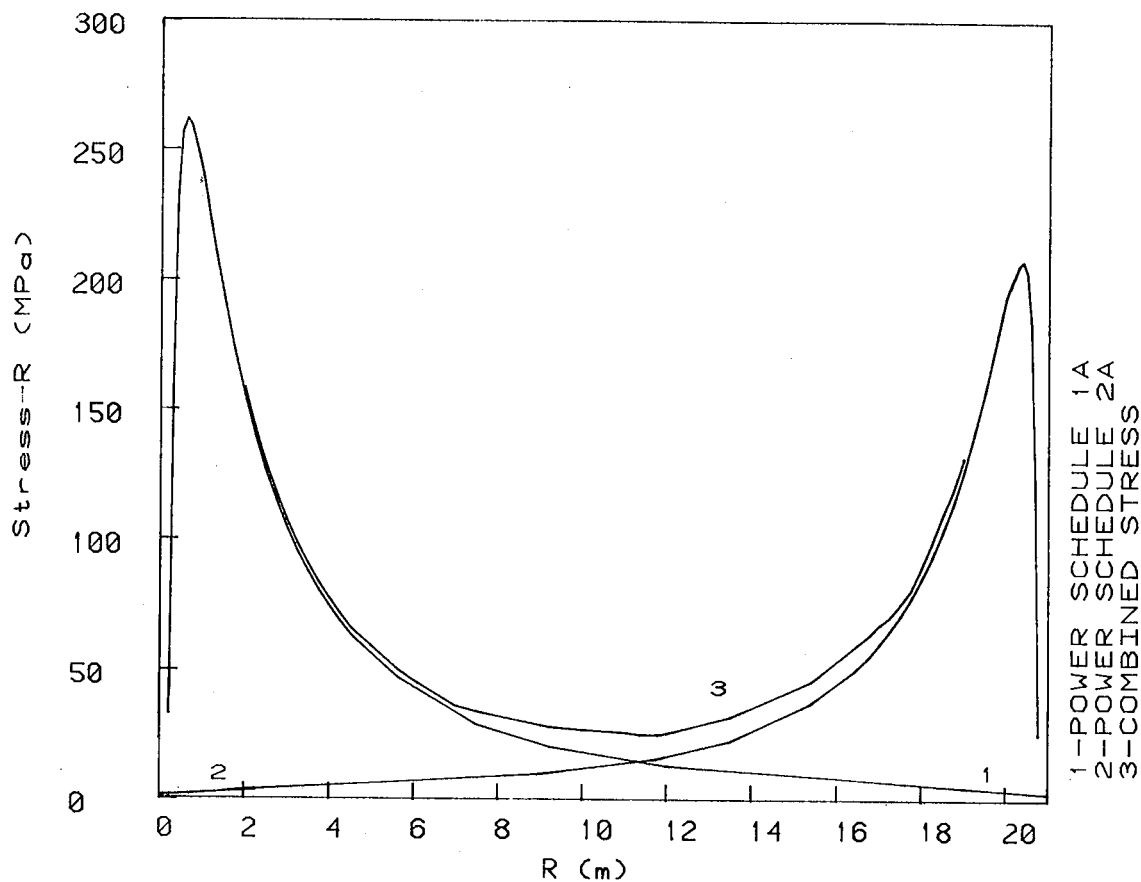
INTERFERENCE BETWEEN TWO FULL-SCALE EXPERIMENTS
Stress-R profiles at Z=0.0m, THETA=0 deg.
Mesh 1, 730 days



XBL 788-10461

Figure D29a

INTERFERENCE BETWEEN TWO FULL-SCALE EXPERIMENTS
Stress-R profiles at Z=0.0m, THETA=0 deg.
Mesh 1, 1095 days



XBL 788-10462

Figure D29b

INTERFERENCE BETWEEN TWO FULL-SCALE EXPERIMENTS
Displacement (U_r) profiles at $Z=0.0m$, $\theta=0$ deg.
Mesh 1, 730 days

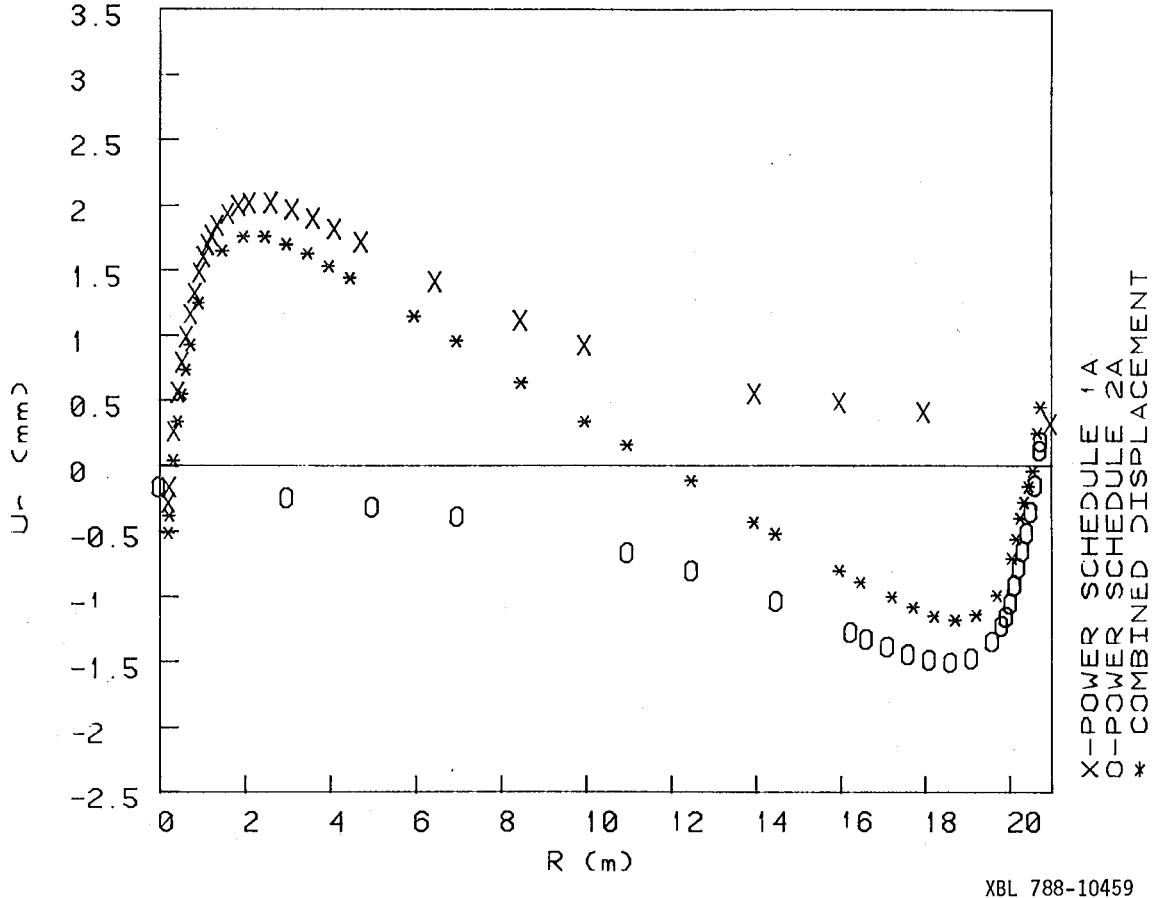


Figure D30a

INTERFERENCE BETWEEN TWO FULL-SCALE EXPERIMENTS
Displacement (U_r) profiles at $Z=0m$, $\theta=0$ deg.
Mesh 1, 1095 days

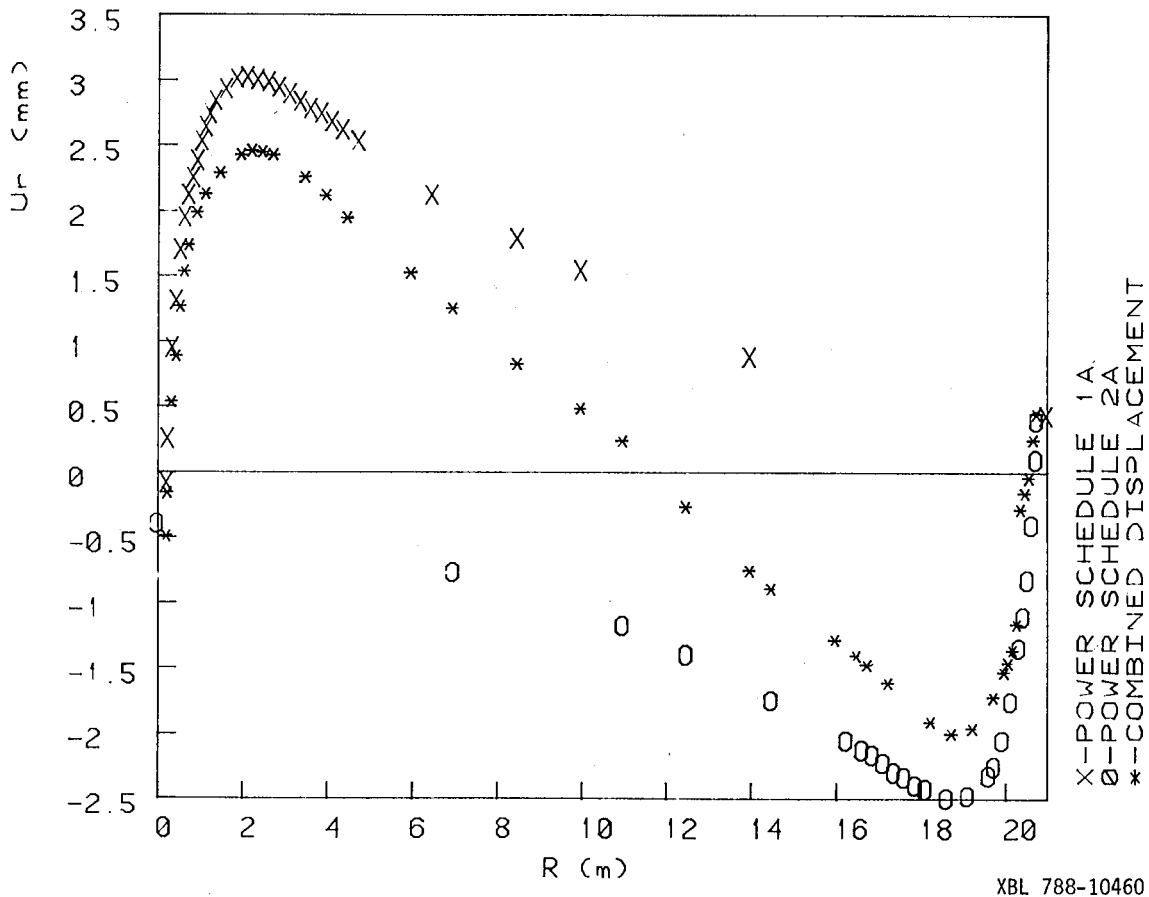
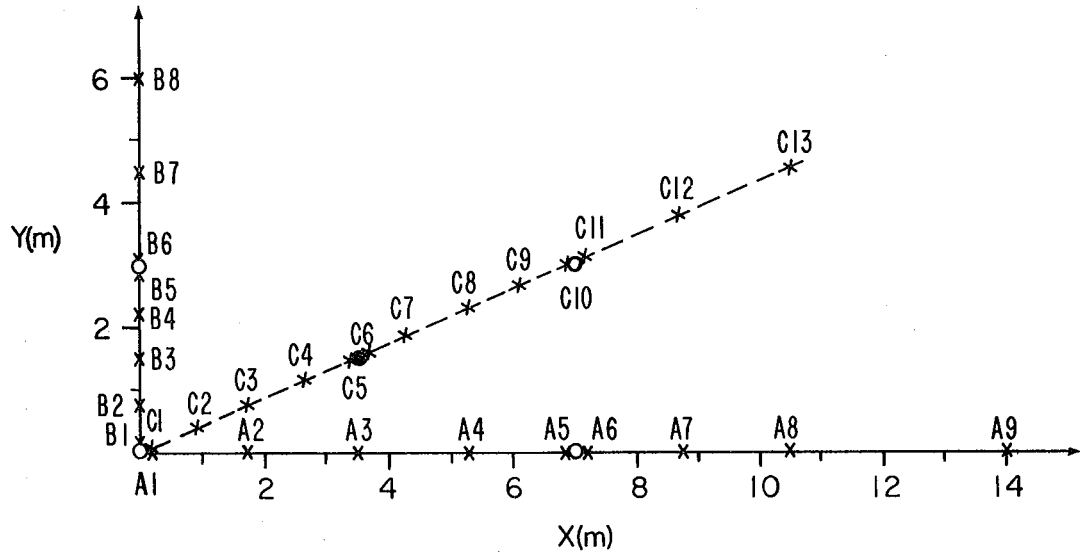


Figure D30b

QUARTER PLANE SHOWING LOCATIONS AT WHICH TEMPERATURE PROFILES WERE MADE

Hanford time-scaled experiment



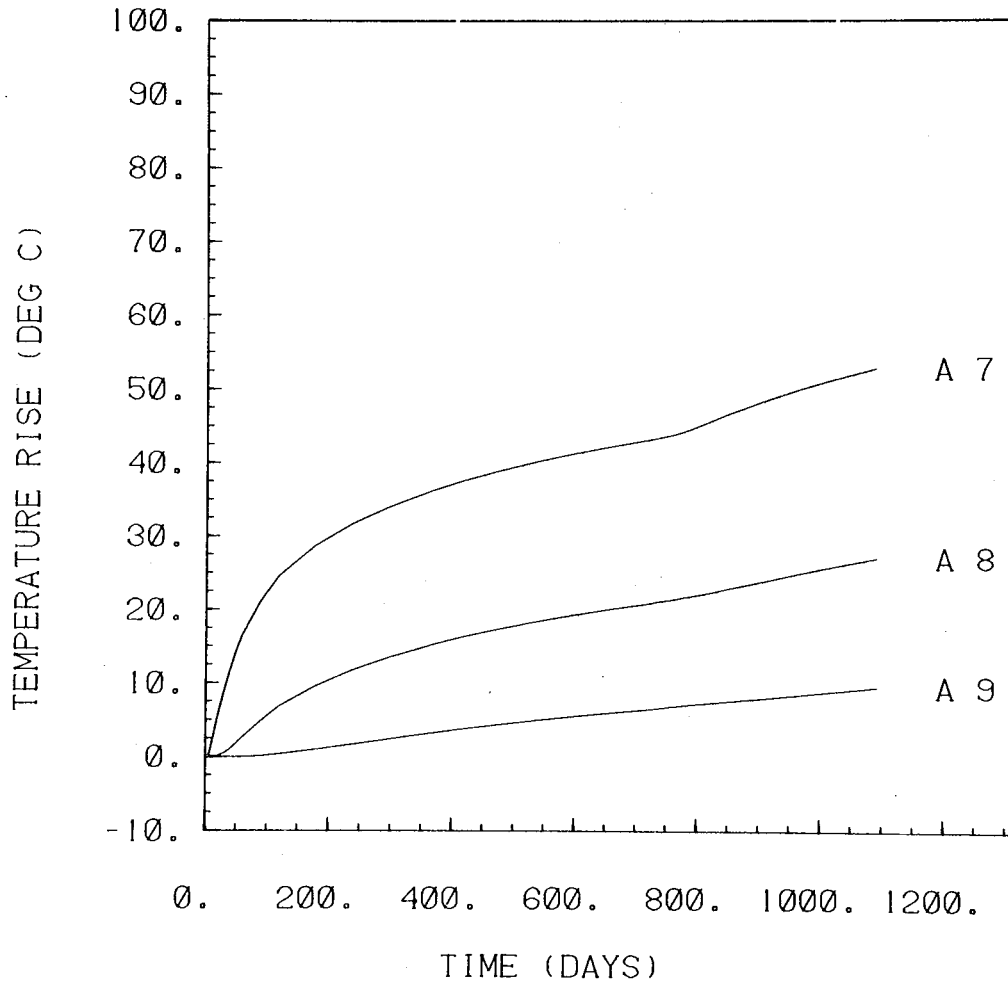
- PRIMARY HEATERS, ENERGIZED AT THE START OF EXPERIMENT.
- SECONDARY HEATERS, ENERGIZED TWO YEARS AFTER THE START OF EXPERIMENT.
(Heaters not drawn to scale).

XBL 788-2014

Figure D31a

HANFORD TIME-SCALE EXPERIMENT
POWER SCHEDULE 3

LABEL	X	Y	Z
A 9	14.0000	0.0000	0.0000
A 8	10.5000	0.0000	0.0000
A 7	8.7500	0.0000	0.0000

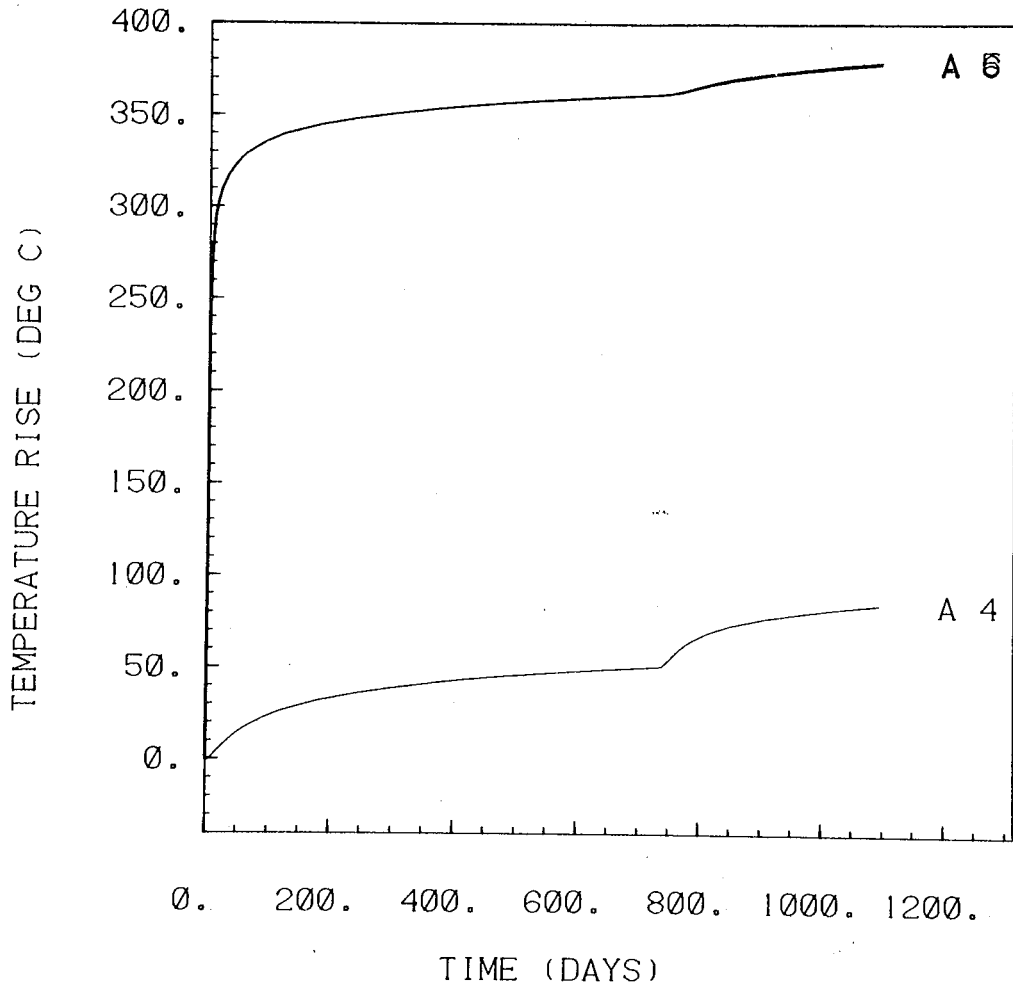


XBL 788-10464

Figure D31b

HANFORD TIME-SCALE EXPERIMENT
POWER SCHEDULE 3

LABEL	X	Y	Z
A 6	7.0640	0.0000	0.0000
A 5	6.9370	0.0000	0.0000
A 4	5.2500	0.0000	0.0000

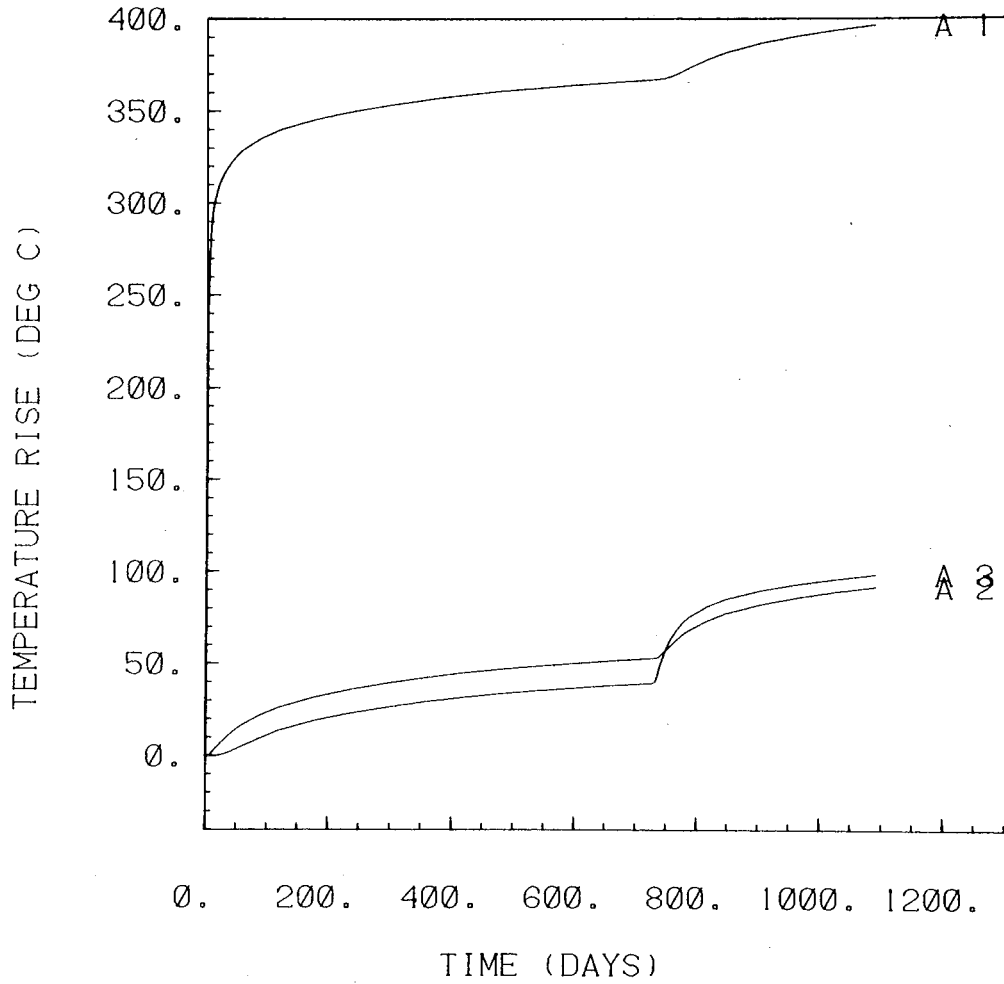


XBL 788-10463

Figure D31c

HANFORD TIME-SCALE EXPERIMENT
POWER SCHEDULE 3

LABEL	X	Y	Z
A 3	3.5000	0.0000	0.0000
A 2	1.7500	0.0000	0.0000
A 1	0.0640	0.0000	0.0000

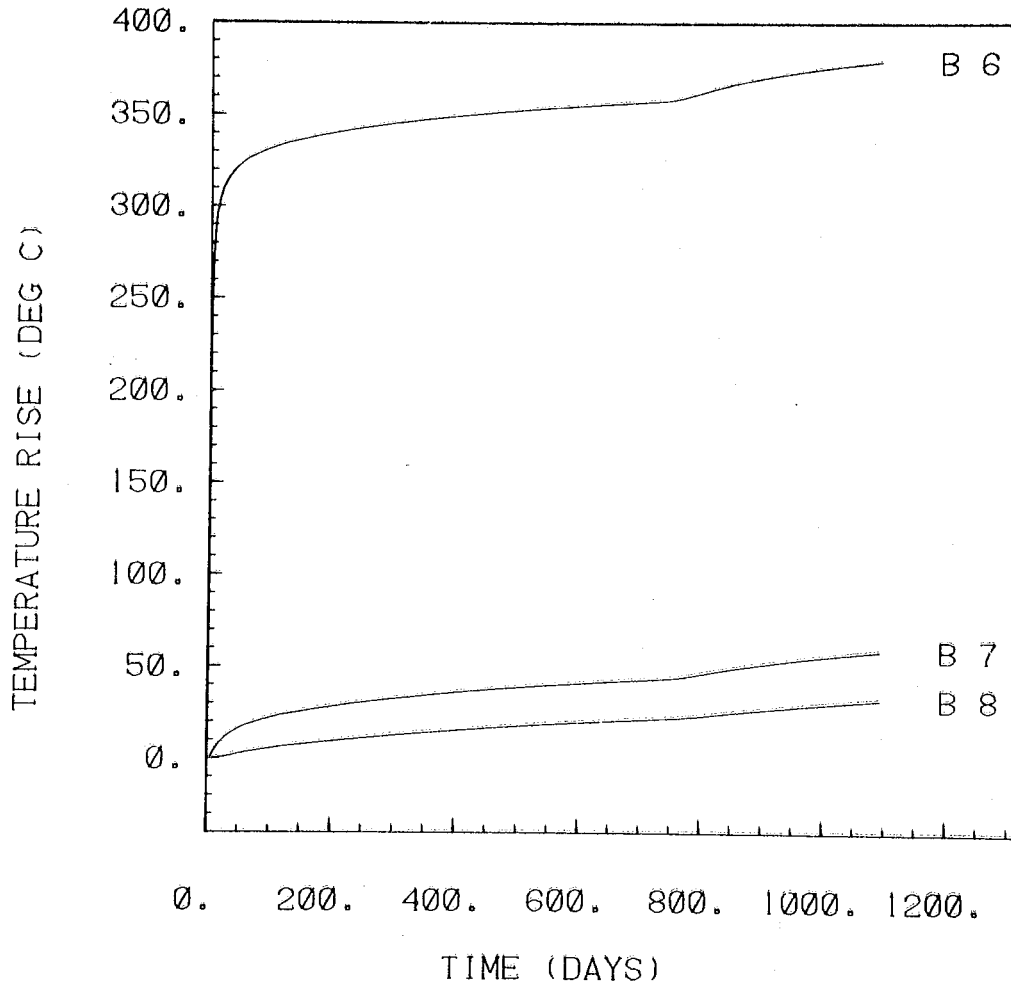


XBL 788-10471

Figure D31d

HANFORD TIME-SCALE EXPERIMENT
POWER SCHEDULE 3

LABEL	X	Y	Z
B 8	0.0000	6.0000	0.0000
B 7	0.0000	4.5000	0.0000
B 6	0.0000	3.0640	0.0000

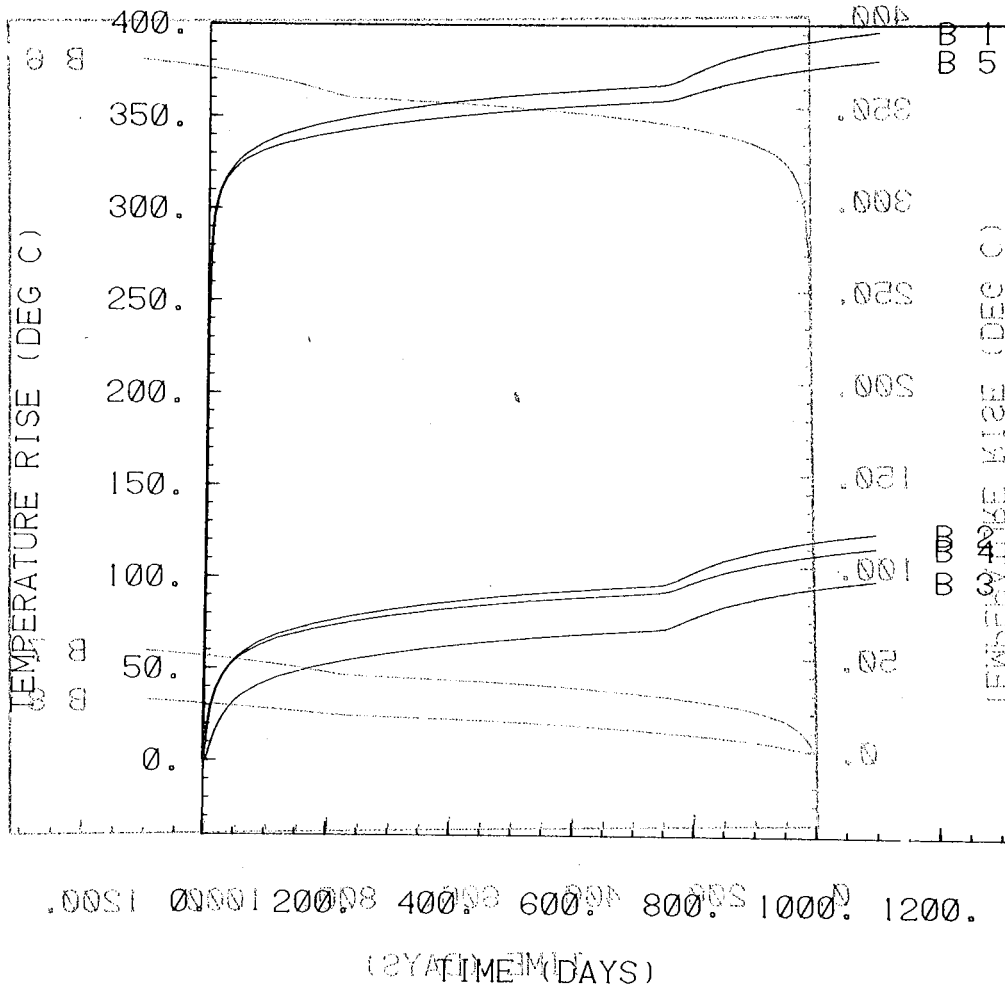


XBL 788-10466

Figure D31e

STANFORD TIME SCALE EXPERIMENT
POWER SCHEDULES

	S LABEL	X	Y	Z
0000.0	B 5	0.0000	2.9870	0.0000
0000.0	B 4	0.0000	2.2500	0.0000
0000.0	B 3	0.0000	1.5000	0.0000
	B 2	0.0000	0.7500	0.0000
	B 1	0.0000	0.0640	0.0000



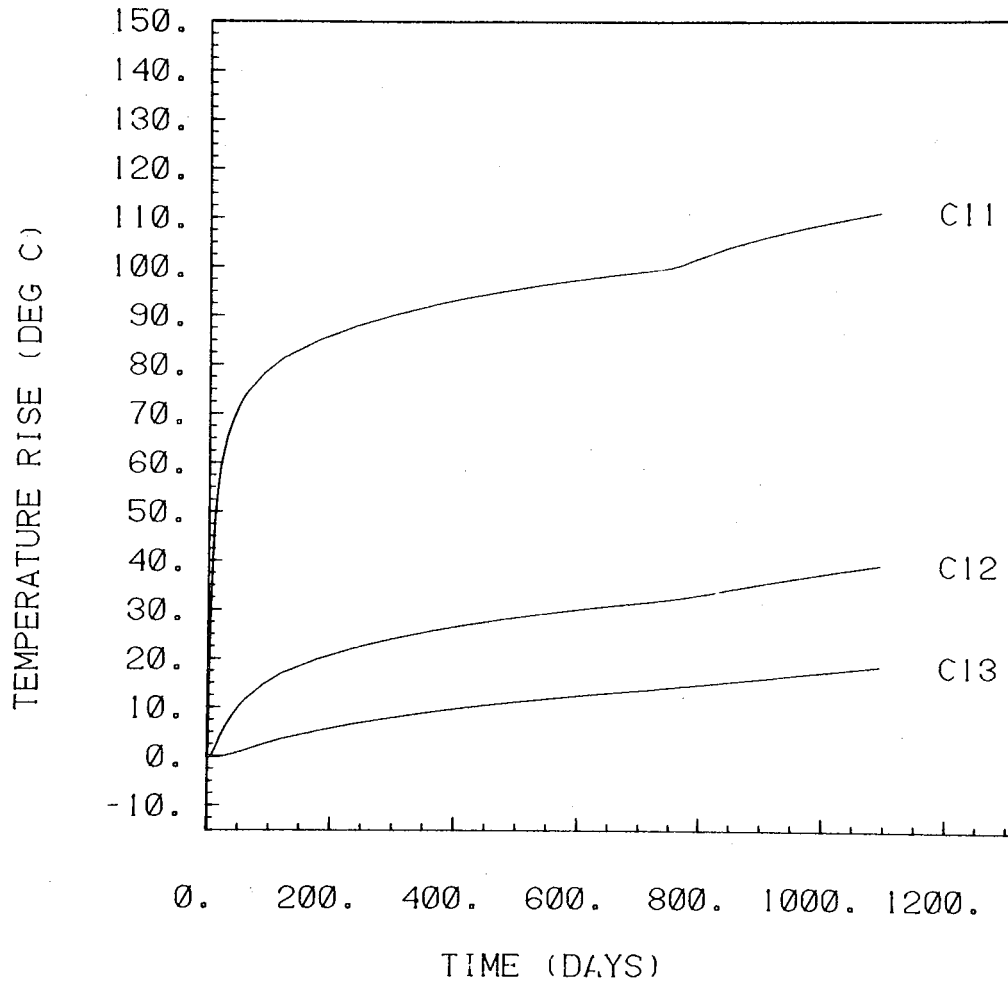
XBL 788-10473

XBL 788-10473

Figure D31f

HANFORD TIME-SCALE EXPERIMENT
POWER SCHEDULE 3

LABEL	X	Y	Z
C13	10.5000	4.5000	0.0000
C12	8.7500	3.7500	0.0000
C11	7.0450	3.5450	0.0000

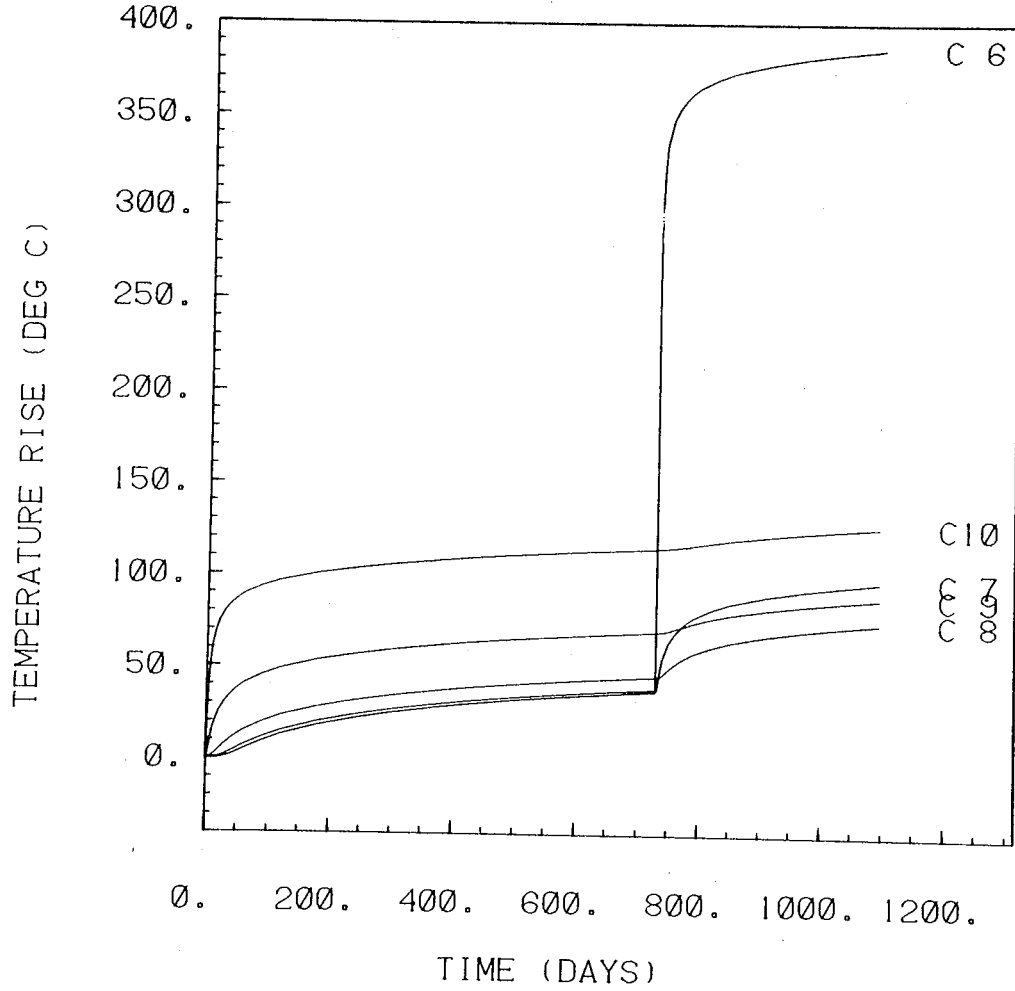


XBL 788-10465

Figure D31g

HANFORD TIME-SCALE EXPERIMENT
POWER SCHEDULE 3

LABEL	X	Y	Z
C 10	6.9550	3.4550	0.0000
C 9	6.1250	2.6250	0.0000
C 8	5.2500	2.2500	0.0000
C 7	4.3750	1.8750	0.0000
C 6	3.5450	1.5450	0.0000

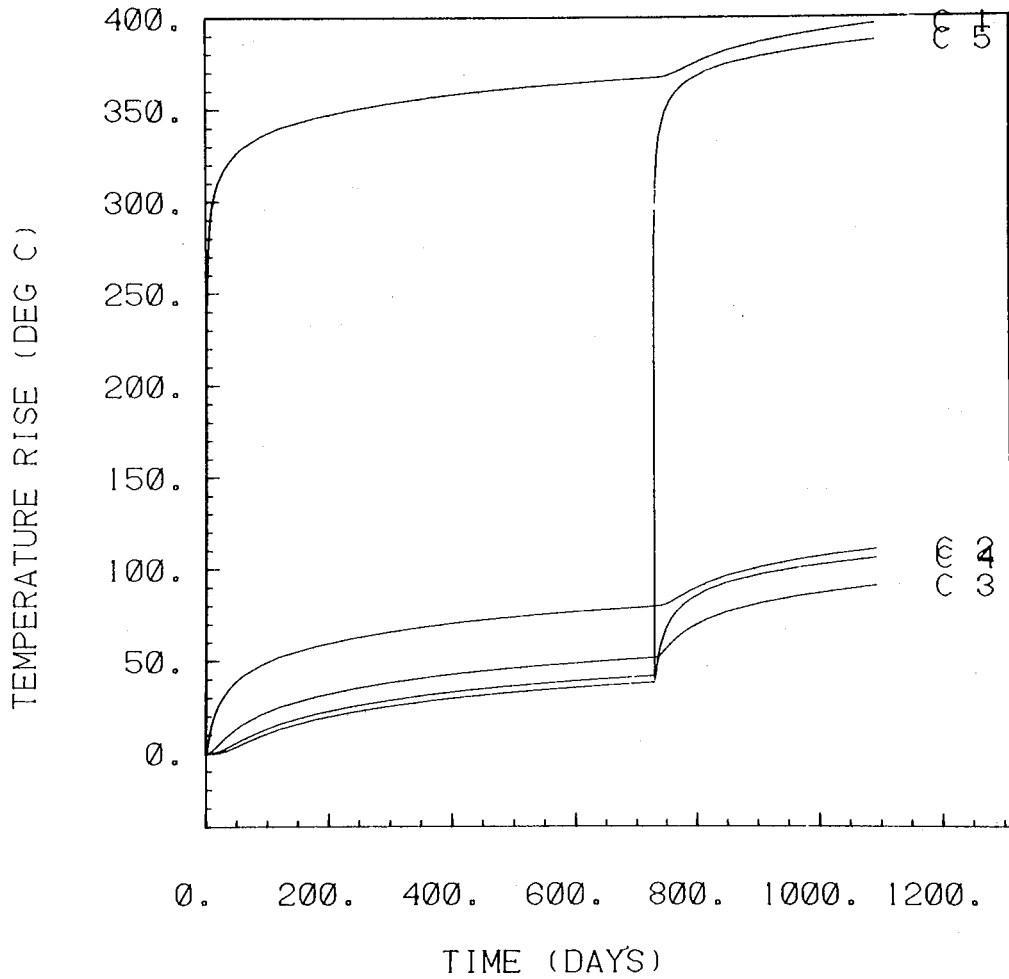


XBL 788-10474

Figure D31h

HANFORD TIME-SCALE EXPERIMENT
POWER SCHEDULE 3

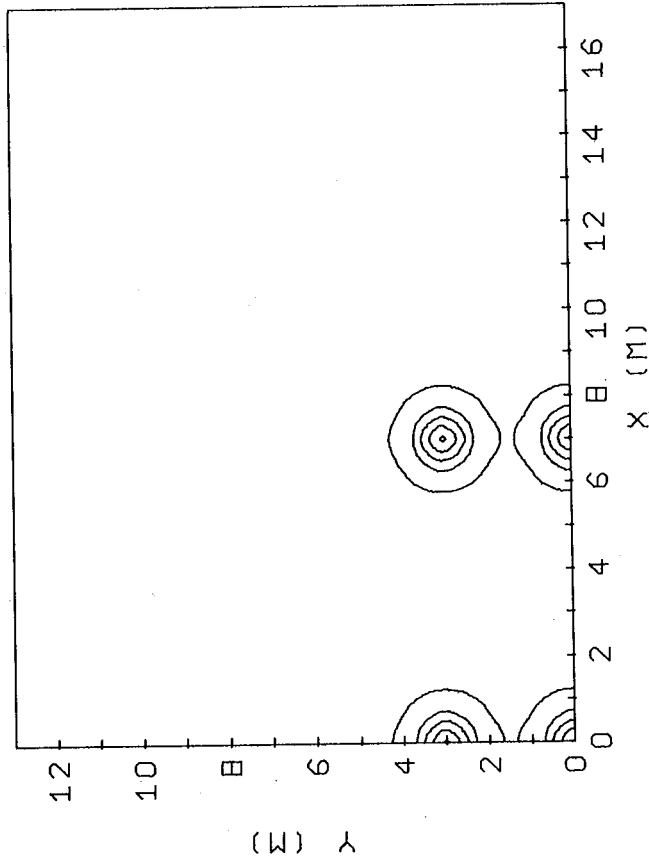
LABEL	X	Y	Z
C 5	3.4550	1.4550	0.0000
C 4	2.6250	1.1250	0.0000
C 3	1.7500	0.7500	0.0000
C 2	0.8750	0.3750	0.0000
C 1	0.0450	0.0450	0.0000



XBL 788-10472

Figure D31i

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 7. DAYS

Z = 0.00 M

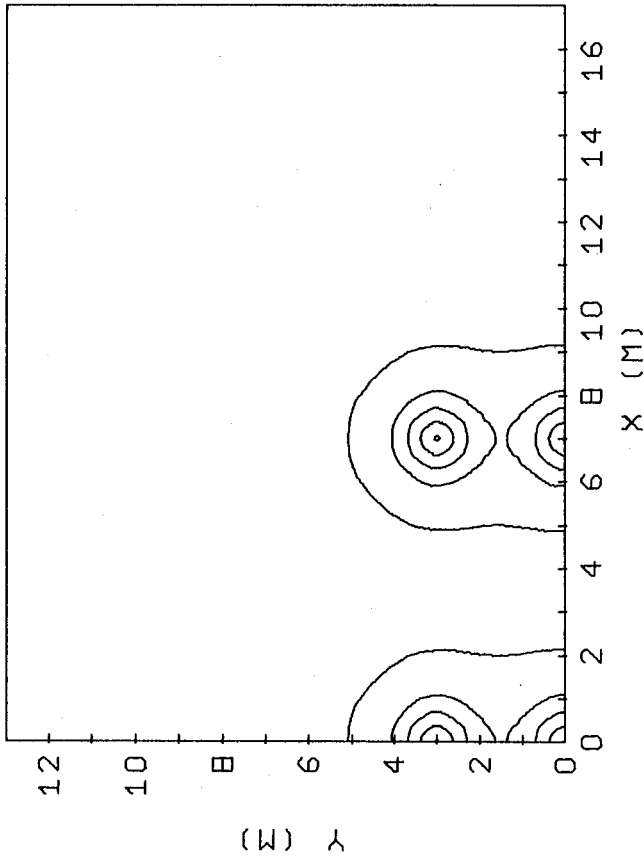
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
300.100.50.25. 5.

XBL 786-9308

Figure D32a

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 30. DAYS

Z = 0.00 M

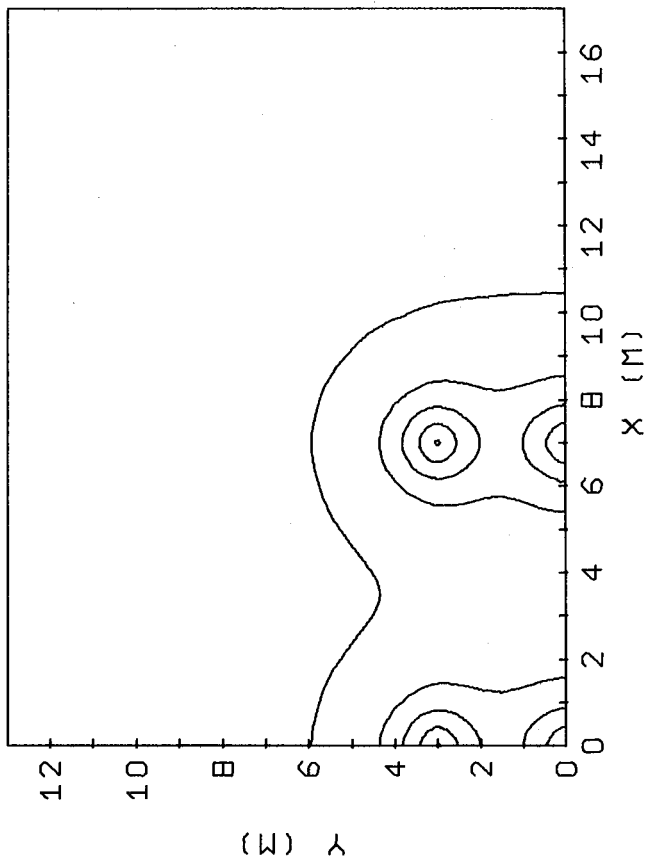
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
325.100. 50. 25. 5.

XBL 786-9309

Figure D32b

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 90. DAYS

Z = 0.00 M

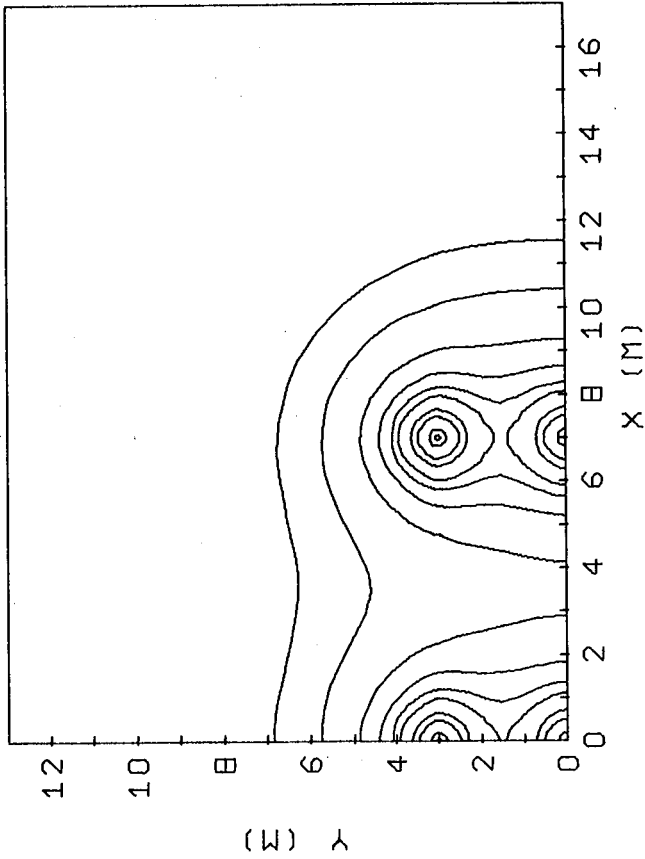
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
350.100. 50. 25. 5.

XBL 786-9307

Figure D32c

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 180. DAYS

Z = 0.00 M

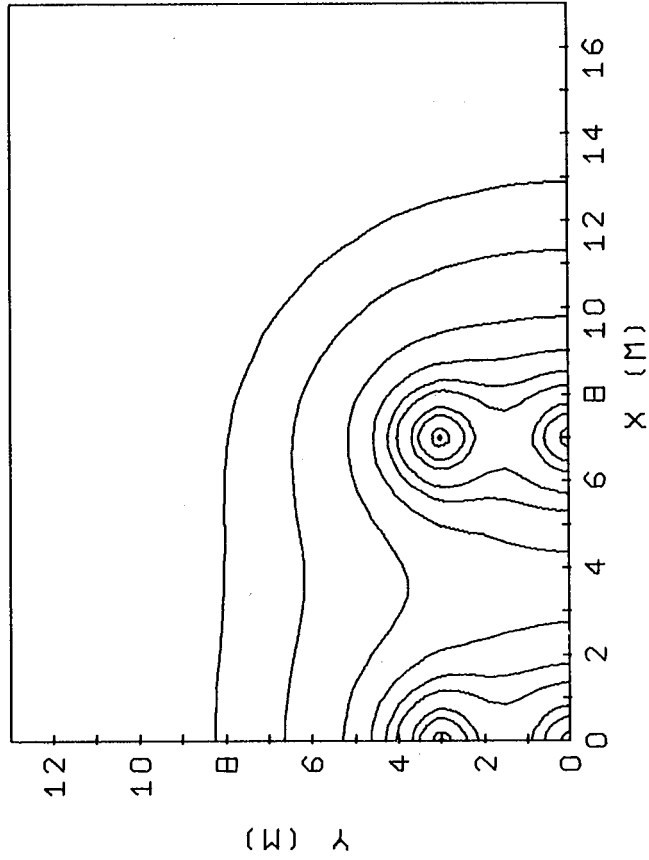
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
350.200.100.75.50.
40.30.20.10.5.

XBL 786-9302

Figure D32d

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 365. DAYS

Z = 0.00 M

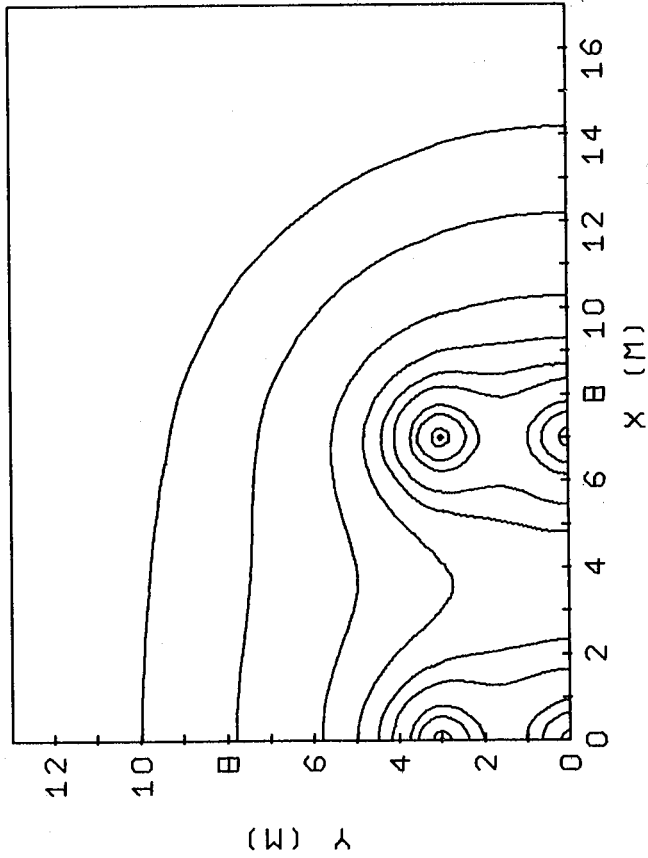
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
375.200.100. 75. 50.
40. 30. 20. 10. 5.

XBL 786-9306

Figure D32e

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 730. DAYS

Z = 0.00 M

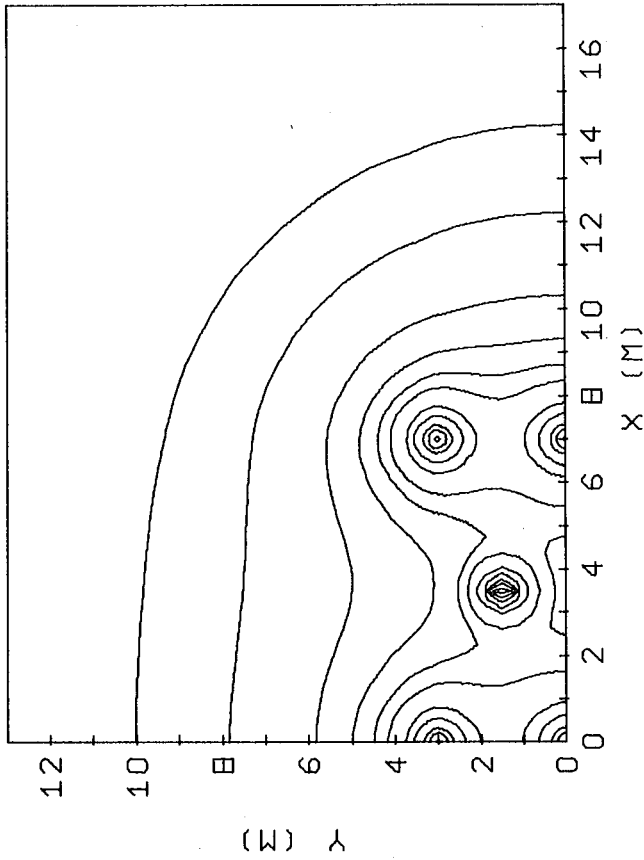
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
375.200.100.75.50.
40.30.20.10.5.

XBL 786-9304

Figure D32f

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 737. DAYS

Z = 0.00 M

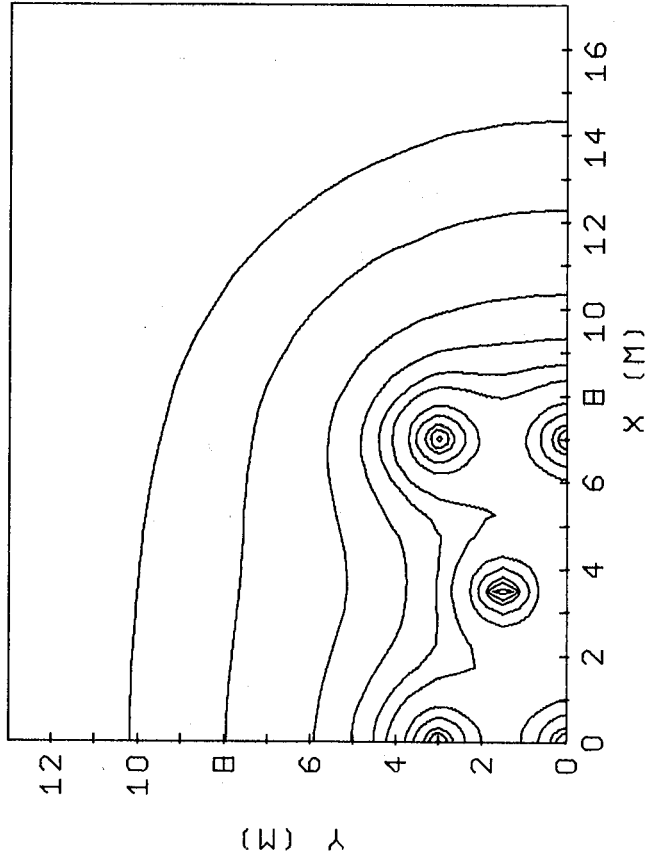
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
375.200.150.100.75.
50. 40. 30. 20. 10.
5.

XBL 786-9305

Figure D32g

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 760. DAYS

Z = 0.00 M

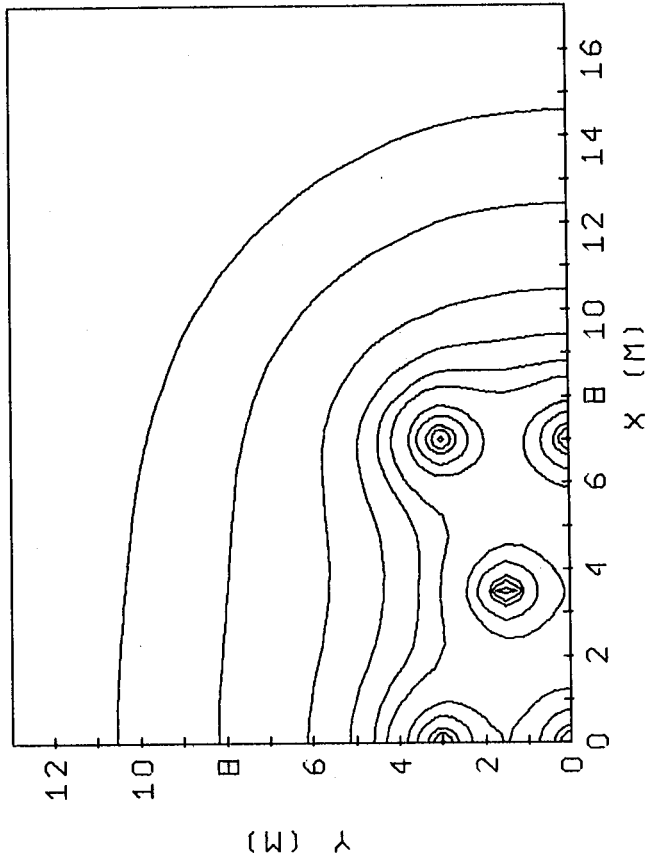
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
375.200.150.100.75.
50.40.30.20.10.
5.

XBL 786-9303

Figure D32h

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 820. DAYS

Z = 0.00 M

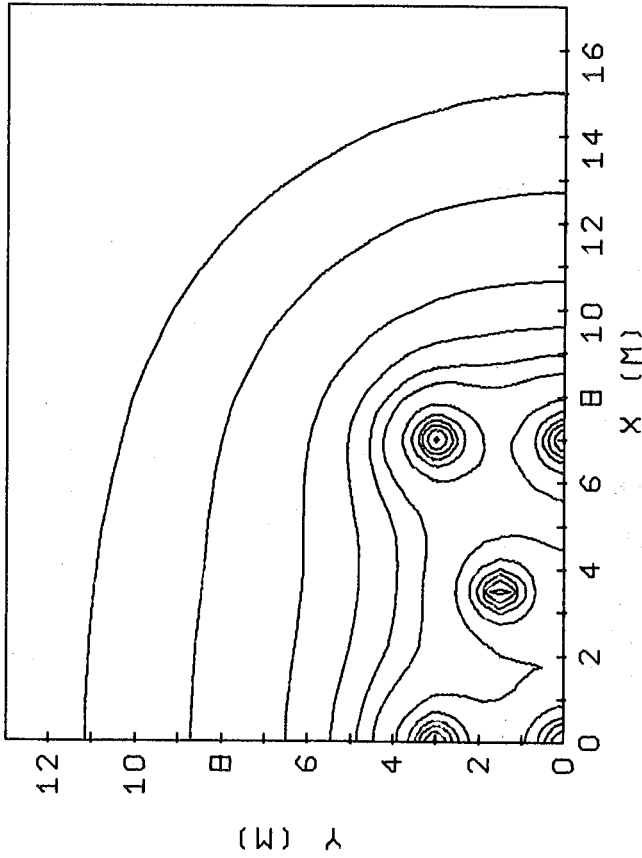
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
375.200.150.100. 75.
50. 40. 30. 20. 10.
5.

XBL 786-9301

Figure D32j

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 910. DAYS

Z = 0.00 M

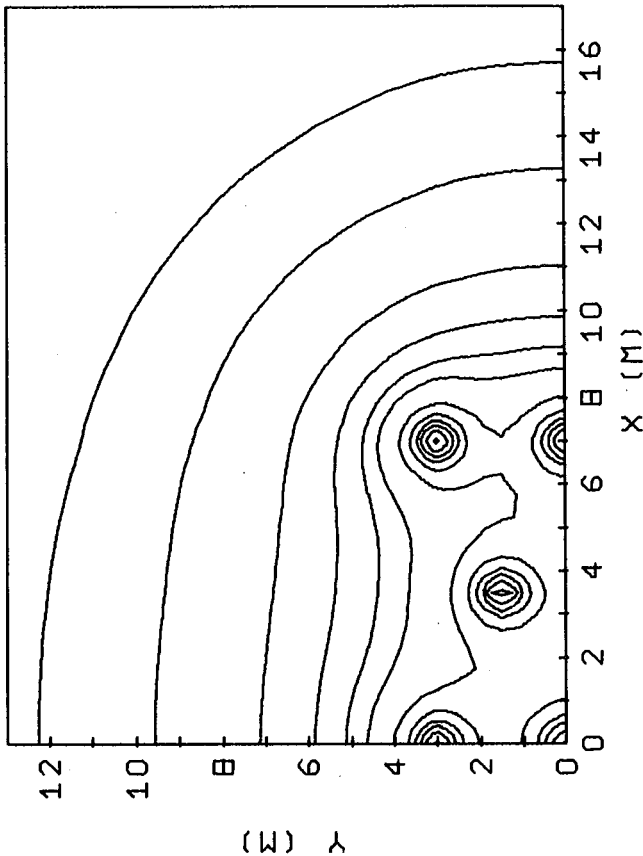
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
400.200.150.125.100.
75. 50. 40. 30. 20.
10. 5.

XBL 786-9310

Figure D32j

ISOTHERMS IN HORIZONTAL PLANE
HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

TIME = 1095. DAYS

Z = 0.00 M

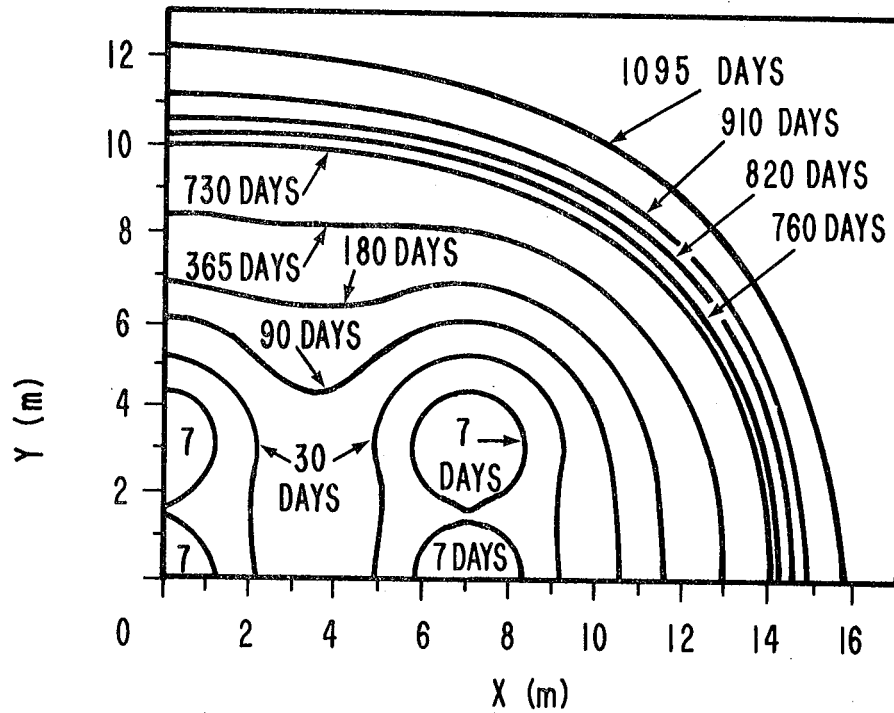
POWER OF HEATERS = 1.125 KW
SECONDARY HEATERS ENERGIZED
AFTER 730. DAYS

CONTOURS (DEG.C.) PLOTTED -
400.200.150.125.100.
75. 50. 40. 30. 20.
10. 5.

XBL 786-9311

Figure D32k

MIGRATION OF 5° ISOTHERM HANFORD TIME-SCALE EXPERIMENT



PLOT INFORMATION

Z = 0(m)

Power of heaters = 1.125 kW

Secondary heaters energized
after 730 days. (Contours (days) shown).

XBL 788-2014A

Figure D33

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