308 - - - Q200402160001

Scientific Notebook No. 559: Thermal Effects on Flow (TEF) Key Technical Issues (12/10/2002 through 01/21/2004)

LABORATORY NOTEBOOK

CNWRA/SwRI

CNWRA
CONTROLLED
COPY 559

NOTEBOOK NO. 559
ISSUED TO James D. Prikryl
ON 12/10/02 **20** 02
DEPARTMENT 20 CNWRA
RETURNED _____ **20**____

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INSTRUCTIONS

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2.
   - When starting a page, enter the title, project number, and book number.
   - Use ink for permanence -- avoid pencil.
   - Record your work as you progress, including any spur-of-the-moment ideas which may be developed later.
   - Avoid making notes on loose paper to be recopied.
   - Record your work in such a manner that a co-worker can continue from where you stop. You might be ill and to protect your priority it could be urgent that the work continue while you are absent.

3.
   - Give a complete account of your experiments and the results, both positive and negative, including your observations.
   - Record all diagrams, layouts, plans, procedures, new ideas, or anything pertinent to your work including the details of any discussions with suppliers, or other people outside the Company.
   - Do not try to erase any incorrect entries; draw lines deleting them, note the corrections, sign and date the changes. This extra care is worthwhile because of the necessity of original data to prove priority of new discoveries.

4.
   - After entering your data, sign and date the entries.
   - Explain your work to at least two witnesses who are not co-inventors, and have them sign and date the pages in the place provided.
   - Record the names of operators and witnesses present during any demonstration and have at least two witnesses sign the page. If no witnesses are present during an experiment of importance, repeat it in the presence of two witnesses.

5. Since computer programs can be patented these instructions apply to the development of computer software. In this case a description of the structure and operation of the program should be recorded in the notebook, together with a basic flow diagram which illustrates the essential features of the program. In the course of developing the code, the number of lines of code written each day should be recorded in the notebook, together with a statement of the portion of the flow diagram to which the section of code is directed.

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Form 590

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12/10/02 JP

Thermal Effects on Flow (TEF) KTI

20.06002.01.091

Initial entry 12/10/02 by James D. Purtymun

This notebook chronicles laboratory studies being conducted for the TEF KTI and is a continuation of scientific Notebook 382.

Specifically, this notebook documents work performed on the Drift Scale Heater Tests investigating reflux/dripping/corrosion using the Topopah Spring tuff.

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12/10/02 JP Temperature + RH readings
(cont. from p 153 of Scientific notebook 382).

Date	Time	RH	Temp	RH	Temp
		mA			
12/10	1020	16.28	9.25	76.7%	45.5°C
12/11	0900	16.06	9.20	75.4%	45.0°C
12/12	0855	16.00	9.17	75.0%	44.6°C
12/13	0855	15.28	9.28	70.5%	46.0°C
12/16	0745	15.21	9.26	70.1%	45.7°C
12/17	0745	15.72	9.23	73.2%	45.4°C
12/18	0805	15.70	9.27	73.1%	45.8°C
12/19	0755	16.10	9.20	75.6%	45.0°C
12/20	0830	15.83	9.11	73.9%	43.9°C
12/30	0830	18.75	9.08	92.2%	43.5°C
12/31	0820	20.00	8.99	100%	42.4°C
1/2	0755	20.00	8.96	100%	42.0°C
1/3	0755	20.00	8.95	100%	41.9°C
1/6	0815	20.00	9.02	100%	42.75°C
1/7	0915	20.00	9.02	100%	42.75°C
1/8	0905	20.00	9.04	100%	43.0°C
1/10	0915	20.00	9.06	100%	43.25°C
1/13	1325	20.00	8.98	100%	42.25°C
1/14	1150	20.00	9.03	100%	42.9°C
1/15	0910	20.00	9.37	100%	47.1°C
1/16	0905	20.00	9.44	100%	48.0°C
1/17	0925	20.00	9.44	100%	48.0°C
1/20	0745	20.00	9.63	100%	50.4°C
1/21	0905	20.00	9.61	100%	50.1°C
1/22	0940	20.00	9.65	100%	50.6°C
1/23	0850	20.00	9.58	100%	49.7°C
1/24	0935	20.00	8.21	100%	32.6°C
1/27	0805	20.00	7.81	100%	27.6°C

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Collected a new set of water samples for chemical analyses. pH was determined using procedure on p 59 of scientific notebook 382.

Sample cup labeled	~Amount	Temp°C	pH
S1J	100ml	29.57°C	8.47
S2J	100ml	28.10°C	8.39
S3J	—	—	—
S4J	—	—	—
S5J	—	—	—
S12J	—	—	—
S13J	—	—	—
S14J	25ml	45.72°C	8.56
S15J	—	—	—

1/22/03 JP

Alkalinity of samples S1J + S2J were determined by procedure on p 61 of notebook 382.
Results are shown on following page.

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========== METTLER DL21 Titrator date 22-01-03 =======

TITRATION	1	operator
METHOD	4011	2 04-12 0
WEIGHT g	1	
IDENT	0	remarks
conc mol/L	.10000	
const	25.000	
START pH	8.645	
pHØ pH	6.980	
SLOPE mV/pH	-56.0	
M-POINT pH	4.300	
P-POINT pH	8.200	
RESULT mL	.05124	
P-VALUE mmol/L	.12810	
RESULT mL	.78330	
M-VALUE mmol/L	1.9583	

S1J

40ml Sample

Alkalinity = $\frac{(.05124 + .78330) * .1 * 50000}{40}$ = 104.32 mg $CaCO_3$/L

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========== METTLER DL21 Titrator date 22-01-03 ===

TITRATION	2	operator
METHOD	4011	2 04-12 0
WEIGHT g	1	
IDENT	0	remarks
conc mol/L	.10000	
const	25.000	
START pH	8.253	
pHØ pH	6.980	
SLOPE mV/pH	-56.0	
M-POINT pH	4.300	
P-POINT pH	8.200	
RESULT mL	.05916	
P-VALUE mmol/L	.14789	
RESULT mL	.91401	
M-VALUE mmol/L	2.2850	

S2J

40ml Sample

Alkalinity = $\frac{(.05916 + .91401) * .1 * 50000}{40}$ = 121.65 mg $CaCO_3$/L

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1/22/03 gp

After pH + alkalinity measurements samples were split into two aliquots + placed in 30 ml pp bottles. One aliquot was acidified by adding 10 µl conc. HNO_3 + labelled as follows.

S1J-A
S2J-A
S14J-A

The unacidified aliquots retained their original label. Samples were refrigerated for later analysis

1/28/03 gp

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1/23/03 gp

Heat to test was cutoff at 0900 hrs on 1/23/03

Variable transformer was changed from 48 to 0.

Water to the test was also cutoff at 0900 hrs on 1/23/03.

The heater test apparatus will be allowed to cool down for several days and will then be disassembled.

1/27/03 gp

Last temperature + humidity readings were taken at 0805 hrs on 1/27/03.

1/27/03 gp

0830 hr. Disassemble of the heater test was begun.

1/28/03 gp

0800 hr. The photos on the following pages document disassembly of the Large Scale heater test. Explanations are also provided.

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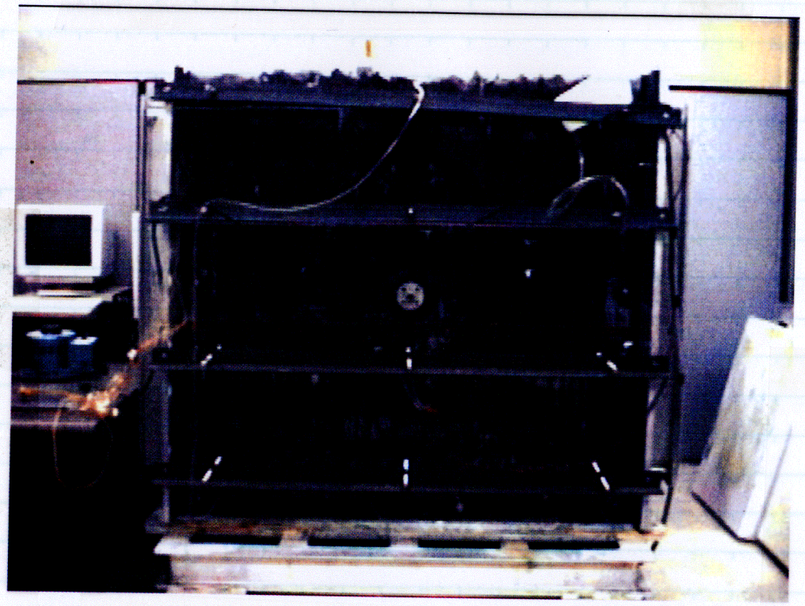

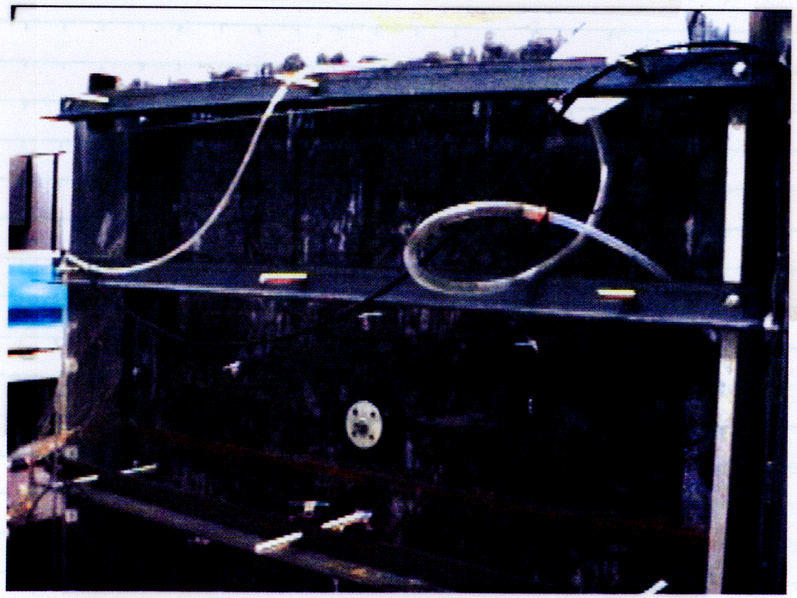

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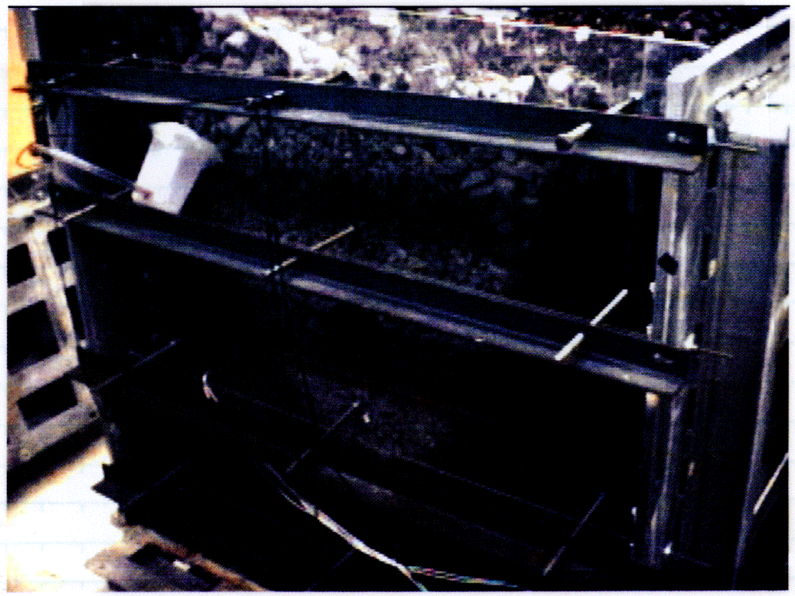
If Photos on previous page show front of box with insulation removed. Rock in the front part of the box was completely wet. Notice discoloration + streak due to dripping on the inside front plastic.

Bottom photo shows rock on the back of the box. Notice the dry out area (light color) that has formed around + above the simulated adit.



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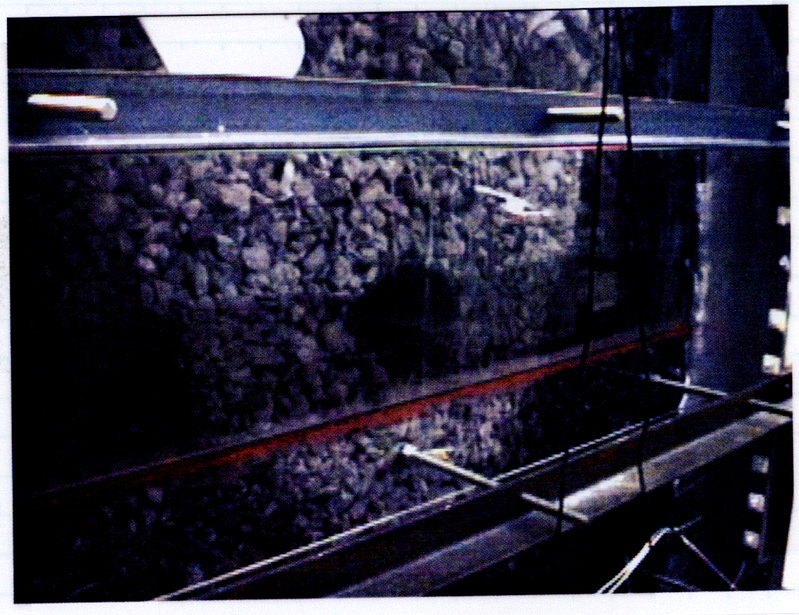

The above photo is a closer view of the dry out area present when the effluent was terminated.

It should be noted that during other times of the expement this area was wet (i.e. dripping was noted in the portion of the smulated adit.

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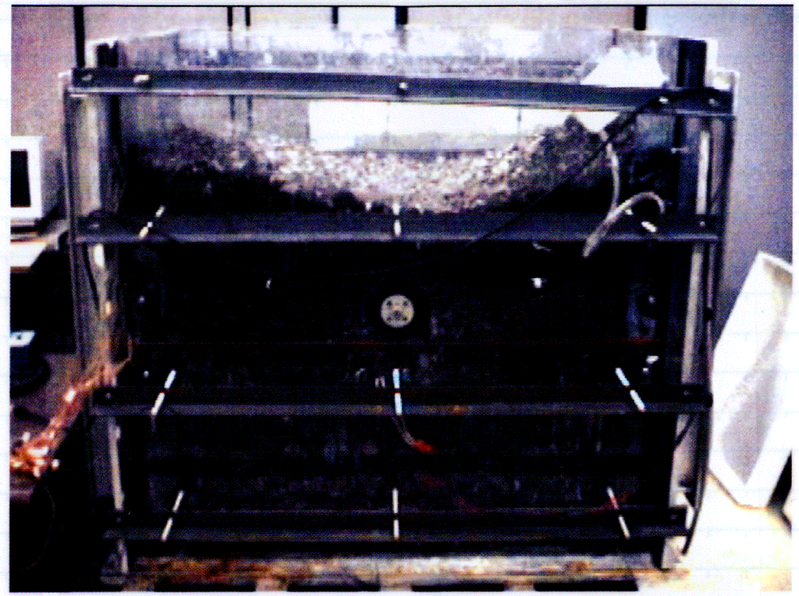

The above photos show the front + back of the box with the top portion of rock removed.

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Top photo looks toward ~~the~~ back of ~~the~~ box ~~+~~ shows the dry out zone ~~with~~ the top portion of ~~the~~ rock removed.

Photos on next page shows first supply cups uncovered during removal of rock from the box.
The cup at the top of ~~the~~ top photo is situated in the wet zone and contains water (see bottom photo).

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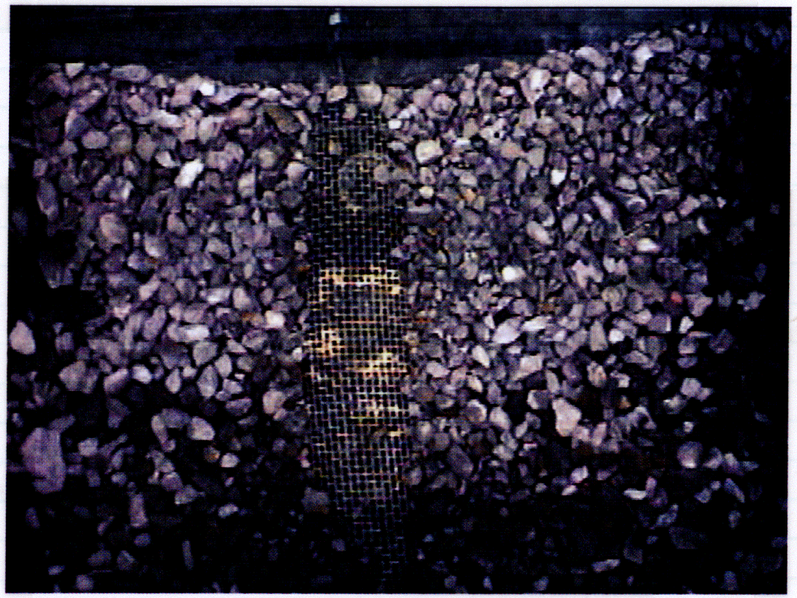

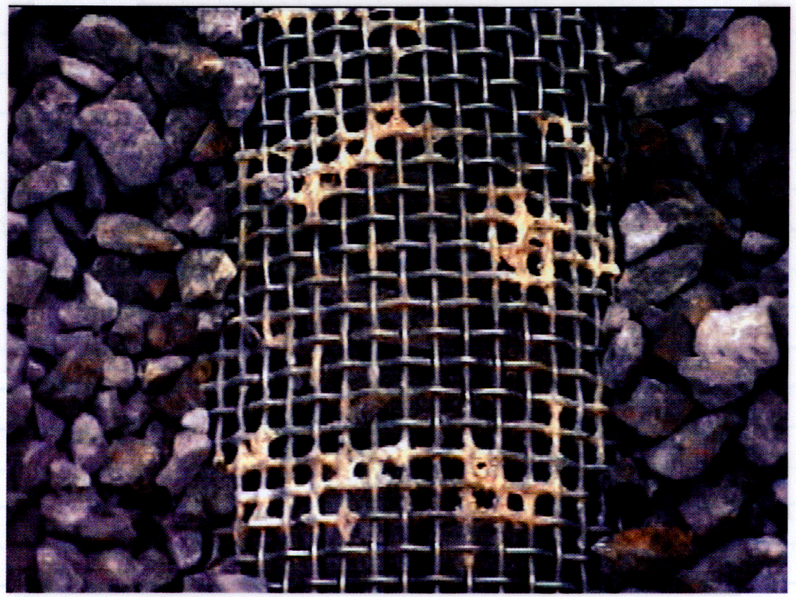

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Photos on previous page show recovery of the to portion of the wire mesh forming the simulated drift. Notice the precipitate (white to brown material) that has formed on the mesh.
This precipitate also formed on rock in contact with the mesh above the drift.
Piece of rock containing retrievable precipitate were collected and placed in a plastic bag which was labeled LSHT3-P1.

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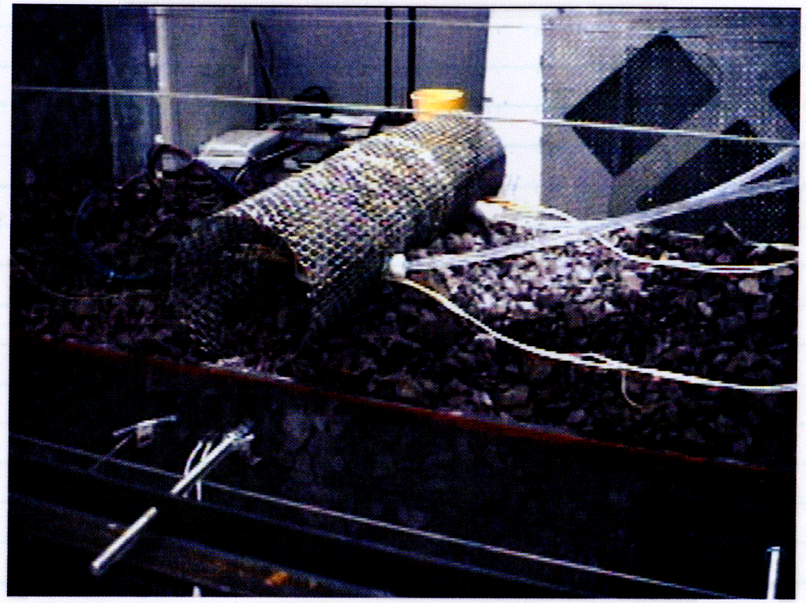

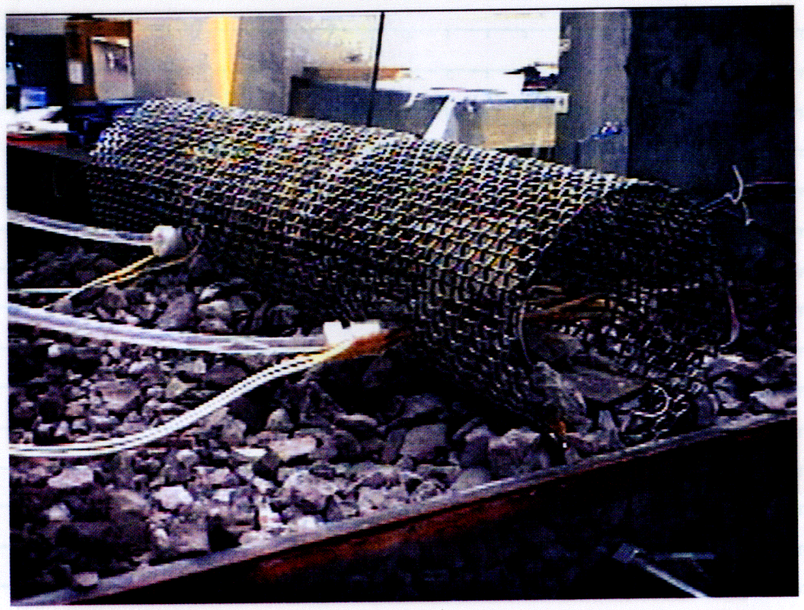

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Photos in prevous page show continuing recovery of the simulated drift. Notice that the precipitate also occur along the side of the drift. Rock along the sides of this drift with cultured noticeable precipitate on their surfaces were collected and placed in a plastic bag labeled HSHT3-P2

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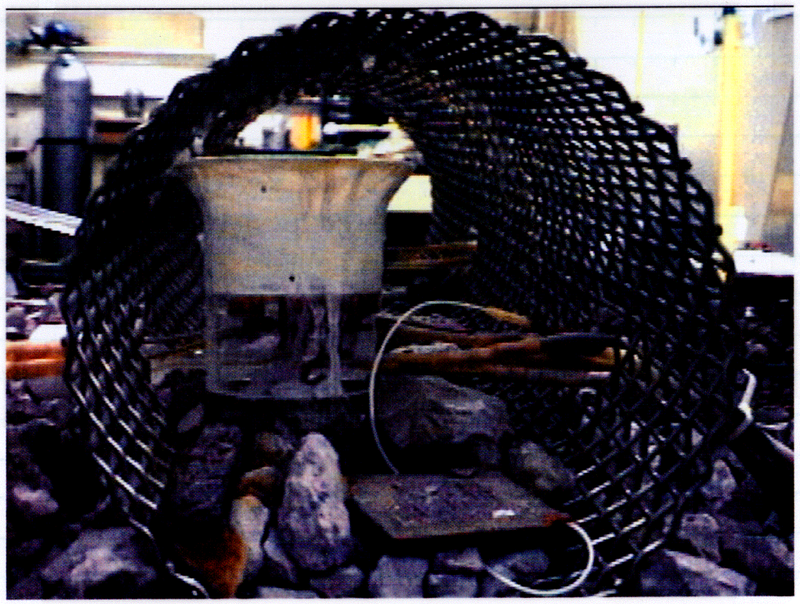

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Photos on next page show sample cups, sensors, & coupons inside the orbit tools from the front of the box (top photo) and the back of the box (bottom photo).

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1/21/04 JP

Data files for the Large Scale Heater test (see p 24 of scientific notebook 382) for initial entry for this test) are included on a CRD disc attached to the end of the Notebook.

Filenames included on the disc are listed below.

lsht3_temp_1.xls
lsht3_temp_2.xls
lsht3_temp_3.xls
lsht3_temp_4.xls
test_1.csv
test_10.csv
test_100.csv
test_100a.csv
test_101.csv
test_101a.csv
test_102.csv
test_102a.csv
test_103.csv
test_103a.csv
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test_105a.csv
test_106.csv
test_106a.csv
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test_3_201.csv
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test_3_299a.csv
test_3_29a.csv
test_3_2a.csv
test_3_3.csv
test_3_30.csv
test_3_300.csv
test_3_300a.csv
test_3_301.csv
test_3_301a.csv
test_3_302.csv
test_3_302a.csv
test_3_303.csv
test_3_303a.csv
test_3_304.csv
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test_3_305.csv
test_3_305a.csv
test_3_306.csv
test_3_306a.csv

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test_3_307.csv
test_3_307a.csv
test_3_308.csv
test_3_308a.csv
test_3_309.csv
test_3_309a.csv
test_3_30a.csv
test_3_31.csv
test_3_310.csv
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test_3_31a.csv
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test_3_5a.csv
test_3_6.csv
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test_3_67.csv
test_3_67a.csv
test_3_68.csv
test_3_68a.csv
test_3_69.csv
test_3_69a.csv
test_3_6a.csv
test_3_7.csv
test_3_70.csv
test_3_70a.csv
test_3_71.csv
test_3_71a.csv
test_3_72.csv
test_3_72a.csv
test_3_73.csv
test_3_73a.csv
test_3_74.csv
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test_3_76.csv
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test_3_79a.csv
test_3_7a.csv
test_3_8.csv
test_3_80.csv
test_3_80a.csv
test_3_81.csv
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test_3_96a.csv
test_3_97.csv
test_3_97a.csv
test_3_98.csv
test_3_98a.csv
test_3_99.csv
test_3_99a.csv
test_3_9a.csv

The above files contain temperature data for the large scale heater test.

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I have reviewed this scientific notebook and find it in agreement with QAP-001. There is sufficient information regarding methods used for conducting tests, acquiring and analyzing data so that another qualified individual could repeat the activity.

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