**Oak Ridge Research Reactor Quarterly Report
January, February, and March of 1976**

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MASTER

OAK RIDGE NATIONAL LABORATORY

OPERATED BY UNION CARBIDE CORPORATION FOR THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

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OAK RIDGE RESEARCH REACTOR QUARTERLY REPORT

JANUARY, FEBRUARY, AND MARCH OF 1976

Date Published: October 1976

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OAK RIDGE NATIONAL LABORATORY
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SUMMARY

The ORR operated at an average power level of 29.9 Mw for 82.8% of the time during January, February, and March of 1976. Two fuel elements were declared spent (58.8% average burnup) during the quarter, while twenty-eight new elements were placed in service. Four shim-rod elements were retired from service at an average burnup of 64.4%.

The reactor was shutdown on nine occasions, one of which was unscheduled. Two end-of-cycle shutdowns accounted for 92.1% of the total downtime. The remaining downtime was used principally for refueling and experiment work.

Maintenance activities, both mechanical and instrument, were essentially routine in nature.

Special tests or measurements completed during the quarter were three calorimeter gamma heating runs made in CP-E5 during the end of Cycle 129 shutdown.

OPERATIONS

The basic operating data presented in Table 1 indicates that the ORR operation for the quarter was normal as compared with recent experience.

Details relative to cycles of operation during the quarter are given in Table 2, while Figures 1 and 2 are plots of shim-rod position versus time for these cycles.

Table 1. ORR Basic Operating Data
January, February, and March of 1976

	This Quarter	Last Quarter	Year To Date	January - March, 1975
Total energy, Mwd	2,254.5	2,333.4	2,254.4	2,238.2
Average power, Mw/operating hr	29.9	29.9	29.9	29.7
Time operating, %	82.8	84.9	82.8	84.9
Availability, %	90.6	86.7	90.6	89.0
Reactor water radio- activity $\frac{\text{c/min}}{\text{ml}}$ (av)	28,200	27,600	28,200	30,600
Pool water radio- activity $\frac{\text{c/min}}{\text{ml}}$ (av)	610	640	610	690
Reactor water resis- tivity, ohm-cm (av)	822,000	1,050,000	822,000	812,000
Pool water resis- tivity, ohm-cm (av)	799,000	761,000	799,000	818,000
Fuel elements depleted	2	11	2	33
Average burnup of fuel elements depleted, %	58.8	52.5	58.8	52.6
Shim rods depleted	4	4	4	4
Average burnup of shim rods depleted, %	64.4	63.0	64.4	64.6
Radioisotope samples	0	1	0	2
Research samples	1	8	1	5

Table 2. Cycles of Operation

Cycle No.	Date Begun	Date Ended	Accumulated Energy (Mwd)
129	December 11, 1975	January 25, 1976	1,302.7*
130	January 29, 1976	March 21, 1976	1,520.2

*734.2 Mwd this report period.

Figure 1. Shim Rod Position vs Time (Cycle No. 129)

Figure 2. Shim Rod Position vs Time (Cycle No. 130)

FUEL USAGE AND INVENTORY

Twenty-eight new fuel elements were placed in service during the quarter. Only two fuel elements were declared spent during the quarter due to the lowering of the minimum fuel content from 120 grams to 100 grams before declaring an element spent. Forty-five fuel elements and six shim-rod elements were transferred to the Savannah River Plant for chemical separation.

Other details of fuel usage and inventory may be found in Tables 1 and 3.

Table 3. ORR Fuel Status

	This Quarter	Last Quarter	Jan-Mar 1976	Jan-Mar 1975
Depleted fuel elements transferred for chemical separation	45	17	45	59
Average percent burnup of fuel elements transferred	52.0	53.0	52.0	48.1
New fuel elements placed in service	28	29	28	16
New fuel elements available for use	93.0*	63		
Depleted shim rods transferred for chemical separation	6	0	6	12
Average percent burnup of shim rods transferred	65.0	---	65.0	65.0
New shim rods placed in service	4	4	4	4
New shim rods available for use	0	0	0	0

*Includes four partial fuel elements.

SHUTDOWNS AND POWER REDUCTIONS

Reactor downtime (power level $<N_L$) totaled approximately 375 hours. A summary of the shutdowns is given in Table 4, and details of each are contained in Table 5. Table 6 offers information relative to the unscheduled shutdown.

Table 4. Summary of Shutdowns

Description of Shutdown	Number	Downtime (hr)
Scheduled		
Regular, end of cycle	2	345.550
Regular: refueling, and iodine removal	3	12.450
Special: end of gamma heat measurement run at N_L	2	0.784
Special: end of gamma heat measurement run at N_L , and completion of end-of-cycle shutdown	<u>1</u>	<u>16.017</u>
Subtotal	8	374.801
Unscheduled		
Human error	<u>1</u>	<u>0.333</u>
Subtotal	<u>1</u>	<u>0.333</u>
Total	9	375.134

Table 5. ORR Scheduled Shutdowns, Details

Date	Duration (hr)	End Cycle	Remarks
1-14-76	3.417	129B	The reactor was refueled and isotope (iodine, xenon) work was completed.
1-25-76	97.550	129C	This shutdown marked the end of cycle 129. Shutdown activities included: (1) The replacement of the water seals on the reactor secondary water pump No. 1, (2) the removal of a faulty pressure gauge on the secondary side of the reactor heat exchangers Nos. 1 and 2, (3) the removal and installation of an experiment in core position B-8, (4) the removal and installation of an experiment in poolside P-5, and (5) the removal and insertion of an experiment in poolside P-4A.
1-29-76	0.417		The shutdown terminated a low power (N_L) run for gamma heat measurement in core position E-5.
1-29-76	0.367		The shutdown terminated a low power (N_L) run for gamma heat measurement in core position E-5.
1-29-76	16.017		This shutdown ended a low power (N_L) run for gamma heat measurement in core position E-5. The end-of-cycle 129 shutdown work was completed. This consisted of (1) the replacement of the bypass filters in the west filter columns on the reactor primary water system, and (2) the routine programmed maintenance.
2-17-76	4.283	130A	The reactor was refueled and isotope (iodine, xenon) work was completed.

Table 5 (continued)

Date	Duration (hr)	End Cycle	Remarks
3-5-76	4.750	130B	The reactor was refueled and isotope (iodine, xenon) work was completed.
3-21-76	248.000	130C	This shutdown marked the end of cycle 130. Shutdown activities included: (1) The cleaning of the primary side of the pool heat exchanger, (2) the installation of a new oil seal on the pool cooling fan gear reducer, (3) the replacement of the No. 1 counting rate fission chamber, (4) the wiring changes in ORR Reactor Control (Change Memo No. 112), made to limit the setback in reactor power to $0.6 N_F$ for the new experiment OC-1, and (5) the installation of the new experiment OC-1 in CP-E5. One experiment was removed from poolside P-4A and one was removed from poolside P-5.

∞

Table 6. ORE Unscheduled Shutdowns, Details

Date	Duration (hr)	End Cycle	Remarks
1-1-76	0.333		The selected No. 1 log-N amplifier was inadvertently turned to "Ground" setting when checking out troubles in the No. 2 log-N channel.

INSTRUMENTATION AND REACTOR CONTROLS

The performance of the instrumentation for the complex was quite satisfactory and only rather routine maintenance was required as indicated in Table 7. Table 8 reflects the status of the various fission and ionization chambers.

PROCESS SYSTEM AND MECHANICAL COMPONENTS

Details of maintenance or changes to the process system are given in Table 9. Table 10 summarizes the results of efficiency test of the various gaseous waste filters. There were no repairs or changes related to the reactor mechanical components (drives, bearings, etc.).

EXPERIMENT FACILITIES AND CORE CHANGES

Experiment facility usage is given in Table 11. The core configuration used during the quarter is shown in Figure No. 3.

For Fuel Cycles 129 B, C, 130 A, B, C,

	1	2	3	4	5	6	7	8	9
A	Be	Be	I ¹³¹	F	F	F	F	F	Be
B	Be	Be	F	S	F	S	F	E	Be
C	Be	Be	F	F	F	F	F	F	Be
D	Be	F	F	S	F	S	F	HT	Be
E	Be	F	E	F	F	F	E	F	Be
F	Be	F	F	S	F	S	F	F	Be
G	Be	Be	Be	Be	Be	Be	Be	Be	Be

LATTICE COMPONENT

NUMBER

Fuel	28
Shim Rod (SR)	6
Beryllium (Be)	24
Experiment (E)	3
Iodine Sleeve (¹³¹ I)	1
Isotope Stringer (Iso)	0
Hydraulic Tube (HT)	1

Figure 3. ORR Lattice Configuration - January 1, 1976 through March 21, 1976.

Table 7. Maintenance and Changes, Instrumentation and Controls

Date	Component	Trouble or Change	Reason or Maintenance
No. 1 Counting-Rate Channel			
3-29-76	No. 1 Counting-rate chamber	Inoperative	The fission chamber was replaced with chamber TSM-1-F52 (IC-8138) which corrected the problem.
No. 2 Counting-Rate Channel			
2-4-76	No. 2 Counting-rate meter	Replacement	The counting-rate meter was replaced to correct an erratic readout.
No. 1 Log-N Channel			
2-24-76	Log-N records	Negative spikes on readout	The recorder slidewire and contacts were cleaned.
No. 2 Log-N Channel			
1-2-76	Amplifier	No power supply	The sola transformer that feeds power to No. 2 log-N channel was replaced.
No. 1 Gamma Channel			
1-21-76	No. 1 Gamma recorder	Inoperative chart drive motor	The chart drive motor was replaced.

Table 7 (continued)

Date	Component	Trouble or Change	Reason or Maintenance
No. 2 Gamma Channel			
2-17-76	No. 2 Gamma re-corder amplifier	Replacement	Erratic readout.
3-8-76	No. 2 Gamma re-corder amplifier	Replacement	Erratic readout.
North ¹⁶ N Channel			
			No maintenance or changes were required.
South ¹⁶ N Channel			
1-12-76	Chart drive	Replacement	Faulty motor.
3-15-76	Recorder	Erratic readout	The recorder contacts were cleaned.
No. 1 Safety Channel			
1-5-76	Safety re-corder contacts	Sticking	The contacts were cleaned.
No. 2 Safety Channel			
			No maintenance or changes were required.
No. 3 Safety Channel			
			No maintenance or changes were required.

Table 7 (continued)

Date	Component	Trouble or Change	Reason or Maintenance
Magnet Amplifiers			
2-17-76	No. 1A Magnet amplifier	Fluctuating magnet current	Replacement of electronic tubes.
2-17-76	No. 1B Magnet amplifier	Fluctuating magnet current	The amplifier was replaced.
Micromicroammeter Channel			
			No maintenance or changes were required.
Servo Channel			
			No maintenance or changes were required.
Process Instrumentation			
2-17-76	No. 1 ΔT recorder battery	Replacement	The battery was replaced to correct an erratic readout.
2-17-76	No. 2 ΔT recorder battery	Replacement	The battery was replaced to correct an erratic readout.
2-17-76	No. 1 Outlet temperature recorder battery	Replacement	The battery was replaced to correct an erratic readout.
2-17-76	No. 2 Outlet temperature recorder battery	Replacement	The battery was replaced to correct an erratic readout.

Table 7 (continued)

Date	Component	Trouble or Change	Reason or Maintenance
Process Instrumentation			
3-26-76	Pressurized off-gas set point temperature element (TM-OF-2)	Replacement	Indications of a breakdown caused by the age of the element.
2-24-76	Reactor secondary pH - problem	Faulty probes	The probes were replaced.
Radiation Detection Instrumentation			
2-13-76	Reactor secondary activity channel	Faulty probe	The probe was replaced.
3-8-76	Monitrons (reactor primary pump cell Nos. 1 and 3)	Tube replacement	The tubes were replaced to give a reliable readout.
1-9-76	Scintillation counter	Replacement	The obsolete decade scaler was replaced.

Table 8. Present Status of Ionization Chambers and Fission Chambers

Chamber Serial No.	Location	Present Service	Date Present Service Started	Previous Service	Remarks
Installed Chambers					
PCP-III- 106-66-9	Position 7	No. 1 safety & No. 2 log N	9-66 (safety)	None	No trouble; fabricated at ORNL. Compensated section used from February, 1969, until March, 1970, as No. 1 log N. Used as No. 2 log N from May 28, 1973.
CTC-2 (C-768)	Position 3	No. 3 safety	12-12-75	LITR-BSR	Served as LITR safety chamber from February, 1963, to July, 1965. Modified for under-water service in 1969. Installed in the BSR in April, 1970, and in August the chamber was removed to storage.
PCP-III- 106A, SN-72-3	Position 2	No. 2 safety & No. 1 log N	5-15-75	None	None
PCP-II- 106-66-3	Position 4	No. 3 safety	5-74 (safety) 3-70 (log N) removed from service 12-12-75	None	Fabricated by ORNL. Chamber failed December 12, 1975.
PCP-II 106-63-4	Position 5	Servo and micromicro- ammeter	6-64	None	No trouble; fabricated by ORNL.

Table 8 (continued)

Chamber Serial No.	Location	Present Service	Date Present Service Started	Previous Service	Remarks
TSM-1-F52	Poolside	No. 1 Counting rate north	3-29-76	ORR	Used as No. 2 counting rate (south) from April 26, 1972, until October 24, 1972. December 5, 1973 until August 8, 1975.
CTC-5 (C-770)	Position 8	Chamber discon- nected	10-71	LITR	Used as No. 1 safety at the LITR; modified for ORR-BSR underwater service.
PCP-II- 105-63-2	Poolside, south	No. 1 gamma, south	4-26-71	ORR	Used as No. 2 gamma, north, from April, 1964, until December, 1970.
PCP-II 105-63-3	Poolside north	No. 2 gamma, north	3-17-71	ORR	Used as No. 1 gamma, south from April, 1964, until March, 1970.
TSM-3-F29	Poolside	No. 2 counting rate	10-24-72	None	Replaced fission chamber "snake" assembly TSM-1-F52.
Spare Chambers					
PCP-II- 105-63-1	Instrumen- tation & Controls Shop	Awaiting repair	4-26-72	ORR	Used as No. 1 gamma, south from March 31, 1970, until April 26, 1972.
S27-34R- F29	ORR plug storage	Awaiting repair	4-26-71	ORR	Used as No. 1 counting rate from July 28, 1970, to April 26, 1971.

Table 8 (continued)

Chamber Serial No.	Location	Present Service	Date Present Service Started	Previous Service	Remarks
S3-8R-F22	ORR plug storage	Awaiting repair	4-26-71	ORR	Used as No. 2 counting rate from January 14, 1970, to April 26, 1971.
CTC-1	Instrumen- tation & Controls Shop	Awaiting repair	10-71	ORR	Used as noise monitor from March, 1962, until October 1, 1971.
CTC-4 (C-769)	ORR plug storage			LITR	Used as No. 2 safety in the LITR; modified for ORR-BSR underwater service.
PCP-III- 106-66-5	Instrumen- tation & Controls Shop	Awaiting repair		ORR	Used as No. 2 safety and log N from September 27, 1968, to July 22, 1970, and from May 7, 1971, to May 20, 1971; from November, 1971, to January 24, 1973, as No. 2 safety and until May 28, 1973, as No. 2 log N.
TSM-2-F45	Instrumen- tation & Controls Shop	Awaiting repair		ORR	Used as No. 1 counting rate from April 26, 1971, until December 5, 1972. Removed March 30, 1976 to shop for repair.

Table 9. Process Systems, Maintenance and Changes

Date	Component	Remarks
Reactor Primary Cooling System		
1-1-76 through 1-30-76	Primary cooling system in the primary pump area (discharge manifold and 27-inch line to the Y-pit).	The installation of concrete walls on each side of the water line was completed; supports were installed for the line. Boiler plate was placed over the opening which allows access to the line for inspection. The pump discharge manifold inside the pumphouse (Bldg. 3085) was exposed for inspection in a similar manner.
1-27-76	Bypass filters (west column)	The filter cartridges were changed. The drain valve on the column was repaired.
2-19-76	North reactor demineralizer anion column	A defective gasket on the bottom of the column was replaced.
2-23-76	South reactor demineralizer	A broken shear pin in the lazy rod to valve No. 27 was replaced.
2-27-76	Decay tank	An audio inspection of the primary flow through the tank was performed. No change in noise from previous inspection was detected.
3-22-76	Bypass filters	The filter cartridges were changed.
3-24-76	Reactor tank access cover	The Lucite windows and gaskets were replaced.
3-24-76	Drain line 109-A north of Bldg. 3085 (pumphouse)	A section of the drain line was replaced.

Table 9 (continued)

Date	Component	Remarks
Reactor Secondary Cooling System		
1-9-76	Steam trap on the steam tracing line	The steam trap, which was faulty, was replaced.
1-28-76	Cooling tower	The water seals on the No. 1 pump were replaced.
1-29-76	Heat exchangers Nos. 1 and 2	The pressure gauge on the secondary side proved to be faulty, it was removed and the line at the gauge connection was plugged.
2-12-76	Cooling tower basin and riser	Corrosion coupons were removed and new coupons were installed.
3-22-76	Cooling tower	Oil was changed in the fan gear boxes.
3-23-76	Cooling tower	New packing was installed in the No. 2 water pump.
Pool Primary Cooling System		
3-22-76	Bypass filters	The filter cartridges were replaced.
3-22-76 through 3-23-76	Heat exchanger (primary side)	Water lines and bonnet were removed and replaced after the inside of each primary flow tube was brushed and flushed with water.
3-24-76	Strainers on primary water lines	Each strainer was checked and cleaned as needed.

Table 9 (continued)

Date	Component	Remarks
Pool Secondary Cooling System		
2-12-76	Cooling tower	The blowdown line, which was ruptured, was replaced.
2-12-76	Cooling tower	Corrosion coupons in the tower basin were changed.
3-10-76	Cooling tower	The filter on the water line to the pH probe was replaced.
3-22-76	Cooling tower	A new oil seal was installed on the cooling fan gear reducer.
Emergency Cooling System		
1-2-76	No. 2 dc unit	A faulty high amperage relay was replaced.
1-29-76	Nos. 1, 2, and 3 dc units	Functional checks of equipment and alarms confirmed that the systems were in satisfactory conditions.
3-25-76	Nos. 1, 2, and 3 dc units	Functional tests of equipment and alarms were completed. Results of the tests were satisfactory.
Electrical System		
1-26-76	Miscellaneous breaker panels for electric motors, dc batteries, battery racks, and control room instrument cabinets	Routine inspection and cleaning were performed. Dust filters for the control room instrument cabinets were changed as needed. Checks for proper grounding on electrical circuits were performed, and programmed maintenance was completed.

Table 9 (continued)

Date	Component	Remarks
Electrical System		
3-9-76	Reactor pool side electrical receptacles	The regular electrical receptacles on the pool parapet were replaced with ground fault detector receptacles.
3-22-76 through 1-26-76	Miscellaneous breaker panels for electric motors, dc batteries, battery racks, 2400 V transformer and 440 V breaker at the reactor secondary cooling tower, and control room instrument cabinets	Routine inspection and cleaning were performed. Dust filters for the control room instrument cabinets were changed as needed. The ac current on all three reactor primary water pumps were checked, and programmed maintenance was completed.
3-24-76 through 3-26-76	ORR Reactor Control Change Memo. No. 112	Wiring changes were made to limit the setback in reactor power to $0.6 N_F$ on the new experiment OC-1 that is to be inserted into the reactor core position E-5 on 3-29-76. The change is for the computer based setbacks only.
Emergency Electrical System		
1-28-76	Diesel generator	The routine end-of-cycle load test was performed with satisfactory results.
3-23-76	Diesel generator	The routine end-of-cycle load test was performed with satisfactory results.
3-24-76	Wiring for Building 3003	Replaced emergency power wiring from the diesel generator. This was necessary because of an increase in the emergency power load at 3003.

Table 9 (continued)

Date	Component	Remarks
Cell-Ventilation		
3-23-76	Backflow preventer	Routine inspection was performed. The results were satisfactory.
3-23-76	Steam turbine	A steam leak was repaired.
Normal Off-Gas System		
2-12-76	West filter bank	New filters (prefilter, absolute, and charcoal) were installed.
Miscellaneous		
1-13-76	Acid line (Building 3004)	A leak in the acid transfer line was repaired.
1-15-76	Sump pump (sump north of Building 3085)	The pump, which was faulty, was replaced.
1-19-76	Building elevator for the ORR	An electrical short in the wiring system was repaired.
1-22-76	Air conditioner cooling tower	An acid line, that was leaking, was replaced.
2-12-76	Air conditioner cooling tower	Corrosion coupons in the basin were replaced.

Table 9. (continued)

Date	Component	Remarks
Miscellaneous (continued)		
2-26-76	Condensate pump in the southeast corner of basement in Building 3042 (ORR)	A float switch on the pump was repaired.
3-23-76	Steam line at the pool secondary pump	A blank cap was installed on a 125 lb steam line for increased safety.
3-23-76	Sump pump No. 1	A broken float arm was repaired.

Table 10. Status of Filters - Gaseous Waste Systems

Type Filter	Bank Designation	Date Installed	Date Last Tested	Type Test	Retention Efficiency (%)
Cell-Ventilation Filters					
CWS	Overall*	North, 6-20-73 South, 1-12-65	3-24-76	DOP	99.993
Charcoal	Both Banks	North, 9-16-74 South, 10-17-67	3-2-76	Elemental Iodine	99.97
Charcoal	Both Banks	North, 9-16-74 South, 10-17-67	3-4-76	Methyl Iodide	34.22
Pressurizable Off-Gas Filters					
CWS	North	5-5-75	3-24-76	DOP	99.965
CWS	South	10-18-67	3-24-76	DOP	99.992
Charcoal	North	2-26-73	1-28-76	Elemental Iodine	99.94
Charcoal	South	8-11-75	8-13-75	Elemental Iodine	99.993
Charcoal	North	2-26-73	10-7-75	Methyl Iodide	87.97
Charcoal	South	8-11-75	10-8-75	Methyl Iodide	97.48
Basement Hood Exhaust					
CWS	North	2-16-72	3-15-76	DOP	99.996
CWS	South	2-16-72	3-15-76	DOP	99.995

*The CWS filters in the cell ventilation system were checked in series.

Table 10 (continued)

Type Filter	Bank Designation	Date Installed	Date Last Tested	Type Test	Retention Efficiency (%)
Normal Off-Gas Filters					
CWS	West	2-12-76	3-24-76	DOP	99.996
CWS	East	6-12-75	3-24-76	DOP	99.998
Charcoal	West	2-12-76	2-17-76	Elemental Iodine	99.99
Charcoal	East	7-29-75	2-24-76	Elemental Iodine	95.76
Charcoal	West	2-12-76	4-20-76	Methyl Iodide	99.93
Charcoal	East	7-29-75	8-27-75	Methyl Iodide	99.41

Table 11. Experiment Facility Assignment and Usage

Facility	Access Flange	Date Installed	Date Removed	Description of Experiment	Division or Other Sponsor
B-8	V-1	12-10-75	1-27-76	Pressurized Capsule	Metals and Ceramics
B-8	V-1	1-27-76		Four internally pressurized Zr capsules.	Metals and Ceramics
D-8	V-3	3-10-67		Hydraulic Tube No. 2 used for isotope production and short term irradiations	Operations
E-3	V-6	5-6-75		P-13T Capsule Experiment	Reactor
E-7	V-5	6-20-75		OF-2 Capsule Experiment	Reactor
A-3	None	8-15-75		Radioisotopes (iodine and xenon)	Isotopes
P-4A	None	11-3-75	1-27-75	TeGen II Capsule Experiment	Reactor
P-4A	None	1-28-76	3-26-75	TeGen III Capsule Experiment	Reactor
P-5	None	12-10-75	1-27-75	Tensile specimens	Metals and Ceramics
P-5	None	1-27-76	3-26-75	Tensile specimens	Metals and Ceramics
P-7-P-8	None	12-30-75	1-5-76	Nose cone experiment	General Electric
GCR-P7-A	None	8-8-72		GB-10 Capsule experiment	Reactor

Table 11 (continued)

Facility	Access Flange	Date Installed	Date Removed	Description of Experiment	Division or Other Sponsor
HB-2	None	7-58		Neutron diffraction experiments	Solid State Physics
HB-3	None	11-1-58		Neutron diffraction experiments	Solid State Physics
HB-4	None	7-58		Neutron diffraction experiments	Chemistry
HB-6	None				Solid State Physics
HN-3	None	11-59		Activation Analysis	Analytical Chemistry
HN-4	None	12-15-63		Void determinations in irradiated materials	Solid State Physics
HN-4	None	12-15-63		"Fly's Eye" two-dimensional neutron detector for neutron diffraction and radiography	Instrumentation and Controls

SPECIAL TEST

Special measurements were made in CP-E5 during the end of Cycle 129 shutdown to test the operation of instrumentation that was designed to measure gamma heating and fission rates. The test consisted of three low power runs (N_L) using special constructed calorimeters.

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