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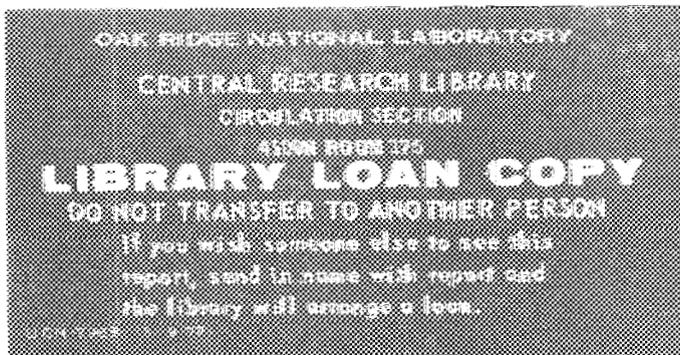


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**Bulk Shielding Facility
Quarterly Report
July, August, and September 1985**

T. P. Hamrick
F. E. Muggridge



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Operations Division
Reactor Operations Section

**BULK SHIELDING FACILITY QUARTERLY REPORT
JULY, AUGUST, AND SEPTEMBER 1985**

T. P. Hamrick
F. E. Muggridge

SPONSOR: J. H. Swanks
Operations Division

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CONTENTS

	<u>Page</u>
LIST OF FIGURES	v
LIST OF TABLES	vii
SUMMARY	1
BULK SHIELDING FACILITY	1
OPERATIONS	1
Shutdowns	3
Maintenance and Changes	4
Operational Activities	8
Experiments	9
Fuel	10
Experiment Facilities Assignments	10
Demineralizer Performance	11
SUMMARY OF SURVEILLANCE TESTS AT THE BSR	11
POOL CRITICAL ASSEMBLY	15
OPERATIONS	15
MAINTENANCE AND CHANGES	15
SURVEILLANCE TESTS AT THE PCA	15
DISTRIBUTION	16

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Core loading 102, BSR	2

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Basic operating data (July-September 1985)	3
2	Analysis of shutdowns	4
3	Maintenance and changes, instrumentation and controls . . .	5
4	Maintenance and changes, process system	7
5	Maintenance and changes, mechanical system	8
6	Operational activities	8
7	Experiment facilities activity, NLTNIF	9
8	Fuel and shim-safety rod status	10
9	Experiment facilities assignments	11
10	Demineralizer performance data	12
11	Summary of surveillance tests at the BSR	13

**BULK SHIELDING FACILITY QUARTERLY REPORT
JULY, AUGUST, AND SEPTEMBER 1985**

SUMMARY

The BSR operated at an average power level of 1368 kW for 0.4 h during July, August, and September. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory.

The PCA is shutdown for shim-safety rod magnets and associated electronic components upgrading.

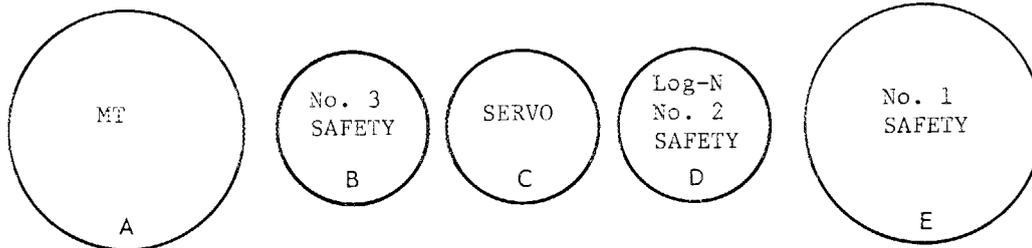
BULK SHIELDING FACILITY

OPERATIONS

The BSR remained down for most of the quarter due to no request to operate. The brief period of operation was used for personnel training.

The preliminary work for the National Low-Temperature Neutron Irradiation Facility (NLTNIF) installation continues.

Core loading 102 is shown in Fig. 1.



BSR CORE

LOADING NO	102
DATE	March 21, 1985
EXCESS REACTIVITY	4.95% $\Delta k/k$
OPERATING MASS	4014 g

ROD POSITIONS AT CRITICAL (With Operating Mass)

ROD NO.	IN. WITHDRAWN	
1	9.09	10.88
2	9.09	10.88
3	9.09	10.88
4	9.09	10.88
5	23.00	10.88
6	23.00	10.88

REMARKS:

81	82	83	84	FC	Al Can	Al Can	Al Can	Al Can
71	72	73	74	Al Can	Al Can	Al Can	Al Can	Al Can
61	EAST	63	64	OR-98-F 200	BSF-S-17 64	BSF-A10 188	BSF-S-18 65	BSF-A9 178
51	D ₂ O	53	54	BSF-T6 218	M-111-F 180	FYZP-0049 204	BSF-T2 182	BSF-T5 215
41	TANK	43	44	BSF-S-T2 110	BSF-T1 173	BSF-S-T4 109	BSF-T3 198	Al ^a Plug
31	32	33	34	M-110-F 181	M-59-H 202	M-102-F 198	M-104-F 202	BSF-T4 216
21	22	23	24	M-60-H 187	BSF-S-T1 85	M-95-F 185	BSF-S-T3 85	M-61-H 189
11	12	13	14	Al Plug	Al Plug	Al Plug	Al Plug	Al Plug

^aCore position for the National Low-Temperature Neutron Irradiation Facility.

Fig. 1. Core loading 102, BSR.

Table 1. Basic operating data
(July-September 1985)

	This quarter	Last quarter	Year to date
Total energy, kWd	23	5,263	5,048
Average operating power, kW	1,368	1,134	1,291
Time operating, %	0.02	5.1	4.4
Reactor availability, %	99.9	99.9	99.9
Reactor water radioactivity, cpm/ml (av)	BG	3,337 ^a	2,951 ^b
Reactor water resistivity, ohm-cm (av)	1,818,000	1,671,000	1,516,000
Research samples	0	0	1

^aAverage water radioactivity during operating time.

^bAverage of first and second quarter only.

Shutdowns

There were no unscheduled shutdowns during the quarter. Table 2 gives an analysis of the scheduled shutdowns.

Table 2. Analysis of shutdowns

Description of shutdown	Number	Downtime (h)
<u>Scheduled</u>		
Experimenters:		
No request to operate	0	1,618.431
Reactor Operations:		
Quarterly checks	1	96.000
Training	<u>1</u>	<u>493.169</u>
Subtotal:	2	2207.600
<u>Unscheduled</u>		
Experimenters:		
	0	0
Reactor Operations:		
	<u>0</u>	<u>0</u>
Subtotal:	0	0
TOTAL:	<u>2</u>	<u>2207.600</u>

Maintenance and Changes

Maintenance and changes to the instrumentation components in the complex are listed in Table 3.

Maintenance and changes of the process systems are listed in Table 4. Maintenance and changes of the mechanical systems are listed in Table 5.

Table 3. Maintenance and changes, instrumentation and controls

Date	Components	Trouble/change	Reason for maintenance
7-2-85	pH meter amplifier	Failure	Replaced secondary pH meter amplifier
7-10-85	East CAM	Routine	Servicing and functional checks
7-19-85	Conductivity amplifier and recorder	Failure	Replaced the control room amplifier and recorder, and calibrated
7-24-85	East CAM	Failure	Repaired
7-26-85	Temperature recorder	New recorder	Installed a new recorder for evaluation
8-16-85	Southwest CAM	Tape drive failed	Repaired tape drive and returned CAM to service
8-22-85	Motion sensors	Relocated	Relocated one sensor two feet north and installed a new sensor south of the pool
8-28-85	Exit water valve, air	Malfunction operator	Removed air operator, cleaned, rebuilt and returned to service
9-6-85	East CAM	Failed	Alarm module removed for repair
9-9-85 thru 9-30-85	Instruments	Routine	Quarterly checks
9-16-85	Security camera	Failure	Removed to shop for repair
9-17-85	ΔT channel	Routine	Annual calibration

Table 3. (Continued)

Date	Components	Trouble/change	Reason for maintenance
9-27-85	Shim-safety rod seat switches	Failure	Replaced a seat switch on rod No. 2 and made an ad- justment to the seat switch on rod No. 3
9-27-85	High bay gamma monitor	Routine	Functional checks

Table 4. Maintenance and changes, process systems

Date	Components	Trouble/change	Reason for maintenance
7-16-85	Spool piece	Routine	Removed for anion column treatment
7-18-85	Spool piece	Routine	Replaced for normal service
7-19-85 thru 7-22-85	Cell vent	Routine	Scheduled maintenance
7-24-85	Phosphate pump	Failure	Repaired ruptured disk
7-30-85	Skimmer filter	Filter change	Prepared column for filter change and return to service
8-26-85 thru 9-4-85	Primary water system	Ten-year weld inspection	Opened primary system at heat exchanger to remove water for the ten-year weld inspection. Removed valve pit cover and removed 2000 pounds of lead from exit water line so that all welds in pit could be dye checked.
9-17-85	Cell vent filters	Routine	Filters replaced
9-17-85	Air conditioner system timer	New timer	Installed for energy conservation
9-18-85 thru 9-24-85	NOG	Routine	System isolated for scheduled maintenance

Table 5. Maintenance and changes, mechanical system

Date	Components	Trouble/change	Reason for maintenance
7-31-85 thru 8-7-85	Fission chamber	Routine	Pulled chamber and drive assembly. Replaced cable, calibrated, and reinstalled
8-28-85	Reactor bridge, instrument bridge, and overhead bridge	Routine inspection	QD performed in-service inspection of bridges and reported that bridges are acceptable for service
9-20-85 thru 9-23-85	Shim-safety rods	Routine	Removed each of the six shim-safety rods for visual inspection of poison rods; cleaned magnets; inspected switches, pushrods, and wire; and returned to core

Operational Activities

The operational activities for the quarter are listed in Table 6.

Table 6. Operational activities

Date	Remarks
7-15-85	Operated reactor for I&C group training
9-16-85	Moved 15 fuel elements from core and placed in storage in preparation for the annual shim safety rod inspection
9-24-85	Returned 15 fuel elements from storage to the core

Experiments

Work relating to the National Low-Temperature Neutron Irradiation Facilities, NLTNIF, is listed in Table 7.

Table 7. Experiment facilities activity, NLTNIF

Date	Remarks
7-23-85	Valve and pipe assembly mounted on work platform
8-9-85	A new jib crane was mounted to the west wall for use at cryostat location
8-22-85	Helium compressor operated for functional test
8-30-85	The jib crane failed load test

Fuel

Changes in the fuel inventory are reported in Table 8.

Table 8. Fuel and shim-safety rod status

	This quarter	Last quarter	Year to date
Fuel elements depleted	0	0	0
Shim-safety rod fuel elements depleted	0	0	0
New fuel elements placed in service	0	0	1
New shim-safety rod fuel elements placed in service	0	0	0
Partially depleted shim-safety rod fuel elements	6	6	6
New fuel elements available for use	1	1	1
New shim-safety rod fuel elements available	7	7	7
Partially depleted fuel elements available for use (includes core)	28	28	31
New boron stainless steel shim rods placed in service	0	0	0
Boron stainless steel shim rods in service	6	6	6
Boron stainless steel shim rods available for use	1	1	1

Experiment Facilities Assignments

Experiment facilities assignments are listed in Table 9. The tubes of the east D₂O tank are not permanently assigned; they have been used by various Laboratory personnel for short-term sample irradiations.

Table 9. Experiment facilities assignments

Facility	Location	Division or sponsor
Dry thermal-neutron tubes (D-3-1 and -2)	East D ₂ O tank	Operations
Wet thermal-neutron tubes (D-4-1 and -2, D-6-1, -2, -3, -4, and -5)	East D ₂ O tank	Operations
National Low-Temperature Neutron Irradiation Facility ^a (NLTNIF)	Southwest corner of pool	Solid State

^aConstruction in progress.

Demineralizer Performance

Table 10 gives detailed information on the condition of the primary water system for the preceding year and pertinent data on the performance of the bypass demineralizer.

SUMMARY OF SURVEILLANCE TESTS AT THE BSR

Table 11 is a tabulation of the completion dates of the surveillance tests required by the Technical Specifications. This table contains all the surveillance tests scheduled for frequencies of one test per month or longer. Other surveillance requirements which are not reported are satisfied by routine completion of daily and weekly check sheets, start-up checklists, hourly data sheets, the operating log book, and miscellaneous quality assurance tests.

Table 10. Demineralizer performance data

Run No.	Initiation date	Termination date	Throughput (gal)	Gross gamma (cpm/ml)		pH		Specific resistance (ohm-cm)	
				In	Out	In	Out	In	Out
55	4-11-79	7-24-79	2,750,000	2,188	164	5.5	5.7	1,006,000	1,675,000
56	7-27-79	11-19-79	2,800,000	1,801	138	5.3	5.5	971,000	1,743,000
57	11-20-79	4-8-80	2,750,000	1,866	134	5.3	5.5	1,084,000	2,038,000
58	4-9-80	5-29-80	1,000,000	1,979	123	5.3	5.5	808,000	1,832,000
59	5-30-80	6-2-80	5,000	1,950	125	5.3	5.6	774,000	1,538,000
60 ^a	6-3-80	8-4-80	1,750,000	1,929	106	5.4	5.6	1,278,000	3,466,000
61	8-5-80	10-30-80	1,850,000	1,824	118	5.4	5.6	1,148,000	2,600,000
62	11-4-80	2-26-81	2,600,000	1,587	110	5.4	5.6	1,368,000	4,319,000
63	3-2-81	6-20-81	2,200,000	1,271	151	5.5	5.7	1,233,000	3,960,000
64	6-29-81	8-11-81	1,250,000	1,941	141	5.4	5.7	896,000	2,258,000
65	8-12-81	9-8-81	425,000	2,163	142	5.2	5.4	445,000	1,126,000
66 ^a	9-19-81	1-3-82	850,000	1,666	119	5.4	5.6	1,138,000	1,980,000
67	1-4-82	4-5-82	2,400,000	1,874	150	5.4	5.6	970,000	1,691,000
68	4-7-82	7-8-82	2,000,000	1,841	138	5.3	5.5	915,000	1,841,000
69	7-9-82	7-27-82	750,000	1,952	129	5.2	5.4	720,000	1,136,000
70 ^a	9-22-84	8-30-83	1,900,000	527	59	5.2	5.4	1,180,000	2,034,000
71 ^b	8-31-83	5-15-84	2,693,560	2,961	166	5.6	5.8	1,030,000	1,830,000
72	6-5-84	9-11-84	2,851,200	--	--	5.5	5.7	1,025,000	2,000,000
73	9-13-84	2-8-85	2,650,000	2,467	230	5.6	5.9	758,000	1,289,000
74	2-16-85	4-1-85	1,114,560	2,565	--	5.6	6.1	468,000	1,501,000
75 ^a	4-2-85	7-16-85	3,389,760	3,337	282	5.7	6.1	736,000	1,590,000
76	7-19-85	--	1,252,800	--	--	5.6	5.9	840,000	1,818,000

^aNew resin in the demineralizer columns.

^bThe demineralizer operated on low flow (approximately 7 gpm) from September 26, 1983, to January 17, 1984, due to a failure of the booster pump.

Table 11. Summary of surveillance tests at the BSR

Test	Most recent test	Previous test
<u>Biennial tests</u>		
Inspection of the shim-safety rods	9-23-85	8-28-84
<u>Annual tests</u>		
Core ΔT channel calibration	9-17-85	12-13-84
Primary coolant flow channel calibration	9-17-85	12-13-84
Pool-water level channel calibration	10-1-85	6-10-85
Maximum rate of reactivity addition by the shim-safety rods	6-7-85	3-7-85
Reactivity assigned to the servo-control system	3-22-85	12-13-84
Subcriticality with each shim-safety rod at its upper limit while all other shim-safety rods are fully inserted	6-7-85	3-7-85
<u>Semiannual</u>		
Cell-ventilation filter efficiency		
A. Elemental iodine	9-26-85	8-14-85
B. Dioctyl phthalate	9-26-85	8-14-85
Radiation monitoring equipment calibration	9-18-85	5-21-85
Stack radiation monitor calibration	6-6-85	12-18-84
<u>Quarterly</u>		
Safety channel No. 1 calibration	9-25-85	6-6-85
Safety channel No. 2 calibration	9-25-85	6-6-85
Safety channel No. 3 calibration	9-25-85	6-6-85
Log-N channel calibration	9-25-85	6-6-85

Table 11. Summary of surveillance tests at the BSR

Test	Most recent test	Previous test
<u>Quarterly (continued)</u>		
Fission chamber channel calibration	9-24-85	6-5-85
Flapper valve position channel functional test	9-30-85	6-10-85
Measurement of release time and time of flight for the shim-safety rods	9-30-85	6-7-85
Containment closure system functional test	9-27-85	6-11-85
In-leakage during containment mode	9-27-85	6-11-85
<u>Others</u>		
Calibration of shim-safety rods	3-22-85	9-12-83

POOL CRITICAL ASSEMBLY

OPERATIONS

The Pool Critical Assembly (PCA) is shutdown for shim-safety rod magnets and associated electronic components upgrading.

MAINTENANCE AND CHANGES

No PCA maintenance activities are reported this quarter.

SURVEILLANCE TESTS AT THE PCA

Shim-safety rod magnets and associated electronic components are being upgraded at the PCA. Until this work is completed, it will not be possible to make all the surveillance tests required at this facility by the Technical Specifications. Thus, a waiver of the PCA Technical Specification surveillance test requirements during the proposed modification and component replacement period was granted.¹

¹Letter to B. L. Corbett from K. H. Poteet, subject "Waiver of Surveillance Tests at the PCA," March 26, 1985.

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