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**OAK RIDGE
NATIONAL
LABORATORY**



**Bulk Shielding Facility
Quarterly Report
January, February, and March 1988**

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Research Reactors Division
Reactor Operations Section

**BULK SHIELDING FACILITY QUARTERLY REPORT
JANUARY, FEBRUARY, AND MARCH 1988**

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F. E. Muggridge

SPONSOR: A. L. Lotts
Research Reactors Division

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CONTENTS

	<u>Page</u>
LIST OF FIGURES	v
LIST OF TABLES	v
SUMMARY	1
BULK SHIELDING FACILITY	1
OPERATIONS	1
Shutdowns	1
Maintenance and Changes	1
Operational Activities	1
Experiments	1
Fuel	7
Experiment Facilities Assignments	8
Demineralizer Performance	8
Gas Filter Status	8
SUMMARY OF SURVEILLANCE TESTS AT THE BSR	8
POOL CRITICAL ASSEMBLY	14
OPERATIONS	14
SURVEILLANCE TESTS AT THE PCA	14

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Core loading 103, BSR	2

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Basic operating data (January-March 1989)	3
2	Analysis of shutdowns	3
3	Maintenance and changes, instrumentation and controls . .	4
4	Maintenance and changes, process system	5
5	Maintenance and changes, mechanical system	5
6	Operational activities	6
7	Experiment facilities activity, LTNIF	6
8	Fuel and shim-safety rod status	7
9	Experiment facilities assignments	8
10	Demineralizer performance data	9
11	Gas filter status	10
12	Summary of surveillance tests at the BSR	11

**BULK SHIELDING FACILITY QUARTERLY REPORT
JANUARY, FEBRUARY, AND MARCH 1988**

SUMMARY

The Bulk Shielding Reactor (BSR) remained shut down during January, February, and March. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory.

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

BULK SHIELDING FACILITY

OPERATIONS

Core loading 103 is shown in Fig. 1. However, the shim-safety rod calibrations are not complete due to a reactor shutdown ordered by the Department of Energy on March 26, 1987.

The BSR remained down during the quarter as ordered by the Department of Energy. The basic operating data are shown in Table 1.

The Low-Temperature Neutron Irradiation Facility (LTNIF) functional testing and facility upgrading continues.

Shutdowns

The reactor remained shut down during the quarter. Table 2 gives an analysis of the scheduled and unscheduled shutdowns.

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.

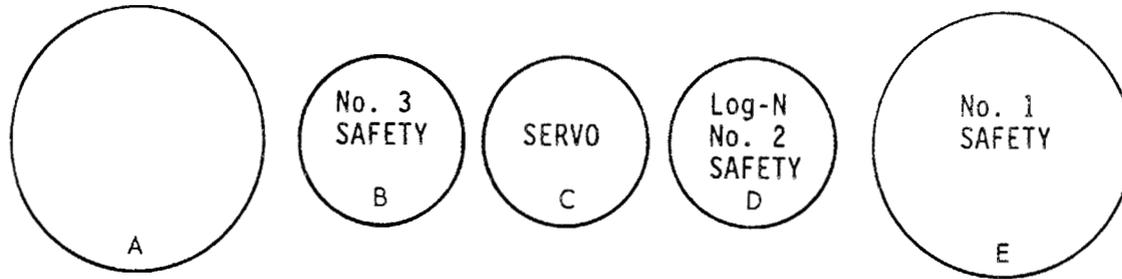
Operational Activities

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

Experiments

Work relating to LTNIF is listed in Table 7.

BSR CORE



				(C)	AL	AL	AL	AL
81	82	83	84	85	86	87	88	89
				AL	AL	AL	AL	AL
71	72	73	74	75	76	77	78	79
		EAST		OR-98-F 193	BSF-S-17 63	BSF-A10 182	BSF-S-18 64	B-83-1 201
61	62	63	64	65	66	67	68	69
		D ₂ O		BSF-T6 211	M-111-F 174	YZP-0049 196	BSF-T2 176	BSF-T5 211
51	52	53	54	55	56	57	58	59
		TANK		BSF-S-T2 107	BSF-T3 190	BSF-S-T4 107	B-83-2 201	(a)
41	42	43	44	45	46	47	48	49
				M-110-F 176	M-59-H 194	M-102-F 190	M-104-F 195	BSF-T4 211
31	32	33	34	35	36	37	38	39
				M-60-H 184	BSF-S-T1 83	M-95-F 180	BSF-S-T3 83	M-61-H 186
21	22	23	24	25	26	27	28	29
11	12	13	14	15	16	17	18	19

LOADING NO.	103
DATE	March 24, 1987
EXCESS REACTIVITY	(b)
OPERATING MASS	3958 g

ROD POSITIONS AT CRITICAL
(With Operating Mass)

ROD NO.	IN. WITHDRAWN	
1	10.05	11.75
2	10.05	11.75
3	10.05	11.75
4	10.05	11.75
5	23.00	11.75
6	23.00	11.75

REMARKS:

DOE mandated reactor to be shut down 4 p.m., March 26, 1987

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

^bRod calibrations are not complete due to a DOE mandated reactor shutdown on March 26, 1987.

^cFission chamber.

Fig. 1. Core loading 103, BSR.

Table 1. Basic operating data
(January-March 1988)

	This quarter	Last quarter	Year to date
Total energy, kWd	0	0	0
Average operating power, kW	0	0	0
Time operating, %	0	0	0
Reactor availability, %	99.9	99.9	99.9
Reactor water radioactivity, cpm/ml (av)	BG	BG	BG
Reactor water resistivity, ohm-cm (av)	1,807,564	1,970,000	1,475,000
Research samples	0	0	0

Table 2. Analysis of shutdowns*

Description of shutdown	Number
Scheduled:	0
Unscheduled:	0
TOTAL:	0

*The Department of Energy ordered the reactor to be shut down on March 26, 1987. The reactor did not operate during the report period.

Table 3. Maintenance and changes, instrumentation and controls

Date	Components	Trouble/change	Maintenance performed
1-4-88	Seismic alarm	New	Functional test completed
1-6-88	Seismic alarm	New	Installed guards around detectors
1-14-88 thru 3-8-88	BSR remote	New	Installed fiber optics from junction box to back of panel board. Pulled fiber optics cable into control room connector box
1-25-88	BSR security	New	Spliced fiber optics through junction box to instrument panel. Replaced all motion detectors with new units
2-16-88	Secondary pH control	Routine	Calibrated secondary pH controller and replaced pH probe
2-26-88 thru 3-15-88	FRCAS	Routine	Calibrated monitrons. Repaired northwest CAM
2-29-88	Cell vent	Routine	Cleaned pitot tubes in cell vent duct
3-7-88 thru 3-11-88	Reactor controls	Routine	Quarterly checks

Table 4. Maintenance and changes, process systems

Date	Components	Trouble/change	Maintenance performed
1-6-88	Building	New	Installed gates at southeast and northwest corners of pool
2-8-88 thru 2-9-88	Control room	New	Cut opening in control room wall for new instrument cabinet. Installed and framed in instrument cabinet
2-25-88	Lifting gear	Routine	QA&I inspected cables
3-14-88	Building electricity		Repaired three receptacles
3-23-88	Pump house exhaust fan		Removed to be replaced
3-23-88	Pump house heater	Routine	Checked operation and lubricated fan motor

Table 5. Maintenance and changes, mechanical systems

Date	Components	Trouble/change	Maintenance performed
3-23-88	Overhead crane	Routine	Operational check of crane bridge

Table 6. Operational activities

Date	Remarks
3-12-88	Returned equipment and systems to normal after electrical power outage
3-28-88	Performed cell vent quarterly functional checks
3-30-88	Performed emergency power quarterly test

Table 7. Experiment facilities activity, LTNIF

Date	Remarks
1-27-88	QA&I inspected the cryostat, storage, and removable work platforms. Results were satisfactory
3-4-88	Changed experiment rig in cryostat

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	0
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	15	15	15
New shim-safety rod fuel elements available	7	7	7
Partially depleted fuel elements available for use (includes core)	30	30	30
New boron stainless steel shim-safety rods placed in service	0	0	0
Boron stainless steel shim-safety rods in service	6	6	6
Boron stainless steel shim-safety 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	Research Reactors
Wet thermal-neutron tubes (D-4-1 and -2, D-6-1, -2, -3, -4, and -5)	East D ₂ O tank	Research Reactors
Low-Temperature Neutron Irradiation Facility (LTNIF)	Southwest corner of pool	Solid State

Demineralizer Performance

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

Gas Filter Status

Table 11 gives detailed information on the condition of both the cell vent and NOG filters.

SUMMARY OF SURVEILLANCE TESTS AT THE BSR

Table 12 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
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	1,962	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	12-6-85	4,354,460	3,727	196	5.7	5.9	840,000	1,818,000
77	12-10-85	4-9-86	3,543,400	1,268	104	5.7	5.8	1,023,000	2,033,000
78	4-11-86	9-15-86	4,521,600	3,238	365	5.9	6.2	686,000	1,613,000
79	9-17-86	11-1-86	1,094,400	1,122	141	5.8	5.9	939,000	2,165,000
80	11-14-86	1-26-87	530,000	1,910	162	6.0	6.4	641,000	1,583,000
81 ^a	1-30-87	9-3-87	4,665,600	374	47	5.6	5.7	922,000	1,708,000
82	9-8-87	--	--	--	--	--	--	--	--

^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. Gas filter status

Type filter	Bank designation	Date last changed	Date last tested	Type test	Retention efficiency (%)
<u>Cell-ventilation system</u>					
North CWS	Overall ^a	East, 9-17-85 West, 8-17-83		DOP	99.993
North charcoal		10-7-87	1-7-88	Elemental iodine	99.935
Center CWS	Overall ^a	East, 9-17-85 West, 8-17-83		DOP	99.990
Center charcoal		10-7-87	1-7-88	Elemental iodine	99.990
South CWS	Overall ^a	East, 9-17-85 West, 8-17-83		DOP	99.992
South charcoal		10-7-87	1-7-88	Elemental iodine	99.946
<u>Normal off-gas</u>					
CWS	West	3-29-88	3-29-88	DOP	99.992
Charcoal	West	3-29-88			b
CWS	East	3-29-88	3-29-88	DOP	99.998
Charcoal	East	3-29-88			b

^aThe CWS filters in the cell-ventilation system were checked in series.

^bThe charcoal filters are to be tested the week of April 11, 1988.

Table 12. Summary of surveillance tests at the BSR

Test	Most recent test	Previous test
<u>Biennial tests</u>		
Inspection of the shim-safety rods	1-22-87	9-23-85
<u>Annual tests</u>		
Core dT channel calibration	9-25-87	9-29-86
Core dP channel calibration	9-30-87	9-30-86
Primary coolant flow channel calibration	9-30-87	9-30-86
Pool water-level channel calibration	9-30-87	6-10-87
Maximum rate of reactivity addition by the shim-safety rods	3-26-87*	12-16-86
Reactivity assigned to the servo-control system	3-26-87*	5-2-86
Subcriticality with each shim-safety rod at its upper limit while all other shim-safety rods are fully inserted	9-25-87	6-9-87
<u>Semiannual</u>		
Cell-ventilation filter efficiency		
A. Elemental iodine	1-7-88	10-9-87
B. Dioctyl phthalate	12-15-87	6-22-87
Continuous air monitor	2-26-88	8-5-87
Radiation monitor	2-26-88	9-3-87
Stack radiation monitor calibration	2-26-88	11-24-87

Table 12. (Continued)

Test	Most recent test	Previous test
<u>Semiannual</u> (continued)		
NOG filter system efficiency		
Elemental iodine test - east bank	3-2-88	8-11-87
Elemental iodine test - west bank	12-21-87	8-27-87
Dioctyl phthalate test - east bank	3-29-88	9-3-87
Dioctyl phthalate test - west bank	3-29-88	9-3-87
<u>Quarterly</u>		
Safety channel No. 1 calibration	3-7-88	12-4-87
Safety channel No. 2 calibration	3-7-88	12-9-87
Safety channel No. 3 calibration	3-7-88	12-9-87
Log-N channel calibration	3-8-88	12-9-87
Fission chamber channel calibration	3-7-88**	3-11-87
Flapper valve position channel functional test	3-11-88	12-16-87
Measurement of release time and time of flight for the shim-safety rods	3-10-88	12-14-87
Containment closure system functional test	3-28-88	12-31-87
In-leakage during containment mode	3-28-88	12-31-87
<u>Ten year</u>		
Syphon break system functional test	7-17-86	3-11-82
Reactor containment inspection	9-22-83	1-3-75

Table 12. (Continued)

Test	Most recent test	Previous test
<u>Ten year</u> (continued)		
Support structure inspection	9-22-83	1-3-75
Reactor bridge inspection	8-30-85	10-12-72
Primary piping (in-pool) inspection	6-16-87	1-3-75
Primary piping (pump house) inspection	9-4-85	10-12-72
Primary piping (valve pit) inspection	8-26-85	10-12-72
Primary pump (when accessible) inspection	3-19-81	5-5-80
<u>Others</u>		
Calibration of shim-safety rods	3-26-87*	5-2-86
Emergency electrical power test	12-31-87	9-10-87
LTNIF, pool water level, functional test	6-5-87	1-20-87

*Rod calibrations are not complete due to the DOE-ordered shutdown on March 26, 1987.

**Counts not sufficient to make calibration check. This will be done prior to reactor start-up.

POOL CRITICAL ASSEMBLY

OPERATIONS

The PCA is shut down for shim-safety rod magnets and associated electronic components to be upgraded. The fuel elements have been shipped to Savannah River for reprocessing.

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 Specifications 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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