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**Bulk Shielding Facility
Quarterly Report
April, May, and June 1987**

T. P. Hamrick
F. E. Muggridge

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Research Reactors Division
Reactor Operations Section

**BULK SHIELDING FACILITY QUARTERLY REPORT
APRIL, MAY, AND JUNE 1987**

T. P. Hamrick
F. E. Muggridge

SPONSOR: A. L. Lotts
Research Reactors Division

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**BULK SHIELDING FACILITY QUARTERLY REPORT
APRIL, MAY, AND JUNE 1987**

SUMMARY

The Bulk Shielding Reactor (BSR) remained shutdown during April, May, and June. 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.

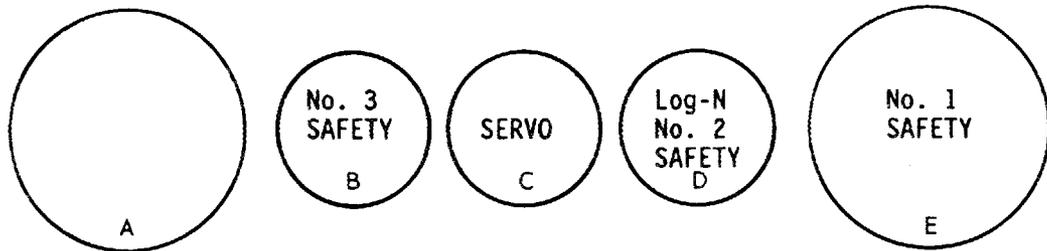
BULK SHIELDING FACILITY

OPERATIONS

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 preliminary work for the Low-Temperature Neutron Irradiation Facility (LTNIF) installation continues.



ORNL/DWG 87-10730

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 WITHDRAWN	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.

Table 1. Basic operating data
(April-June 1987)

	This quarter	Last quarter	Year to date
Total energy, kWd	0	20,709	20,709
Average operating power, kW	0	1,318	659
Time operating, %	0	21.1	10.6
Reactor availability, %	99.9	99.9	99.9
Reactor water radioactivity, cpm/ml (av)	BG	1,122	686
Reactor water resistivity, ohm-cm (av)	1,779,000	939,000	1,359,000
Research samples	0	7	7

Shutdowns

The reactor remained shutdown 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.

Table 2. Analysis of shutdowns*

Description of shutdown	Number
<u>Scheduled</u>	
Experimenters:	
LTNIF samples	0
ATNIF samples	0
Other samples	0
Maintenance:	
Functional systems checks	0
Quarterly checks	0
Reactor Operations:	
Student training	0
Operator training	<u>0</u>
Subtotal:	0
<u>Unscheduled</u>	
Experimenters:	0
Reactor Operations:	<u>0</u>
Subtotal:	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
4-16-87	Rod drop test panel	Routine	Checked instrument and placed panel in service
5-5-87 thru 5-19-87	Headphones	Failed	Repaired
5-5-87	Rod drop test panel	Failed	Removed unit to shop for repairs, and returned to service
5-5-87	CAMs and monitrons	Routine	Calibration checks
5-5-87 thru 5-6-87	FRCAS	System	System modified to include an annunciator when less than two CAMs or monitrons in service. System returned to service
5-14-87 thru 5-15-87	FRCAS	No local alarm	Repaired and placed back into service
5-18-87 thru 5-19-87	GM survey meter and cutie pie	Battery low	Replaced
6-1-87 thru 6-10-87	Instruments	Routine	Quarterly checks
6-3-87	Pump house monitron	Tube failure	Replaced all vacuum tubes and returned instrument to service
6-3-87	Bay area TV monitor	Upgrade	Replaced bay area TV monitors and installed one additional monitor

Table 3. (Continued)

Date	Components	Trouble/change	Maintenance performed
6-5-87	East CAM	Modify	Installed a small source to modify inoperative alarm signal
6-5-87	Southeast monitron	Serviced	Replaced vacuum tube
6-9-87	Servo controller	Malfunction	Replaced
6-17-87	No. 3 rod drive	Routine	Tested drop current, release time and time of flight
6-17-87 thru 6-18-87	Remote TV camera	Out of adjustment	Cleaned, adjusted, and returned to service

Table 4. Maintenance and changes, process systems

Date	Components	Trouble/change	Maintenance performed
4-9-87	Cell vent filters	Routine	Made elemental iodine test, 99.93% efficient
5-11-87 thru 5-26-87	Heat exchanger	Routine	Removed heads for cleaning and inspection, performed service, returned heads for normal operation
5-14-87	Sparge head	New	Set up manifold to test an air sparge head
5-18-87	No. 7 A.C. unit	Routine	Added freon and returned to service
5-27-87	Heat exchanger drain connector	Routine	Removed and stored
5-28-87 thru 6-1-87	Acid pump	Failed	Line unplugged and returned system to normal service
6-4-87	No. 7 A.C. unit	Condenser leak	A.C. unit will be replaced
6-15-87 thru 6-16-87	Reactor exit underwater pipe	Inservice	Quality Department inspected underwater pipe using TV camera

Table 5. Maintenance and changes, mechanical systems

Date	Components	Trouble/change	Maintenance performed
4-13-87	Emergency lights	Routine check	Tested all building emergency lights
6-17-87	No. 3 rod drive	Clutch switch	Removed rod drive, cleaned and adjusted clutch switch activator rod, replaced rod drive for normal service
6-19-87	Lights	Routine	Relamped bay area and control room

Operational Activities

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

Experiments

Work relating to the Low-Temperature Neutron Irradiation Facility, LTNIF, is listed in Table 7.

Fuel

Changes in the fuel inventory are reported in Table 8.

Table 6. Operational activities

Date	Remarks
5-11-87	Shutdown primary water pump, demineralizer pump, and drained secondary heat exchanger for cleaning and inspection
5-12-87	Cleaned heat exchanger tubes and heads
5-14-87	Made flow measurements on air sparge heads
5-21-87	Removed sample 86-05-02 and placed in lead carrier for experimenter
5-26-87	Filled secondary side of heat exchanger, leak rated and started pump for normal service, placed primary pump and demineralizer pump into service
6-18-87	Tested process sink pump. Measured gamma radiation of Co ⁶⁰ source (14,000 R at 1 ft). Measured radiation of core at centerline (15,000 R) and at top (3,000 R). Tested ¹⁶ N jet system
6-19-87	Completed the cell vent functional checks. Relocated emergency cabinet from control room to north entrance foyer

Table 7. Experiment facilities activity, LTNIF

Date	Remarks
4-9-87	Removed experiment from cryostat
5-5-87	Repaired liquid nitrogen line leak on transfer line outside building. Additional support added to the LTNIF storage rack

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.

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
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	1,962	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	--	--	--	--	--	--	--	--

^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	1-22-87	9-23-85
<u>Annual tests</u>		
Core ΔT channel calibration	6-10-87	6-29-86
Primary coolant flow channel calibration	9-30-86	12-13-85
Pool water-level channel calibration	6-10-87	9-30-86
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	6-9-87	3-12-87
<u>Semiannual</u>		
Cell-ventilation filter efficiency:		
A. Elemental iodine	6-19-87	2-27-87
B. Dioctyl phthalate	12-12-86	6-2-86
Radiation monitoring equipment calibration	5-5-87	3-11-87
Stack radiation monitor calibration	3-16-87	9-5-86
NOG filter system efficiency		
Elemental iodine test - east bank	10-3-86	9-23-86
Elemental iodine test - west bank	10-28-86	5-20-86
Dioctyl phthalate test - east bank	3-25-87	9-23-86
Dioctyl phthalate test - west bank	3-25-87	10-28-86

Table 11. (Continued)

Test	Most recent test	Previous test
<u>Quarterly</u>		
Safety channel No. 1 calibration	6-5-87	3-11-87
Safety channel No. 2 calibration	6-5-87	3-11-87
Safety channel No. 3 calibration	6-5-87	3-11-87
Log-N channel calibration	6-5-87	3-11-87
Fission chamber channel calibration	3-11-87**	12-4-86
Flapper valve position channel functional test	6-10-87	3-13-87
Measurement of release time and time of flight for the shim-safety rods	6-9-87	3-12-87
Containment closure system functional test	6-19-87	3-10-87
In-leakage during containment mode	6-19-87	3-10-87
<u>Others</u>		
Calibration of shim-safety rods	3-26-87*	5-2-86
Emergency electrical power test	6-22-87	3-10-87
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 startup.

POOL CRITICAL ASSEMBLY

OPERATIONS

The Pool Critical Assembly (PCA) is shutdown 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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