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**Bulk Shielding Facility
Quarterly Report
July, August, and September
1989**

D. L. Laughlin
T. P. Hamrick

OAK RIDGE NATIONAL LABORATORY

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Research Reactors Division
Reactor Operations Section

**BULK SHIELDING FACILITY QUARTERLY REPORT
JULY, AUGUST, AND SEPTEMBER 1989**

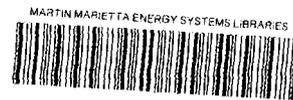
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ACRONYMS

BG	Background
BSR	Bulk Shielding Reactor
CAM	Constant Air Monitor
DOE	Department of Energy
DOP	Diocetyl phthalate
dP	Difference of Pressure
dT	Difference of Temperature
FR&CAS	Facility Radiation and Contamination Alarm system
HEPA	High-Efficiency Particulate, Air
HEU	High-Enriched Uranium
I&C	Instrumentation and Controls
LEW	Low-Enriched Uranium
LTNIF	Low-Temperature Neutron Irradiation Facility
NOG	Normal Off-Gas
P&E	Plant and Equipment
PCA	Pool Critical Assembly

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**BULK SHIELDING FACILITY QUARTERLY REPORT
JULY, AUGUST, AND SEPTEMBER 1989**

SUMMARY

The Bulk Shielding Reactor (BSR) remained shut down during July, August, and September. 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

The BSR core is shown in Fig. 1. However, the shim-safety rod calibrations are not complete because of a reactor shutdown ordered by the Department of Energy (DOE) 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.

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.

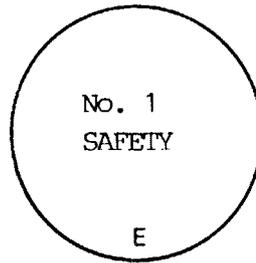
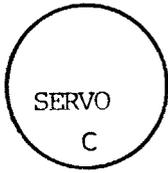
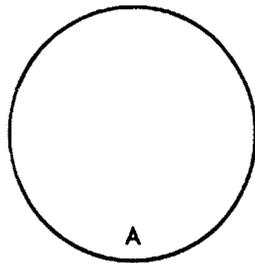
Maintenance and changes of the mechanical systems are listed in Table 5.

Operational Activities

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

Experiments

There was no work relating to the Low-Temperature Neutron Irradiation Facility (LTNIF).



ORNL/DWG 89-7898

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				BSF-S-17 63		BSF-S-18 64	
61	62	63	64	65	66	67	68	69
	D ₂ O							
51	52	53	54	55	56	57	58	59
	TANK			BSF-S-T2 107		BSF-S-T4 107		(a)
41	42	43	44	45	46	47	48	49
31	32	33	34	35	36	37	38	39
					BSF-S-T1 83		BSF-S-T3 83	
21	22	23	24	25	26	27	28	29
11	12	13	14	15	16	17	18	19

LOADING NO.

DATE

November 16, 1988

EXCESS REACTIVITY

(b)

OPERATING MASS

507g

ROD POSITIONS AT CRITICAL
(With Operating Mass)

ROD NO.	IN. WITHDRAWN
1	
2	
3	
4	
5	
6	

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 BSR Core.

Table 1. Basic operating data
(July-September 1989)

	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)	753,000	656,233	755,411
Research samples	0	0	0

Table 2. Analysis of shutdowns^a

Description of shutdown	Number
Scheduled	0
Unscheduled	0
Total	0

^aThe 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
7-7-89	Cell vent	Routine	Instrumentation & Controls (I&C) cleaned flow element.
8-9-89	FR&CAS	Bad module	Instrumentation & Controls (I&C) replaced pool center east CAM panel module.
8-9-89	FR&CAS	Routine	Instrumentation & Controls (I&C) performed bimonthly checks.
9-7-89	Quarterly checks	Routine	Instrumentation & Controls (I&C) completed third-quarter surveillance functional tests.

Table 4. Maintenance and changes - process systems

Date	Components	Trouble/change	Maintenance performed
7-6-89	Control room emergency lights	Three bulbs burned out	P&E relamped.
7-28-89	3010 CAMs		P&E performed programmed maintenance.
7-31-89	Southwest CAM	Bad motor	P&E replaced motor.
8-30-89	Building AC-1 solenoid	Failed	P&E replaced two solenoids for AC-1 louvers.
9-22-89	Bridge trolleys		P&E performed programmed maintenance on east and west bridges.

Table 5. Maintenance and changes - mechanical systems

Date	Components	Trouble/change	Maintenance performed
	None	None	None

Table 6. Operational activities

Date	Remarks
7-20-89	Assisted I&C personnel in measuring the gamma radiation flux of nine fuel elements for Tom Radcliff.
8-1-89	Inventoried 17 fuel elements in storage rack I for DOE material balance area auditor.
9-7-89	Removed primary water exit valve pit cover for inspection and I&C check of radiation probes. Cover reinstalled after inspection.
9-29-89	Performed quarterly containment system functional checks.
9-30-89	Sampled secondary water system once a month and sent to Industrial Hygiene for <i>Legionella</i> analysis.
9-30-89	Treated and ran secondary system twice a week during the quarter.
9-30-89	Water quality during quarter: inlet resistivity ohm-cm 753,001; exit resistivity ohm-cm 822-032; and water radioactivity C/m/mL BG.

Fuel

Changes in the fuel inventory are reported in Table 7.

Table 7. 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 (HEU)	6	6	6
Partially depleted shim-safety rod fuel elements (HEU) for PCA	4	4	4
New fuel elements (HEU) available for use	15	15	15
New shim-safety rod fuel elements (HEU) available	7	7	7
Partially depleted fuel elements (HEU) available for use	30	30	30
Partially depleted fuel elements (LEU) for PCA	32	32	32
Partially depleted fuel elements (HEU) for PCA	1	1	1
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 8. 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 8. 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

Gas Filter Status

Table 9 gives detailed information on the condition of both the cell vent and NOG filters.

SUMMARY OF SURVEILLANCE TESTS AT THE BSR

Table 10 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 that are not reported are satisfied by routine completion of daily and weekly check sheets, startup checklists, hourly data sheets, the operating log book, and miscellaneous quality assurance tests.

Table 9. Gas filter status

Filter system	Type filter	Bank designation	Filter segment	Date changed	Date of last test	Date of previous test	Type test	Efficiency (%)
Cell vent	HEPA	North (5857)	East West	9-17-85 8-17-83	6-20-89	12-14-88	DOP	99.996
Cell vent	HEPA	Center (5858)	East West	9-17-85 8-17-83	6-20-89	12-14-88	DOP	99.996
Cell vent	HEPA	South (5859)	East West	9-17-85 8-17-83	6-20-89	12-14-89	DOP	99.994
Cell vent	Charcoal	North (612)	Overall	10-8-87	7-27-88	1-6-88	Iodine	98.635
Cell vent	Charcoal	Center (613)	Overall	10-8-87	7-27-88	1-6-88	Iodine	98.652
Cell vent	Charcoal	South (614)	Overall	10-8-87	7-27-88	1-6-88	Iodine	99.184
NOG	HEPA	East (5650)	Overall	1-27-89	9-13-89	3-16-89	DOP	99.998
NOG	HEPA	West (5651)	Overall	1-27-89	9-13-89	3-16-89	DOP	99.998
NOG	Charcoal	East (610)	Overall	1-27-89	2-1-89	6-23-88	Iodine	99.883
NOG	Charcoal	West (609)	Overall	1-27-89	1-31-89	12-29-89	Iodine	99.900

Table 10. Summary of surveillance tests at the BSR

Test	Most recent test	Previous test
<i>Biennial tests</i>		
Inspection of the shim-safety rods	1-22-87 ^a	9-23-85 ^a
<i>Annual tests</i>		
Core dT channel calibration	9-27-88 ^a	9-25-87
Core dP channel calibration	9-28-88 ^a	9-30-87
Primary coolant flow channel calibration	9-28-88 ^a	9-30-87
Pool water-level channel calibration	9-29-88 ^a	9-30-87
Maximum rate of reactivity addition by the shim-safety rods	3-26-87 ^b	12-16-86 ^b
Reactivity assigned to the servo-control system	3-26-87 ^b	5-2-86 ^b
Subcriticality with each shim-safety rod at its upper limit while all other shim-safety rods are fully inserted	9-22-88	6-13-88
<i>Semiannual</i>		
Cell ventilation filters		
HEPA filters:		
North	6-20-89	12-14-88
Center	6-20-89	12-14-88
South	6-20-89	12-14-88
Charcoal filters:		
North	7-27-88 ^a	1-6-88
Center	7-27-88 ^a	1-6-88
South	7-27-88 ^a	1-6-88
Continuous air monitor	8-11-89	5-10-89
Radiation monitor	9-6-89	6-6-89
Stack radiation monitor calibration	7-10-89	5-18-89

Table 10. (continued)

	Most recent test	Previous test
<i>Semiannual (continued)</i>		
NOG filter system efficiency		
Elemental iodine test - east bank	2-1-89 ^a	6-23-88
Elemental iodine test - west bank	1-31-89 ^a	12-19-88
Diocetyl phthalate test - east bank	9-13-89	3-16-89
Diocetyl phthalate test - west bank	9-13-89	3-16-89
<i>Quarterly</i>		
Safety channel No. 1 calibration	9-19-88 ^a	6-7-88
Safety channel No. 2 calibration	9-20-88 ^a	6-7-88
Safety channel No. 3 calibration	9-20-88 ^a	6-7-88
Log-N channel calibration	9-19-88 ^a	6-7-88
Fission chamber channel calibration	9-22-88 ^c	5-26-88 ^c
Flapper valve position channel functional test	9-29-88 ^a	6-14-88
Measurement of release time and time of flights for the shim-safety rods	9-22-88 ^a	6-13-88
Containment closure system functional test	9-29-89	6-27-89
Inleakage during containment mode	9-29-89	6-27-89
<i>Ten-year</i>		
Siphon break system functional test	7-17-86	3-11-82
Reactor containment inspection	9-22-83	1-3-75

Table 10. (Continued)

Test	Most recent test	Previous test
<i>Ten-year (continued)</i>		
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
<i>Others</i>		
Calibration of shim-safety rods	3-26-87 ^b	5-2-86
Emergency electrical power test	9-28-88 ^a	7-12-88
LTNIF, pool water level, functional test	6-23-88 ^a	6-5-87
Flying bridge structure inspection	1-27-88	
Work platforms (southeast and southwest) structure inspection	1-27-88	
BSR heat exchanger internal inspection	5-13-87 ^a	

^aThese items will be checked prior to startup.

^bRod calibrations are not complete because of the DOE-ordered shutdown on March 26, 1987.

^cCounts were not sufficient to make a calibration check. This will be done prior to reactor startup.

POOL CRITICAL ASSEMBLY

OPERATIONS

The PCA is shut down for shim-safety rod magnets and associated electronic components to be upgraded.

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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