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Bulk Shielding Facility Semi-Annual Report January, February, March, April, May, June 1990

D. L. Laughlin
G. H. Coleman

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Research Reactors Division
"B" Reactors Section

BULK SHIELDING FACILITY SEMI-ANNUAL REPORT JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE 1990

D. L. Laughlin
G. H. Coleman

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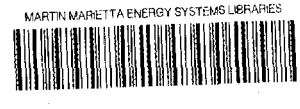

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ACRONYMS

BG	background
BSR	Bulk Shielding Reactor
CAM	constant air monitor
DOE	Department of Energy
DOP	dioctylphthalate
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 Division
LEU	low-enriched uranium
LTNIF	Low-Temperature Neutron Irradiation Facility
NOG	normal off-gas
P&E	Plant and Equipment Division
PCA	Pool Critical Assembly
RORC	Reactor Operations Review Committee

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BULK SHIELDING FACILITY SEMI-ANNUAL REPORT
JANUARY through JUNE 1990

SUMMARY

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

The Pool Critical Assembly (PCA) remains shut down.

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 period as ordered by the DOE. 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.

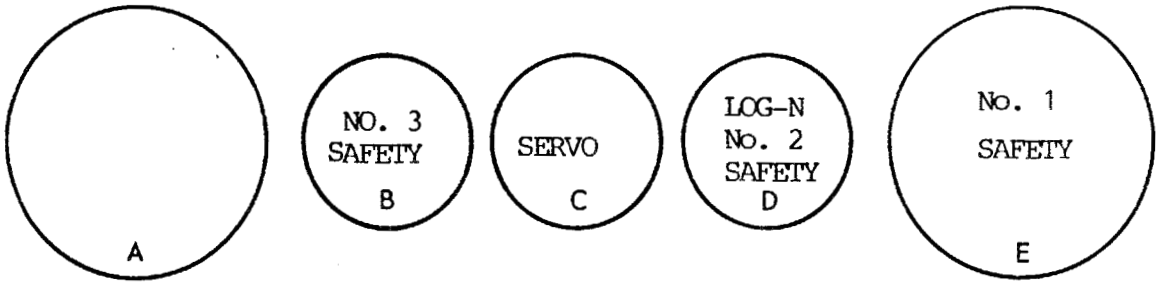
Maintenance and changes of the mechanical systems are listed in Table 5.

Operational Activities

The operational activities for the period 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

81	82	83	84	(C) 85	AL 86	AL 87	AL 88	AL 89
71	72	73	74	AL 75	AL 76	AL 77	AL 78	AL 79
61	EAST 62	63	64	65	BSF-S-17 63 66	67	BSF-S-18 64 68	69
51	D_2O 52	53	54	55	56	57	58	59
41	TANK 42	43	44	BSF-S-T2 107 45	46	BSF-S-T4 107 47	48	(a) 49
31	32	33	34	35	36	37	38	39
21	22	23	24	25	BSF-S-T1 83 26	27	BSF-S-T3 83 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 shutdown 4 p.m., March 26, 1987

(a) Core position for the Low-Temperature Neutron Irradiation Facility.
(b) Rod calibrations are not complete due to a DOE mandated reactor shutdown on March 26, 1987.
(c) Fission chamber.

UCN-8804
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Fig. 1 BSR Core

Table 1. Basic operating data
(January - June 1990)

	This period	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)	730,716	731,999	730,716
Research samples	0	0	0

Table 2. Analysis of shutdowns[a]

Description of shutdown	Number
Scheduled	0
Unscheduled	0
Total	0

[a]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
2/12/90	FR&CAS	Routine	I&C performed quarterly checks.
2/23/90	Quarterly checks	Routine	I&C performed first-quarter surveillance functional tests.
3/13/90	CAMs	Routine	I&C calibrated building CAMs air flow.
3/26/90	LMB-105 and CAM-347	Routine	I&C removed to shop, bench calibrated, and returned to service.
3/29/90	CAM-307	Routine	I&C removed to shop, bench calibrated, and returned to service.
3/30/90	CAM-309	Routine	I&C removed to shop, bench calibrated, and returned to service.
4/4/90	Monitrons 208 & 185	Routine	I&C removed to shop, bench and radiologically calibrated, and returned to service.
5/2/90	FR&CAS	Routine	I&C performed bimonthly checks.
5/31/90	Quarterly checks	Routine	I&C performed second-quarter surveillance functional tests.
6/12/90	Monitrons 34 & 207	Routine	I&C removed to shop, bench and radiologically calibrated, and returned to service.
6/21/90	FR&CAS	Routine	I&C performed quarterly checks.

Table 4. Maintenance and changes - process systems

Date	Component	Trouble/change	Maintenance performed
1/22/90	Control room lights	Burned out	P&E relamped.
1/22/90	Building groundwire	Loose clamp	P&E reclamped.
1/23/90	Bldg 3119 lights	Burned out	P&E relamped.
1/23/90	Electrical wires	Ends bare	P&E covered non-energized bare wires in heat exchanger room.
1/30/90	Chokers and cables	Routine	QA&I inspected and placed inspection stickers on miscellaneous cables and chokers in pool room.
2/1/90	Sulfuric acid tanks	Leaking	P&E disconnected and transferred from Building 3119 to Building 3004.
3/14/90	Control room lights	Burned out	P&E relamped.
3/21/90	Ladders	Routine	P&E inspected and tagged ladders in Buildings 3010 and 3119.
3/22/90	Relief valve	Defective	QA&I changed out safety relief valves for air header and dryer in Building 3009.
4/2/90	CAMs	Routine	P&E performed programmed maintenance
4/5/90	Overhead crane	Routine	P&E performed programmed maintenance.
4/6/90	Skimmer pump	Routine	P&E performed programmed maintenance.
4/16/90	Truck doors	Slipping clutches	P&E made adjustments on open and close clutches.

Table 4. Continued

Date	Component	Trouble/change	Maintenance performed
5/15/90	Underwater pump	Defective	Removed defective pump from north end of pool between fuel racks and installed new pump.
5/21/90	Records		P&E transferred old BSR records from Room 103 to Room 302 in Building 3042.
5/24/90	Tower fans	Routine	P&E performed yearly check of Dodge couplings.
5/31/90	Control room lights	Burned out	P&E relamped.

Table 5. Maintenance and changes - mechanical systems

Date	Components	Trouble/change	Maintenance performed
	None	None	None

Table 6. Operational activities

Date	Remarks
1/17/90	Placed DO NOT OPERATE and STOP tags on closed valves HCV-100,-101, -302, D-17, and D-20 in preparation for disconnecting and removal of sulfuric acid tank in Building 3119. SWP 20910 issued.
1/19/90	Received four drums of sodium hypochlorite for tower treatment.
1/24/90	Industrial Higiene sampled frayed and broken insulation around downspout in northwest corner of pool room for asbestos. Samples were positive.
2/9/90	Fire Department inspected building fire extinguishers.
2/14/90	HP calibrated CAMs in Building 3010.
2/23/90	Removed concrete shield from primary exit valve pit for I&C check of radiation probes and inspection of pit. Shield reinstalled after inspection.
3/6/90	HP calibrated monitrons in Building 3010.
3/14/90	HP tagged or updated tags of items hanging in pool.
3/27/90	EH&P radiologically calibrated CAM-347.
3/30/90	EH&P radiologically claibrated CAMs 307 and 309.
3/30/90	Performed first-quarter containment system functional checks.
4/3/90	Met with criticality committee and DOE auditor on fuel racks and NSRs.
4/19/90	Placed a copy of letter concerning overload failure on ORNL Model Q1154 monitrons in BSR Technical Specifications.
5/15/90	HP calibrated monitrons and CAMSs in Building 3010.
5/31/90	Removed concrete shield from primary exit valve pit for I&C check of radiation probes and inspection of pit. Shield reinstalled after inspection.
6/6/90	Assisted HP with calibration and response test of building monitrons. Reset building containment after completion of test.

Table 6. Continued

Date	Remarks
6/7/90	Assisted Steve Harris with inspection and seismic analysis sudy.
6/7/90	Fire Department inspected Scott air packs.
6/12/90	On Friday, June 12, 1990, approximately 690 gallons of pool water overflowed to the creek. An event fact form was filled out and DOE was informed. Samples of pool water were sent to Analytical Chemistry labs for spectrum and RCRA contents. The spectrum analysis revealed nothing detectable, and the RCRA contents were negligible. The cause of the overflow was the leaving open of a demineralized water valve used to prime the skimmer pump. See UOR-ORNL-90-25-BSR-90-1.
6/26/90	Performed second-quarter containment system functional checks.
6/30/90	Sampled secondary water system once a month and sent to Industrial Hygiene for *Legionella* analysis.
6/30/90	Water quality during the report period: inlet resistivity ohm-cm 730, 716 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 D_2O 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_2O tank	Research Reactors
Wet thermal-neutron tubes (D-4-1 and -2, D-6-1, -2, -3, -4 and -5)	East D_2O 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	9/17/89 8/17/83	6/13/90	12/1/89	DOP	99.995
Cell vent	HEPA	Center (5858)	East West	9/17/85 8/17/83	6/13/90	12/1/89	DOP	99.994
Cell vent	HEPA	South (5859)	East West	9/17/85 8/17/83	6/13/90	12/1/89	DOP	99.996
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	3/22/90	9/13/89	DOP	99.996
NOG	HEPA	West (5651)	Overall	1/27/89	3/22/90	9/13/89	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
Biennial tests		
Inspection of the shim-safety rods	1/22/87[a]	9/23/85[a]
Annual tests		
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
Semiannual		
Cell ventilation filters		
HEPA filters:		
North	6/13/90	12/1/89
Center	6/13/90	12/1/90
South	6/13/90	12/1/89
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	5/15/90	2/14/90
Radiation monitron	5/15/90	3/6/90
Stack radiation monitor calibration	3/27/90	12/1/89

Table 10. Continued

Test	Most recent test	Previous test
Semiannual (continued)		
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
Dioctyl phthalate test - east bank	3/22/90	9/13/90
Dioctyl phthalate test - west bank	3/22/90	9/13/89
Quarterly		
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	6/26/90	3/30/90
Inleakage during containment mode	6/26/90	3/30/90
Ten-year		
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
Ten-year (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
Others		
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]	

[a]These items will be checked prior to startup.
[b]Rod calibrations are not complete because of the DOE-ordered shutdown on March 26, 1987.
[c]Counts 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]

---

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

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