

ANNUAL OPERATING REPORT
STATE UNIVERSITY OF NEW YORK AT BUFFALO
BUFFALO MATERIALS RESEARCH CENTER

License R-77
Docket 50-57

CALENDAR YEAR 1987

Submitted by Louis G. Henry, Director

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INTRODUCTION

This report is submitted pursuant to section 6.7.2 of Appendix A, license R-77, Technical Specifications for the Buffalo Materials Research Center of The State University of New York at Buffalo. It summarizes operations, personnel radiation exposures, and radioactive effluents for the calendar year 1987.

1. Safety-Related Changes in Facility Design or Performance

There were no safety-related changes in facility design or performance during 1987. Some equipment changes were implemented, however, as described in section 5 of this report.

2. Results of Surveillance Tests and Inspections

All required monthly, quarterly, and annual inspections, tests, and calibrations were performed. The results were unremarkable.

Control Blade #4 was removed from the reactor core for visual inspection. No discernible damage, distortion, or degradation of the blade or its support structures was observed.

3. Monthly Energy Releases

The reactor released 459 megawatt-days of energy during the calendar year 1987. This represents an average of 105.8 hours of full-power operation per week. A summary of energy releases is presented in Appendix A.

4. Unplanned Shutdowns During 1987

There were 11 unplanned shutdowns during 1987, as follows:

<u>Date</u>	<u>Type</u>	<u>Cause</u>	<u>Action Taken</u>
1/09/87	Safety Amp	Power Supply Failure	Replaced Safety Amp
1/09/87	Rod Drop (#'s 1 & 3)	Low Magnet Current	Adjusted Magnet Current
1/22/87	Manual	Relay Failure	Reset, checked OK
2/09/87	Manual	Foreign object on core (1)	Removed object from core
2/09/87	Manual	Foreign object on core (2)	Removed object from core
2/12/87	Run In	Foreign object on core (3)	Removed object from core
5/18/87	Manual	Foreign object in pool (4)	Removed object from top of TC nosepiece
9/9/87	Run In	Log N/period amp failure	Replaced amplifier
10/30/87	Flow	Compressed air to flow meter failure	Replaced air supply unit
11/03/87	Flow	Compressed air to flow meter failure	Replaced air supply unit
12/15/87	Run In	High bldg. air concentration	Re-start after airborne source eliminated

- (1) 3/8" x 18" stainless steel tube
- (2) 1/16" cable
- (3) lab coat button
- (4) eyeglasses

5. Maintenance Operations

The following episodic maintenance operations were implemented in 1987:

- Installed new resins in clean-up regeneration system.
- Installed new pilot valves in the containment isolation dampers.
- Automated the secondary coolant chemical treatment system.
- Placed new pool pH and conductivity probes in service.
- Put new liquid radioactive waste storage system into service.

6. Experiments, Tests, and Facility Changes

There were no changes which would change a description in the Safety Analysis Report; no experiments were conducted that deviated from the Safety Analysis Report. There were no major changes or upgrades in the Facility. The new liquid waste storage system is substantially the same as the old (but more accessible). The Nuclear Safety Committee evaluated this system and agreed with Facility management that the new system did not pose previously unreviewed safety questions.

7. Effluents

a. Releases to the Sanitary Sewer

During 1987 there were four controlled releases of radioactivity to the sanitary sewer. The total volume of water released was 59,520 liters, with a total radioactivity of 315.49 millicuries. The yearly and isotopically averaged fraction of maximum permissible concentrations released was .28 per cent.

Tables I - IV provide individual nuclide and total quantity information for each release. Table V provides the yearly averages. The average sewer flow rate for the Winspear Avenue trunk for 1987 was 3.89 E08 ml/day.

b. Building Air

The building air (BA) system releases airborne effluents from the general bay areas (breathing air) and certain low level fume hoods. There were no detected particulate releases from the BA system. The primary gaseous effluent is Argon 41, of which a total of 12 curies was released. The maximum and yearly average release concentrations were 7.5 E-07 and 1.8 E-07 microcuries/ml, respectively. This corresponds with 19 per cent and 8.9 per cent of the limits established by technical specifications.

2. Stack Gas

The stack exhaust (SE) system releases airborne effluents from the high level fume hoods, the hot cell, and from various irradiation and experiment facilities, through a filtered 50 meter high stack. The primary gaseous release is Argon 41, and the primary particulate release is Cesium 138. The maximum and yearly averaged release rates were 2.0E-04 and 5.9 E-06 curies per second, respectively. This represents 21 per cent and 1.8 per cent of the limits established by technical specifications.

Table VI provides the total activities and yearly average concentrations for measured particulates and gases.

8. Environmental Surveys

There were no environmental surveys outside the BMRC building, with the exception of occasional checks for radiation near the large "truck" containment door, and surveys of vehicles leaving or arriving at BMRC. All results were unremarkable.

9. Dosimetry

Dosimetry records were maintained for a total of 122 staff members and facility users. Out of this total, 52 were University Public Safety Officers, who received no measurable exposure. An additional 806 persons entered the facility, using the "visitor" dosimetry badges, 6 of whom received measurable exposures.

The maximum annual whole body dose to an individual was 1.37 Rem. The average annual exposure was .40 Rem, with a total man-rem expenditure of 16.6, distributed over 41 individuals who received measurable exposures. Table VII provides a summary of personnel exposures.

10. Radiation and Contamination Surveys

a. Exit Monitoring

Exit monitoring is required from each egress from the reactor containment or the sub-basement. These surveys occasionally detect contamination, allowing rapid detection and correction of contamination problems.

b. Routine Surveys

Short-lived radioisotopes are processed on a nominal twice per week frequency. Contamination and dose rate surveys are performed after each day's processing. The results of these surveys during 1987 were unremarkable.

Monthly surveys are performed by the BMRC Health Physics personnel, of all areas of the Center. Contamination in excess of action limits was detected 30 times during these surveys. Of the 30 detections, only two exceeded 10,000 dpm/100cm². Surveys include the inside of fume hoods and liquid disposal sinks. There were no known or suspected uncontrolled releases, or personnel uptakes of radioactive materials.

TABLE I
Waste Tank 87-1

1.6×10^7 mls released on 3/16/87

<u>Isotope</u>	<u>$\mu\text{Ci/ml}$ mpc</u>	<u>$\mu\text{Ci/ml}$ Tank</u>	<u>$\mu\text{Ci/ml}$ Release</u>	<u>% mpc @ Release</u>
H-3	1×10^{-1}	7.4×10^{-5}	3.12×10^{-6}	3.12×10^{-3}
Na-24	6×10^{-3}	8.4×10^{-6}	3.54×10^{-7}	.01
Mn-54	4×10^{-3}	7.2×10^{-6}	3.03×10^{-7}	7.58×10^{-3}
Co-58	4×10^{-3}	3.9×10^{-5}	1.64×10^{-6}	.04
Co-60	1×10^{-3}	7.2×10^{-5}	3.03×10^{-6}	0.30
Ag-110m	9×10^{-4}	1.2×10^{-3}	5.05×10^{-5}	5.61
Sb-122	8×10^{-4}	5.5×10^{-5}	2.32×10^{-6}	.29
Sb-124	7×10^{-4}	3.8×10^{-4}	1.60×10^{-5}	2.29
I-131	6×10^{-5}	2.1×10^{-5}	8.84×10^{-7}	1.47
La-140	7×10^{-4}	1.8×10^{-4}	7.58×10^{-6}	1.08
Unidentified β	9×10^{-5}	1.1×10^{-4}	4.63×10^{-6}	5.14
$T_{1/2} > 2$			Total	16.24% of mpc

TABLE II
Waste Tank 87-2

2.37×10^7 mls released on 6/25/87

<u>Isotope</u>	<u>$\mu\text{Ci/ml}$ mpc</u>	<u>$\mu\text{Ci/ml}$ Tank</u>	<u>$\mu\text{Ci/ml}$ Release</u>	<u>% mpc @ Release</u>
H-3	1×10^{-1}	7.5×10^{-5}	4.68×10^{-6}	4.68×10^{-3}
Mn-54	4×10^{-3}	7.1×10^{-6}	4.43×10^{-7}	.01
Co-58	4×10^{-3}	6.9×10^{-5}	4.30×10^{-6}	.11
Co-60	1×10^{-3}	7.0×10^{-5}	4.37×10^{-6}	.44
Ag-110m	9×10^{-4}	3.0×10^{-3}	1.87×10^{-4}	20.78
Sb-124	7×10^{-4}	3.2×10^{-4}	2.00×10^{-5}	2.86
La-140	7×10^{-4}	6.7×10^{-6}	4.18×10^{-7}	.06
			Total	24.26% of mpc

TABLE III
Waste Tank 87-3A

1.52×10^7 mls released on 9/25/87

<u>Isotope</u>	<u>$\mu\text{Ci/ml}$ mpc</u>	<u>$\mu\text{Ci/ml}$ Tank</u>	<u>$\mu\text{Ci/ml}$ Release</u>	<u>% mpc @ Release</u>
H-3	1×10^{-1}	4.9×10^{-5}	1.96×10^{-6}	1.96×10^{-3}
Co-58	4×10^{-3}	1.4×10^{-4}	5.60×10^{-6}	.14
Co-60	1×10^{-3}	1.6×10^{-4}	6.40×10^{-6}	.64
Ag-110m	9×10^{-4}	9.7×10^{-3}	3.88×10^{-4}	43.11
Sb-124	7×10^{-4}	4.1×10^{-4}	1.64×10^{-5}	2.34
La-140	7×10^{-4}	7.0×10^{-6}	2.80×10^{-7}	<u>.04</u>
Total				46.27% of mpc

TABLE IV
Waste Tank 87-3B

4.62×10^6 mls released on 9/27/87

<u>Isotope</u>	<u>$\mu\text{Ci/ml}$ mpc</u>	<u>$\mu\text{Ci/ml}$ Tank</u>	<u>$\mu\text{Ci/ml}$ Release</u>	<u>% mpc @ Release</u>
H-3	1×10^{-1}	4.9×10^{-5}	5.96×10^{-7}	5.96×10^{-4}
Co-58	4×10^{-3}	1.4×10^{-4}	1.70×10^{-6}	.04
Co-60	1×10^{-3}	1.6×10^{-4}	1.95×10^{-6}	19
Ag-110m	9×10^{-4}	9.7×10^{-3}	1.18×10^{-4}	13.10
Sb-124	7×10^{-4}	4.1×10^{-4}	4.98×10^{-6}	.71
La-140	7×10^{-4}	7.0×10^{-6}	8.51×10^{-8}	<u>.01</u>
Total				14.05% of mpc

TABLE V
Yearly Average Releases to the Sanitary Sewer - 1987

<u>Isotope</u>	<u>Curies Released</u>	<u>* Average Annual Concentration ($\mu\text{Ci}/\text{ml}$)</u>
H-3	3.93×10^{-3}	2.83×10^{-8}
Na-24	1.34×10^{-4}	9.64×10^{-10}
Mn-54	2.83×10^{-4}	2.04×10^{-9}
Cr-58	5.04×10^{-3}	3.63×10^{-8}
Co-60	5.98×10^{-3}	4.30×10^{-8}
Ag-110m	2.82×10^{-1}	2.01×10^{-6}
Sb-122	8.80×10^{-4}	6.33×10^{-9}
Sb-124	2.18×10^{-2}	1.57×10^{-7}
I-131	3.36×10^{-4}	2.42×10^{-9}
La-140	3.18×10^{-3}	2.29×10^{-8}
Unidentified β ($T_{1/2} > 2 \text{ hrs}$)	1.76×10^{-3}	1.27×10^{-8}

* Obtained by dividing the total activity released (μCi) by the annual sewer flow ($1.39 \times 10^{11} \text{ mls}$)

BMRC ARGON-41 AND CESIUM-138 AIR RELEASES FOR 1987

Nuclide	POINT OF RELEASE			UNITS
	BUILDING AIR	STACK GAS	STACK PARTICULATE	
	Argon-41	Argon-41	Cesium-138	
Total amount	1.2E+01	1.8E+02	1.2E-02	Curies
Maximum values:				
concentration	7.5E-07	7.0E-05	7.5E-10	uCi/cc
rate	1.6E-06	2.0E-04	2.1E-09	Ci/sec
limit*	4.0E-06	9.6E-04	7.2E-04	uCi/cc Ci/sec
% of limit**	1.9E+01	2.1E+01	3.0E-04	percent
Annual average:				
concentration	1.8E-07	2.3E-06	1.5E-10	uCi/cc
rate	3.8E-07	5.9E-06	3.8E-10	Ci/sec
limit*	2.0E-06	3.2E-04	2.4E-04	uCi/cc Ci/sec
% of limit**	8.9E+00	1.6E+00	1.6E-04	percent
Monitor sensitivities:				
JANUARY 1 -	2.7E-09	2.6E-09	4.3E-13	uCi/cc-CPM
SEPTEMBER 18 -	2.7E-09	2.2E-09	4.6E-13	uCi/cc-CPM
Additional data:				
Period included in calculations	=	365	days	
Number of transient releases	=	185		
Time of reactor operation	=	5575	hours	
Ventillation system ON	=	7230.6	hours	
Stack flow rates:				
Building air	=	7.65E+09	cc/hr	
Stack (vent. ON)	=	1.02E+10	cc/hr	
Stack (shut-down)	=	4.25E+09	cc/hr	
Total stack flow to date	=	8.02E+13	cc	

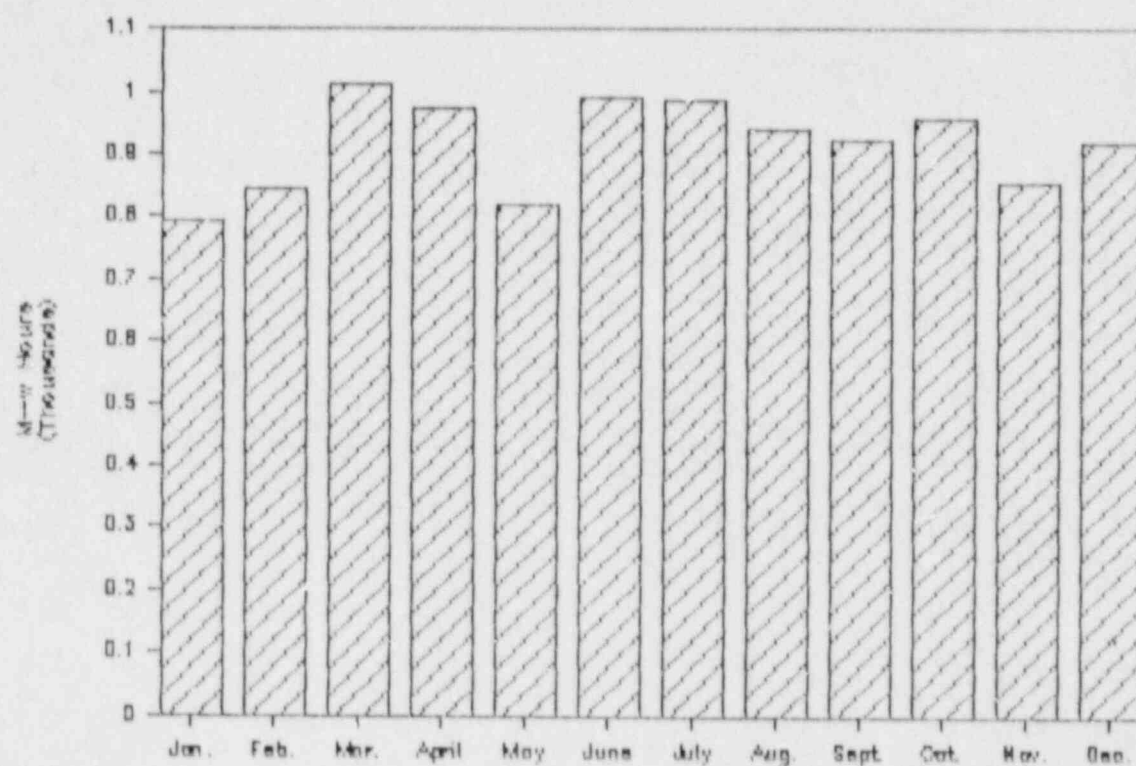
* = Permissible limit based on BMRC Technical Specifications (6/83).
 ** = Percents must be summed for all nuclides for each release point.

TABLE VII

Exposure Summary - 1987

<u>Total W.B. Dose (Rem)</u>	<u>Processors</u>	<u>General Staff</u>	<u>Investi- gators</u>	<u>Visitors</u>	<u>Tours</u>	<u>Security</u>
None measurable	0	6	23	436	361	52
None - < 0.100	0	8	3	9	0	0
0.100 - 0.250	0	3	4	0	0	0
0.250 - 0.500	0	5	5	0	0	0
0.500 - 0.750	2	4	1	0	0	0
0.750 - 1.000	0	3	0	0	0	0
1 - 2	2	1	0	0	0	0
2 - 3	0	0	0	0	0	0
Totals	4	30	36	445	361	52

Monthly Energy Releases



Monthly Energy Releases for 1987

Month -----	Mw-hours Released -----
January	793.7
February	844.0
March	1010.2
April	973.3
May	818.0
June	991.3
July	388.3
August	937.6
September	920.0
October	957.8
November	854.4
December	919.8
Total Mw-hours	11010.4
Total Mw-days	458.8



BUFFALO MATERIALS RESEARCH CENTER

April 11, 1988

TRANL

Mr. Richard W. Starostecki
Director, Division of Project and Resident Programs
U. S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, Pennsylvania 19406

Dear Sir:

Docket 50-57
License R-77

We are enclosing three copies of the Annual Operating Report of the Buffalo Materials Research center, State University of New York at Buffalo, for the calendar year 1987. We submit the report pursuant to 10 CFR 50.71(b).

Very truly yours,

Daniel W. Sullivan, Jr.
Reactor Engineer

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