



**University at Buffalo**  
*The State University of New York*

Occupational and Environmental Safety Services

March 31, 2005

**Docket 50-57**  
**License R-77**

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington D.C. 20555

Dear Sir or Madam:

Enclosed please find two copies of the 2004 Annual Facility Technical Report for the Buffalo Materials Research Center at the State University of New York at Buffalo. This report is submitted pursuant to Facility Technical Specification Requirement 15.1. If you have any questions or wish further information, please contact me at (716) 829-3301.

Sincerely,

David R. Vasbinder  
Director, Buffalo Materials Research Center

Cc: Daniel Hughes, Project Manager USNRC

Steve Holmes, USNRC Inspector Region 1

Joseph Raab,	Director Environment, Health, and Safety
Kevin Thompson,	Chairman Reactor Decommissioning Safety Committee
Mike Dupre,	Associate Vice President for University Facilities
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Mark Adams,	Reactor Engineer
Harry Miller,	Operations Manager

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*The State University of New York*  
Occupational and Environmental Safety Services

# **ANNUAL TECHNICAL** **REPORT**

**STATE UNIVERSITY OF NEW YORK AT BUFFALO**  
**BUFFALO MATERIALS RESEARCH CENTER**

License R-77

Docket 50-57

Calendar Year 2004

Submitted by:

David R. Vasbinder  
Director

March 31, 2005

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## **1. INTRODUCTION**

This report is submitted to the United States Nuclear Regulatory Commission (NRC) pursuant to section 15.1 of Appendix A, of the Technical Specifications (License R-77) for the Buffalo Materials Research Center (BMRC) located at the State University of New York at Buffalo. It summarizes changes to the facility, major maintenance activities, surveillance tests and inspections, radiation surveys, and radioactive effluents for the 2004 calendar year. The facility remained in Possession Only License status throughout the year. All required surveillance was completed.

## **2. MAJOR MAINTENANCE**

Many routine maintenance activities were undertaken in the B.M.R.C. However, there were no maintenance activities undertaken in 2004 that would qualify as major maintenance.

## **3. 10CFR 50.59 CHANGES**

There were no 50.59 reviews performed during the 2004 calendar year.

## **4. RADIOACTIVE EFFLUENTS**

### **4.1 Controlled Discharges to the Sanitary Sewer**

There were three controlled discharges to the sanitary sewer system in 2004. The total volume of water released was 89,200 liters, containing a total of approximately 0.043 millicuries of radioactivity. All three releases were made from the 10,000 gallon above ground waste storage tank (referred to as 10K Tank). Tables 1, 2, and 3 contain the discharge information specific to the releases including comparisons to the monthly average concentration in 10 CFR Part 20, Appendix B, Table 3 "Releases to Sewers" and the sum of the fractions.

### **4.2 Airborne Releases**

No airborne radioactive releases, other than natural background resulting from radon and its daughter products, were made during 2004. The sensitivities of the air effluent monitors (based on the injection of a known quantity of Kr-85 gas) were not performed. A sensitivity ( $\mu\text{Ci/cc/cpm}$ ) of the building air system will be conducted prior to moving reactor fuel.

## **5. ENVIRONMENTAL RADIOLOGICAL SURVEYS**

### **5.1 Routine Surveys**

The direct radiation levels outside the BMRC reactor building are routinely monitored adjacent to the "truck door" access area and on the roof of the liquid waste holding tank vault.

Global Dosimetry Solutions dosimeters are used to monitor integrated radiation levels in seven exterior areas around the facility. These dosimeters are replaced with a new badge every month and the previous month's sent to the dosimetry vendor for processing. The vendor is NVLAP certified. The minimum photon sensitivity for the dosimeter is 5 mrem. Table 4 lists the cumulative summary of the environmental radiation dose equivalent around the facility. The maximum cumulative annual deep dose equivalent reading was 16 mrem on the dosimeter (# 2116) located on the roof of the vault containing the above ground waste holding tank.

Semi-annual "tell-tale" samples are drawn and analyzed from the sampling well tubes adjacent to the underground liquid waste holding tanks (Tank #1). These analyses detected no radioactivity in excess of background levels.

## **6. RADIATION EXPOSURES**

### **6.1 External Dosimetry**

Dosimetry records were maintained for a total of eight staff members and other authorized facility entrants. Film dosimeters provide X, beta, and gamma exposure monitoring. Thermoluminescent dosimeter (TLD) rings are used to measure extremity dose for selected personnel. Also, a TLD for neutron detection is available when necessary. All dosimeters are processed by Global Dosimetry Solutions, a NVLAP certified vendor. These dosimeters are replaced on a bi-monthly basis.

The film dosimeters have a minimum sensitivity of 10 mrem for both beta and photon radiation. A separate neutron sensitive dosimeter (with a minimum sensitivity of 20 mrem per monitoring period) is available and is worn by personnel during manipulations involving the reactor fuel or plutonium - beryllium (PuBe) sources.

During 2004 no monitored individual received a measurable whole body deep dose equivalent. The maximum extremity shallow dose equivalent to an individual was 0.105 rem. This individual received measurable extremity dose performing fuel pre-shipment activities.

University Police Department officers perform routine security tours of the building. The patrol officers wear a University Police dosimeter pack when they perform these walkthroughs. These dosimeters did not record any dose equivalent during 2004.

Four visitor dosimeter packs are also available. These dosimeters are issued to visitors who may need to enter into areas requiring exposure monitoring. None of these visitor dosimeters recorded any measurable dose equivalent in 2004.

Tables 5 and 6 provide summaries of personnel whole body and extremity dose for calendar year 2004.

## **7. RADIATION AND CONTAMINATION SURVEYS**

### **7.1 Exit Monitoring**

Exit monitoring is required as part of each egress from the reactor containment building and other radioactive materials areas within the BMRC. These surveys occasionally detect radioactive contamination, allowing rapid correction of contamination problems.

### **7.2 Routine Surveys**

The BMRC staff performs monthly radiation and contamination surveys of the BMRC building. BMRC contamination action levels are 30 dpm/100 cm<sup>2</sup> beta for personal items, 200 dpm/100 cm<sup>2</sup> beta, otherwise. In calendar year 2005, no contamination was detected in excess of action levels by these surveys on items, surfaces, or areas not labeled or restricted as contaminated.

## **8. MISCELLANEOUS**

- The Reactor Decommissioning Safety Committee convened three times during calendar year 2004. This meets the annual requirement in Facility Technical Specifications for a minimum of two committee meetings.

- **As per periodic requirement, the average annual flow rate through the sanitary sewer system from the facility was measured via flow measurements and the updated dilution factor applied.**

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**Table 1 -- Waste Tank Release to Sanitary Sewer**

Release Number: 2004-01  
From: 10K Tank  
Month: February

Amount Released: 7850 gal.  
2.98E+07 ml  
Date of Release: 2/17/04

Nuclide	Tank ( $\mu\text{Ci/ml}$ )	Monthly Limit ( $\mu\text{Ci/ml}$ )	Release ( $\mu\text{Ci/ml}$ )	Percent of Monthly Limit
Co-60	2.39E-07	3E-05	1.2E-08	4.1E-02
Ag-108m	2.29E-07	9E-05	1.2E-08	1.3E-02
Sr-90	2.17E-07	5E-06	1.1E-08	2.2E-01
Y-90	2.17E-07	7E-05	1.1E-08	1.6E-02
Unidentified Beta	2.36E-10	2E-08	9.5E-13	4.8E-03

TOTAL 9.02E-07  $\mu\text{Ci/ml}$

Total of Limit Released: 0.29 %

Total of Activity Released: 26.91  $\mu\text{Ci}$

Year to Date Activity Released 26.91  $\mu\text{Ci}$



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**Table 2 -- Waste Tank Release to Sanitary Sewer**

Release Number: 2004-02  
From: 10K Tank  
Month: May

Amount Released: 7800 gal.  
2.96E+07 ml  
Date of Release: 5/28/04

Nuclide	Tank ( $\mu\text{Ci/ml}$ )	Monthly Limit ( $\mu\text{Ci/ml}$ )	Release ( $\mu\text{Ci/ml}$ )	Percent of Monthly Limit
Co-60	6.65E-08	3E-05	3.4E-09	1.1E-02
Sr-90	5.66E-08	5E-06	2.9E-09	5.8E-02
Y-90	5.66E-08	7E-05	2.9E-09	4.1E-03
Unidentified Beta	8.98E-08	2E-08	4.6E-09	2.3E+01

**TOTAL** 2.7E-7  $\mu\text{Ci/ml}$

Total of Limit Released: 23.11 %  
Total of Activity Released: 7.99  $\mu\text{Ci}$   
Year to Date Activity Released 34.90  $\mu\text{Ci}$

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**Table 3 -- Waste Tank Release to Sanitary Sewer**

Release Number: 2004-03  
From: 10K Tank  
Month: November

Amount Released: 78500 gal.  
2.98+07 ml  
Date of Release: 12/6/04

Nuclide	Tank ( $\mu\text{Ci/ml}$ )	Monthly Limit ( $\mu\text{Ci/ml}$ )	Release ( $\mu\text{Ci/ml}$ )	Percent of Monthly Limit
Unidentified Beta	2.90E-07	2E-08	5.0E-09	2.5E+01

**TOTAL** 2.90E-07  $\mu\text{Ci/ml}$

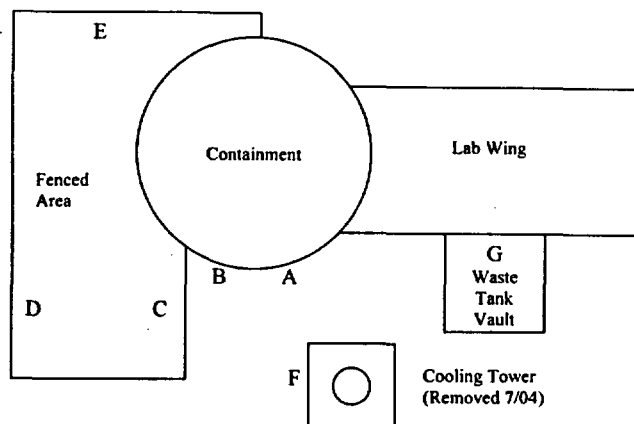
Total of Limit Released: 24.98 %  
Total of Activity Released: 8.66  $\mu\text{Ci}$   
Year to Date Activity Released 43.56  $\mu\text{Ci}$

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**Table 4 -- 2004 Cumulative Summary of Environmental Radiation Dose Equivalent (mrem)**

Monthly Monitoring Period	A	B	C	D	E	F	G	Control Average
	2119 Truck Flight	2118 Truck Left	2120 Fence 1	2121 Fence 2	2122 Fence 3	2117 Cooling Tower	2116 Waste Vault	
January	0	0	0	0	0	0	0	13
February	0	0	0	0	0	0	5	11
March	0	0	0	0	1	0	2	14
April	0	0	0	0	0	0	0	16
May	0	0	0	5	1	0	0	9
June	0	0	0	2	0	0	0	16
July	0	0	0	0	4	N/A	2	14
August	0	0	0	0	0	N/A	1	11
September	0	0	0	0	0	N/A	0	11
October	0	0	0	0	0	N/A	0	15
November	0	0	0	2	1	N/A	2	11
December	0	0	1	1	1	N/A	4	16
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>10</b>	<b>8</b>	<b>0</b>	<b>16</b>	

Dose equivalent reported is subtracted from control average.



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**Table 5 -- 2003 Whole Body Deep Dose Equivalent Summary**

Deep Dose Equivalent (rem)	BMRC Staff	University Police	Visitor	Fuel Handler Dosimeter
None Measurable	8	1	4	2
0.001 to 0.010	0	0	0	0
0.011 to 0.100	0	0	0	0
> 0.100	0	0	0	0

**Table 6 -- 2003 Extremity Shallow Dose Equivalent Summary**

Extremity Shallow Dose (rem)	BMRC Staff
None Measurable	4
0.010 to 0.100	4
> 0.100	0