



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

Occupational and Environmental Safety Services

March 30, 2000

**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 1999 Annual Facility Technical Report for the Buffalo Materials Research Center at the State University of New York at Buffalo. If you have any questions or wish further information, please contact me.

Sincerely,

A handwritten signature in cursive script, reading 'David R. Vasbinder'.

David R. Vasbinder  
Director, Buffalo Materials Research Center

Cc: Tom Dragoun, USNRC

Lou Henry, Director of Occupational and Environmental Safety Services  
Roger McGill, Chairman Reactor Decommissioning Safety Committee  
Mike Dupre, Associate Vice President for University Facilities  
Mark Pierro, Radiation Safety Officer

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**University at Buffalo**  
*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 1999

Submitted by:

David R. Vasbinder  
Director

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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 1999 calendar year. The Facility remained in Possession Only License status throughout the year. All required surveillance's were completed.

## **2. MAJOR MAINTENANCE**

Early in 1999, the building emergency generator was rebuilt. Although the unit experienced very little operational run time, it was original equipment from 1960. University Facilities plumbers, electricians, and an outside contractor upgraded the generator's electricals, gas delivery and exhaust systems.

On October 10<sup>th</sup>, the failure of a 23kV:480V transformer in the substation adjacent to BMRC caused a power outage at BMRC and an adjacent campus building. BMRC facility power was restored by running a temporary cord from the emergency transfer switch, through the steam tunnel, to Acheson Hall, the next closest building with power. On October 13<sup>th</sup>, a portable transformer was placed in the BMRC Electrical Distribution Room and wired to a power feed from Acheson Hall. This temporary installation remained in place through the end of 1999.

During this outage, the rebuilt emergency generator ran for about 2 hours before overheating. Following this incident, the generator was permanently removed from service. On site back up power is not required by Facility Technical Specifications.

The power outage resulted in plans to power the facility from a new substation. The power feed to the facility would come from the McKay heating plant located adjacent to the BMRC. This system of integrated automatic transfer switches would allow for automatic backup power from the University's main 800kW turbine generator. This would eliminate the need for on-site backup power.

## **3. 50.59 CHANGES**

Two 50.59 reviews were performed during the year. Both of these reviews were related to the power outage described in the major maintenance section above.

The first review covered the temporary re-powering of the facility using a portable transformer and temporary wiring to get power from a panel in Acheson Hall. This review also covered the temporary power feed to the BMRC emergency transfer panel.

The second review covered the permanent installation of the new primary and backup power feed from the McKay heating plant. This included an automatically switched main feed and an automatically switched backup feed.

Both reviews were approved in 1999 and the permanent installation was to be completed in early 2000.

#### **4. RADIOACTIVE EFFLUENTS**

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

There were three controlled discharges to the sanitary sewer in 1999. The total volume of water released was 84,700 liters, containing a total of 0.259 millicuries of radioactivity. Two releases were from the 10,000 gallon above ground waste storage tank (referred to as 10K Tank). The other was from the original underground waste tank system (referred to as Tank #1). Tables 1, 2, and 3 contain the discharge information specific to each release including comparison to the monthly average concentration in 10 CFR Part 20, Appendix B, Table 3 "Releases to Sewers" and the sum of the fractions. Table 4 summarizes the total discharges for the year.

##### **4.2 Airborne Releases**

There were no airborne radioactive releases during 1999 other than natural background resulting from radon and its daughter products.

#### **5. ENVIRONMENTAL RADIOLOGICAL SURVEYS**

##### **5.1 Routine Surveys**

The direct radiation levels outside the BMRC reactor building are frequently monitored adjacent to the "truck door" access area and on the roof of the above ground 10,000 gallon liquid waste holding tank vault.

Environmental Luxel badges are used to monitor integrated radiation levels in eight areas around the facility. These badges are replaced with a new badge every month and the previous month's sent to the dosimetry vendor for reading. The minimum sensitivity for the badges is 1 mRem. Table 5 lists the cumulative summary of environmental and area radiation exposures around the facility. The maximum cumulative annual exposure reading

was 26 mRem on the badge located on the roof of the vault containing the above ground 10,000 gallon liquid waste holding tank.

It should be noted that calendar year 1999 was the first year in which the Landauer Luxel badge technology was used exclusively for the environmental badges. The Luxel technology allows for a minimum sensitivity of 1 mRem per monitoring period as compared to a minimum sensitivity of 10 mRem for the badges used in previous years. All monthly readings except for one (Reading of 11 mRem for December on badge 2116, Waste Vault) would have been reported as below the former 10 mRem sensitivity.

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.

## **6. RADIATION EXPOSURES**

### **6.1 External Dosimetry**

Dosimetry records were maintained for a total of 8 staff members and authorized facility entrants. Dosimeters provide X, beta, and gamma exposure monitoring, and for selected personnel, neutron detection. TLD rings are used to measure extremity dose for selected personnel. All dosimeters are processed by a NVLAP certified vendor.

As with the environmental dosimeters, 1999 was the first year in which Luxel technology personnel dosimeters were used exclusively for whole body exposure monitoring. The Luxel badges have a minimum sensitivity of 1 mRem compared to a 10 mRem minimum sensitivity for the previously used film badges. As a result of this greater sensitivity, some small doses are indicated in the exposure reports that in previous years would have been listed as below the minimum reporting sensitivity.

The maximum annual whole body dose to an individual in 1999 was 0.060 Rem which was received by the individual who performs radiation survey meter, area, and effluent monitor calibrations. The maximum extremity dose to an individual was 0.070 Rem which was received by a Health Physicist.

The University Police perform security tours of the building at least once every eight-hour shift during off-hours and holidays. The patrol officers wear one of two University Police dosimeter packs located in the building reception area when they perform these walkthroughs. These dosimeters recorded annual exposures of 3 and 5 mRem .

Four visitor packs are also available. These packs are issued to visitors who may need to enter into areas requiring exposure monitoring. Two of these dosimeters recorded no measurable dose in 1999. The other two recorded annual doses of 10 and 1 mRem.

Tables 6 and 7 provide summaries of personnel whole body and extremity dose for calendar year 1999.

## **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 Health Physics staff performs monthly radiation and contamination surveys of the BMRC building. BMRC contamination action levels are 30 DPM/100cm<sup>2</sup> beta for personal items, 200 DPM/100cm<sup>2</sup> beta otherwise. In calendar year 1999, no contamination in excess of action levels was detected by these surveys on items, surfaces, or areas not labeled or restricted as contaminated.

## **8. FACILITY ORGANIZATION**

BMRC received amendment number 25 to Facility License R-77 on March 17<sup>th</sup>, 1999. This amendment is an administrative measure to update several position titles that had changed within the University at Buffalo and to request a change in the minimum meeting frequency of the Reactor Decommissioning Safety Committee from three times to twice per year. The same individuals at the University at Buffalo, however, continue to serve in those positions.

## **9. MISCELLANEOUS**

- A new University employee, Mr. Scott Barnes, was licensed by the N.R.C. on May 26<sup>th</sup> as a Senior Reactor Operator – Limited to Fuel Handling activities
- Security Events- During 1999, the NRC and FBI issued notices to facilities concerning potential security threats that indicated the need for increased facility security awareness. BMRC and University Police personnel worked closely in reviewing these notices and instituting appropriate security measures.
- The annual emergency preparedness exercise was conducted on November 18, 1999.

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**Table 1 99-01 10K Tank**

**BMRC Waste Tank Release to Sanitary Sewer Report**

Release Number: 99-01  
From: 10K Tank  
Month: January

Amount Released: 7750 gal.  
2.95E+07 ml  
Date of Release: 1/20/99

| Nuclide              | Tank<br>(uCi/ml) | Monthly<br>Limit<br>(uCi/ml) | Release<br>(uCi/ml) | Percent<br>of Monthly<br>Limit |
|----------------------|------------------|------------------------------|---------------------|--------------------------------|
| Co-60                | 1.34E-07         | 3E-05                        | 4.6E-10             | 1.5E-03                        |
| Cs-137               | 2.25E-07         | 1E-05                        | 7.6E-10             | 7.6E-03                        |
| Ag-108m              | 6.30E-08         | 9E-05                        | 2.1E-10             | 2.4E-04                        |
| Unidentified<br>Beta | 1.15E-06         | 1E-07                        | 3.9E-09             | 3.9E+00                        |

**TOTAL 1.57E-06 uCi/ml**

Total of Limit Released: 3.92 %

Total of Activity Released: 46.30 uCi

Year to Date Activity Released 46.30 uCi



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**Table 2 99-02 Tank #1**

**BMRC Waste Tank Release to Sanitary Sewer Report**

Release Number: 99-02  
From: Old Waste  
Tank #1  
Month: May-99

Amount Released: 5500 gal.  
2.09E+07 ml  
Date of Release: 5/28/99

| Nuclide              | Tank<br>(uCi/ml) | Monthly<br>Limit<br>(uCi/ml) | Release<br>(uCi/ml) | Percent<br>of<br>Monthly<br>Limit |
|----------------------|------------------|------------------------------|---------------------|-----------------------------------|
| Co-60                | 9.72E-08         | 3E-05                        | 2.3E-10             | 7.8E-04                           |
| Cs-137               | 1.49E-07         | 1E-05                        | 3.6E-10             | 3.6E-03                           |
| Unidentified<br>Beta | 8.84E-06         | 1E-07                        | 2.1E-08             | 2.1E+01                           |

TOTAL 9.09E-06 uCi/ml

Total of Limit Released: 21.33 %

Total of activity Released: 189.97 uCi

Year to date activity Released 236.27 uCi

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**Table 3 99-03 10 K Tank**

**BMRC Waste Tank Release to Sanitary Sewer Report**

Release Number: 99-03  
 From: 10K Tank  
 Month: Nov-99

Amount Released: 9025 gal.  
 3.43E+07 MI

Date of Release: 11/24/99

| Nuclide              | Tank<br>(uCi/ml) | Monthly<br>Limit<br>(uCi/ml) | Release<br>(uCi/ml) | Percent<br>of<br>Monthly<br>Limit |
|----------------------|------------------|------------------------------|---------------------|-----------------------------------|
| Co-60                | 1.03E-07         | 3E-05                        | 4.1E-10             | 1.4E-03                           |
| Cs-137               | 1.03E-07         | 1E-05                        | 4.1E-10             | 4.1E-03                           |
| Unidentified<br>Beta | 4.54E-07         | 1E-07                        | 1.8E-09             | 1.8E+00                           |

TOTAL 6.60E-07 uCi/ml

Total of Limit Released: 1.80 %

Total of activity Released: 22.63 uCi

Year to date activity Released 258.90 uCi

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**Table 4 - 1999 Yearly Releases to the Sanitary Sewer**

| Nuclide           | Quantity Released (Ci) | Average Annual Concentration (uCi/ml) |
|-------------------|------------------------|---------------------------------------|
| Co-60             | 9.51E-06               | 9.1E-11                               |
| Ag-108m           | 1.86E-06               | 1.8E-11                               |
| Cs-137            | 1.33E-05               | 1.3E-10                               |
| Unidentified Beta | 2.34E-04               | 2.3E-09                               |

TOTAL 0.259 mCi

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**TABLE 5 – 1999 Cumulative Summary of Environmental and Area  
Radiation Exposures**

**Cumulative Summary of Environmental and Area Radiation Exposures  
Calendar Year - 1999  
All Results Reported in mRem**

| Buffalo Materials Research Center |                   |                 |                 |                 |                             |                            |                          |                        |
|-----------------------------------|-------------------|-----------------|-----------------|-----------------|-----------------------------|----------------------------|--------------------------|------------------------|
| Monthly<br>Monitoring<br>Period   | 335<br>Truck door | 2122<br>Fence 3 | 2121<br>Fence 2 | 2120<br>Fence 1 | 2119<br>Truck door<br>Right | 2118<br>Truck door<br>Left | 2117<br>Cooling<br>Tower | 2116<br>Waste<br>Vault |
| 1/1-31/99                         | 1                 | M               | M               | M               | M                           | M                          | M                        | 2                      |
| 2/1-28/99                         | M                 | M               | M               | M               | M                           | M                          | M                        | 3                      |
| 3/1-31/99                         | M                 | M               | M               | M               | M                           | M                          | M                        | 2                      |
| 4/1-30/99                         | M                 | M               | M               | M               | M                           | M                          | M                        | 3                      |
| 5/1-31/99                         | M                 | M               | M               | M               | M                           | M                          | M                        | M                      |
| 6/1-30/99                         | M                 | M               | M               | M               | M                           | M                          | M                        | M                      |
| 7/1-31/99                         | M                 | 1               | 1               | M               | M                           | M                          | M                        | 2                      |
| 8/1-31/99                         | M                 | M               | M               | M               | M                           | M                          | M                        | 1                      |
| 9/1-30/99                         | 1                 | 1               | M               | M               | M                           | M                          | M                        | M                      |
| 10/1-31/99                        | M                 | M               | M               | M               | M                           | M                          | M                        | M                      |
| 11/1-30/99                        | 2                 | 1               | 1               | M               | M                           | M                          | M                        | 2                      |
| 12/1-31/99                        | M                 | 1               | M               | M               | M                           | M                          | M                        | 11                     |
| Cumulative<br>Total               | 4                 | 4               | 2               | M               | M                           | M                          | M                        | 26                     |

M = minimal, less than 1 mRem

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**Table 6 - 1999 Whole Body Exposure Summary**

| Total Whole Body Dose (Rem) | BMRC Staff | University Police Dosimeters | Visitors Badges | Fuel Handler Badge |
|-----------------------------|------------|------------------------------|-----------------|--------------------|
| None Measurable             | 0          | 0                            | 2               | 1                  |
| 0.001 to 0.010              | 7          | 2                            | 2               | 0                  |
| 0.011 to 0.100              | 1          | 0                            | 0               | 0                  |
| > 0.100                     | 0          | 0                            | 0               | 0                  |

**Table 7 - 1999 Extremity Exposure Summary**

| Total Extremity Dose (Rem) | BMRC Staff |
|----------------------------|------------|
| None Measurable            | 4          |
| 0.010 to 0.100             | 3          |
| > 0.100                    | 0          |