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College of Science and Mathematics
Harrisonburg, VA 22807
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J-6

October 16, 2007

U.S. Nuclear Regulatory Commission- Region I
Attn: License Assistance Team
475 Allendale Road
King of Prussia, PA 19406-1415

030 01125

RE: License Number 45-10414-01

To Whom it May Concern:

The purpose of this letter is to (1) request an amendment to the license to remove/decommission currently licensed rooms in Burruss Hall (2) request an amendment to the license to authorize additional rooms in [REDACTED] for the intended purpose of radioactive material usage (3) request an amendment to the license to add an authorized user.

(1) Amendment to Remove Burruss Hall Rooms

141579

Pursuant to 10 CFR 20 Subpart E, James Madison University- College of Science and Mathematics requests release of rooms 322, 328, 332, and 333 of Burruss Hall for unrestricted use. These rooms were previously licensed (refer to license application renewal dated April 29, 1991) for radioactive material usage. A final status survey in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSIMM) was conducted by the Radiation Safety Academy in August 2007. The final status survey report, including work plan and data is attached.

(2) Amendment to Add [REDACTED] Rooms

In order to accommodate the needs of the research collaboration between James Madison University and SRI International, we are requesting that five newly constructed labs be added to the license as authorized facilities for the usage of radioactive materials.

These rooms are the laboratories designated by room numbers [REDACTED] and [REDACTED]. All [REDACTED] rooms will be posted "Caution Radioactive Materials". Radioactive materials will be received in rooms [REDACTED] and [REDACTED]. Radioactive material will be stored in rooms [REDACTED] and [REDACTED]. A description of the security measures that will be employed and a copy of the facility floor plans are attached.

141579

NMSS/RGN1 MATERIALS-002
SEPARATED OUT OF 141225
1/11/2008.

(3) Amendment to Add an Authorized User to License

We are requesting that Dr. Krishna Kodukula be added to our license as an authorized user. We request that Dr. Kodukula be granted authorization to use any radioactive material covered under our current license. A copy of Dr. Kodukula's resume detailing his extensive experience is attached.

Thank you for your attention to these matters. If you have any questions, please contact me at (540) 568-6678 or armstrhk@jmu.edu.

Sincerely,

Heather K. Armstrong

Heather K. Armstrong
Laboratory Safety Manager/RSO

Attachments: Burruss Hall- Final Status Survey Report
[REDACTED] - Security Measures
[REDACTED] - Facility Floor Plan
Resume- Dr. Krishna Kodukula

45-10414-01
030 01125

James Madison University
Burruss Hall
FINAL STATUS SURVEY REPORT

August 21, 2007

Prepared by:



**RADIATION
SAFETY ACADEMY**

**481 North Frederick Avenue, Suite 302
Gaithersburg, MD 20877**

141579

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I. INTRODUCTION

On August 15, 2007, the Radiation Safety Academy performed final status survey (FSS) activities in four rooms at Burruss Hall on the campus of James Madison University (JMU). The FSS was based on the October 2005 *Work Plan For The Final Status Survey Of Miller Hall at the James Madison University*. As described in that document, the FSS strategy was consistent with the Multi-Agency Radiation Survey And Site Investigation Manual (MARSSIM).

The JMU FSS was conducted on four rooms in Burruss Hall that were posted for the presence of radioactive materials. They were rooms 322, 328, 332, and 333. As described in the Work Plan, each room was divided into two survey units (floor and lower walls). All rooms were designated as MARSSIM Class 2 surveys.

The basic FSS activities involved comprehensive scanning for gross alpha and gross beta radioactivity of floors and lower walls with gas proportional detectors, collection of nine static measurements of surface beta activity in each survey unit, collection of nine smear samples in each survey unit for analysis of removable contamination, and collection of smear samples from hoods, sinks, and other appropriate surfaces at biased locations.

Data quality objectives (DQOs) were specified in the Work Plan. They included quantification of minimum detectable count rates for static measurements and scanning, a determination that nine measurements per survey unit would provide the necessary statistical power for nonparametric testing, and the establishment of an appropriate derived concentration guideline limit (DCGL_w) as a limit of acceptable activity on building surfaces. Evaluation of historical radioisotope usage led to the conclusion that residual radioactivity remaining on room surfaces could be due to any number of isotopes, but most likely would be from a beta-particle emitting material.

The NRC has developed the D and D code, Version 2.1, enabling projections of radiation doses based on unit levels of surface radioactivity. Several screening levels established at the NRC license termination rule standard of 25 mrem per year have been published by NRC in NUREG 1556 Volume 11. As part of this project, equivalent values were either generated with the D and D code or taken from NUREG 1556 Volume 11 for all radionuclides of potential concern. These values appear in the Work Plan and are reproduced in Table 1.

Table 1 - DCGL_w Values For Total Surface Radioactivity		
Radionuclide	NRC Screening Value ¹ (dpm/100 cm ²)	Source
H-3	1.2 E +08	NUREG 1556
C-14	3.7 E +06	NUREG 1556
Na-22	9.5 E+03	NUREG 1556
S-35	1.3 E+07	NUREG 1556
Mn-54	2.3 E+04	NUREG 1556
Co-57	2.1 E+05	D and D code
Co-60	7.1 E+03	NUREG 1556
Zn-65	4.8 E+04	D and D code
Sr-90/Y-90	8.7 E+06	D and D code
Cd-109	1.1 E+05	D and D code
Ag-110m	1.0 E+04	D and D code
Ba-133	*	Not available in either
Cs-137	2.8 E+04	NUREG 1556
Pb-210	5.4 E+02	D and D code
Ra-226	1.1 E+03	D and D code

¹From NUREG 1556 Volume 11, Table 11.1 and/or the D and D code; equivalent to 25 mrem per year.

For the beta particle emitting radionuclides of concern (all of the radionuclides in the table except Pb-210 and Ra-226), the screening level is lowest for Co-60. The most conservative approach to the surveys was to establish the DCGL_w based on the assumption that all gross beta surface activity was due to Co-60 contamination. As discussed in the Work Plan, the objective in establishing a DCGL_w was to select a level that was not only compliant with NRC's license termination rule but additionally, was consistent with ALARA. These objectives were attained by using the most conservative value, i.e., the 7,100 dpm/100 cm² for Co-60, as the DCGL_w for these final status surveys. So as not to miss any potential alpha contamination, survey units were also scanned with the gas proportional detectors in the "alpha only" setting.

The hand-held gas proportional detectors register count rates of approximately 450 cpm at the DCGL_w. As described in the Work Plan, all instruments used in the surveys had the desired sensitivity necessary to quantify levels of activity which were less than the DCGL_w. Expressed as a count rate, the scanning minimum detectable count rate (Scan MDC) was 175 cpm (equivalent to 1,750 dpm/100 cm²). The count time for static measurements using the gas proportional detector was 0.5 minutes; for that count interval, the Static measurement MDC was 75 cpm (equivalent to 1,150 dpm/100 cm²). For a 0.5 minute static measurement, 225 counts indicated the presence of activity at the 7,100 dpm/100 cm² DCGL_w.

II. SURVEY RESULTS

A total of 8 survey units were investigated. Each survey unit was assigned a unique survey unit number. Numbers were assigned sequentially in the order that the survey unit was investigated. Each room or laboratory comprised two survey units (floors and lower walls). See Appendix A for completed FSS forms of each room.

Floor Scan

Comprehensive floor scans were conducted using the Academy's Ludlum Model 239-1F floor monitor equipped with a Ludlum Model 43-37 gas proportional probe. All accessible floors were scanned in each survey unit. Fixed measurements were made on the floor using a Ludlum Model 2224-1 equipped with a Ludlum Model 43-68 gas proportional probe. Total surface beta activity and total surface alpha activity were evaluated. Scanning of all survey units revealed no radioactive contamination.

Lower Wall Scan

The lower walls, consisting of the walls from the floor to a height of two meters (approximately six feet) were scanned with hand-held gas proportional detectors (Ludlum Model 2224-1 equipped with a Ludlum Model 43-68 gas proportional probe. Consistent with floor coverage, 100 percent of the lower wall surfaces were scanned in each survey unit. Total surface

beta activity and total surface alpha activity were evaluated. Scanning of all survey units revealed no radioactive contamination.

Total Surface Activity Measurements

Nine static total surface activity measurements were collected with 100 cm² surface area gas flow proportional detector (Ludlum Model 43-68) in each survey unit. The duration for each measurement was 0.5 minute. Measurement locations were determined following the triangular grid methodology described in MARSSIM. When the methodology resulted in an inaccessible location, it was replaced by selecting the nearest accessible location to the desired coordinates.

Removable Surface Activity – Smear Sample Surveys

Nine smear samples were collected in each survey unit. The sample locations were selected based on the methodology found in MARSSIM following a triangular grid pattern in each survey unit. Samples were also collected from sink drains and chemical fume hood as described in the Work Plan. Additional samples were collected off benchtops as identified on each FSS survey form. Samples were analyzed via gamma counting and via liquid scintillation counting. Sample locations were identified on the final status survey forms (Appendix A). The sample results are provided in Appendix B.

Hood Surveys

In addition to the smear samples collected in hoods, interior hood surfaces were scanned with gas proportional detectors. The smear/swab samples are identified on the final status survey forms (Appendix A) and the analytical data are provided in Appendix B.

Sink and Sink Drain Surveys

Sink surfaces were scanned with gas proportional detectors. Smear samples were collected in each sink and sink drain. Samples collected in sinks are identified on the final status survey forms (Appendix A) and the analytical data are provided in Appendix B.

No radioactive contamination was found in any of the survey units when scanning with the meters, including both floor and wall scans. No radioactive contamination was found when scanning the benchtops, hood surfaces, and sinks with the meters; furthermore, no removable radioactive contamination was found on any of the smear/swab samples taken in each survey unit. Because of the lack of contamination, statistical testing via the Wilcoxon Rank Sum (WRS) test was not necessary to establish compliance with NRC release limits.

IV. QUALITY CONTROL

All instruments used in the final status surveys were subject to strict quality control measurements. All radiation detectors were checked for proper operation prior to conducting the surveys. Background levels were recorded prior to the surveys and are recorded on each FSS survey form (Appendix A). The calibration certificates for each meter used to scan surfaces are provided in Appendix C. Laboratory quality control data is available upon request.

V. DISCUSSION

The MARSSIM approach to FSS data evaluation calls for using a nonparametric statistical test to evaluate conditions in each survey unit with respect to the allowable limit, or $DCGL_w$. If statistical testing concludes with acceptance of the Null Hypothesis, the survey unit must be remediated and resurveyed prior to being released for unrestricted use. However, since all of the measurement data collected along randomized grid patterns in JMU survey units did not exceed the $DCGL_w$, statistical testing was not necessary to determine compliance with the $DCGL_w$ and a rejection of the Null Hypothesis¹ was warranted.

It should be noted that MARSSIM includes a methodology to account for areas of elevated activity in Class 1 survey units. This is known as the Elevated Measurement Comparison (EMC). While no survey units were initially classified as Class 1, where measurements exceeded the $DCGL_w$, the survey units can be reclassified as Class 1. The purpose of the EMC is to provide assurance that areas exhibiting unusually large measurements receive proper attention regardless of the outcome of the appropriate nonparametric statistical test such that the

¹ The Null Hypothesis states that residual radioactivity in the survey unit exceeds the release limit.

potential for significant radiation doses are identified. By incorporating a 100 percent scan in Class 2 survey units, these final status surveys effectively identified all contaminated areas, regardless of how small they were relative to the size of the grids used to establish measurements locations. Rather than using statistical testing to establish compliance with the release criterion, the contaminated areas were investigated such that the final status of the building surfaces in each survey unit supports rejection of the Null Hypothesis.

Based on the results of the FSS investigation, radiological conditions in the posted rooms in question in Burruss Hall are such that the building is suitable for unrestricted use.

Prepared by: 
Alan Fellman, Ph.D., C.H.P.

Date: August 21, 2007

James Madison University FSS Report
August 21, 2007

-----**Appendix A**-----

Final Status Survey Forms

James Madison University FSS Report
August 21, 2007

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**JAMES MADISON UNIVERSITY FINAL STATUS SURVEY FORM
BURRUSS HALL**

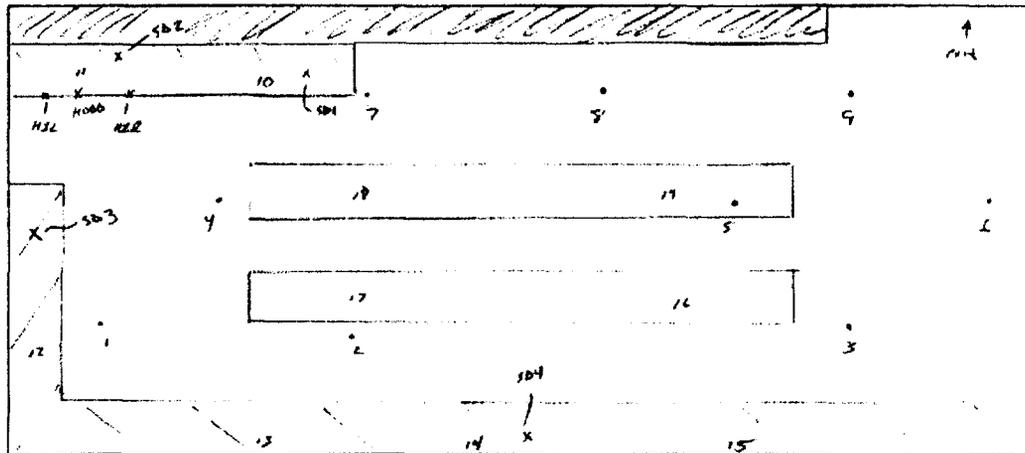
CLASS II SURVEY - FLOOR UNIT

Survey Unit # 1

Survey Date: 8/15/07

Location: Floor 2

Room # 328



Length (x): 9.45 (m) Width (y): 7.50 (m) Area: 71 (m²)
 L₁ = 235 (cm) L₂ = 204 (cm) First Point (65°, 40°S)
 Number of Hoods 1 Hood Number of Sinks 4 drains (50)

METERS

	Type	Serial Number	Calibration Date	Background (cpm)
Floor Scan	43.37	162850	1/20/07	408
Integrated Counts	41.68	141175	1/20/07	655
Other				

INTEGRATED COUNTS (ALL COUNT RATES IN CPM) (30 seconds)

Location	Count Rate	Location	Count Rate	Location	Count Rate
1	138	4	127	7	152
2	135	5	142	8	143
3	120	6	142	9	136

Comments: _____

Approved: *Al Fell*

Date: 8/20/07

**JAMES MADISON UNIVERSITY FINAL STATUS SURVEY FORM
BURRUSS HALL**

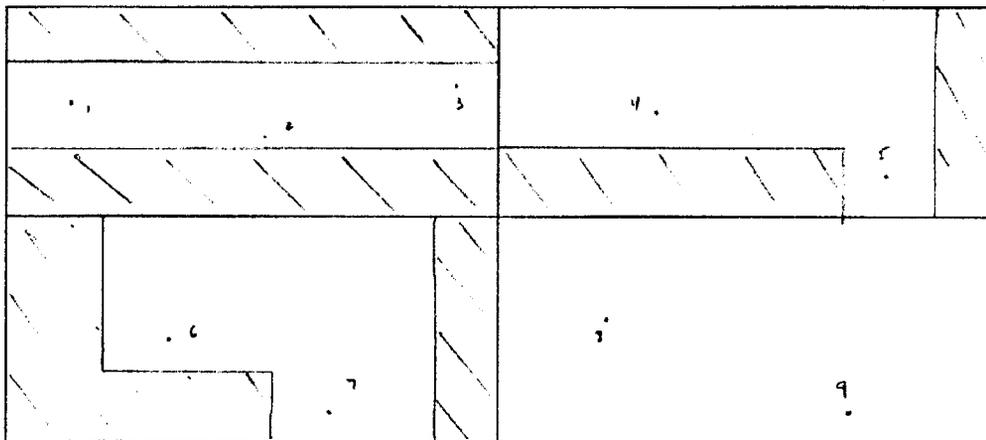
CLASS II SURVEY - WALL UNIT

Survey Unit # 2

Survey Date: 8/15/07

Location: Floor 3

Room # 328



Length (x): 9.45 (m) Width (y): 7.55 (m) Area: 678 (m²)

METERS

	Type	Serial Number	Calibration Date	Background (cpm)
Wall Scan	43-68	187275	1/30/07	235
Integrated Counts	43-65	187275	1/30/07	235
Other				

INTEGRATED COUNTS (ALL COUNT RATES IN CPM) (30 seconds)

Location	Count Rate	Location	Count Rate	Location	Count Rate
1	96	4	51	7	97
2	71	5	82	8	112
3	95	6	91	9	89

Comments: _____

Approved: [Signature]

Date: 8/20/07

**JAMES MADISON UNIVERSITY FINAL STATUS SURVEY FORM
BURRUSS HALL**

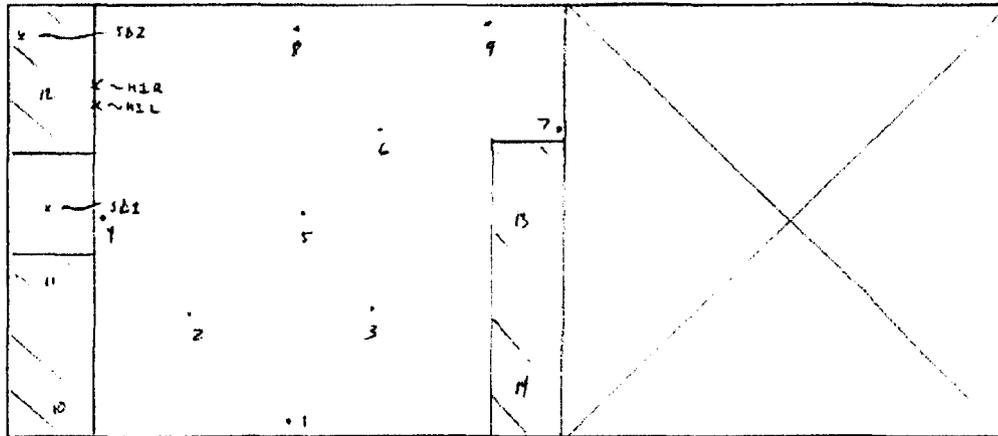
CLASS II SURVEY - FLOOR UNIT

Survey Unit # 3

Survey Date: 8/15/07

Location: Floor 3

Room # 332



Length (x): 2.95 (m) Width (y): 3.60 (m) Area: 10.5 (m²)
 L₁ = 90 (cm) L₂ = 78 (cm) First Point (169, 255)
 Number of Hoods 1 + level Number of Sinks 2 Drains (SD)

METERS

	Type	Serial Number	Calibration Date	Background (cpm)
Floor Scan	43-37	162850	1/30/07	408
Integrated Counts	45-68	187275	1/30/07	235
Other				

INTEGRATED COUNTS (ALL COUNT RATES IN CPM) (30 seconds)

Location	Count Rate	Location	Count Rate	Location	Count Rate
1	107	4	112	7	112
2	136	5	133	8	94
3	116	6	116	9	111

Comments: _____

Approved: *[Signature]*

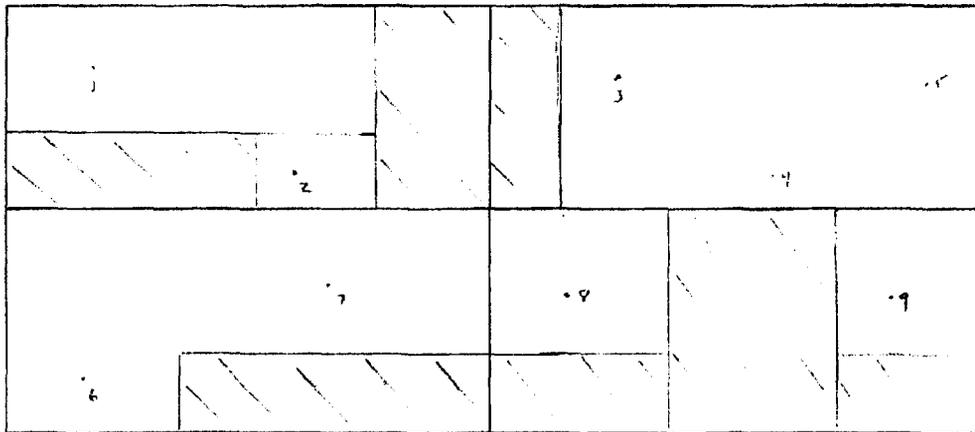
Date: 8/20/07

**JAMES MADISON UNIVERSITY FINAL STATUS SURVEY FORM
BURRUSS HALL**

CLASS II SURVEY - WALL UNIT

Survey Unit # 4
Location: Floor 3

Survey Date: 8/15/07
Room # 332



Length (x): 2.95 (m) Width (y): 3.50 (m) Area: 25.8 (m²)

METERS

	Type	Serial Number	Calibration Date	Background (cpm)
Wall Scan	43-69	197275	1/30/07	235
Integrated Counts	42-68	187275	1/30/07	255
Other				

INTEGRATED COUNTS (ALL COUNT RATES IN CPM) (30 s. exp)

Location	Count Rate	Location	Count Rate	Location	Count Rate
1	182	4	75	7	88
2	175	5	95	8	142
3	101	6	80	9	192

Comments: _____

Approved: *Al Fell*

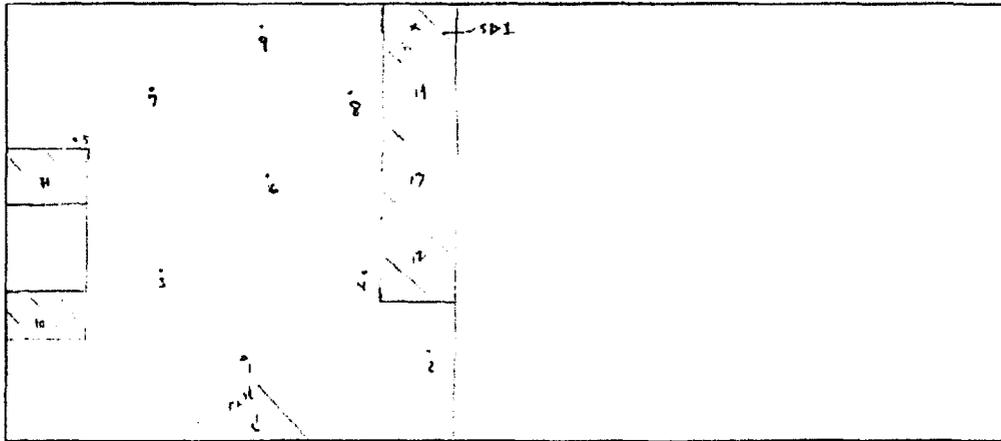
Date: 8/20/07

**JAMES MADISON UNIVERSITY FINAL STATUS SURVEY FORM
BURRUSS HALL**

CLASS II SURVEY - FLOOR UNIT

Survey Unit # 5
Location: Floor 3

Survey Date: 8/15/07
Room # 322



Length (x): 3.10 (m) Width (y): 5.85 (m) Area: 18.1 (m²)
L₁ = 119 (cm) L₂ = 103 (cm) First Point (171, 172)
Number of Hoods 0 Number of Sinks 1 Drain (50)

METERS

	Type	Serial Number	Calibration Date	Background (cpm)
Floor Scan	43-37	162850	1/30/07	408
Integrated Counts	43-68	157275	1/30/07	155
Other				

INTEGRATED COUNTS (ALL COUNT RATES IN CPM) (30 sec counts)

Location	Count Rate	Location	Count Rate	Location	Count Rate
1	122	4	110	7	123
2	123	5	117	8	119
3	122	6	107	9	97

Comments: _____

Approved: [Signature]

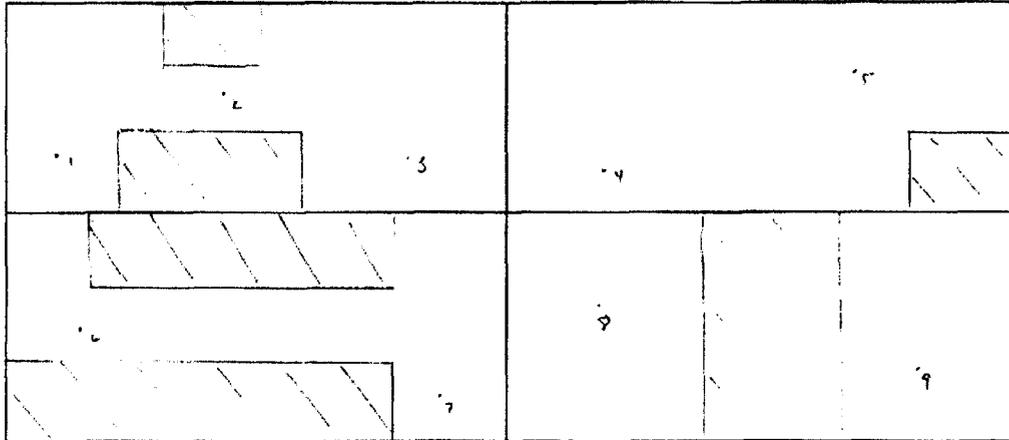
Date: 8/20/07

**JAMES MADISON UNIVERSITY FINAL STATUS SURVEY FORM
BURRUSS HALL**

CLASS II SURVEY – WALL UNIT

Survey Unit # 6
Location: Floor 3

Survey Date: 8/15/07
Room # 322



Length (x): 3.10 (m) Width (y): 5.85 (m) Area: 35.9 (m²)

METERS

	Type	Serial Number	Calibration Date	Background (cpm)
Wall Scan	43-65	187275	1/30/07	255
Integrated Counts	42-65	67775	1/30/07	255
Other				

INTEGRATED COUNTS (ALL COUNT RATES IN CPM) (30 seconds)

Location	Count Rate	Location	Count Rate	Location	Count Rate
1	73	4	76	7	53
2	87	5	66	8	101
3	86	6	78	9	89

Comments: _____

Approved: *De Jell*

Date: 8/20/07

**JAMES MADISON UNIVERSITY FINAL STATUS SURVEY FORM
BURRUSS HALL**

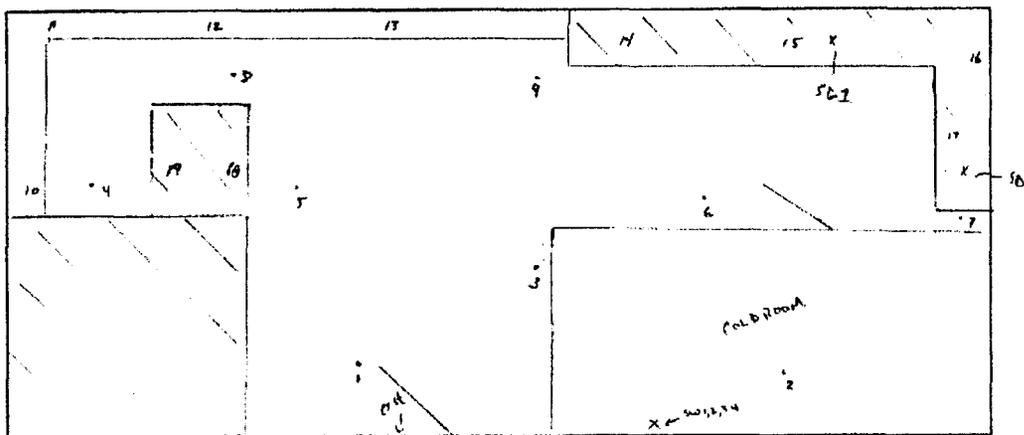
CLASS II SURVEY - FLOOR UNIT

Survey Unit # 7

Survey Date: 8/15/07

Location: Floor 3

Room # 333



Length (x): 6.80 (m) Width (y): 7.70 (m) Area: 52 (m²)
 L₁ = 202 (cm) L₂ = 175 (cm) First Point (423, 658)
 Number of Hoods 0 Number of Sinks 2 Drains (SB)

METERS

	Type	Serial Number	Calibration Date	Background (cpm)
Floor Scan	43-57	162950	1/20/07	408
Integrated Counts	43-62	157275	1/20/07	255
Other				

INTEGRATED COUNTS (ALL COUNT RATES IN CPM) (30 seconds)

Location	Count Rate	Location	Count Rate	Location	Count Rate
1	125	4	120	7	110
2	152	5	117	8	120
3	121	6	110	9	112

Comments: SW - Sample 1,2,3 all were taken at spot w/ slightly higher count rate than high (approx 400cpm w/ 43-62 157275)

Approved: [Signature]

Date: 8/20/07

**JAMES MADISON UNIVERSITY FINAL STATUS SURVEY FORM
BURRUSS HALL**

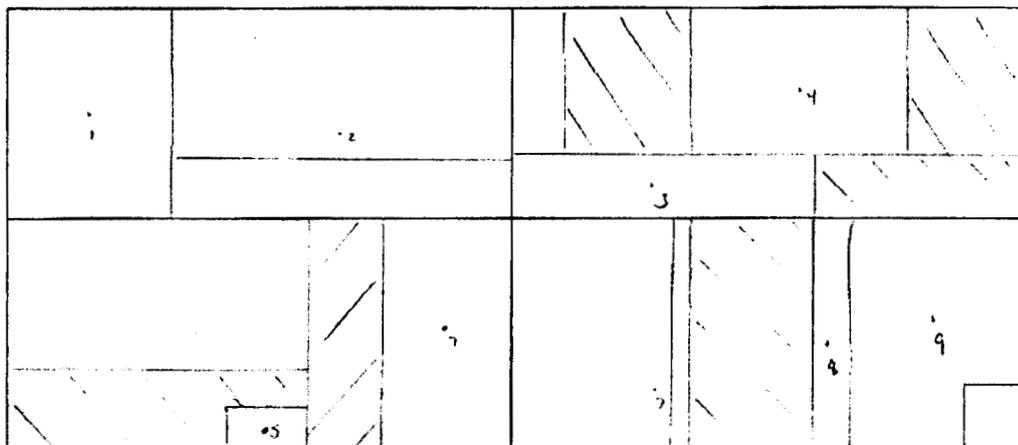
CLASS II SURVEY - WALL UNIT

Survey Unit # 8

Survey Date: 8/15/07

Location: Floor 3

Room # 333



Length (x): 6.50 (m) Width (y): 7.70 (m) Area: 58 (m²)

METERS

	Type	Serial Number	Calibration Date	Background (cpm)
Wall Scan	43-68	187275	1/30/07	235
Integrated Counts	43-68	187275	1/30/07	255
Other				

INTEGRATED COUNTS (ALL COUNT RATES IN CPM) (30 seconds)

Location	Count Rate	Location	Count Rate	Location	Count Rate
1	87	4	154	7	102
2	190	5	75	8	147
3	128	6	97	9	107

Comments: _____

Approved: *Al Jell*

Date: 8/20/07

----- **Appendix B** -----

Table of Swab/Smear Samples Taken

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James Madison University FSS Report
August 21, 2007

Item Description *	Swipe Number**	Lab Analysis Number	Results (dpm)
329 Burruss Hall ~ Floor Unit	1	1	< 100
	2	2	< 100
	3	3	< 100
	4	4	< 100
	5	5	< 100
	6	6	< 100
	7	7	< 100
	8	8	< 100
	9	9	< 100
329 Burruss Hall ~ Wall Unit	1	11	< 100
	2	12	< 100
	3	13	< 100
	4	14	< 100
	5	15	< 100
	6	16	< 100
	7	17	< 100
	8	18	< 100
	9	19	< 100
329 ~ Bench	10	21	< 100
329 ~ Bench	11	22	< 100
329 ~ Bench	12	23	< 100
329 ~ Bench	13	24	< 100
329 ~ Bench	14	25	< 100
329 ~ Bench	15	26	< 100
329 ~ Bench	16	27	< 100
329 ~ Bench	17	28	< 100
329 ~ Bench	18	29	< 100
329 ~ Bench	19	30	< 100
329 ~ Sink Drain #1	SD1	32	< 100
329 ~ Sink Drain #2	SD2	33	< 100
329 ~ Sink Drain #3	SD3	34	< 100
329 ~ Sink Drain #4	SD4	35	< 100
329 ~ Hood Duct - Left Side	H1L	36	< 100
329 ~ Hood Duct - Right Side	H1R	37	< 100
332 Burruss Hall ~ Floor Unit	1	39	< 100
	2	40	< 100
	3	41	< 100
	4	42	< 100
	5	43	< 100
	6	44	< 100
	7	45	< 100
	8	46	< 100
	9	47	< 100

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332 Burruss Hall ~ Wall Unit	1	49	< 100
	2	50	< 100
	3	51	< 100
	4	52	< 100
	5	53	< 100
	6	54	< 100
	7	55	< 100
	8	56	< 100
	9	57	< 100
332 ~ Bench	10	59	< 100
332 ~ Bench	11	60	< 100
332 ~ Bench	12	61	< 100
332 ~ Bench	13	62	< 100
332 ~ Bench	14	63	< 100
332 ~ Sink Drain #1	SD1	65	< 100
332 ~ Sink Drain #2	SD2	66	< 100
332 ~ Hood Duct – Left Side	H1L	67	< 100
332 ~ Hood Duct – Right Side	H1R	68	< 100
322 Burruss Hall ~ Floor Unit	1	70	< 100
	2	71	< 100
	3	72	< 100
	4	73	< 100
	5	74	< 100
	6	75	< 100
	7	76	< 100
	8	77	< 100
	9	78	< 100
322 Burruss Hall ~ Wall Unit	1	80	< 100
	2	81	< 100
	3	82	< 100
	4	83	< 100
	5	84	< 100
	6	85	< 100
	7	86	< 100
	8	87	< 100
	9	88	< 100
322 ~ Bench	10	90	< 100
322 ~ Bench	11	91	< 100
322 ~ Bench	12	92	< 100
322 ~ Bench	13	93	< 100
322 ~ Bench	14	94	< 100
322 ~ Sink Drain #1	SD1	96	< 100

James Madison University FSS Report
August 21, 2007

333 Burruss Hall ~ Floor Unit	1	98	< 100
	2	99	< 100
	3	100	< 100
	4	101	< 100
	5	102	< 100
	6	103	< 100
	7	104	< 100
	8	105	< 100
	9	106	< 100
333 Burruss Hall ~ Wall Unit	1	108	< 100
	2	109	< 100
	3	110	< 100
	4	111	< 100
	5	112	< 100
	6	113	< 100
	7	114	< 100
	8	115	< 100
	9	116	< 100
333 ~ Bench	10	118	< 100
333 ~ Bench	11	119	< 100
333 ~ Bench	12	120	< 100
333 ~ Bench	13	121	< 100
333 ~ Bench	14	122	< 100
333 ~ Bench	15	123	< 100
333 ~ Bench	16	124	< 100
333 ~ Bench	17	125	< 100
333 ~ Bench	18	126	< 100
333 ~ Bench	19	127	< 100
333 ~ Sink Drain #1	SD1	129	< 100
333 ~ Sink Drain #2	SD2	130	< 100
333 ~ Samples from Cold Room Floor	SW1	132	< 100
	SW2	133	< 100
	SW3	134	< 100
	SW4	135	< 100
Blank Smear	n/a	137	n/a
Blank Smear	n/a	138	n/a
Blank Swab	n/a	139	n/a
Blank Swab	n/a	140	n/a

* Exact location of samples can be found on the survey forms for each room.

** Number of smear/swab as it appears on survey forms.

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August 21, 2007

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Appendix C

Raw Analytical Data

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James Madison University FSS Report
August 21, 2007

TMU 07-0092

ANALYST: J. J. ...
 DATE: 8/21/07
 TIME: 11:00
 LOCATION: ...

INSTRUMENT: ...
 MODEL: ...
 SERIAL: ...

OPERATOR: ...

DATE: ...

SAM NO	POS	TIME MIN	HW	ISO	CORRECTED CPM	WERROR	DFM	EFF-1	EFF-2	RATIO	LUMEX X	ELAPSED TIME
329 Floor	1	11:00	...	...	...	...	20.97	...	...	...	...	...
	2	11:01	...	...	...	...	11.77	...	...	...	...	...
	3	11:02	...	...	...	...	13.75	...	...	...	...	...
	4	11:03	...	...	...	...	7.58	...	...	...	...	...
	5	11:04	...	...	...	...	19.09	...	...	...	...	...
	6	11:05	...	...	...	...	10.07	...	...	...	...	...
	7	11:06	...	...	...	...	9.61	...	...	...	...	...
	8	11:07	...	...	...	...	2.44	...	...	...	...	...
	9	11:08	...	...	...	...	18.39	...	...	...	...	...
	10	11:09	...	...	...	...	7.51	...	...	...	...	...
	11	11:10	...	...	...	...	1.53	...	...	...	...	...
	12	11:11	...	...	...	...	12.99	...	...	...	...	...
	13	11:12	...	...	...	...	3.68	...	...	...	...	...
	14	11:13	...	...	...	...	12.96	...	...	...	...	...
MISSING SAMPLE	15	11:14	...	...	...	...	13.41	...	...	...	...	...
	16	11:15	...	...	...	...	3.68	...	...	...	...	...
	17	11:16	...	...	...	...	10.27	...	...	...	...	...
	18	11:17	...	...	...	...	11.54	...	...	...	...	...
	19	11:18	...	...	...	...	15.82	...	...	...	...	...
	20	11:19	6.23
	21	11:20	0.40
	22	11:21	10.39
	23	11:22	12.94
	24	11:23	0.87
25	11:24	16.60	
26	11:25	0.80	

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SAM NO	POS	TIME MIN	HW	ISO	CORRECTED CPM	%ERROR	DPM	EFF-1	EFF-2	RATIO	LUMEX %	ELAPSED TIME
329 wall	100	11:00	100.1	140	10.00	01.20	16.31	40.00	10.00	1.00	100.0	01:00
				140	10.00	01.40	11.43	47.36	10.00			
329 wall	100	11:20	100.3	140	7.00	01.00	8.29	40.00	10.00	1.00	100.0	01:20
				140	7.00	01.10	16.76	7.00	10.00			
329 wall	100	11:40	100.2	140	10.00	01.10	23.04	40.00	10.00	1.00	100.0	01:40
				140	10.00	01.10	10.02	40.00	10.00			
329 wall	100	11:00	100.0	140	10.00	01.00	11.72	40.00	10.00	1.00	100.0	01:00
				140	10.00	01.40	6.29	40.00	10.00			
329 wall	100	11:20	100.2	140	10.00	01.10	10.61	40.00	10.00	1.00	100.0	01:20
				140	10.00	01.10	15.42	40.00	10.00			
MISSING SAMPLE												
329 wall	100	11:00	100.1	140	10.00	01.00	6.08	40.00	10.00	1.00	100.0	01:00
				140	10.00	01.20	12.98	40.00	10.00			
329 wall	100	11:20	100.3	140	10.00	01.10	13.83	40.00	10.00	1.00	100.0	01:20
				140	10.00	01.00	8.90	40.00	10.00			
329 wall	100	11:40	100.2	140	10.00	01.10	15.11	40.00	10.00	1.00	100.0	01:40
				140	10.00	01.10	10.17	40.00	10.00			
329 wall	100	11:00	100.0	140	10.00	01.00	1.51	40.00	10.00	1.00	100.0	01:00
				140	10.00	01.00	12.97	40.00	10.00			
329 wall	100	11:20	100.2	140	10.00	01.10	10.09	40.00	10.00	1.00	100.0	01:20
				140	10.00	01.10	12.75	40.00	10.00			
329 wall	100	11:40	100.2	140	10.00	01.10	14.92	40.00	10.00	1.00	100.0	01:40
				140	10.00	01.10	4.96	40.00	10.00			
329 wall	100	11:00	100.1	140	10.00	01.00	10.96	40.00	10.00	1.00	100.0	01:00
				140	10.00	01.00	10.24	40.00	10.00			
329 wall	100	11:20	100.3	140	10.00	01.10	10.51	40.00	10.00	1.00	100.0	01:20
				140	10.00	01.10	6.35	40.00	10.00			
329 wall	100	11:40	100.2	140	10.00	01.10	8.95	40.00	10.00	1.00	100.0	01:40
				140	10.00	01.10	3.75	40.00	10.00			
329 wall	100	11:00	100.0	140	10.00	01.00	13.10	40.00	10.00	1.00	100.0	01:00
				140	10.00	01.10	8.88	40.00	10.00			
MISSING SAMPLE												
329 52	100	11:40	100.2	140	10.00	01.10	18.71	40.00	10.00	1.00	100.0	01:40
				140	10.00	01.10	10.01	40.00	10.00			
329 52	100	11:20	100.3	140	10.00	01.10	12.68	40.00	10.00	1.00	100.0	01:20
				140	10.00	01.10	6.24	40.00	10.00			
329 53	100	11:00	100.1	140	10.00	01.00	12.99	40.00	10.00	1.00	100.0	01:00
				140	10.00	01.10	11.41	40.00	10.00			

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SAM NO	POS	TIME MIN	HW	ISO	CORRECTED CPM	XERROR	DPM	EFF-1	EFF-2	RATIO	LUMEX %	ELAPSED TIME
329 S4		1:22	329	140	12.80	11.74	15.77	90.05	11.14	0.127	0.04	11:01
				140	12.80	12.77	20.42	90.05	11.14	0.127	0.04	
329 H1 L		1:23	329	140	12.80	12.77	10.19	90.05	11.14	0.127	0.04	11:02
				140	12.80	12.77	15.37	90.05	11.14	0.127	0.04	
329 H1 R		1:40	329	140	12.80	12.77	19.01	90.05	11.14	0.127	0.04	11:03
				140	12.80	12.77	6.15	90.05	11.14	0.127	0.04	
MISSING SAMPLE												
		1:40	329	140	12.80	12.77	7.70	90.05	11.14	0.127	0.04	11:04
				140	12.80	12.77	12.89	90.05	11.14	0.127	0.04	
		1:27	329	140	12.80	12.77	7.05	90.05	11.14	0.127	0.04	11:05
				140	12.80	12.77	8.99	90.05	11.14	0.127	0.04	
		1:28	329	140	12.80	12.77	14.38	90.05	11.14	0.127	0.04	11:06
				140	12.80	12.77	10.14	90.05	11.14	0.127	0.04	
		1:28	329	140	12.80	12.77	21.52	90.05	11.14	0.127	0.04	11:07
				140	12.80	12.77	8.74	90.05	11.14	0.127	0.04	
		1:29	329	140	12.80	12.77	12.43	90.05	11.14	0.127	0.04	11:08
				140	12.80	12.77	4.99	90.05	11.14	0.127	0.04	
		1:29	329	140	12.80	12.77	19.07	90.05	11.14	0.127	0.04	11:09
				140	12.80	12.77	10.09	90.05	11.14	0.127	0.04	
		1:30	329	140	12.80	12.77	18.70	90.05	11.14	0.127	0.04	11:10
				140	12.80	12.77	6.20	90.05	11.14	0.127	0.04	
		1:30	329	140	12.80	12.77	26.58	90.05	11.14	0.127	0.04	11:11
				140	12.80	12.77	6.05	90.05	11.14	0.127	0.04	
		1:31	329	140	12.80	12.77	9.88	90.05	11.14	0.127	0.04	11:12
				140	12.80	12.77	7.66	90.05	11.14	0.127	0.04	
MISSING SAMPLE												
		1:32	329	140	12.80	12.77	21.19	90.05	11.14	0.127	0.04	11:13
				140	12.80	12.77	3.54	90.05	11.14	0.127	0.04	
		1:33	329	140	12.80	12.77	8.63	90.05	11.14	0.127	0.04	11:14
				140	12.80	12.77	15.44	90.05	11.14	0.127	0.04	
		1:33	329	140	12.80	12.77	14.18	90.05	11.14	0.127	0.04	11:15
				140	12.80	12.77	11.46	90.05	11.14	0.127	0.04	
		1:34	329	140	12.80	12.77	13.84	90.05	11.14	0.127	0.04	11:16
				140	12.80	12.77	6.26	90.05	11.14	0.127	0.04	
		1:34	329	140	12.80	12.77	16.06	90.05	11.14	0.127	0.04	11:17
				140	12.80	12.77	6.23	90.05	11.14	0.127	0.04	
		1:35	329	140	12.80	12.77	17.51	90.05	11.14	0.127	0.04	11:18
				140	12.80	12.77	7.50	90.05	11.14	0.127	0.04	

332 Floor

332 Wall

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SAM NO	POS	TIME MIN	HM	ISO	CORRECTED CPM	%ERROR	DPM	EFF-1	EFF-2	RATIO	LUMEX X	ELAPSED TIME
10	332	11:20	05:17	34	8.00	76.71	12.94	18.12	11.01	1.677	11.41	40:47
				140	7.00	76.71	10.20	17.00	10.10			
				140	10.00	76.71						
11	332	11:20	07:10	34	11.00	111.67	4.24	18.17	11.11	2.000	11.00	40:50
				140	11.00	111.67	5.13	17.74	10.10			
				140	12.00	111.67						
12	332	11:20	11:12	34	9.00	86.67	13.11	18.22	11.11	2.000	11.11	40:53
				140	8.00	86.67	15.40	17.00	10.10			
				140	11.00	86.67						
MISSING SAMPLE												
13	332	11:20	11:18	34	11.00	111.67	18.83	18.10	11.11	1.978	11.00	40:56
				140	10.00	111.67	12.73	17.00	10.10			
				140	10.00	111.67						
14	332	11:20	11:11	34	11.00	111.67	9.42	18.10	11.11	2.000	11.00	40:59
				140	11.00	111.67	12.82	17.00	10.10			
				140	12.00	111.67						
15	332	11:20	09:08	34	8.00	76.64	5.85	18.00	11.11	0.945	11.00	41:02
				140	11.00	76.64	14.36	17.10	11.10			
				140	11.00	76.64						
16	332	11:20	08:12	34	11.00	111.67	20.34	18.01	11.11	1.987	11.11	41:05
				140	11.00	111.67	6.16	17.00	10.10			
				140	10.00	111.67						
17	332	11:20	09:01	34	11.00	111.67	13.54	18.10	11.11	1.977	11.11	41:08
				140	11.00	111.67	3.68	17.00	10.10			
				140	11.00	111.67						
MISSING SAMPLE												
18	332	11:20	07:11	34	9.00	86.67	13.47	18.10	11.11	2.000	11.00	41:11
				140	8.00	86.67	3.64	17.00	10.10			
				140	11.00	86.67						
19	332	11:20	08:08	34	9.00	86.67	5.42	18.10	11.11	2.000	11.11	41:14
				140	9.00	86.67	6.38	17.10	11.10			
				140	10.00	86.67						
20	332	11:20	09:10	34	11.00	111.67	18.20	18.10	11.11	1.978	11.11	41:17
				140	11.00	111.67	7.45	17.00	10.10			
				140	11.00	111.67						
21	332	11:20	07:11	34	11.00	111.67	20.25	18.10	11.11	1.983	11.00	41:20
				140	11.00	111.67	7.40	17.00	10.10			
				140	11.00	111.67						
MISSING SAMPLE												
22	332	11:20	09:10	34	10.00	96.67	17.77	18.00	11.11	2.000	11.00	41:23
				140	10.00	96.67	8.82	17.00	10.10			
				140	10.00	96.67						
23	332	11:20	08:11	34	9.00	86.67	13.57	18.00	11.11	1.978	11.00	41:26
				140	9.00	86.67	7.57	17.00	10.10			
				140	11.00	86.67						
24	332	11:20	08:11	34	9.00	86.67	6.04	18.00	11.11	2.000	11.11	41:29
				140	9.00	86.67	6.41	17.00	10.10			
				140	10.00	86.67						
25	332	11:20	08:10	34	11.00	111.67	14.04	18.00	11.11	2.000	11.00	41:32
				140	11.00	111.67	1.06	17.00	10.10			
				140	11.00	111.67						
26	332	11:20	07:11	34	11.00	111.67	9.59	18.00	11.11	2.000	11.11	41:35
				140	11.00	111.67	12.83	17.00	10.10			
				140	11.00	111.67						
27	332	11:20	07:10	34	11.00	111.67	10.74	18.00	11.11	2.000	11.11	41:38
				140	11.00	111.67	5.03	17.00	10.10			
				140	11.00	111.67						

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SAM NO	POS	TIME MIN	H#	ISO	CORRECTED CPM	ERROR	DPM	EFF-1	EFF-2	RATIO	LUMEX X	ELAPSED TIME
10	322	11:00	10	10	10.00	10.00	14.87	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	10.15	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	9.86	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	7.66	10.00	10.00	1.000	10.00	10:00
11	322	11:00	10	10	10.00	10.00	13.11	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	10.21	10.00	10.00	1.000	10.00	10:00
MISSING SAMPLE												
12	322	11:00	10	10	10.00	10.00	16.17	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	8.79	10.00	10.00	1.000	10.00	10:00
13	322	11:00	10	10	10.00	10.00	15.88	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	6.23	10.00	10.00	1.000	10.00	10:00
14	322	11:00	10	10	10.00	10.00	20.60	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	7.42	10.00	10.00	1.000	10.00	10:00
15	322	11:00	10	10	10.00	10.00	17.36	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	8.81	10.00	10.00	1.000	10.00	10:00
16	322	11:00	10	10	10.00	10.00	11.05	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	8.91	10.00	10.00	1.000	10.00	10:00
17	322	11:00	10	10	10.00	10.00	8.59	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	10.26	10.00	10.00	1.000	10.00	10:00
18	322	11:00	10	10	10.00	10.00	18.85	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	7.46	10.00	10.00	1.000	10.00	10:00
19	322	11:00	10	10	10.00	10.00	13.69	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	6.26	10.00	10.00	1.000	10.00	10:00
MISSING SAMPLE												
20	322	11:00	10	10	10.00	10.00	16.78	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	11.44	10.00	10.00	1.000	10.00	10:00
21	322	11:00	10	10	10.00	10.00	16.11	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	8.87	10.00	10.00	1.000	10.00	10:00
22	322	11:00	10	10	10.00	10.00	11.01	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	15.44	10.00	10.00	1.000	10.00	10:00
23	322	11:00	10	10	10.00	10.00	17.48	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	8.82	10.00	10.00	1.000	10.00	10:00
24	322	11:00	10	10	10.00	10.00	12.05	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	12.82	10.00	10.00	1.000	10.00	10:00
MISSING SAMPLE												
25	322	11:00	10	10	10.00	10.00	28.69	10.00	10.00	1.000	10.00	10:00
					10.00	10.00	8.55	10.00	10.00	1.000	10.00	10:00
MISSING SAMPLE												

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322 S1

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SAM NO	POS	TIME MIN	#	ISO	CORRECTED CPM	ERROR	DPM	EFF-1	EFF-2	RATIO	LUMEX %	ELAPSED TIME
88	4-10	11:00	2	9	5.00	0.00	5.76	90.00	10.00	0.10	0.00	11:00
				19E	5.00	0.00	6.40	90.00	10.00	0.10	0.00	11:00
				41001	11.00	0.00	29.73	90.00	10.00	0.40	0.00	11:00
				147	8.00	0.00	7.41	90.00	10.00	0.10	0.00	11:00
				41002	11.00	0.00	17.53	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	8.82	90.00	10.00	0.10	0.00	11:00
				41003	11.00	0.00	11.50	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	8.93	90.00	10.00	0.10	0.00	11:00
				41004	11.00	0.00	12.10	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	7.62	90.00	10.00	0.10	0.00	11:00
				41005	11.00	0.00	10.60	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	11.56	90.00	10.00	0.10	0.00	11:00
				41006	11.00	0.00	20.50	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	6.16	90.00	10.00	0.10	0.00	11:00
				41007	11.00	0.00	16.34	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	7.55	90.00	10.00	0.10	0.00	11:00
				41008	11.00	0.00	8.18	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	7.72	90.00	10.00	0.10	0.00	11:00
				41009	11.00	0.00	9.93	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	11.52	90.00	10.00	0.10	0.00	11:00
				41010	11.00	0.00	17.08	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	8.81	90.00	10.00	0.10	0.00	11:00
				41011	11.00	0.00	16.83	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	10.12	90.00	10.00	0.10	0.00	11:00
				41012	11.00	0.00	6.22	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	16.79	90.00	10.00	0.10	0.00	11:00
				41013	11.00	0.00	19.73	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	17.85	90.00	10.00	0.10	0.00	11:00
				41014	11.00	0.00	13.50	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	12.76	90.00	10.00	0.10	0.00	11:00
				41015	11.00	0.00	20.50	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	4.85	90.00	10.00	0.10	0.00	11:00
				41016	11.00	0.00	16.52	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	10.11	90.00	10.00	0.10	0.00	11:00
				41017	11.00	0.00	10.55	90.00	10.00	0.10	0.00	11:00
				147	8.00	0.00	10.22	90.00	10.00	0.10	0.00	11:00
				41018	11.00	0.00						11:00
				147	8.00	0.00						11:00
				41019	11.00	0.00						11:00

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333 floor

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333 main

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SAM NO	POS	TIME MIN	HW	ISO	CORRECTED EPM	ERROR	DPM	EFF-1	EFF-2	RATIO	LUMEX X	ELAPSED TIME
138	10-19	1:00	1	301	5.88	37.54	6.88	95.52	11.40	0.866	11.40	1:00
139	10-19	1:00	1	142	11.02	42.75	10.33	115.44	171.36			1:00
140	10-19	1:00	1	219	21.80	20.00	24.54	11.07	11.01	1.007	11.07	1:00
141	10-19	1:00	1	147	11.04	41.11	11.29	115.11	170.94			1:00
142	10-19	1:00	1	301	5.88	37.54	6.60	95.71	11.41	0.841	11.41	1:00
143	10-19	1:00	1	147	11.02	42.84	5.06	115.47	171.17			1:00
144	10-19	1:00	1	301	5.88	37.54	9.60	95.52	11.41	0.817	11.41	1:00
145	10-19	1:00	1	147	11.04	42.82	10.83	115.11	170.82			1:00
146	10-19	1:00	1	301	5.88	37.54	12.91	95.52	11.36	0.804	11.36	1:00
147	10-19	1:00	1	147	11.04	42.84	6.32	115.47	171.17			1:00
148	10-19	1:00	1	301	5.88	37.54	7.75	95.52	11.31	0.821	11.31	1:00
149	10-19	1:00	1	147	11.04	42.82	12.88	115.11	170.82			1:00
150	10-19	1:00	1	301	5.88	37.54	16.94	95.52	11.31	0.807	11.31	1:00
151	10-19	1:00	1	147	11.04	42.82	4.92	115.47	171.17			1:00
152	10-19	1:00	1	301	5.88	37.54	6.15	95.52	11.31	0.812	11.31	1:00
153	10-19	1:00	1	147	11.04	42.82	11.61	115.47	171.17			1:00
154	10-19	1:00	1	301	5.88	37.54	9.78	95.52	11.31	0.801	11.31	1:00
155	10-19	1:00	1	147	11.04	42.82	12.85	115.47	171.17			1:00
156	10-19	1:00	1	301	5.88	37.54	8.01	95.52	11.30	0.807	11.30	1:00
157	10-19	1:00	1	147	11.04	42.82	10.27	115.47	171.17			1:00
MISSING SAMPLE												
158	10-19	1:00	1	301	11.00	42.72	17.40	95.52	11.31	0.854	11.31	1:00
159	10-19	1:00	1	147	11.00	42.72	9.75	115.47	171.17			1:00
333 S1												
160	10-19	1:00	1	301	11.00	42.72	10.62	95.52	11.31	0.813	11.31	1:00
161	10-19	1:00	1	147	11.00	42.72	7.58	115.47	171.17			1:00
333 S2												
MISSING SAMPLE												
162	10-19	1:00	1	301	11.00	42.72	24.35	95.52	11.31	0.844	11.31	1:00
163	10-19	1:00	1	147	11.00	42.72	9.92	115.47	171.17			1:00
333 CR1												
164	10-19	1:00	1	301	11.00	42.72	37.59	95.52	11.31	0.877	11.31	1:00
165	10-19	1:00	1	147	11.00	42.72	9.69	115.47	171.17			1:00
333 CR1												
166	10-19	1:00	1	301	11.00	42.72	21.81	95.52	11.31	0.844	11.31	1:00
167	10-19	1:00	1	147	11.00	42.72	7.38	115.47	171.17			1:00
333 CR2												
168	10-19	1:00	1	301	11.00	42.72	14.69	95.52	11.31	0.811	11.31	1:00
169	10-19	1:00	1	147	11.00	42.72	17.85	115.47	171.17			1:00
333 CR2												
MISSING SAMPLE												
170	10-19	1:00	1	301	11.00	42.72	11.37	95.52	11.31	0.844	11.31	1:00
171	10-19	1:00	1	147	11.00	42.72	7.60	115.47	171.17			1:00
Blank Smear												
172	10-19	1:00	1	301	11.00	42.72	19.21	95.52	11.31	0.804	11.31	1:00
173	10-19	1:00	1	147	11.00	42.72	15.29	115.47	171.17			1:00
Blank Smear												

James Madison University FSS Report
August 21, 2007

SAM NO	POS	TIME MIN	W#	ISO	CORRECTED CPM	%ERROR	DPM	EFF-1	EFF-2	RATIO	LUMEX %	ELAPSED TIME
		1.00	1000	100	10.00	00.00	18.24	10.00	10.00	1.00	100	1.00
	Blank Swab			100	10.00	00.00	6.15	10.00	10.00	1.00	100	1.00
				10001	10.00	00.00						
		1.00	1000	100	10.00	00.00	12.88	10.00	10.00	1.00	100	1.00
	Blank Swab			100	10.00	00.00	11.41	10.00	10.00	1.00	100	1.00
				10001	10.00	00.00						

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 PARAMETER LOADS: 07-0082 07-0082
 LOG NUMBER: 00000000
 MODE: 1

1. TIME 0
 2. TIME 000
 3. POINTS 900000
 4. COLSIN 2 900000
 5. I.P. POINTS 0
 6. I.P. TIME 0
 7. BACKGROUND 1 0
 8. BACKGROUND 2 0
 9. WINDOW 1 100-180
 10. WINDOW 2 001-250
 11. HALF LIFE 1 0
 12. HALF LIFE 2 0
 13. FACTOR 1 1
 14. FACTOR 2 1
 15. SUMMARY 1
 16. REPETITION 1
 17. FILE NO 1
 18. LAB NUMBER 1
 19. CODING FOS-0508

07-0082
 8/16/07
 JMU Decom Survey
 * Y ANALYSIS *

20. PRINT: 07-0082-07-0082-10-10

POS	RTIME	TIME	POINTS	TIME	FWHM	COLSIN 2	TIME	FWHM
001	0.05	180	118	17	8.1	1000	139	2.8
002	0.30	180	155	22	8.0	1073	141	2.8
003	0.16	180	131	15	8.4	1086	139	2.8
004	0.21	180	151	20	8.1	1035	135	2.7
006	0.06	180	115	17	8.1	1036	112	2.8
007	0.31	180	112	17	8.1	1005	135	2.8
008	0.11	180	137	16	8.5	1217	115	2.9
009	0.42	180	113	18	8.1	1067	122	2.8
011	0.18	180	151	20	8.3	1315	139	2.8
012	0.01	180	127	13	8.0	1028	113	2.7
013	0.33	180	156	22	8.0	1077	137	2.8
014	0.61	180	143	18	8.0	1036	110	2.9
016	0.09	180	133	15	8.4	1035	145	2.7
017	0.05	180	115	18	8.3	1042	113	2.7
018	0.50	180	117	19	8.2	1001	110	2.8
019	0.35	180	163	21	8.0	1036	117	2.7
021	0.01	180	132	15	8.1	1058	130	2.8
022	0.07	180	145	18	8.0	1031	117	2.7

} 328

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 END OF ASSAY

James Madison University FSS Report
August 21, 2007

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James Madison University FSS Report
August 21, 2007

----- **Appendix D** -----
Equipment Calibration Certificates

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RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

Certificate of Calibration

RSO Job No: 7014

ISSUED TO: Radiation Safety Academy
481 N. Frederick Avenue Suite 302
Gaithersburg, MD 20877

INSTRUMENT: LUDLAM
MODEL: 2224
TYPE: RATEMETER
SN: 162850

CONTACT: Mike Jedlicka
PHONE: (301) 993-6066

PO NO:

RSO, Inc. certifies that on 01/30/2007 the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data

RANGE	EXPECTED	OBSERVED	C.E.
X	100	100 cpm	1.00
	400	400 cpm	1.00
X	1000	999 cpm	1.00
	4000	3995 cpm	1.00
X	10000	10000 cpm	1.00
	40000	39952 cpm	1.00
X	100000	99970 cpm	1.00
	400000	399630 cpm	1.00
C F AVERAGE			1.00

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF (%)	ISOTOPE 2	EFF (%)	ISOTOPE 3	EFF (%)	ISOTOPE 4	EFF (%)
43-37	PR161685	FIXED	CONTACT	1538	C-14	17	Sr-90	8	Co-60	15		

INSTRUMENT CHECKS

Leak/Seal CHECK N/A
BATTERY CHECK NORMAL
CHECK SOURCE 1 N/A READING
CHECK SOURCE 2 N/A READING

ENVIRONMENTAL

TEMP: 21°C
PRESS: 758 mmHg
HUMID: 26%

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS **01/30/2008**

Calibrated By:

Mike Jedlicka
16443 8/20/07

Reviewed By:

POE

Cal Date: 01/30/2007

Maryland License MD-33-C21-01

4120

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. 7014

Certificate of Calibration

ISSUED TO: Radiation Safety Academy
481 N. Frederick Avenue Suite 302
Gaithersburg, MD 20877

INSTRUMENT: LUDLUM
MODEL: 2224 I
TYPE: RATEMETER
SN: 187246

CONTACT: Mike Jedlicka
PHONE: (301) 990-6006

PO NO:

RSO, Inc. certifies that on 01/30/2007 the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity. Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data

RANGE	EXPECTED	OBSERVED	C.F.
X	100	102 cpm	0.98
	400	399 cpm	1.00
X	1000	1002 cpm	1.00
	4000	3994 cpm	1.00
X	10000	10002 cpm	1.00
	40000	39934 cpm	1.00
X	100000	100022 cpm	1.00
	400000	399406 cpm	1.00
C.F. AVERAGE			1.00

Probe type(s) Probe1: PROPORTIONAL Probe2: Probe3:

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
43-68	PK216244	FIXED	CONTACT	1570	C-14	16	SeG	21	TC-99	17		

INSTRUMENT CHECKS

LEAKAGE CHECK: N/A
BATTERY CHECK: NORMAL
CHECK SOURCE 1: N/A READING:
CHECK SOURCE 2: N/A READING:

ENVIRONMENTAL

TEMP: 22°C
PRESS: 759 mmHg
HUMID: 25%

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 01/30/2008

Calibrated By:

Mike Jedlicka
Quality Control

Reviewed By:

ROE

Cal Date: 01/30/2007

Maryland License MD-33-021-01

4318

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. 7014

Certificate of Calibration

ISSUED TO: **Radiation Safety Academy**
481 N. Frederick Avenue Suite 302
Gaithersburg, MD 20877

INSTRUMENT: **LUDLUM**
MODEL: **2224-1**
TYPE: **RATEMETER**
SN: **187244**

CONTACT: **Mike Jedzeka**
PHONE: **(301) 990-6006**

PO NO:

RSO, Inc. certifies that on **01/30/2007** the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity. Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data

RANGE	EXPECTED	OBSERVED	C.F.
X 1	300	300 cpm	1.00
	400	399 cpm	1.00
X 10	1000	1004 cpm	1.00
	4000	3992 cpm	1.00
X 100	10000	10020 cpm	1.00
	40000	39928 cpm	1.00
X 1000	100000	100017 cpm	1.00
	400000	399112 cpm	1.00
C.F. AVERAGE			1.00

MOD#	SER#	WINDOW	GOMETRY	VOLT	ISOTOPE 1	EFF.(%)	ISOTOPE 2	EFF.(%)	ISOTOPE 3	EFF.(%)	ISOTOPE 4	EFF.(%)
43-68	PK190289	FIXED	CONTACT	1570	C14	16	Sr90	22	Ti-49	16		

INSTRUMENT CHECKS

LEAKAGE CHECK: N/A
BATTERY CHECK: NORMAL
CHECK SOURCE 1: N/A READING
CHECK SOURCE 2: N/A READING

ENVIRONMENTAL

TEMP: 22 C
PRESS: 758 mmHg
HUMID: 25 %

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS **01/30/2008**

Calibrated By:

[Signature]
Amy Avon

Reviewed By:

[Signature]

Cal Date 01-30-2007

Maryland License MD-33-021-01

4317

RSO, Inc.
P.O. Box 1450
Laurel, MD 20725
(301) 953-2482

RSO Job No. 7014

Certificate of Calibration

ISSUED TO: Radiation Safety Academy
481 N. Frederick Avenue Suite 302
Gaithersburg, MD 20877

INSTRUMENT: LUDLUM
MODEL: 2224-1
TYPE: RATEMETER
SN: 187275

CONTACT: Mike Jedlicka
PHONE: (301) 980-6006

PO NO:

RSO, Inc. certifies that on 01/30/2007 the above described instrument was calibrated using a radioactive source to determine the efficiency for a specific radionuclide(s) and using electronically generated pulse for the linearity. Pulsed using Ludlum 500-2, S/N 159110.

The results are tabulated below. Calibration is traceable to NIST.

Calibration Data

RANGE	EXPECTED	OBSERVED	C.F.
X	1	100	0.99
		400	1.00
X	10	1000	1.00
		4000	1.00
X	100	10000	1.00
		40000	1.00
X	1000	100000	1.00
		400000	1.00
C.F. AVERAGE			1.00

Probe type(s) Probe1: PROPORTIONAL Probe2: Probe3:

MODEL	SER#	WINDOW	GEOMETRY	VOLT	ISOTOPE 1	EFF (%)	ISOTOPE 2	EFF (%)	ISOTOPE 3	EFF (%)	ISOTOPE 4	EFF (%)
43-68	PR216252	FIXED	CONTACT	1670	Pu239	19						

INSTRUMENT CHECKS

1 mR/hr CHECK N/A
BATTERY CHECK NORMAL
CHECK SOURCE 1 N/A READING
CHECK SOURCE 2 N/A READING

ENVIRONMENTAL

TEMP: 22°C
PRESS: 758 mmHg
HUMID: 25%

THE SUGGESTED RECALIBRATION DATE FOR THIS INSTRUMENT IS 01/30/2008

Calibrated By:

[Signature]
James Austin

Reviewed By:

[Signature]
RAE

Cal Date: 01/30/2007

Maryland License MD-33-021-01

4319