



University of Missouri-Rolla
Nuclear Reactor Facility

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April 28, 2005

Dear Sir:

Please find enclosed the Annual Progress Report 2004-2005 for the University of Missouri-Rolla Reactor Facility (License R-79, Docket No: 50-123). This report is being filed under the reporting requirements of our Technical Specifications. Copies of this report are also being sent to our Regional Administrator and Project Manager.

Sincerely,



Dr. Akira T. Tokuhira
Reactor Director

mh

Enclosure

xc: Patrick Isaac, Project Manager (NRC)
Document Control Desk (NRC)
Chancellor Gary Thomas (UMR)
Dr. Mariesa L. Crow Dean, School of Mines & Metallurgy (UMR)
Mr. Ray Bono, Radiation Safety Officer (UMR)
Dr. Robert Mitchell, Dean, School of Engineering (UMR)
Dr. Paula M. Lutz, Dean, College of Arts and Science (UMR)
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Dr. Mark Fitch, Chairman, Radiation Safety Committee (UMR)
University of Missouri-Columbia Research Reactor (MURR)
Dr. Arvind Kumar, Chairman of Nuclear Engineering (UMR)
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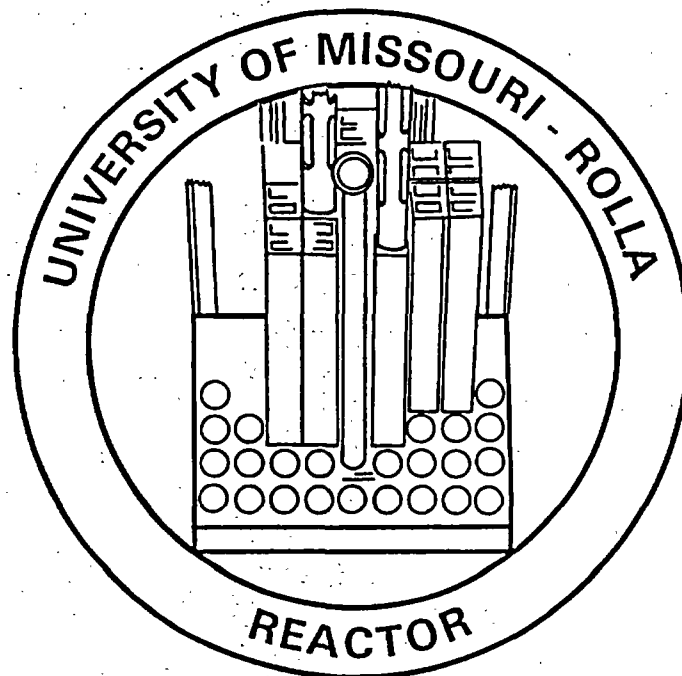
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PROGRESS REPORT

2004-2005

UNIVERSITY OF MISSOURI – ROLLA

NUCLEAR REACTOR FACILITY



PROGRESS REPORT
FOR THE
UNIVERSITY OF MISSOURI-ROLLA
NUCLEAR REACTOR FACILITY

April 1, 2004 to March 31, 2005
Submitted to
The U.S. Nuclear Regulatory Commission
and
The University of Missouri-Rolla

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SUMMARY

During the 2004-2005 reporting period the University of Missouri-Rolla Reactor (UMRR) was in use for 1,018 hours. The major part of this time, about 95% was used for class instruction, research, and training purposes.

The UMRR operated safely and efficiently over the past year. No significant safety-related incidents or personnel exposures occurred.

The reactor facility supported several UMR courses over the year for a total of 5,552 student-hours. About 4,932 visitors visited the reactor during the past year. There were 1,796 participants, mostly high school students, in the U.S. Department of Energy Reactor Sharing Program.

The reactor produced 30,358 kilowatt-hours of thermal energy using approximately 1.33 grams of uranium. A total of 364 samples were neutron irradiated in the reactor with most of them being analyzed in the Reactor Counting Laboratory. An additional 767 samples were exposed to gamma radiation in the reactor.

1.0 INTRODUCTION

This progress report covers activities at the University of Missouri-Rolla Reactor (UMRR) Facility for the period April 1, 2004 to March 31, 2005

The reactor is operated as a university facility, available to the faculty and students from various departments of the University for their educational and research programs. Several other college and pre-college institutions also made use of the facility during the reporting period. The facility is also available for the training of reactor personnel from commercial concerns with legitimate interest in our facility use.

1.1 Background Information

The University of Missouri-Rolla Reactor Facility attained initial criticality on December 9th, 1961. The UMRR was the first operating nuclear reactor in the State of Missouri. The reactor design is based on the Bulk Shielding Reactor at Oak Ridge National Laboratory. The reactor is a light water, open pool reactor cooled by natural convective flow. The fuel is MTR plate-type fuel. The initial licensed power was 10 kW. The licensed power was upgraded to 200 kW in 1966. During the summer of 1992, the reactor fuel was converted from highly enriched uranium fuel to low-enriched uranium.

The facility is equipped with several experimental facilities including a beam port, thermal column, pneumatic rabbit system and several manual sample irradiation containers and systems. Additionally, the facility is equipped with a counting laboratory that has gamma and alpha spectroscopy capabilities. The gamma spectroscopy system includes germanium and sodium-iodide detectors, associated electronics, and state-of-the-art data acquisition and spectrum analysis software. The alpha spectroscopy system consists of a surface barrier detector and data acquisition equipment. The beam port experimental area is equipped with NE-213 and time-of-flight neutron spectroscopy systems.

The UMR Reactor also uses several biometric devices to enhance its traditional security system.

1.2 General Facility Status

The UMRR operated safely and efficiently over the past year. No significant safety-related incidents or personnel exposures occurred.

The application and supporting documentation to renew the UMRR license was submitted to NRC August 30, 2004 and announced in the Federal Register on November 29, 2004 under title, Notice of License Renewal Application for Facility Operating License, University of Missouri--Rolla (Volume 69, Number 228; Page: 69418-69419). UMRR will operate under extension of the existing license until the license renewal is completed.

With much appreciated support from DOE Reactor Sharing grants, the reactor was able to support two graduate students to conduct accident analysis in support of the revised SAR, which has been completed and sent to NRC with the license renewal documentation.

An independent auditor from the University of Columbia audited the Reactor Facility on November 18, 2004. There were no significant areas of concern. We have entered into an agreement with the University of Missouri-Columbia to audit each other. This has been a very beneficial arrangement for both facilities involved.

The reactor staff has continued to review the operation of the Reactor Facility in an effort to improve the safety and efficiency of its operation and to provide conditions conducive to its utilization by students and faculty. An "outreach" program, implemented over the past years, has been continued in order to let both students and faculty in a number of departments across campus know how the reactor could be used to enhance course work and research. As a result, additional classes have been using the Reactor Facility to augment their programs, including:

1. Physics 4&5, 'Concepts in Physics'
2. Physics 7, 'Environnemental Physics'
3. Chemistry 8, 'Qualitative Analysis Laboratory'
4. Physics 107, 'Modern Physics'
5. Physics 207, 'Modern Physics II'
6. Physics 322, 'Advanced Physics'
7. Chemical Engineering 261, 'Introduction to Environmental Engineering'
8. Chemistry 2, 'General Chemistry Laboratory'
9. Mechanical Engineering 229, 'Energy Conversion'
10. Life Sciences 352, 'Biological Effects of Radiation'

11. Chemistry 251, 'Intermediate Quantitative Analysis'
12. Chemistry 355, 'Instrumental Methods Laboratory'
13. Civil Engineering 310, 'Senior Design Class'
14. Basic Engineering 50, 'Engineering Mechanics – Statics'
15. Engineering Management 386, 'Safety Engineering Management'

SOPs have been revised over the past year in order to improve our operations and efficiency. The following is a list of SOPs revised during the reporting period:

- 1) SOP 501 Emergency Procedures for Reactor Building Evacuation (Page 7 of 7)
- 2) SOP 501 Emergency Procedures for Reactor Building Evacuation (Page 7 of 7)

The above listed SOP revisions are provided in Appendix A.

2.0 REACTOR STAFF AND PERSONNEL

2.1 Reactor Staff

<u>Name</u>	<u>Title</u>
Dr. Akira Tokuhira	Director & Senior Operator
William Bonzer	Reactor Manager & Senior Operator
Maureen Henry	Senior Secretary
Brian Porter	Senior Electronics Technician & Reactor Operator
Dan Estel	Senior Lab Mechanic & Senior Operator

2.2 Licensed Operators

<u>Name</u>	<u>License</u>
1) William Bonzer	Senior Operator
2) Akira Tokuhira	Senior Operator
3) Dan Estel	Senior Operator
4) Jeremy Gorelick ¹	Senior Operator
5) Craig Heimericks	Senior Operator
6) Michelle Minard	Reactor Operator
7) Kurt Koch	Reactor Operator
8) Hannah Yount ¹	Reactor Operator
9) James Kramer ¹	Reactor Operator
10) Christopher Carroll	Reactor Operator
11) Mathew Dennis ²	Senior Operator
12) Zachary Miller ¹	Reactor Operator
13) Bren Phillips	Senior Operator
14) Brian Porter	Reactor Operator
15) Alfred Schovanez ²	Senior Operator
16) Heather Lewis	Reactor Operator
17) Michelle Marincel	Reactor Operator
18) Seth Bradley	Reactor Operator
19) Victor Smith ³	Reactor Operator
20) Jim Jackson ¹	Senior Operator
21) Dale Waller ¹	Reactor Operator
22) Shannon Conner ²	Reactor Operator
23) Jason Hall ⁴	Reactor Operator
24) Ben Swoboda ⁴	Senior Operator
25) Justin Munson ⁴	Reactor Operator
26) Michael Lacey ⁴	Reactor Operator

¹ Termination date of license 09/22/04

² Effective upgrade date 6/8/04

³ Effective date 10/21/04

⁴ Effective date 03/23/05

2.3 Radiation Safety Committee

The Radiation Safety Committee meets quarterly. The committee met on 6/25/04, 7/9/04, and 12/14/04 and 3/23/05 during the reporting period. The committee members are listed below.

<u>Name</u>	<u>Department</u>
1. Dr. Mark Fitch ¹	Civil Engineering
2. Mr. Ray Bono ²	Environmental Health and Safety Services
3. Mr. William Bonzer	Nuclear Reactor; Reactor Manager
4. Dr. Roger Brown	Biological Sciences
5. Dr. Robert DuBois	Physics
6. Dr. David Wronkiewicz	Geology/Geophysics
7. Dr. Ekkehard Sinn	Chemistry
8. Mr. Randy Stoll	Director, Business Services
9. Dr. Akira Tokuhira	Director, Nuclear Reactor
10. Dr. Shoaib Usman ³	Nuclear Engineering

1 Chairman

2 Secretary, ex-officio, non-voting

3 Effective date 9/30/04

2.4 Health Physics

Health Physics support is provided through the Environmental Health and Safety Department, which is organizationally independent of the Reactor Facility operations group.

Health Physics personnel are listed below:

<u>Name</u>	<u>Title</u>
Mr. Ray Bono	Director of Environmental Health and Safety & Radiation Safety Officer
Mr. Brian Smith	Industrial Hygienist
Michelle Minard ¹	HP Technician

1. Effective 9/30/04

3.0 REACTOR OPERATIONS

Core Confirmation 101W is presently in use. The "W" mode core is completely water reflected and is used for normal reactor operations. The "T" mode (core positioned near graphite thermal column) may be used for various experiments, including beam port and thermal column experiments.

Table 3-1 presents pertinent core data and Figure 3-1 shows the core configuration of core 101W. The excess reactivity, shutdown margin, and rod worths were measured in cold, clean conditions.

Table 3-1. Core 101W Technical Data

Parameter	Value
Rod 1	2.73 % $\Delta k/k$
Rod 2	2.69 % $\Delta k/k$
Rod 3	3.22 % $\Delta k/k$
Reg Rod	0.371 % $\Delta k/k$
Excess Reactivity	0.496 % $\Delta k/k$
Shutdown Margin*	4.92 % $\Delta k/k$

* Assumes Rod 3 (highest worth rod) and Reg Rod are fully withdrawn.

Figure 3-1. UMRR Core 101W Configuration

A								
B				S				
C			F-8	F-4	C-4			
D		F-13	C-1	F-3	F-2	F-12	F-15	
E		F-10	C-2	F-1	C-3	F-9	F-14	
F		CR	F-5	F-6	F-7	BR		
	1	2	3	4	5	6	7	8

KEY TO PREFIXES

F - Standard Elements

C - Control Elements

BR - Bare Rabbit

CR - Cadmium Rabbit

S - Source Holder

Table 3-2: Unscheduled Shutdowns for 2004-2005

Date	Type of Shutdown/Cause and Corrective Action Taken
4/10/04	120% Demand Rundown. Operator up scaled at 90% power. Corrective action: Proper up scaling procedure discussed. SRO grants permission to restart the reactor.
5/01/04	120% Demand Rundown. Operator not attentive to Linear recorder. Corrective action: SRO instructs operator to pay attention to power change procedures. SRO grants permission to restart reactor.
5/05/04	120% Demand Rundown. Trainee was instructed to downscale Linear meter in order to cause rundown for NRC exam. No corrective action necessary. SRO grants permission to restart reactor.
5/06/04	120% Demand Rundown. Trainee was instructed to downscale Linear meter in order to cause rundown for NRC exam. No corrective action necessary. SRO grants permission to restart reactor.
5/06/04	120% Demand Rundown. While rods at 6", operator misadjusted compensating voltage. Corrective action: Trainee was instructed to adjust voltage slowly. SRO grants permission to restart reactor.
5/06/04	120% Demand Rundown. Trainee was instructed to downscale Linear meter in order to cause rundown for NRC exam. No corrective action required. SRO grants permission to restart reactor.
5/12/04	120% Demand Rundown. Operator inattentive to Linear recorder. Corrective action: SRO instructs operator to pay attention to power change procedures as listed in SOP 104. SRO grants permission to restart reactor.
6/04/04	150% Full Power Scram. SRO at console noticed Safety Channel #2 power reading fluctuating from 42-51% and requested Electronic Tech to ensure the cable was inserted properly, thereby causing a noise spike. SRO granted permission to restart the reactor.
6/18/04	120% Demand Rundown. Operator inattentive to Linear recorder. Corrective action: SRO instructs operator to pay attention to power change procedures. SRO grants permission to restart reactor.
6/22/04	120% Demand Rundown. Operator downscaled too soon. Corrective action: Operator instructed to downscale at 8% and one range at a time. SRO grants permission to restart Reactor.

- 7/24/04 120% Demand Rundown. Operator downscaled too soon.
Corrective action: Operator instructed to downscale at 8%. SRO grants permission to restart reactor.
- 8/23/04 Unplanned Shutdown. Rod dropped due to electrical noise during thunder storm. No other instrumentation effected. No corrective action required. SRO on duty grants permission to restart reactor.
- 9/15/04 120% Demand Rundown. Operator did pay attention to scale.
Corrective action: Operator was instructed by SRO to pay attention to scale. SRO on duty grants permission to restart reactor.
- 9/16/04 Log-N & Period Non-operate Scram. Operator pressed non-operate switch on front of Log & Linear drawer while changing chart paper.
Corrective action: Operator was instructed to not bump switch during operations. SRO grants permission to restart reactor.
- 10/22/04 120% Full Power Rundown. While at 90% full power, noise spike caused rundown. No corrective action taken. SRO grants permission to restart reactor.
- 10/29/04 Unplanned Shutdown. Rod #1 dropped.
Corrective action: Rx shut down.
- 11/01/04 120% Demand Rundown. While increasing to 116 watts, operator did not upscale before reaching trip point. No Corrective action noted. SRO grants permission to restart reactor.
- 11/03/04 120% Demand Rundown. Operator did not button depress firmly, when up scaling.
Corrective action: operator instructed to press firmly when changing scales. SRO grants permission to restart reactor.
- 11/22/04 High Radiation Rundown. Training scenario only, no existing high radiation. No corrective action necessary. SRO grants permission to restart reactor.
- 11/22/04 High Radiation Rundown. Training scenario only, no existing high radiation. No corrective action necessary. SRO grants permission to restart reactor.
- 11/30/04 120% Demand Rundown. While control rods at 6 inches, operator over adjusted compensating voltage, causing trip.
Corrective action: Operator instructed to be more cautious when adjusting compensating voltage. SRO permission granted to restart reactor.
- 12/02/04 Low CIC Voltage Rundown. SRO on duty tripped CIC alarm test for training purposes. No corrective action necessary. SRO grants permission to restart reactor.

- 12/06/04 Low CIC Voltage Rundown. SRO on duty tripped CIC alarm test for training purposes. No corrective action necessary. SRO grants permission to restart reactor.
- 12/07/04 Low CIC Voltage Rundown. SRO on duty tripped CIC alarm test for training purposes. No corrective action necessary. SRO grants permission to restart reactor.
- 12/07/04 Low CIC Voltage Rundown. SRO on duty tripped CIC alarm test for training purposes. No corrective action necessary. SRO grants permission to restart reactor.
- 01/12/05 Unplanned Shutdown. Control rod 1 dropped. No corrective action taken. SRO grants permission to restart reactor.
- 01/04/05 Unplanned Shutdown. Control rod #3 dropped. #3 magnet current fluctuating from 33 - 51 milliamps.
Corrective action: SRO checked rod drop current for magnet #3, and noted rod drop current has increased from 21 to 30 milliamps. SRO grants permission to restart reactor.
- 02/08/05 Rundown. Rundown occurred at less than 4 watts. No annunciator activation, and not able to determine cause. Appears to be an electronic failure. No corrective action taken. SRO grants permission to restart reactor.
- 03/07/05 120% Demand Rundown. Rundown occurred due to operator inattention. Operator instructed to watch Linear channel closely to avoid 120% Demand Rundown. SRO grants permission to restart reactor.
- 03/11/05 Unplanned Shutdown. Control rods #2 & #3 dropped possibly due to magnet #3 current changing.
Corrective action: Rod drop current test performed on magnets. Magnet #3 holding and drop currents had increased by 5 milliamps. Troubleshoot magnet power supplies #2 and #3 to isolate problem, noting magnet #2 and #3 power supplies were operating correctly. SRO grants permission to restart reactor.
- 03/15/05 Unplanned Shutdown. Control rod #3 dropped possibly due to faulty magnet #3.
Corrective action: Rod drop current test performed. SRO grants permission to restart reactor.
- 03/17/05 Rundown. No annunciators or indicators accompanying rundown. The cause is thought to be intermittent noise problem. SRO grants permission to restart reactor.
- 03/18/05 Unplanned Shutdown. Control rods #2 and #3 dropped. No corrective action taken. SRO grants permission to restart reactor.
- 03/22/05 Unplanned Shutdown. Magnet of control rod #3 lost all current. Magnet #3 removed for repair.

- 03/28/05 Rundown. No apparent cause noted. No corrective action taken. SRO grants permission to restart reactor.
- 03/30/05 120% Demand Rundown. Noise spike when changing scales from 20kw to 200kw. No corrective action taken. SRO grants permission to restart reactor.

Table 3-3: Maintenance for 2004-2005

Date	Problem/Event and Action Taken
05/17/04	Routine semi-annual calibration of control room instrumentation.
05/19/04	Routing thermal couple calibration
05/25/04	Problem: Safety Channel #2 power reading fluctuating.. Corrective action: Center pin on coax lengthened.
06/04/04	Problem: Safety Channel 2 power reading fluctuating from 42%-51%. Corrective action: Signal input connector for channel 2 removed and re-installed.
08/18/04	Routine annual control rod visual inspections.
08/19/04	Problem: Magnet #3 failure. Corrective action: Removed magnet from pool, replaced coil, reinstalled and performed rod drop time test.
09/09/04	Problem: Fission chamber positioning cable broke. Corrective action: Replaced cable.
09/09/04	Problem: Control rod #3 rod height indicator reading incorrectly. Corrective action: Adjusted rod height indicator to read zero when rod is fully inserted.
10/11/04	Problem: Log & Linear recorder Log-N ink pen positioning cable broke. Corrective action: Replaced cable.
10/29/04	Problem: Period not displaying same values on drawer and recorder. Corrective action: Check pen holder for holding pen securely and verified recorder and Log & Linear drawer period voltages reading correctly.
12/13/04	Routine semi-annual calibration of control room instrumentation.
01/10/05	Problem: Control rod # magnet failure Corrective action: Removed magnet from pool, replaced coil, reinstalled and performed rod drop time test.

- 01/11/05 Problem: Control Rod 3 magnet failure
Corrective action: Removed magnet from pool, replaced coil, reinstalled and performed rod drop time test.
- 01/24/05 Problem: Rod height indicator for control rod #3 not reading correctly.
Corrective action: Adjusted rod height indicator to read zero inches when control rod #3 is fully inserted. Checked rod height indication when rod drive was fully with drawn.
- 01/31/05 Problem: Linear Power Supply high voltage meter is reading incorrectly.
Corrective action: Removed Linear Power Supply drawer for repair. Repaired and reinstalled drawer. Checked output voltages and Low CIC Voltage trip setting.
- 01/31/05 Problem: Beam port motor not working.
Corrective action: Repaired motor, checked for proper open and closed indications.
- 02/04/05 Problem: Control rod #3 magnet failure.
Corrective action: Removed magnet from pool, replaced coil, reinstalled and performed rod drop time test.
- 02/08/05 Problem: Bridge motion switch not working correctly.
Corrective action: Replace a snap ring that holds linkage in place.
- 03/08/05 Problem: Can not clear "beam port open" indicator.
Corrective action: Replaced "beam port shut" bulb and two fuses.
- 02/21/05 Problem: Loose magnet current selector switch on magnet power supply.
Corrective action: Secured switch.
- 03/14/05 Problem: Lower level basement RAM power indicator light not working.
Corrective action: Replaced power indicator bulb.
- 03/22/05 Problem: Control rod #3 magnet failure.
Corrective action: Removed magnet from pool, replaced coil, reinstalled and performed rod drop time test.

Table 3-4. Reactor Utilization

1.	Reactor use	1017.95 hrs.
2.	Time at power	570.47 hrs.
3.	Energy generated	30358.15 kW/hrs
4.	Total number of samples	Neutron irradiated 364
		Gamma Exposure 767
5.	U-235 Burned	1.3282 g
6.	U-235 Burned and Converted	1.5685 g

Table 3-5. Experimental Facility Usage

<u>Facility</u>	<u>Hours</u>
Bare Rabbit Tube	123.75 hr.
Cadmium Rabbit Tube	0.00 hr.
Beam Port	1.5 hr.
Other Core Positions	1087.5 hr.
Total	1212.75 hr.

4.0 EDUCATIONAL UTILIZATION

The reactor facility supported several UMR courses in the past year for a total of 5,154.5 student-hours. The number of UMR students utilizing the facility was 1,181. This usage is a direct result of an aggressive and continuing campus wide "outreach" program. The reactor facility provided financial support for seven students with hourly wages, and part to full support of Graduate Research Assistants. Additionally, students from several universities, colleges and high schools have used the facility.

Table 4-1 lists UMR classes taught at the facility along with associated reactor usage for this reporting period.

The University of Missouri-Columbia Nuclear Engineering Department again sent its NE 404 class, "Advanced Reactor Laboratory," to our facility (spring, 2004) for a total of 6.5 hours to participate in a wide variety of reactor-based experiments. The laboratory was conducted by the UMR reactor staff and student licensed operators.

The Reactor Sharing Program, which is funded by the U.S. Department of Energy, was established for colleges, universities, and high schools that do not have a nuclear reactor. This past year, 1,796 students and instructors from 68 institutions participated in the program. Table 4-2 lists those schools and groups that were involved in this year's Reactor Sharing Program. The majority of our participants were high school students. We coordinate with the UMR Admissions Office to schedule high school students to see other items of interest at UMR after they have visited our facility, such as the UMR-Chapter of American Nuclear Society, the Computer Integrated Manufacturing Lab, the Foundry, Ceramics Engineering, Mineral Museum, Computer Center, Experimental Mine, Solar Car, Electron Microscope, and Stonehenge. The Reactor Sharing Program serves as a strong campus-wide recruiting tool by attracting high school students to the university and hopefully sparking some interest in nuclear engineering, science, and technology.

The reactor staff continues to educate the public about applications of nuclear science. Over 4,932 persons visited the facility during this reporting period. Tour groups are typically given a brief orientation and/or demonstration by a member of the reactor staff.

**Table 4-1. UMR Classes at Reactor Facility
2004-2005 Reporting Period**

WS- Winter FS- Fall	CLASS NUMBER/TITLE	# OF STUDENTS	TIME AT REACTOR	STUDENT HOURS
WS 04	NE 25 Nuclear Technology Applications	19	4	76
WS 04	NE 206 Reactor Operations I	20	15	300
WS 04	NE 306 Reactor Operations II	8	15	120
WS 04	NE 308 Reactor Laboratory II	13	15	195
WS 04	NE 300 Special Topics	2	10	20
WS 04	NE 490 Graduate Research	4	36	144
WS 04	NE 204 Radiation Laboratory	12	3	36
WS 04	NE 204 Measurement/Detection of Radiation	12	3	36
SS 04	NE 206	3	24	72
SS 04	NE 306	8	24	192
FS 04	NE 206	16	15	240
FS 04	OURE (Opportunity for Undergraduate Research Experience)	11	30	240
FS 04	NE 304 Reactor Laboratory I	18	30	540
FS 04	NE 306 Reactor Operations II	10	23	230
FS 04	NE 307 Nuclear Fuel Cycle	11	2	22
FS 04	NE 490	6	40	240
FS 04	Chemistry Labs (Half Life)	609	0.5	304.5
FS 04	Dr Pringle Physics107	23	1	20
FS 04	NE 25	12	5	60
WS 05	Chemistry Labs (Half-life) Dr Long	262	0.5	131
WS 05	NE 204	10	4	40
WS 05	NE 308	22	15	330
WS 05	NE 390 Undergraduate Research	4	45	180
WS 05	Dr. Thompson UMC 404	16	30	480
WS 05	Dr. Thompson UMC 404	16	30	480
WS 05	Dr. Thompson UMC 404	14	9	126
WS 05	NE 206	20	15	300
	TOTAL	1181	444	5154.5

Table 4-2. Reactor Sharing Program (2003-2004)		
DATE	PARTICIPANTS	Number
4/12/04	Chamois High School	14
4/14/04	Thomas Jefferson High School	12
4/12/04	Bobby Thompson UMC Lab 404	16
4/29/04	Marshfield High School	25
5/12/04	Normandy High School	19
5/14/04	Visitation Academy	44
6/7/04	Enrollment Management Office	4
6/3/04	UAMS Nuclear Medicine	13
6/17/04	HY-Tech Camp	33
6/17/04	Introduction To Jackling	18
6/21/04	Fort Leonard Wood Chemical School Trainees	22
6/24/04	Minority Introduction to Engineering	16
7/01/04	Introduction to Engineering/Jackling	24
7/15/04	Introduction to Engineering/Jackling	28
7/27/04	Reactor Operators Workshop (4 Days)	6
6/4/04	Biometrics	4
7/14/04	Reactor Operators Workshop (4 Days)	6
7/27/04	John Parft Tour	7
7/23/04	Nuclear Engineering Camp (Total for week)	70
7/19/04	Nuclear Engineering Camp (Total for week)	70
8/10/04	Financial Aid Tour	8
8/23/04	Fort Leonard Wood Chemical School Trainees	25
8/15/04	Pre Registration Orientation Session	6
10/9/04	Open House Campus wide	14
10/19/04	Ash Grove High School	12
10/21/04	East Central College	12
11/5/04	Expanding Young Horizons (ANS)	56
11/13/04	Open House Campus wide	27
11/18/04	Mansfield High School	14
12/2/04	Cartridge High School	3
12/12/04	Society of Women Engineers	17
2/19/05	Boy Scouts	42
2/25/05	Society of Women Engineers	38

DATE	PARTICIPANTS	Number
3/15/05	Charles Beasley project	2
2/21/05	Chem Labs	212
2/28/05	UMC 404 Lab	16
2/14/05	UMC 404 Lab	16
9/ 05	Chem Labs	609
2/17/05	Parkway K-12	15
3/16/05	Hazelwood West High School	40
2/21/05	Open House campus wide	38
3/19/05	Open House campus wide	18
2/17/05	Parkway K-12	28
2/22/05	Pre Registration Orientation Session	15
3/21/05	Pre Registration Orientation Session	7
4/17/04	Pre Registration Orientation Session	7
4/23/04	Pre Registration Orientation Session	4
6/7/04	Pre Registration Orientation Session	2
6/9/04	Pre Registration Orientation Session	12
6/11/04	Pre Registration Orientation Session	4
	TOTAL	919

5.0 REACTOR HEALTH PHYSICS ACTIVITIES

The health physics activities at the UMR Reactor Facility consist primarily of radiation and contamination surveys, monitoring of personnel exposures, airborne activity, pool water activity and waste disposal. Releases of all by-product material to authorized, licensed recipients are surveyed and recorded. In addition, health physics activities include calibrations of portable and stationary radiation detection instruments, personnel training, special surveys and monitoring of non-routine procedures.

5.1. Routine Surveys

Monthly radiation exposure surveys of the facility consist of direct gamma and neutron measurements. No unusual exposure rates were identified. Monthly surface contamination surveys consist of 20 to 40 swipes counted separately for alpha, and beta/gamma activity. No significant contamination outside of contained work areas was found.

5.2. By-Product Material Release Surveys

There was one shipment of by-product material released off-campus from the reactor facility on 2/18/05 consisting of 300 Microcuries of Co-60. There were no by product material shipments released on-campus.

5.3. Routine Monitoring

Eighty nine reactor facility personnel and students involved with the operations in the reactor facility are currently assigned Luxel, optically stimulated luminescence (OSL) dosimeters. Four (Reactor Staff) have beta, gamma, neutron dosimeters which are read twice a month. There are four area beta, gamma, neutron dosimeters and one TLD ring dosimeter, which are read twice monthly. The remaining dosimeters detect beta and gamma radiation only and are read monthly. There are 20 area dosimeters assigned on campus for beta and gamma monitoring and one for beta, gamma, and neutron monitoring. In addition, 9 digital, direct-reading dosimeters, 5 chirpers, and are used for visitors and high radiation work. There have been no significant personnel exposures during this reporting period. Visitors are monitored with direct reading dosimeters. No visitors received any neither reportable nor significant exposure.

Airborne activity in the reactor bay is monitored by a fixed-filter, particulate continuous air monitor (CAM). Low levels of Argon-41 are routinely produced during operations.

Pool water activity is monitored monthly to ensure that no gross pool contamination or fuel cladding rupture has occurred. Gross counts and spectra of long-lived gamma activity are compared to previous monthly counts. From April 2003 through March 2004 sample concentrations averaged 1.677×10^{-4} $\mu\text{Ci/ml}$.

Release of gaseous Ar-41 activity through the building exhausts is determined by relating the operating times of the exhaust fans and reactor power during fan operation to previously measured air activity at maximum reactor power. During this period, an estimated 58,208.53 Microcuries of Ar-41 were released into the air.

5.4. Waste Disposal

Solid waste, including used water filters, used resins and contaminated paper is stored and/or transferred to the campus waste storage area for later shipment to a commercial burial site. Water is analyzed for radioactive contamination and approval is required before the water is released. During this period there were two waste barrels transferred from the Reactor Facility to the Dangerous Materials Storage Facility (DMSF) on campus. The first barrel contained 13 pounds of pool filters and was moved from the reactor to the DMSF on August 7, 2004. The barrel had activity of 0.112 Microcuries. The second barrel consisted of 70 pounds of solid (i.e. gloves, paper towels, and plastic bags). This barrel was moved from the reactor to the DMSF on July 22, 2004. The barrel had no detectable activity.

5.5. Instrument Calibrations

During this period, portable instruments and area monitors were calibrated annually.

6.0 PLANS

The reactor staff will be heavily involved in four major projects during the next reporting period; 1) license renewal process 2) implementation and revision of the new activities plan, 3) installing new reactor nuclear instrumentation, and 4) continuation of the reactor operator training program.

6.1 Administrative Changes

UMRR is presently fully staffed. No changes in personnel occurred during this reporting period.

6.2. Relicensing

License renewal activities will continue during the upcoming reporting period. Our present license is valid until relicensing is completed by NRC. UMRR anticipates the required materials including SAR, technical specifications, emergency plan, operator requalification plan, and environmental report will be reviewed by NRC during the next reporting period. The renewal process is expected to involve NRC approving or requiring additional information regarding the materials received from UMRR.

6.3. Strategic Plan

A strategic plan has been developed to help the facility achieve its vision "to become nationally recognized as the leading educational and training university reactor in the country and to become recognized as an active 200 kW facility in terms of research". The strategic plan identifies strategic goals and action items to enhance research, educational outreach and teaching. The action items will be initiated over the coming year and will guide the facility towards its vision.

6.4. Instrumentation Upgrade

The reactor console upgrade is continuing. Under provisions of 10CFR50.59 the installation of a pool water cooling system and replacement of the Start-up drawer may be completed during the upcoming reporting period. UMRR is taking a proactive role in partnering with security companies to test security equipment within our facility. We have successfully tested and acquired a facial recognition system that allows only authorized personnel into the reactor bay. Another company is testing several biometric access devices that were installed during 2004, these devices require fingerprints to access our vital areas. Additional security equipment will be installed and tested during the upcoming reporting period.

6.5 Reactor Operator Training

The results of the third annual group of reactor operator trainees, which initially took the NRC examination during the week of May 3, 2004, were release to UMRR in July 2004. One trainee was licensed as reactor operator (RO) with an additional two ROs upgraded to senior reactor operators (SROs). Four trainees did not pass the NRC operators examination May, 2004 and successfully retook the exam February, 2004. The training program has undergone revisions in response to input from the NRC. A third group of trainees schedule for the operator's examination October, 2005.

An additional reactor operator training program was initiated August, 2003 for high school students attending a week of UMR Nuclear Engineering Camp. This program is titled as the Reactor Operations Workshop and design specifically for students who plan to attend UMR and

become licensed operators at UMRR. Four students from each of the two nuclear engineering camps were selected to complete a four-day training course that provided a thorough introduction to the UMRR licensed documentation, which include the facility's Technical Specifications, Safety Analysis Report, Emergency Plan, Standard Operating Procedures, and the 10CFR20. Students received lectures regarding reactor theory and operated the reactor to reinforce basic principles of the reactor theory. Two of these students became UMRR licensed operators during this reporting period.

Two Reactor Operation Workshop sessions were offered in summer 2004 to select UMR Nuclear Engineering Camp attendees. The Reactor Operations Workshop will again be offered for the third year this summer of 2005.

APPENDIX A.

STANDARD OPERATING PROCEDURES
CHANGED DURING THE 2004-2005
REPORTING YEAR

*** UMR REACTOR STANDARD OPERATING PROCEDURES ***

SOP: 501

TITLE: **EMERGENCY PROCEDURES FOR REACTOR
BUILDING EVACUATION**

Revised: September 9, 2004

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UMR REACTOR EMERGENCY PHONE LIST

<u>Reactor Staff</u>	<u>Cell</u>	<u>Pager</u>	<u>HOME</u>	<u>WORK</u>
Brian Porter, Sr. Electronics Tech. RO			368-3090	341- 4291
William Bonzer, Manager, SRO.	578-9463		368-3727	341- 4384
Akira Tokuhiko, Director, SRO	578-0542		368-7121	341- 4746
Daniel Estel, SRO		(573) 435-6328		341- 4291
Ray Bono, Radiation Safety Officer		428-6469	364-5728	341- 4240,4305,4403
Maureen Henry, Sr. Sec.			364-7272	341- 4236

University Administrative Staff

1. Director, UMR Police, William Bleckman			364-1294	341- 4345
2. Chancellor, Gary Thomas	308-8240		368-3552	341- 4116
3. Vice Chancellor for Admin. Services, Steve Malott			364-7927	341- 4122
4. Director, Physical Plant, Marvin Patton			364-6278	341- 4252
5. Director, Health Service - Infirmary, Dwight Deardeuff, MD			364-0809	341- 4284
6. Transition Dean, SoMEER- Mariesa L. Crow			341-5158	341- 4153
7. Radiation Safety Officer, Ray Bono	428-6469		364-5728	341- 4240,4305,4403

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Local

UMR University Police				341- 4300
Rolla City Police				9-911
Rolla Fire Department				9-911
Phelps County Hospital				9-911
Rolla Emergency Management Agency				9-911

State Agencies

Missouri Highway Patrol			(573) 368-2345	
Missouri State Emergency Mgt. Agency (24 hr.)			(573) 751-2748	
Missouri Dept. of Natural Resources (24 hr.)			(573) 634-2436	
Missouri Bureau of Environmental Epidemiology	(573) 751-6160		(573) 751-4674	(24hrs)

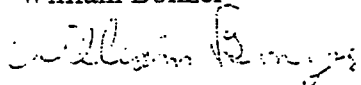
Federal Agencies

NRC, Operations Center			(301) 816-5100	
NRC Duty Officer (24 hour)			(301) 816-5100	

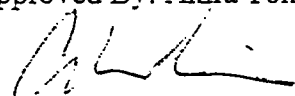
Other

American Nuclear Insurers			(860) 561-3433	
Radiation Emergency Assistance Center	(423) 576-3131		(865) 576-1005	(24hrs)

Revised By: William Bonzer



Approved By: Akira Tokuhiko



*** UMR REACTOR STANDARD OPERATING PROCEDURES ***

SOP: 501

TITLE: **EMERGENCY PROCEDURES FOR REACTOR
BUILDING EVACUATION**

Revised: January 11, 2005

Page 7 of 7

UMR REACTOR EMERGENCY PHONE LIST

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4. Director, Physical Plant, Marvin Patton			364-6278	341- <u>4252</u>
5. Director, Health Service - Infirmary, Jerry Thomas DO			364-6845	341- <u>4284</u>
6. Dean, SoMEER- Mariesa L. Crow			341-5158	341- <u>4153</u>
7. Radiation Safety Officer, Ray Bono	428-6469		364-5728	341- <u>4240,4305,4403</u>

REV

Local

UMR University Police				341- <u>4300</u>
Rolla City Police				9-911
Rolla Fire Department				9-911
Phelps County Hospital				9-911
Rolla Emergency Management Agency				9-911

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Missouri Dept. of Natural Resources (24 hr.)			(573) 634-2436	
Missouri Bureau of Environmental Epidemiology	(573) 751-6160		(573) 751-4674	(24hrs)

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NRC Duty Officer (24 hour)			(301) 816-5100	

Other

American Nuclear Insurers			(860) 561-3433	
Radiation Emergency Assistance Center	(423) 576-3131		(865) 576-1005	(24hrs)

Revised By: William Bonzer

Approved By: Akira Tokuhiko

APPENDIX B:
REVISED SAR
CHANGED DURING THE 2004-2005
REPORTING YEAR