University of Missouri-Rolla
Nuclear Reactor Facility

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April 28. 2004

Dear Sir:

Please find enclosed the Annual Progress Report 2003-2004 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. Tokuhiro
Reactor Director

mh

Enclosure

xc: Patrick Isaac, Project Manager (NRC)
Document Control Desk (NRC)
Chancellor Gary Thomas (UMR)
Dr. Mariesa L .Crow Interim 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)
American Nuclear Insurers, c/o Librarian
Dr. Mark Fitch, Chairman, Radiation Safety Committee (UMR)
University of Missouri-Columbia Research Reactor (MURR)
Dr. Arvind Kumar, Chairman of Nuclear Engineering (UMR)
Dr. Arlan R. DeKock, Dean of School of Management & Information Systems

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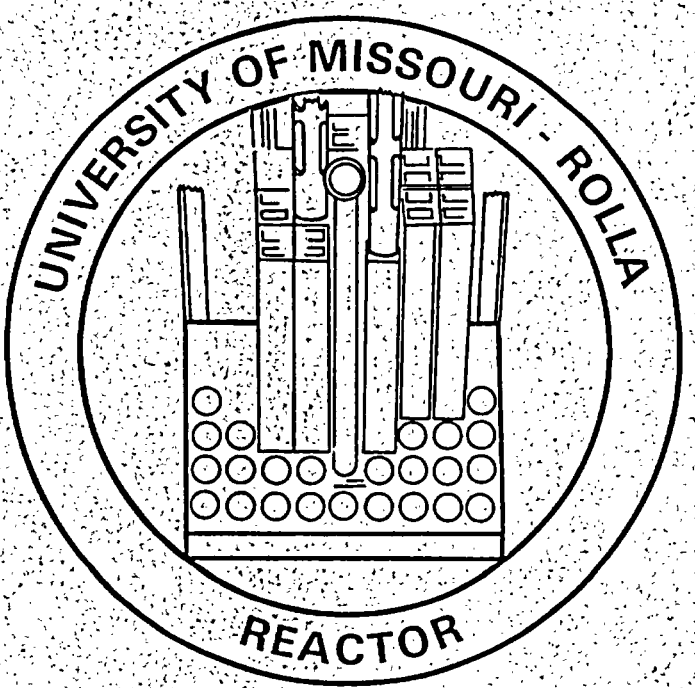
PROGRESS REPORT

2003-2004

UNIVERSITY OF MISSOURI – ROLLA

NUCLEAR REACTOR FACILITY



PROGRESS REPORT

2003-2004

UNIVERSITY OF MISSOURI-ROLLA

NUCLEAR REACTOR FACILITY

PROGRESS REPORT

FOR THE

UNIVERSITY OF MISSOURI-ROLLA

NUCLEAR REACTOR FACILITY

April 1, 2003 to March 31, 2004

Submitted to
The U.S. Nuclear Regulatory Commission
and
The University of Missouri-Rolla

SUMMARY

During the 2003-2004 reporting period the University of Missouri-Rolla Reactor (UMRR) was in use for 416 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 4,456 student-hours. About 3,172 visitors visited the reactor during the past year. There were 1,440 participants, mostly high school students, in the U.S. Department of Energy Reactor Sharing Program.

The reactor produced 33661.6 kilowatt-hours of thermal energy using approximately 1.466 grams of uranium. A total of 293 samples were neutron irradiated in the reactor with most of them being analyzed in the Reactor Counting Laboratory. An additional 440 samples were exposed to gamma radiation in the reactor.

TABLE OF CONTENTS

List of Tables

List of Figures

1.0 INTRODUCTION

This progress report covers activities at the University of Missouri-Rolla Reactor (UMRR) Facility for the period April 1, 2003 to March 31, 2004.

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 license for UMRR has been extended to January 14, 2005, Amendment No. 16 (August 6, 1999). We have been working on re-licensing during this period and will continue. We will submit a re-licensing application by December 15, 2004.

We are continuing efforts to upgrade our console using grant awards from DOE combined with money directly from reactor funds. We have received grant funds for Reactor Instrumentation upgrade in Spring 2003 and have received notice of an award for additional grant funds in Spring 2004.

The reactor has supported several graduate students in part or in full, to perform research in support of the relicensing effort. To date research on atmospheric dispersion modeling dose assessments associated with normal operations and accident conditions has been finished. An additional graduate student is now conducting severe accident analysis in support of the SAR.

An independent auditor from the University of Columbia audited the Reactor Facility on December 17, 2003. 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 102 Pre-Startup Checklist Procedure (Page 1 of 9)
2) SOP 102 Pre-Startup Checklist Procedure (Page 2 of 9)
3) SOP 102 Pre-Startup Checklist Procedure (Page 3 of 9)
4) SOP 102 Pre-Startup Checklist Procedure (Page 4 of 9)
5) SOP 102 Pre-Startup Checklist Procedure (Page 5 of 9)
6) SOP 102 Pre-Startup Checklist Procedure (Page 6 of 9)
7) SOP 102 Pre-Startup Checklist Procedure (Page 7 of 9)
8) SOP 102 Pre-Startup Checklist Procedure (Page 8 of 9)
9) SOP 102 Pre-Startup Checklist Procedure (Page 9 of 9)
10) SOP 106 Restart of the Reactor When not secured (Page 1 of 2)
11) SOP 106 Restart of Reactor When not secured (Page 2 of 2)
12) SOP 107 Permanent Log Hourly Log and Operational Data (Page 3 of 6)
13) SOP 107 Permanent Log, Hourly Log and Operational Data (page 6 of 6)
14) SOP 501 Emergency Procedures for Reactor Building Evacuation (Page 7of 7)
15) SOP 501 Emergency Procedures for Reactor Building Evacuation (Page 7of 7)

The above listed SOP revisions are provided in Appendix A.

2.0 REACTOR STAFF AND PERSONNEL

2.1 Reactor Staff

	Name	Title
1)	Dr. Akira Tokuhiro	Director & Senior Operator
2)	William Bonzer	Reactor Manager & Senior Operator
3)	Maureen Henry	Senior Secretary
4)	Brian Porter [1]	Senior Electronics Technician & Reactor Operator
5)	Dan Estel	Senior Lab Mechanic & Senior Operator

2.2 Licensed Operators

	Name	License
1)	William Bonzer	Senior Operator
2)	Akira Tokuhiro	Senior Operator
3)	Dan Estel[1]	Senior Operator
4)	Jeremy Gorelick[1]	Senior Operator
5)	Craig Heimericks[1]	Senior Operator
6)	Michelle Minard	Reactor Operator
7)	Kurt Koch	Reactor Operator
8)	Hannah Yount	Reactor Operator
9)	James Kramer[2]	Reactor Operator
10)	Christopher Carroll[1]	Reactor Operator
11)	Mathew Dennis[2]	Reactor Operator
12)	Zachary Miller[1]	Reactor Operator
13)	Bren Phillips[2]	Senior Operator
14)	Brian Porter[1]	Reactor Operator
15)	Alfred Schovanez[1]	Reactor Operator
16)	Heather Lewis	Reactor Operator
17)	Michelle Marincel[2]	Reactor Operator
18)	Seth Bradley[2]	Reactor Operator

1 Effective date 4/7/03

2 Effective date 10/21/03

2.3 Radiation Safety Committee

The Radiation Safety Committee meets quarterly. The committee met on 6/17/03, 11/25/03, 8/20/03 and 2/6/04 during the reporting period. The committee members are listed below.

	Name	Department
1)	Dr. Mark Fitch, (Chairman)	Civil Engineering
2)	Mr. Ray Bono (Secretary, ex-officio, non-voting)	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. Seungjin Kim Effective 9/9/03	Nuclear Engineering
7)	Dr. David Wronkiewicz Effective 9/9/03	Geology/Geophysics
8)	Dr. Ekkehard Sinn	Chemistry
9)	Mr. Randy Stoll	Director, Business Services
10)	Dr. Akira Tokuhiro	Director, Nuclear Reactor
11)	Dr. Heather Gepford Until 5/03	Nuclear Engineering

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:

Name		Title
1)	Mr. Ray Bono[1]	Director of Environmental Health and Safety & Radiation Safety Officer
2)	Mr. Brian Smith	Industrial Hygienist
3)	Allison Adams	HP Technician
4)	Michelle Minard	HP Technician

1. Effective as of 1/04

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 %Δk/k
Rod 2	2.69 %Δk/k
Rod 3	3.22 %Δk/k
Reg Rod	0.371 %Δk/k
Excess Reactivity	0.496 %Δk/k
Shutdown Margin*	4.92 %Δk/k

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

Figure 3-1. UMRR Core 101W Configuration

	1	2	3	4	5	6	7	8	9
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		

KEY TO PREFIXES

F - Standard Elements

C - Control Elements

BR - Bare Rabbit

CR - Cadmium Rabbit

S - Source Holder

Table 3-2 presents a listing of unscheduled shutdowns (scrams, rundowns, and unplanned normal shutdowns) along with their causes and corrective actions. One scram occurred due to a building evacuation drill that was conducted during reactor operations. The manual scram of the reactor was enacted as prescribed in the building evacuation standard operating procedure.

Four of the 16 rundowns were 120% Full Power rundowns caused by electrical noise spikes to the Log and Linear Channel in which this trip originates. The noise spikes generally were created from the auto controller circuitry. The reactor was at a stable power during each of these trips. The 120% Demand rundowns occurred due to switching errors and noise spikes originating in the Linear Channel's meter switches. Operators were instructed to properly switch scales to avoid additional switching errors.

Maintenance activities are listed in Table 3-3. Table 3-4 shows reactor utilization and Table 3-5 shows other facility usage.

Table 3-2. Unscheduled Shutdowns for 2003-2004

Date	Type of Shutdown/Cause and Corrective Action Taken
04/17/03	120% Demand Rundown. Cause: Student caused rundown by downscaling the picoamp meter too soon. Corrective Action: License operator instructed student to downscale at the proper setting. SRO on Duty granted permission to restart the reactor.
04/29/03	120% Demand Rundown. Cause: While student up scaling to the 2 kW scale, an electrical noise spike occurred. Corrective Action: No corrective action taken. SRO on Duty granted permission to restart the reactor.
05/14/03	120% Full Power Rundown. While operating at licensed power, an electrical noise spike from auto controller caused rundown. Corrective Action: None. SRO on Duty granted permission to restart the reactor.
05/28/03	120% Full Power Rundown. Cause: While operating the reactor at 90% full power, an electrical noise spike from the auto controller caused the rundown. Corrective Action: No corrective action taken. SRO on Duty granted permission to restart the reactor.
06/05/03	15 Second Period Rundown. Cause: While reloading the core a fuel element was move past the Log & Linear CIC too quickly, causing a rapid period change. Corrective Action: RO was instructed to move slowly past the Log & Linear CIC with the fuel element. SRO on Duty granted permission to restart the reactor.
06/10/03	Regulating Rod Insert Limit on Auto Rundown. Cause: While performing a regulating rod calibration by positive period method, the RO applied an improper procedure. Corrective action: The RO was instructed on proper procedure for conducting the regulating rod

	calibration. SRO on Duty granted permission to restart the reactor.
08/22/04	120% Demand Rundown. Cause: Student improperly downscaled Linear picoamp meter during power change. Corrective action: Instructed student to properly downscale according to SOP. SRO on Duty granted permission to restart the reactor.
09/09/03	120% Demand Rundown. Cause: SRO was instructing student about reactor operations. Corrective action: No corrective action taken. SRO on Duty granted permission to restart the reactor.
09/18/03	120% Full Power Rundown. Cause: Electrical noise spike in the console instrumentation. Corrective action: No corrective action. SRO on Duty granted permission to restart the reactor.
09/11/03	120% Demand Rundown. Cause: Student improperly downscaled too soon. Corrective Action: Operator instructed student the proper down scaling procedure. SRO on Duty granted permission to restart the reactor.
09/11/03	120% Full Power Rundown. Cause: Rundown caused by an electrical noise spike. Corrective action: No corrective action taken. SRO on Duty granted permission to restart the reactor.
09/11/03	120% Demand Rundown. Cause: Student improperly changed scales. Corrective action: Student instructed to press button in firmly. SRO on Duty granted permission to restart the reactor.
12/15/03	Manual Scram. Cause: Routine building evacuation drill perform while reactor was operating. Corrective action: No corrective action taken. SRO on Duty granted permission to restart the reactor.
12/17/03	120% Demand Rundown. Cause: Operator did not completely depress picoamp meter switch before releasing. Corrective action: Operator instructed on procedure for changing scales on the Linear picoamp meter. SRO on Duty granted permission to restart the reactor.
02/03/04	120% Demand Rundown. Cause: Operator was not observing the Linear recorder while changing recorder paper. Corrective action: Operator was instructed to not change recorder paper unless at a stable power in auto-control or having someone help with observation of the control room equipment when in manual and at a stable power. SRO on Duty granted permission to restart the reactor.
02/07/04	120% Demand Rundown. Cause: Student improperly up-scaled Linear picoamp meter. Corrective action: SRO instructed student to properly change scales as directed in the SOPs. SRO on Duty granted permission to restart the reactor.
02/10/04	120% Demand Rundown. Cause: Trainee was not observing Linear recorder. Corrective action: SRO instructed trainee to watch all the console equipment including the Linear channel recorder. SRO on Duty granted permission to restart the reactor.
02/16/04	120 % Demand Rundown. Cause: Trainee did not observe increase on Linear channel. Corrective action: Trainee was instructed to observe this channel. SRO on Duty granted permission to restart the reactor.
03/25/04	120% Demand Rundown. Cause: Student down-scaled instead of up-scaling during a power increase. Corrective action: Student instructed on proper scaling procedures. SRO on Duty granted permission to restart the reactor.

Table 3-3. Maintenance for 2003-2004

Date	Problem/Event and Action Taken
01/07/04	Problem: Thermocouple #2 mounting screw falls into pool and lands on a fuel element. Corrective action: Removed screw from top of fuel element with an electro magnet.
01/26/04	Problem: Beam port will not close and beam port motor is blowing fuses. Corrective action: Beam port motor removed for repair and beam port closed manually.
05/12/03	Problem: Linear channel not responding. Corrective action: Removed Linear CIC from the core to inspect water proof canister, cables, connectors, and the detector. Resealed canister and reinstalled CIC into the core. Repeated this process until the CIC was working properly, which took several days. A channel check was performed before taking the reactor to power. Reactor was taken to power and the CIC reposition to read correctly compared to the Log N channel.
06/03/03	Routine annual rod visual inspection: Eight fuel elements and three magnets removed from the core. Rods were visually inspected abnormalities and a measure of the bow in each rod was recorded. Only one rod was removed from the partially unloaded core at a time. After inspection fuel elements and magnets were reinstalled. Rod drop time tests were performed.
06/16/03	Routine semi-annual calibration started and completed on 7/22/03. Nuclear instrumentation equipment calibrated, including safety channels and thermal power calibration performed. Routine operations were scheduled during the semi-annual calibration.
11/21/03	Problem: Magnet power supply current readings were not stable. Corrective action: Removed magnet power supply, replaced the magnet current selector switch, and reinstalled unit.
12/31/04	Routine semi-annual calibration started and completed on 2/06/04. Nuclear instrumentation equipment calibrated, including safety channels, rod drop time tests and thermal power calibration performed. Routine operations were scheduled during the semi-annual calibration.
01/09/04	Routine annual radiation monitoring systems calibration performed and completed 01/12/04.

Table 3-4. Reactor Utilization

1.	Reactor use		962.03 hrs.
2.	Time at power		397.033.1 hrs.
3.	Energy generated		33661.6 kW/hrs
4.	Total number of samples	Neutron irradiated	293
		Gamma Exposure	440
5.	U-235 Burned		1.46609 g
6.	U-235 Burned and Converted		1.7353 g

Table 3-5. Experimental Facility Use Other Than The Reactor

Facility	Hours
Bare Rabbit Tube	82.14 hr.
Cadmium Rabbit Tube	0.00 hr.
Beam Port	3.25 hr.
Other Core Positions	2873 hr.
Total	2054 hr.

4.0 EDUCATIONAL UTILIZATION

The reactor facility supported several UMR courses in the past year for a total of 4,456 student-hours. The number of UMR students utilizing the facility was 1,111. This usage is a direct result of an aggressive and continuing campus wide "outreach" program. The reactor facility provided financial support for four 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 experiments that they are unable to perform with their reactor. The laboratory was held from late-afternoon to the evening (4:00 pm until 10:30 pm) and

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, 1,393 students and instructors from 55 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 3,172 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 2003-2004 Reporting Period				
WS- Winter FS- Fall	CLASS NUMBER/TITLE	# OF STUDENTS	TIME AT REACTOR	STUDENT HOURS
WS 03	NE 25	8	4	32
WS 03	NE 204	15	1	15
WS 03	NE 306	9	30	270
WS 03	NE 308	9	30	270
WS 03	NE 300	5	5	25
FS 03	Reactor Operator Trainees	16	44	704
FS 03	OURE	5	30	150
FS 03	NE 304	16	30	460
FS 03	NE 306	10	30	300
FS 03	Engineering Management Safety Class	20	1	20
FS 03	NE 490	8	30	240
FS 03	Chemistry Labs (half-life); Dr. Terry Bone	626	0.5	313
FS 03	Dr Pringle Physics 107	20	1	20
FS 03	NE 25	12	5	60
WS 04	NE 204	10	4	40
WS04	NE 308	26	30	780
WS04	NE 306	8	30	240
WS 04	Dr Thompson UMC 404	14	6.5	91
4/29/03	Physics	20	1	20
WS 04	Chem Labs	212	0.5	106
WS04	NE 204	10	4	40
WS 04	NE 25	28	5	140
FS 03-04	Research Graduate Students	4	30	120
TOTALS FOR 2002-2003		**1111**	**352.5**	**4456**

Table 4-2. Reactor Sharing Program (2003-2004)		
DATE	PARTICIPANTS	Number
4/7/03	Dr Thomas UMC 404	10
4/8/03	St Elizabeth High School Janice Wieberg	23
4/15/03	Thomas Jefferson High School	22
4/29/03	Potosi High School	40
5/5/03	Fort Leonard Wood Chemical School Trainees	22
6/11/03	Jackling I Session I	34
6/13/03	Jackling I Session I Blue Glow	34
6/16/03	Jackling I Session I Tour	21
6/19/03	Introduction to Engineering Camp	35
6/20/03	Introduction to Engineering Camp	37
6/20/03	Jackling I	37
6/23/03	Jackling I Session Tour	23
6/26/03	MITE Cindy Voght	35
6/27/03	Jackling I Session Blue Glow	24
7/6/03	Introduction to Engineering	44
7/7/03	Visitors from Admission Office	2
7/8/03	Mechanical & Aerospace Engineering	36
7/10/03	Introduction to Engineering Dr. Flori	130
7/11/03	Introduction to Engineering Camp Blue Glow	27
7/13/03	Introduction to Engineering	73
7/21/03	Nuclear Engineering Camp Session I	21
7/23/03	Nuclear Engineering Camp Session 1	24
7/24/03	Nuclear Engineering Night Group	4
7/25/03	Nuclear Engineering Camp Blue Glow	23
7/26/03	Reactor Operators Workshop Camp 7-26-31-04	4
7/28/03	Nuclear Engineering Camp Session II	54
7/30/03	Nuclear Engineering Camp Session II	54
8/2/03	Reactor Operators Workshop Camp 8-2-7-03	4
9/19/03	Freshmen ANS Blue Glow	176
10/21/03	East Central College	13
11/11/03	Newburg High School	28
11/13/03	Parkway West High School	20
11/25/03	Rolla High School	60
2/21/04	Admission Pro Session	25
2/21/04	Boy Scouts	37

	Table 4-2. Reactor Sharing Program (2003-2004) (continued)	
DATE	**PARTICIPANTS**	**Number**
3/1/04	Dr. Thompson UMC 404	14
3/3/04	Kabool High School	11
3/5/04	Hazelwood High School	50
3/6/04	PRO Session	27
3/22/04	Fort Leonward Wood Chemical School Trainees	16
3/25/04	St. Elizebeth High School	19
2003	Keong Kam, Overland Park KS, Gamma Exposure to Zenner diodes. High	1
2003	Matt Krantz , Loudon Tn. Gamma exposeure to TTL Logic chips	1
2003	Matt McCreary, Arnold Mo. Gamma exposeure to TTL Logic	1
4/18/03	Spring Open House	18
9/23/03	SOMM Open House	26
	Total 2003-2004	**1440**

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 2/20/04 consisting of 30 Microcuries of Co-60. There were no by product material shipments released on-campus.

5.3. Routine Monitoring

Sixty-one 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 monthly. The remaining dosimeters detect beta and gamma radiation only and are read monthly. There are 23 area dosimeters assigned on campus for beta and gamma monitoring and one for beta, gamma, and neutron monitoring. In addition, 5 digital, direct-reading dosimeters, 5 chirpers and 2 pocket ion chamber dosimeters 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 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 1.866×10^{-5} μCi/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 81,270.38 Microucuries 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 8/7//2003. 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 7/22/2003. 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) analysis for relicensing 2) implementation and revision of the new activities plan, 3) installing new reactor nuclear instrumentation, 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

Relicensing activities will continue during the upcoming reporting period. Our present license is valid until January, 2005. The required materials including SAR, technical specifications, emergency plan, operator requalification plan, and environmental report will be submitted to NRC this year, 2004, to initiate the process of renewing the UMRR license.

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. Several pieces of new equipment have been installed under the provisions of 10 CFR Part 50.59. New Safety Channels and a magnet power supply were installed in Spring of 2002. The Linear drawer may be replaced during the upcoming reporting period. UMRR is taking an aggressive 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 will be installed this year, 2004. These devices will require fingerprints and PIN cards to access our vital areas. Most of the changes will be made under the provisions of 50.59; however, some changes may require NRC approval.

6.5 Reactor Operator Training

The results of the second annual group of reactor operator trainees, which took the NRC examination during the week of March 10, 2003, were release to UMRR in April 2003. Six

trainees were licensed as reactor operators (ROs) with an additional three ROs upgraded to senior reactor operators (SROs). Five trainees did not pass the NRC operators examination March, 2003 and successfully retook the exam September, 2003 with an additional RO upgrading to an SRO. The training program is progressing well with a third group of trainees schedule for the operator's examination May, 2004.

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 would be attending UMR and intending to 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 included UMRR's Technical Specifications, Safety Analysis Report, Emergency Plan, Standard Operating Procedures, and the 10CFR20. Students were received lectures regarding reactor theory and operated the reactor to demonstrate basic principles of the reactor theory. Presently of the eight students receiving this introductory training three are scheduled to take the NRC operators exam in May of 2004. Two Reactor Operation Workshops will be offered this summer to selected UMR Nuclear Engineering Camp attendees.

APPENDIX A.

STANDARD OPERATING PROCEDURES
CHANGED DURING THE 2002-2003
REPORTING YEAR

A. PURPOSE:

The purpose of the checklist is to verify that reactor systems are operating correctly prior to reactor start-up.

B. PRECAUTIONS, PREREQUISITES, OR LIMITATIONS:

1. A licensed operator shall be responsible for performing the pre-startup checklist. The operator may assign various steps to be completed by unlicensed personnel; however, the operator is still fully responsible for the proper performance of the checklist.

2. The checklist shall be completed prior to the first reactor start-up of the day. The checklist shall be completed prior to a reactor start-up after a "Secure" checklist has been completed.

3. After each step on the checklist is performed the operator will record the readings made, or in cases where no readings are required, will simply check the appropriate blank on the form.

4. Any malfunction or abnormality identified during performance of the checklist shall be immediately reported to the Senior Operator on Duty, and corrected as necessary before completion of the checklist.

C. PROCEDURE

Complete the checklist in accordance with the following steps:

1. **Date** - Record the date using the rubber date stamp.

2. **Initials** - Record the initials of the person performing the checklist.

3. **Time** - Record the time shown on the console clock.

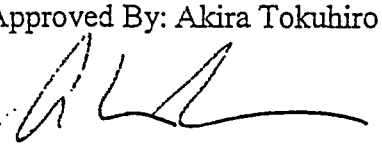
4. **Core Loading** - Enter core loading number and mode.

5. Verify that the P.A. system is operable. Turn on the bridge intercom and video monitor.

Revised By: William Bonzer

William Bonzer

Approved By: Akira Tokuhiro



6. **RAM System Check:**

   a. Announce, "THE BUILDING ALARM WILL SOUND. THIS IS A TEST. DO NOT EVACUATE THE BUILDING."
   b. Check that the setpoints and automatic functions of the RAM systems meet the criteria listed below. For each High Radiation Alarm, verify that both the audible alarm and the visual annunciator are actuated. **Reset the RMS II module within ten seconds after trip occurs.** Reset the annunciator panel after each High Radiation Alarm check. | Rev.

CHANNEL	SETPOINT	AUTOMATIC ACTION
1. Bridge RAM	10 - 18 mR/hr	High Radiation Alarm
2. Bridge RAM	15 - 28 mR/hr	Building Evacuation Alarm
3. Demin RAM	10 - 18 mR/hr	High Radiation Alarm
4. Basement RAM	10 - 18 mR/hr	High Radiation Alarm

   c. Announce, "TEST COMPLETE, ACKNOWLEDGE ALL FURTHER ALARMS".

7. Verify that all monitors (Bridge, Demin, Basement, and Neutron RAM) read below 2 mrem/hr. | Rev

8. **Beamport and Thermal Column Status:** Record the status of the beamport and thermal column ("open" or "shut") as indicated by 1) the "Beam Port or Thermal Column Open" annunciator light and 2) the Beam Port Indication light. Notify the Senior Operator on Duty if either facility is "open".

9. **Linear Channel:**

   a. Depress the zero check button; verify that the digital display reads "0.000". | Rev.
   b. Depress the zero check button again to release the check function. Set the Linear compensating voltage to obtain a Linear reading between 0.02 and 0.05 on the 2 W scale. Following a high power run, the SRO on Duty may adjust the Linear compensating voltage as appropriate.
   c. Record the Linear reading. Record the scale.

10. **Linear CIC Voltage:** Record the high voltage (HV) and compensating voltage (CV) settings of the Linear power supply. Read the CV setting by depressing the meter range switch and multiplying the meter reading by 0.1. Record to the nearest tenth of a volt. Values should correspond approximately to the following:

    HV ~ 540 VDC
    CV ~ 2 to 8 VDC

11. a. Observe the temperature and CAM recorder "RCD" is illuminated in the upper left hand corner of the display.
    b. Turn on and date the Startup, Linear, and Log/Period recorders. Reset the annunciator panel.

12. **Core Check:** Turn the pool lights on.

    a. Record water level of pool.
    b. Visually verify all fuel elements in the core and fuel storage rack are accounted for. | Rev.
    c. Visually inspect the core and pool for abnormalities. Check in-core experiments.
    d. Insert the source into the core source holder.

13. **Start-Up Channel Test:** Turn the Log Count Rate selector switch to 10^2, 10^3, and 10^4. Verify that the meter and recorder follow. Return the selector switch to the "OPERATE" position.

14. **Verify Fission Chamber Response:** Insert the fission chamber until the green Insert Limit light comes on. Observe the count rate. Raise the fission chamber until the count rate shows a definite decrease. Verify that the 2 cps alarm trips at a count rate greater than or equal to 2 cps. Insert the fission chamber to insert limit. Verify that the count rate is greater than 2 cps. (Following a high power run, the SRO on Duty may position the fission chamber as desired as long as a count rate greater than 2 cps is maintained.)

15. Observe the Log Count Rate H.V. power supply setting is positive 400 VDC. If setting is different then notify the SRO on Duty.

Revised By: William Bonzer
William Bonzer

Approved By: Akira Tokuhiro

16. **Log and Power Range Test:**

    a. Depress and hold the 10pA keypad switch on the Log and Linear drawer to obtain a stable digital log power display. | Rev.
    b. Verify receipt of the **"Non-Operative"** scram and **"Low CIC Voltage"** rundown audible and visual alarms.
    c. Verify that the digital meter and recorder read within the tolerances of the following table. The bargraph should generally follow the digital display and recorder.

Keypad Switch	Log Scale (%)	Power Range (%)
10pA	4.0 E -6 - 2.5 E -5	0-1%
0.1uA	8.4 E -2 - 1.2 E -1	0-1%
1mA	8.4 E 1 - 1.2 E 2	90 - 100%

    d. Release the switch and reset the annunciator board.
    e. Repeat Steps a. through d. for the 0.1 uA and 1 mA switches.

17. **Period Response Test:**

    a. Depress and hold the **3 SEC** keypad switch.
    b. Verify receipt of the **"Non-Operative"** scram and **"Low CIC Voltage"** rundown audible and visual alarms.
    c. Verify that the Period bargraph, digital meter, and recorder all read about 3 seconds.
    d. Verify that the 30 second, 15 second , and 5 second period annunciator alarms are actuated.
    e. Release the switch. Clear the annunciator panel.

18. Turn on the magnet power using the key switch. Push the Scram Reset button to energize the magnets. Reset the annunciator panel.

19. Record inlet temperature. Notify the SRO on Duty if the inlet temperature is below 60°F.

20. Record the magnet currents. (Typical readings should be between 25 and 85 mamp.)

Revised By: William Bonzer William Bonzer

Approved By: Akira Tokuhiro

21. **150% Power Scram Check:**

    a. Withdraw the control rods to 3 inches.
    b. Depress the test button on Safety Amplifier 1.
    c. Verify that a scram occurs before 150%.
    d. Verify that the 150% Full Power annunciator light and the audible alarm are activated.
    e. Record the trip test reading displayed on Safety Amplifier 1.
    f. Depress the reset button on Safety Amplifier 1.
    g. Reset the annunciator panel and insert magnets.
    h. Repeat steps a – g for Safety Amplifier 2.

Rev.

22. **Log and Linear Drawer Non-Operative Scram and Rundown Test:**

    a. Withdraw shim rods to 3 inches.
    b. Depress the **NON-OPER** keypad switch. Check for the Non-Operate Scram and Low CIC Voltage Rundown visual and audible alarms.
    c. Verify that the rods have dropped and rod drives are running down.
    d. Try to stop the rundown by lifting the shim joy stick.
    e. Stop the rundown with the rundown reset button.
    f. Reset the scram, rundown, and annunciator panel.

23. **Period Trip Test:**

    a. Withdraw shim rods to 3 inches.
    b. Depress and hold the **PERIOD TEST** keypad switch. Verify that the 30 Second Rod Withdrawal Prohibit annunciator is activated with a simulated period greater than or equal to 30 seconds.
    c. Continue depressing the **PERIOD TEST** keypad switch. Verify that the 15 Second Rundown is activated with a simulated period greater than or equal to 15 seconds.
    d. Continue depressing the **PERIOD TEST** keypad switch. Verify that the 5 Second Scram is activated with a simulated period greater than 5 seconds by observing a loss of magnet current and the annunciators.
    e. Release the switch.
    f. Reset the scram, rundown, and annunciator panel.

24. **Manual Scram:**

    a. Raise shim rods to 3 inches.
    b. Push the manual scram button. Verify that the rods have dropped by visually observing the video display and noting that the blue magnet contact lights are off.
    c. Push the scram reset button and reset the annunciator panel.

25. Push the annunciator test button and check for burned out bulbs. Replace any burned out bulbs. Reset the annunciator panel.

26. Verify that the magnets are on and that all rods are on insert limit.

27. Prepare hourly and permanent logs.

28. **Detector Response Check:**
    a. Inspect the core. Make certain core cooling is clear and experiments are firmly secured.
    b. "Spike" the Log and Linear Channel CIC and the Linear Channel CIC by positioning the neutron source next to the detectors.
    c. Insert the source into the holder.
    d. Observe the Log/ Period and the Linear recorder traces to verify proper response to the source spike.
    e. Observe the Startup Channel recorder to verify that the recorder responded properly with a decreased count rate when the source was moved away from the core.
    f. Reset the annunciator panel.

29. Raise the shim rods to 6 inches. Record the time on both the checklist and in the permanent log.

30. **Nitrogen Diffusers Status:** Turn on nitrogen diffuser pumps as desired. Record status of pumps as "ON" or "OFF". (Note: At least one pump should be turned on for operations in excess of 20 kW.)

31. Record the intended power level.

32. Announce, **"The Reactor Will Be Started and Taken to a Power of _____ Watts".**

33. Review the Pre-Startup Checklist. Verify that all of the steps have been completed. The licensed operator responsible for performing the checklist will initial the checklist thus verifying that it has been properly completed.

Rev.

Revised By: William Bonzer

William Bonzer

Approved By: Akira Tokuhiro

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34. The Senior Operator on Duty will announce "**The SRO on Duty is _____ and the licensed operator in the control room is _____**".

35. SRO on Duty's picture displayed in the control room.

36. The Senior Operator on Duty will initial the checklist verifying that all items have been completed and any problems identified have been satisfactorily resolved.

37. Record the date using the rubber date stamp.

Rev.

Revised By: William Bonzer

Approved By: Akira Tokuhiro

1. Date					
2. Initials of the Person Performing Checklist					
3. Time (Console Clock)					
4. Core Loading					
5. P.A., Intercom, Video Monitor On					
6. RAM System Check					
7. Radiation Level Normal					
8. Beam Port and Thermal Column Status (OPEN or SHUT)					
9. Linear Channel	Zero				
	Meter Reading				
	Scale				
10. Linear C.I.C. Voltages	HV (~540)				
	CV (~2 to 8)				
11. Recorders On, Dated, "RCD" Light On Temp. & CAM Recorders					
12. Core Check (Lights On)	Water Level (inches)				
	Elements Verified				
	Inspect Core				
	Source Inserted				
13. Start-Up Channel Test					
14. Verify FC Response, FC Inserted, Count Rate > 2 CPS					
15. Log Count Rate HV Power Supply (+400 VDC)					
16. Log and Power Range Test					
17. Period Response Test					
18. Magnet Power On, Scram Reset, Board Reset					
19. Inlet Temperature (°F)					

Rev

Revised By: William Bonzer
William Bonzer

Approved By: Akira Tokuhiro

20. Magnet Currents (milliamps)		No. 1 (A)				
		No. 2 (B)				
		No. 3 (C)				
21. 150% Power Scram Test	Safety Amplifier 1 Trip Test Reading	Raise Rods 3 in. Push "Test" Button				
	Safety Amplifier 2 Trip Test Reading					
22. Log and Linear Drawer Non-Operative Scram Test		Raise Rods 3 in. Press NON-OPER switch.				
23. Period Trip Test						
24. Manual Scram Test		Raise Rods 3 in. Push Manual Scram				
25. Annunciator Test, All Lights On						
26. Magnets On, Rods on Insert Limit						
27. Prepare Hourly and Permanent Logs						
28. Detector Response Check		Inspect Core				
		Log Spike				
		Period Spike				
		Linear Spike				
		Startup Channel Response				
29. Raise Rods to 6 in., Record Time in **Both** Logs						
30. Nitrogen Diffuser Status (ON or OFF)		No. 1				
		No. 2				
31. Intended Power Level						
32. Announce Intention to Start						
33. Pre-Startup Check Properly Completed (Licensed Operator's Initials)						
34. Senior Operator on Duty announcement's of licensed operators						
35. Senior Operator on Duty's Picture in Control Room						
36. Senior Operator on Duty's Initials						
37. Date						

Revised By: William Bonzer William Bonzer

Approved By: Akira Tokuhiro

A. **Purpose**

To be used when the reactor is shutdown to zero inches, magnet current turned off, and recorders turned off but not secured. A restart may be initiated without an additional Pre-Startup Checklist being completed.

B. **Precautions. Prerequisites. Limitations**

This procedure can only be used during the same day of the last completed Pre-Startup Checklist.

Verify that the daily Pre-Startup Checklist has been completed.

The SRO on Duty shall verify maintenance has not been performed on the control room equipment or the reactor core structure since the reactor has been shutdown to zero inches. If maintenance has been performed, the SRO on Duty shall determine if the reactor is operable by performing a channel test, Pre-Startup Checklist, or independent test to verify the repaired equipment is operable.

C. **Procedure**

Complete the following steps to re-start the reactor.

1) Verify that a secure checklist has not been completed.

2) Record the time and intended power level (2 W – 100 KW) in the permanent logbook.

3) Insert the source and inspect the core.

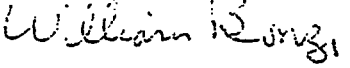
4) Make certain picoammeter is on the 2 watt scale.

5) Adjust the compensating voltage of the linear channel to read between 0.02 and 0.05 on the picoammeter.

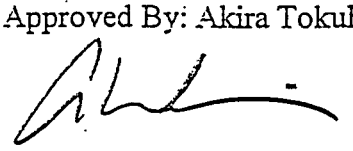
6) Verify that all rods or at insert limits.

7) Turn recorders on and verify that RCD is illuminated on the temperature and constant air monitor recorders and that both systems are on.

Revised by: William Bonzer



Approved By: Akira Tokuhiro



8) Adjust fission chamber to insert limit (this SOP is not intended to be used in a hot restart situation)

9) Spike the Linear and Log/Period CIC's. Observe the spikes on the recorders and the proper response by the fission chamber on the Log Count Rate recorder.

10) Turn on magnet current and reset the annunciator and scram. Check magnet currents.

11) Raise conrol rods to six inches and enter the time into the permanent log book. The SRO on Duty or his designed shall enter "SRO permission granted to restart the reactor" into the permanent logbook

12) Announce intentions to start reactor to desire power. **Note : Initial power can not exceed 100 kW.**

13) Follow procedures in S.O.P. 103 "Reactor Startup to Low Power" for raising control rods and observing turn around to attain desired power level not greater than 100 kW.

Revised By: William Bonzer Approved By: Akira Tokuhiro

William Bonzer

16. Record the position of Shim Rod #3 to the nearest tenth of an inch.

17. Record the position of the Regulating Rod to the nearest tenth of an inch.

18. Check Radiation Area Monitors (Reactor Bridge, Demineralizer and Beam Room) for approximately the same values observed during completion of startup checklist (SOP 102).

19. Record Reactor Bridge RAM reading in mr/hr.

20. Check Magnet Currents for approximately the same values observed (and recorded) during the startup checklist (SOP 102).

21. Record the reading on the Safety Channel No. 1.

22. Record the reading on the Safety Channel No. 2.

23. Verify that the time at which a stable power level was obtained is recorded in the Permanent Log. Other entries to the Permanent Log such as samples being irradiated, etc. should also be made at this time. (See section B of SOP 107). | Rev.

24. Record the reactor Inlet Temperature (thermocouple 1 or 3) as displayed on the Pool Water Temperature Recorder.

25. Verification SRO on Duty is aware of his or her status as SRO on Duty. | Rev.

26. Record initials if SRO on duty

27. Licensed operator initials.

2. Permanent Log Entries

   a. All entries in the Permanent Log shall be preceded by the date (Use the date stamp).

Date _____
(Start a new form each day)

HOURLY OPERATING LOG

Signatures: (1) _____ (4) _____ (7) _____
(Including Licensed (2) _____ (5) _____ (8) _____
Operator on Duty) (3) _____ (6) _____ (9) _____
(10) _____ (11) _____ (12) _____

1. Time at Power														
2. Initials - Person at Console														
3. Nominal Power (W or kW)														
4. Linear Recorder (%)														
5. Linear Scale (W or kW)														
6. Auto Set/Board Reset (Y or N)														
7. Log Level (%)														
8. Period Trace Normal (√)														
9. Log and Linear Power Range (%)														
10. Log Count Rate Recorder (cps)														
11. Source Removed? (Y or N)														
12. Diffuser(s) On? (Y or N)														
13. Exhaust Fan On? (Y or N)														
14. Shim Rod No. 1 (inches)														
15. Shim Rod No. 2 (inches)														
16. Shim Rod No. 3 (inches)														
17. Regulating Rod (inches)														
18. Radiation Levels Normal (√)														
19. Bridge Monitor (mr/hr)														
20. Magnet Currents Normal (√)														
21. Power Chamber No. 1 (%)														
22. Power Chamber No. 2 (%)														
23. Permanent Log Entries (√)														
24. Core Inlet Water Temp. (°F)														
25. SRO on Duty Verification (√)														
26. SRO on Duty Initials														
27. Licensed Operator Initials														

William E. Bonzer

Revised By: William Bonzer

Approved By: Akira Tokuhiro

UMR REACTOR EMERGENCY PHONE LIST

Reactor Staff	Cell	Pager	HOME	WORK
Brian Porter, Sr. Electronics Tech. RO			368-3090	341-4291
William Bonzer, Manager, SRO	578-9463		368-3727	341-4384
Akira Tokuhiro, 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. Interim Dean, School of Mines and Metallurgy, Mariesa L Crow			341-5158	341-4153
7. Radiation Safety Officer, Ray Bono		428-6469	364-5728	341-4240,4305,4403
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)

Rev.

Revised By: William Bonzer Approved By: Akira Tokuhiro

UMR REACTOR EMERGENCY PHONE LIST

Reactor Staff	Cell	Pager	HOME	WORK	
Brian Porter, Sr. Electronics Tech.			368-3090	341-4291	
William Bonzer, Manager, SRO	578-9463		368-3727	341-4384	
Akira Tokuhiro, Director, SRO	578-0542		368-7121	341-4746	
Daniel Estel, RO			(573) 435-6328	341-4291	
Ray Bono, Radiation Safety Officer		428-6469	364-5728	341-4240,4305,4403	
Jim Jackson, SRO			(573) 699-4897	341-4258	Rev.
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. Dean, School of Mines and Metallurgy, Lee W. Saperstein	578-0602		368-3782	341-4153	
7. Radiation Safety Officer, Ray Bono		428-6469	364-5728	341-4240,4305,4403	Rev.

Local	
UMR University Police	341-4300 Rev.
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 Rev.
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 Tokuhiro

APPENDIX B.

REVISED SAR CHANGED DURING THE 2002-2003

REPORTING YEAR