UNIVERSITY OF MISSOURI

UNIVERSITY OF MISSOURI RESEARCH REACTOR

ANNUAL REPORT 1984-85

RESEARCH REACTOR FACILITY

UNIVERSITY OF MISSOURI

RESEARCH REACTOR FACILITY

REACTOR OPERATIONS

ANNUAL REPORT

AUGUST 1985

Compiled by the Reactor Staff

Submitted by

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Acting Reactor Manager

Reviewed and Approved

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Director

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SECTION I

REACTOR OPERATIONS SUMMARY

1 July 1984 through 30 June 1985

The following table and discussion summarize reactor operations in the period 1 July 1984 through 30 June 1985.

Date	Full Power Hours	Megawatt Days	Full Power Percent* of Total Time	Full Power Percent* of Schedule
July 1984	695.6	290.39	93.49	104.71
Aug. 1984	687.3	286.90	92.38	103.46
Sep. 1984	669.1	278.80	92.93	104.08
Oct. 1984	634.1	264.44	85.11	95.33
Nov. 1984	671.7	279.88	93.29	104.49
Dec. 1984	636.8	265.59	85.59**	105.51
Jan. 1985	661.9	275.80	88.97**	103.90
Feb. 1985	610.4	254.33	90.83	101.73
Mar. 1985	683.8	284.93	91.91	102.94
Apr. 1985	653.8	272.44	90.93	101.84
May 1985	684.1	285.07	91.95	102.98
June 1985	667.7	278.22	92.74	103.87
Total for Year	7,956.3	3,316.79	90.83% of time for yr. at 10MW	102.88% of sched. time for yr. at 10MW

*MURR is scheduled to average at least 150 hours per week at 10MW. Total time is the number of hours in a month or year.

**MURR scheduled shutdowns accounting for 109 hours over the Christmas and New Years holidays.

JULY 1984

The reactor operated continuously during July with the following exceptions: three shutdowns for refueling and/or flux trap changes; two shutdowns for maintenance; and three unscheduled shutdowns.

On July 3, the reactor scrammed due to an electrical power dip that was verified with the Power Plant. All systems functioned normally and the reactor was refueled and returned to normal operation.

On July 7, spurious secondary low sump cut-out signals caused the secondary pumps to cycle. Reactor power was lowered by manual rod run-in to reduce the necessary cooling load. The source of the spurious low sump signals was found to be an intermittent contact in the sump float switch. This switch was repaired and no further problems have been experienced.

On July 12, a channel 4 high power scram occurred during a startup when the range switch was inadvertently turned the wrong way. The operator trainee was counseled in the proper use of the range switch and the reactor was returned to normal operation.

Major maintenance items for July included installing Modification 84-4 on offset "A"; and installing topaz irradiation facility over beamport "E".

AUGUST 1984

The reactor operated continuously in August with the following exceptions: four shutdowns for refueling and/or flux trap changes; two shutdowns for maintenance; and one unscheduled shutdown.

On August 31, a reactor scram and isolation occurred due to high radiation at the reactor bridge level ARMS detector which was set to trip at 50 mr/hr. This occurred when a maintenance tool was being removed from the pool, without having the bridge Area Radiation Monitor turned upscale. The tool was immeditely put back in the pool and reactor personnel evacuated the containment

building as per the containment isolation procedure. Health Physicists subsequently surveyed the containment building and checked the radiation level of the maintenance tool to ensure no personnel had received an unexpectedly high radiation dose. The tool had a contact radiation level of 150 mrem/hr. The reactor was returned to normal operation.

The major maintenance activity for August involved repairing a tear in the gasket of the truck entry door. A routine safety inspection was performed August 27-30, by Region III inspector, K. R. Ridgway and two subcontractors, J. E. Hyder and C. C. Thomas, Jr.

SEPTEMBER 1984

The reactor operated continuously during September with the following exceptions: two shutdowns for refueling and/or flux trap changes; three shutdowns for maintenance; and two unscheduled shutdowns.

On September 13, a rod-run-in occurred when control rod "D" disengaged from its magnet during a routine shimming evolution. The anvil and magnet were inspected and the alignment of the rod drive housing was adjusted. The reactor was then returned to normal operation.

On September 27, a power level interlock scram occurred when the control air solenoid coil for valve 507B shorted out, causing the valve to move from its normally open position. The coil was replaced and the reactor was returned to normal operation.

Major maintenance items for September included replacing the control relay coil for pool cleanup pump P513B; repairing and reinserting the Nuclepore irradiator case.

OCTOBER 1984

The reactor operated continuously during October with the following exceptions: three shutdowns for refueling and/or flux trap changes; five shutdowns for maintenance; and five unscheduled shutdowns.

On October 5, a reactor loop high temperature scram occurred while an electronics technician was checking the primary T_H MV/I ribbon cable connection. The cable connection was suspected as a cause of small deviations in the primary T_H readings. Electronics technicians subsequently replaced the millivolt transmitter, the RTD, and the terminal board cable assembly for reactor loop T_H (901B). Compliance checks were completed satisfactorily and the reactor was returned to operation with no further problems.

On October 16, two separate scrams occurred due to momentary dips in electrical power which were verified by the Power Plant. The reactor was returned to normal operation after each incident.

On October 29, a channel 4 high power rod-run-in occurred during a reactor startup when the operator failed to move the channel 4 range switch upscale at the proper time. The rod-run-in was reset and the startup resumed with no further problems. Proper operating procedures were discussed with the operator involved.

On October 31, the reactor scrammed due to a momentary power dip which was verified by the Power Plant. The reactor was refueled and returned to normal operation.

Major maintenance activities for October included installing new offset "B"; replacing the millivolt transmitter, RTD, and terminal board cable assembly for primary T_H (901B); shipping the old beryllium reflector for disposal; and shipping 16 spent fuel elements.

NOVEMBER 1984

The reactor operated continuously during November with the following exceptions: three shutdowns for refueling and/or flux trap changes; four shutdowns for maintenance; and five unscheduled shutdowns.

On November 4, the reactor scrammed due to a momentary power dip which was verified by the Power Plant.

On November 9, a power level interlock scram occurred when the master control switch was accidentally bumped. All systems functioned normally and the reactor was returned to operation.

On November 19, the reactor scrammed upon failure of N. I. channel #3 (intermediate range monitor). Electronics technicians replaced the detector and the power supply for this channel. The detector was tested satisfactorily and the reactor was returned to normal operation.

On November 24, the reactor experienced a scram due to what was thought to be a momentary power dip. However, this could not be verified with the Power Plant. All safety systems functioned normally and no discrepancies were noted in any related system. The reactor was refueled and returned to normal operation.

On November 27, the reactor scrammed due to a momentary power dip which was verified by the Power Plant.

Major maintenance activities for November included shipping eight spent fuel elements; and replacing power supply and detector for IRM channel #3.

DECEMBER 1984

The reactor operated continuously in December with the following exceptions: four shutdowns for flux trap sample changes and/or refueling; two shutdowns for maintenance day; and two reactor shutdowns with the building secured for the holiday periods on December 24, 25, and 31. There were no unscheduled shutdowns.

Major maintenance activities for December included installing 100 ohm RTD's for pool T_C and T_H; and inserting a nuclear powered fluorescent centertube in Beamport "F".

JANUARY 1985

The reactor operated continuously in January with the following exceptions: three shutdowns for flux trap sample changes and/or refueling; two shutdowns for maintenance day; and four unscheduled shutdowns.

On January 10, a rod not in contact with magnet rod-run-in occurred three separate times when control rod "D" disengaged from its magnet during normal reactor start-ups. The control rod guide tube was realigned, the anvil surface was cleaned, and the magnet was re-centered. The reactor was then returned to normal operation.

On January 17, a rod not in contact with magnet rod-run-in occurred when rod "D" disengaged from its magnet during a normal reactor start-up. The guide tube was realigned and a rod pull and drop test were performed satisfactorily.

During the next maintenance day, January 24, the blade full-in switch for rod "D" was shortened to relieve its contact pressure with the anvil, which was suspected to be causing a misalignment when the magnet made up with the anvil. This particular problem is believed to have caused the misalignments and subsequent rod-run-ins on January 10.

The Emergency Plan for MURR was implemented on January 8, 1985. The plan had been reviewed and approved by the Nuclear Regulatory Commission on July 12, 1984.

Major maintenance activities for January were removal of beamport "F" nuclear powered fluorescent centertube and installation of a slit centertube.

FEBRUARY 1985

The reactor operated continuously in February with the following exceptions: three shutdowns for flux trap sample changes and/or refueling; two shutdowns for maintenance day; and three unscheduled shutdowns.

During the period February 5-7, three Nuclear Regulatory Commission (NRC) inspectors for emergency planning visited the facility to review the implementation of our emergency plan.

On February 9, the reactor was scrammed by what was thought to be a momentary loss of site power but which could not be verified by the power plant. On the subsequent hot start-up, the reactor scrammed due to a low pressure trip from pressure transmitter 944 (core discharge). Investigation of this second scram revealed that the actual flow was greater than the flow indication for primary loop B. The higher than normal flow rate produced a lower reactor discharge pressure which caused the signal to the 944 trip units to be much closer than normal to the trip set points. It is felt that a low fluctuation of the 944 signal reached the trip point, initiating the scram. This is believed to have caused the first scram as well. Primary loop B flow was reduced and the reactor was returned to operation. During the following maintenance shutdown, the compliance check for loop B reactor flow (CP-4B) determined the flow trip setpoints to be in compliance. The transmitter was replaced due to the low flow indication.

On February 20, a 12% drop from normal indication occurred on Nuclear Instrumentation channel 6 which lasted 17 minutes. This reduced indication was determined to provide a 126% full power scram for channel 6 which is less conservative than the technical specification of 125% of full power. The scram setpoints for channel 4 and channel 5 would have provided a reactor scram at 120% of full power if a high power transient had occurred. A letter of explanation and the corrective measures taken was sent to the NRC Director of Nuclear Reactor Regulation dated March 18, 1985.

On February 21, a rod not in contact with magnet rod-run-in occurred when control rod "D" separated from its magnet during a routine shimming. The anvil and magnet were cleaned and realigned and the reactor was returned to operation.

Major maintenance items for the month included repairing primary flow transmitter (712E) for loop B and replacing primary demineralizer flow transmitter and power supply.

MARCH 1985

The reactor operated continuously in March with the following exceptions: two shutdowns for refueling and flux trap changes; one shutdown for maintenance; and five unscheduled shutdowns.

On March 6, the reactor scrammed due to an electrical power dip which was verified by the Power Plant. This shutdown occurred just prior to a scheduled maintenance shutdown and the maintenance schedule was completed before the reactor was returned to normal operation.

On March 8, March 22, and March 28, rod-run-ins occurred when control rod "D" disengaged from its magnet during shimming. In each case, the housing, bracket, and magnet were realigned before the reactor was returned to normal operation.

On March 29, the reactor scrammed due to an electrical power dip which was verified by the Power Plant. The reactor was subsequently returned to normal operation.

Mr. Gary Pirtle, an NRC inspector, conducted a safeguards inspection on March 4, 1985 of reactor security and special nuclear materials; no items of noncompliance were identified.

Major maintenance items for March included performing the annual containment building leak rate check (RTP-13); replacing the truck entry door gasket and performing a modified containment building leak rate check; replacing the trip relays for pressure transmitters 944 A and B, and 943; and replacing the trip relays for RTD's 980 A and B.

APRIL 1985

The reactor operated continuously in April, with the following exceptions: two shutdowns for refueling and flux trap changes; two shutdowns for maintenance; and five unscheduled shutdowns.

On April 3, April 4, and April 8, rod-run-ins occurred when control rod "D" disengaged from its magnet. On April 3, this occurred spontaneously, with the cause suspected to be a bad solder joint on the amphenol connector (which was subsequently repaired). On April 4, and April 8, this occurred while shimming rod "D". Misalignment of the rod drive housing was the suspected cause. On April 18, the offset for rod "D" was replaced. The lower rod drive housing was aligned and shimmed and no further problems of this type have occurred.

On April 7, a rod not in contact with magnet rod-run-in occurred when the magnet current for rod "D" was inadvertently turned down. The magnet current adjusting switch for rod "D" was bumped while pushing a chair between the reactor console and the front panel. The auxiliary operator responsible was counseled on the need to exercise caution when passing equipment by the front panel. The reactor was subsequently refueled and returned to normal operation.

On April 23, a manual scram was initiated immediately upon discovery of the failure of the inner personnel airlock door. Both airlock doors remained closed with their sealing gaskets inflated until the reactor was shutdown. The door malfunctioned when the timing sequence chain jumped its sprocket during a door cycling event. This was repaired and tested satisfactorily. The reactor was refueled and returned to normal operation.

W. B. Grant, Region III NRC Inspector, conducted a routine safety inspection from April 16-18, in the areas of radiation protection and radwaste management. No items of noncompliance were identified.

Major maintenance items for April included changing out offset "D"; installing new hold-down bolt insert on offset "D" (Modification Package 84-4); installing new photoelectric cells on control rod "D" for the rod drop timer and the blade full in indications (Modification Package 85-2); and repairing the timing sequence chain on the inner airlock door.

MAY 1985

The reactor operated continuously during May with the following exceptions: three shutdowns for refueling and flux trap changes; three shutdowns for maintenance; and three unscheduled shutdowns.

On May 2, the reactor was scrammed during a reactor startup by a static charge buildup on the Channel 4 range switch. The switch was cycled to discharge any remaining static buildup and the reactor was returned to normal operation.

On May 19, a manual rod-run-in was initiated when the drive chain for the regulating blade height indication failed. The chain was repaired and a compliance check was performed satisfactorily. The reactor was refueled and returned to normal operation. Reactor operation with the failed position indicator, which actuates the regulating blade less than 10% withdrawn RRI, was a deviation from Technical Specification 3.4.c. This deviation was reported to the NRC by an LER dated May 31, 1985.

On May 23, a high power rod-run-in occurred when a reactor operator trainee failed to rotate the channel 4 range selector switch upscale at the proper time during a normal reactor startup. The rod-run-in was reset and the operator was counseled on the proper operating procedures. The startup then continued normally with no further problems.

Kenneth Ridgway and Edward Schweibinz, Region III NRC Inspectors, conducted an Operations Audit from May 22 through May 24. No items of noncompliance were identified.

Major maintenance items for May included the change-out of offset "A"; replacing the D. C. amplifier on N. I. channel 5; and repairing a broken wire on control rod "A" drive mechanism.

JUNE 1985

The reactor operated continuously during June with the following exceptions: two shutdowns for refueling and flux trap changes; two shutdowns for maintenance; three unscheduled shutdowns.

On June 8, the reactor scrammed due to the failure of the nuclear instrument detector for channel number two (intermediate range monitor). The D. C. amplifier, fuse F-2, and the detector were replaced and the channel was tested satisfactorily. The failure of channel two was caused by embrittlement of the cable insulation and subsequent current leakage in the detector leads. The reactor was refueled and returned to operation.

On June 17, a reactor scram and isolation occurred as a result of a momentary loss of electrical power that was verified by the Power Plant. The reactor was refueled and returned to normal operation.

On June 25, a power level interlock scram occurred when the solenoid for valve 546(A) failed. Valve 546(A) is one of the two (redundant) in-pool convection cooling loop valves which open on loss of primary coolant. The failure of the solenoid caused the valve to fail open which permitted coolant bypass flow around the core. The resulting reduction in core flow was sensed by core ΔP pressure sensor 929, which immediately initiated the scram. The primary and pool coolant systems remained in operation, providing normal cooling after the shutdown. The solenoid was replaced and the reactor was refueled and returned to normal operation.

Major maintenance items for June included: repositioning of the dash pot piston on rod "D" down 1/8 inch; replacing the D. C. amplifier, fuse F-2, and N. I. detector #2; installing new check sources in the north, south, and west beamport floor area radiation monitors; and replacing valve 546(A) solenoid.

SECTION II

CHANGES TO THE STANDARD OPERATING PROCEDURES AND THE OPERATOR REQUALIFICATION PROGRAM

A. Operating Procedure Changes To Revised October 1981 Manual.

As required by the MURR Technical Specifications, the Acting Reactor Manager reviewed and approved the Standard Operating and Emergency Procedures (SOP).

There has been one revision (#18) made to the Revised October 1981 manual during the past year. This revision is contained in this section with the part of each page that was revised marked on the right side of the page by a bracket (]).

B. Operator Requalification Program Changes.

Two changes were made to the operator requalification program to clarify the use of the performance evaluation forms. The supervisor who should perform the evaluation for each licensed operator is defined more clearly. The performance evaluation sheet was modified to allow evaluation of an operator's performance during reactivity manipulations and performance under emergency conditions at separate times. This will allow the supervisor to impose emergency scenarios to test an operator's responses to emergencies not limited to those associated with reactivity manipulations.

These changes are consistent with 10 CRF 50.54 (i-1) since they do not involve a change in the scope of the operator requalification program, the time allotted for completion of the program, or decrease the frequency in conducting different parts of the program.

The changes to the operator requalification program are contained in this section with the part of each page that was changed marked on the right side of the page by a bracket (]).

REVISION NUMBER 18
TO
OCTOBER 1981 MANUAL

Page Number	Date Revised
SOP/VIII-11a	3/12/85
SOP/VIII-11b	3/12/85
SOP/VIII-51	3/12/85
SOP/VIII-52	3/12/85
SOP/A-8a	3/4/85
SOP/A-8b	3/4/85
SOP/A-16a	3/4/85

F. 1. Natural uranium;
   2. Special nuclear materials as defined in Title 10, Part 70, Paragraph 70.4m of the Federal Code of Regulations (i.e., plutonium, uranium-233, or uranium enriched in isotope 233 or 235);
   3. Pure elements: Li, Na, K, Rb, Cs, Ca, Sr, Ba, Hg, Os, H, O, F, Ne, Ar, Kr, Xe, and P;
   4. Compounds: NH_4NO_3, CaC_2, CaO, perchlorates, permanganates, Na_2O, and Na_2O_2;
   5. Materials which chemically react with water to produce undesirable quantities of heat and pressure;
   6. Any explosive, flammable, combustible, or toxic materials.

E. Capsules may be run shielded with cadmium or boron (as boron, BC, or BN) but weight and time are restricted due to the heat generated and their reactivity effect on the reactor. The experimenter shall take measures to insure the heat generated can be dissipated without causing damage to the rabbit or sample. The following limitations apply to shielded capsules in addition to the activity limits of Section VIII.3.2.A:]
   1. The authorized p-tube user will inform the control room he is going to run shielded capsules and will insert the rabbit so that the cap is on top when the rabbit is in the reactor.
   2. Cadmium shielded capsules:]
      a. 5 or less grams of cadmium may be run for up to 30 minutes.]
      b. 50 or less grams of cadmium may be run for up to 10 seconds in row 1 or 20 seconds in row 2.]
   3. Boron shielded capsules:
      NOTE: The weight limit is only on the boron, i.e., the carbon weight in BC does count towards the weight limit.

D. Turn on drive motor.

NOTE: Ensure take-up reel is turning. If not, immediately stop machine.

E. Run film approximately five (5) meters at four (4) to five (5) meters per minute.

F. Turn off drive motor. Leave speed set at running speed.

G. Turn of lamp.

H. Log entry.

VIII.7 Thermal Column Door Operations

VIII.7.1 Opening The Thermal Column Door

NOTE: Do not open thermal column door with the reactor critical.

1. Clear all obstructions from behind thermal column door.
2. Verify air off to Radiograph with Control Room.
3. Disconnect air supply line on thermal column door at the snap fitting.
4. Verify Neutron Radiograph rotating aperture drive shaft pulled back and disconnected.]
5. Preparation of Nuclepore Case:
   A. Decouple Nuclepore take-up shaft.
   B. Remove alignment pins from shield box door.
   C. Roll shield box cover as far back along track as possible. (NOTE: If thermal column door must be backed out further than this, attach shield box door lifting rig and move to south side of the platform using the building crane.)
   D. Decouple Nuclepore drive shaft.
   E. Decouple Nuclepore rabbit drive. (NOTE: Remove rubber grommet and store.)
   F. Secure air to the Nuclepore equipment.
   G. Disconnect PVC air lines to the drive roll.
6. Unstack shielding as necessary to allow free movement of the door.
7. Plug in thermal column door drive motors (2).

8. Back out thermal column door approximately six (6) inches.
9. Disconnect four (4) PVC lines connected to the top of the Nuclepore Irradiator Case.
10. With Health Physics coverage, open the thermal column door to the desired position.

VIII.7.2 Shutting The Thermal Column Door

1. Shut the thermal column door far enough to allow the four (4) PVC lines to be reconnected to the Nuclepore Irradiator Case.
2. Reconnect the four (4) PVC lines.
3. Completely shut the thermal column door while monitoring to insure that the four (4) PVC lines do not become pinched off.
4. Verify the thermal column door open limit switch has cleared in the Control Room.
5. Verify Neutron Radiograph rotating aperture drive shaft]
   will mate properly.]
   NOTE: DO NOT rotate aperture.]
6. Unplug the thermal column door drive motors.
7. Restack shielding on the top of the thermal column.
8. Connect the Radiograph air supply line to the regulator assembly.
9. Install the platform deck plates.
10. Nuclepore Experiment:
    A. Recouple and lock Nuclepore drive roll.
    B. Attach PVC air lines to the drive roll.
    C. Install rubber grommet and attach rabbit drive mechanism.
    D. Place shield box door back on rails and shut it. Pin door fully shut.
    E. Recouple take-up spline coupling.
    F. Open Nuclepore air supply valve and reset all tension controls.
    G. Test run film.
    H. Place the experiment in its desired operational mode in accordance with approved procedures.
11. Inform operators of the system status.

REACTOR ROUTINE PATROL Date: ____________

1. Time of start of patrol.							
2. Time and date all charts.							
3. Check ARMS trip settings.							
4. Visual check of entire pool.							
5. Anti-siphon tank pressure.	36 psig ± 3 psi						
6. North iso door seal press.	18-28 psig						
7. South iso door seal press.	18-28 psig						
8. 5th level backup doors.	Open						
9. 5th level detector reading.	0-3.5 mr/hr						
10. 5th level trip point set.	3.5 mr/hr						
11. 16" iso vlv A air pressure.	45-55 psig						
12. Emerg compress on standby.	Bkr closed, vlv open, gage 90-120 psig						
13. Containment hot sump pumps.	Operable						
14. Door 101 seal pressure.	18-28 psig						
15. BP Floor	Conditions normal.						
16. Fuel Vault	Locked						
17. Inner airlock door seal press.	18-28 psig						
18. Outer airlock door seal press.	18-28 psig						
19. T-300 level.	> 2000 gal.						
20. T-301 level.	< 6000 gal.						
21. Labyrinth Sump	Level < Alarm Pt.						
22. RO Unit Power ON	Operate/Standby						
23. RO Unit Temp	24-28°C/standby						
24. RO Unit Pressure	190-200 psig/standby						
25. EG Rm. (Batt. check Sun. mids.) (EG OP switch to Auto) (Gas | sight glass)	Thermostat > 50°F Temp > 40°F						
26. T-300, 301 Room	Thermostat > 55°F Thermostat > 40°F						

On the first routine patrol of the day or the first patrol after a startup, drain all water from the anti-siphon system. If draining causes the pressure to drop significantly, return to the middle of the band (36 psig) and record the pressure here. If a condition or reading is normal, enter a "√" (for conditions) or the reading in the applicable box. If the condition is abnormal, enter the condition or reading and circle it. Explain all abnormal conditions or readings in the remarks.

REMARKS:

Rev. 3/4/85 App'd [signature] SOP/A-8a

27. Rm. 114 Particulate filter ΔP	< 2.5" H_2O						
28. External Doors	All locked except east when sec on duty.						
29. CT basin water level.	5-10"						
30. Acid day tank level.	Visible						
31. CT sump pumps.	Operable						
32. P-pump(s) running.							
33. Pump strainer ΔP.	0-7.0 psi						
34. Discharge pressure.							
35. Pump strainer ΔP.	0-7.0 psi						
36. Discharge pressure.							
37. Tunnel sump pumps.	Operable						
38. WT booster fan.	Running						
39. Acid control and pH.	Flow 400-800 cc/min pH 7.8 - 8.2						
40. Blowdown control/cond.	Flow 500-800 cc/min Cond. 2.0K-2.9K						
41. Fission Product Monitor Flow	95-105 cc/min						
42. Vlv control header pressure.	90-120 psig						
43. Pressurizer N_2 supply press.	90-100 psig						
44. Check Rm. 114 from door.							
45. Deltech oil filter "red level" and blowdown.	< 75% dark red						
46. Seal trench.	61-66" Run pump on days.						
47. Full N_2 bottles.	Total > 3						
48. Bank A bottle press.	> 250 psig						
49. Bank B bottle press.	> 250 psig						
50. Bank on service.	A or B						
51. N_2 header pressure.	135-145 psi						
52. Waste tank #3 level.							
53. Waste tank #2 level.							
54. Waste tank #1 level.							
55. Doors to Ct, WT's, Demin. Rm. 114 and CT Tunnel.	Locked						
56. Time of Completion of Patrol.							
57. Operator initials.							

REMARKS: ______

Rev. 3/4/85 App'd JCPhe

______________ / ______
Month / Year

D. I. WATER MAKEUP LOG
(Fill in only if sending D.I. water.)

Day	Time		Conductivity			Water Meter			Pre-Filter ΔP	REMARKS
	Start	Stop	RO Unit	T-300 Start	T-300 Stop	Start	Stop	Net		

Rev. 3/4/85 App'd [signature]

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REVISION NUMBER 1

TO

MURR REQUALIFICATION PROGRAM

SUBMITTED January 31, 1978

Page Number	Date Revised
5	3/20/85

APPENDIX A:

Performance Evaluation Form	3/20/85

Revised: 3/20/85
Approved: [signature]

2.2 On-The-Job Training

This section of the program provides assurance that all operators will maintain competence in those major evolutions which can be performed by licensed operators only. The on-the-job requirements are outlined in the checklist in Appendix A.

2.3 Periodic Observation and Evaluation

Reactor Management will, on a continuing basis, observe and evaluate the performance of all operators to maintain familiarity with the operator's competence in handling routine and emergency evolutions. This program implements the means of documenting the evaluations made by management.

The Training Coordinator, Reactor Manager, Reactor Operations Engineer, or Shift Supervisor will annually conduct a performance evaluation of all operators during one of their reactivity manipulations. The supervisor conducting the evaluation will complete an Operator Performance Evaluation Sheet (Appendix A). The evaluator will also discuss or simulate abnormal]
or emergency conditions and grade the operator on his response to these conditions. Each operator's present supervisor fills out the final section]
of the evaluation sheet as an overall appraisal of the operator's perfor-]
mance during the time on the supervisor's shift. If the present supervisor]
feels there has been insufficient time on his shift to make such an evalua-]
tion, the previous supervisor will fill out the final section of the evalua-]
tion sheet based on performance on the previous shift.]

Revised: 3/20/85
Approved: [signature]

MURR OPERATOR REQUALIFICATION PROGRAM
PERFORMANCE EVALUATION FORM

Operator's Name: ____________________ Date: ____________________

Evolution Performed: ____________________

	Excel-lent	Good	Aver-age	Poor	Unsatis-factory
PERFORMANCE DURING REACTIVITY MANIPULATION:					
1. Procedures - knowledge and understanding of					
2. Console Log Entries - adequacy, completeness and legibility of entries.					
3. Checksheets and Data Sheets - thoroughness in completing checklist, accuracy of and interpretation of data on data sheets.					
4. Manipulation of Controls - proficiency in handling controls and positive approach to handling the plant.					
5. Use of Instrumentation - used all available instrumentation and properly interpreted same.					
6. Awareness of Reactor Conditions - knowledge of plant conditions, understanding trends or abnormal indications, response to changing conditions.					
OVERALL PERFORMANCE:					

PERFORMANCE UNDER ABNORMAL OR EMERGENCY CONDITIONS:					
1. Immediate actions - recognized condition and took immediate steps to put plant in safe condition.					
2. Communications - communicated problem, took charge, initiated or directed corrective action.					
3. Follow-up Actions - ability to recover plant.					
OVERALL PERFORMANCE:					

Abnormal or Emergency Conditions Imposed or Observed: ____________________

____

Comments and Recommendations: ____________________

____

____

Evaluator: ____________________

OPERATOR ON SHIFT PERFORMANCE APPRAISAL:
Appraisal Period: From ______________ To ____________________

OVERALL PERFORMANCE:					

Comments: ____________________

____

____

Supervisor's Signature: ____________________

SECTION III

1985 REVISIONS TO THE HAZARDS SUMMARY
1 July 1984 through 30 June 1985

There were no revisions to the Hazards Summary between July 1, 1984 and June 30, 1985.

SECTION IV

PLANT AND SYSTEM MODIFICATIONS

1 July 1984 through 30 June 1985

SEPTEMBER 1984

Modification 84-7: This modification adds a manual blowdown valve to the nitrogen bank system which allows the nitrogen bank to be bled down, creating a demand on the system and allowing the banks to switch from bank "A" to bank "B" manually.

This does not downgrade the system, but provides a simple way to switch from one bank to the other and test the switch-over pressure point for preventive maintenance.

OCTOBER 1984

Modification 84-4: This modification changes the technique used to secure the offset mechanisms to the reflector tank pedestal. An aluminum insert is bolted into the reflector pedestal and then the offset holddown bolt is screwed into the insert to secure the offset mechanism.

This eliminates stainless-on-stainless threads which gall and cause operational maintenance problems. It does not change the final positioning and alignment of the offset. The strength of the aluminum insert is many times greater than the maximum stress that could be exerted during operation.

Modification 84-3: This modification changes the control room indication for charging pump P533 and the conditions for the indication. The "ON" indication was changed to "AUTO" and will enable only if the following conditions are met:

1) Main power breaker at MCC5 is closed.
2) Room 114 lockout switch is unlocked.
3) Control power switch on MCC5 is in 'AUTO", and
4) Control room switch is in 'AUTO".

This prevents a green light from being indicated for P533 when either the control room switch or control power switch on MCC5 is out of 'AUTO".

During charging, both the red "RUN" light and the green "AUTO" light will be on. When any of the four switches are out of position, both lights will be off.

This change enables the operator to more quickly determine that the charging pump control system is lined up for proper operation. It does not affect the operation of the primary water makeup system.

DECEMBER 1984

Modification 84-14: This modification replaced the 10 ohm RTD's in Pool T_c and Pool T_h with 100 ohm RTD's. The 100 ohm RTD's provide a .227 ohm/°F change over the temperature range of 0°F to 200°F, where the 10 ohm RTD's provided a .0218 ohm/°F change over this range. The increased ohm/°F obtained by using the 100 ohm RTD's makes the temperature indications less susceptible to variations due to small resistance changes, i.e. terminal board connections, wire connectors, etc. in the temperature indicating current loop.

This modification in no way affects the operation of the safety system. The change is designed to enhance the accuracy of the temperature signal and its transmission to temperature indicating circuitry.

APRIL 1985

Modification 85-1: This modification to the exhaust fan system ensures that the exhaust fan running prior to a loss of site power is the fan that re-starts when the emergency generator picks up the emergency load. This takes advantage of the fan coast down and reduces the starting current on the emergency generator.

Modification 85-2: This modification, installed first on the Rod "D" housing, replaced both the "blade full in" and rod drop reed switch with photo-electric activated switches and circuitry.

The "blade full in" indication had been actuated by a spring arm style microswitch being moved by the offset pull rod anvil. This was suspected to have created an alignment problem between the anvil and magnet which resulted in unscheduled reactor shutdowns when the anvil would contact the upper guide tube.

Each control blade travel drop time is measured from full out to 80% full in. A magnetic reed switch had been used as the disconnect to stop the timers. Alignment of the magnet located in the pull rod and the reed switch located on the outside of the upper guide tube was critical and any misalignment greater than 1/4" would require a realignment before the drop time could be obtained.

The reliability of this modification has been proven by prior testing. Rod "A" will have this modification installed in May 1985. Rods "B" and "C" will have this modification installed when their offset mechanisms are changed out on their regular schedule.

<u>MAY 1985</u>

Modification 85-4: This modification changes the offset "A" blade arm design, giving a 3/4" step in the arm. The change to the blade arm will allow for clearance of the relocated pneumatic tubes. This was done in an effort to maximize and create reflector sample irradiation facilities. To do this, the pneumatic tube ends will be relocated from the G-1 and G-2 positions (north side of pool) to a special graphite element adjacent to Beamport "A" (south side of pool).

Two new blade arms were constructed and will be cycled in service for offset "A" at the biennial preventive maintenance. Since the load created by the control blade is vertical, the side load created by the stepped arm will have negligible effect on rod drop times. Operation of the offset and control blade remain as existing.

Modification 85-5: This modification installed a 1/8" aluminum shim plate between the reflector tank pedestal and offset "A" base. This was necessary due to one of the offset "A" locating pins being galled. The offset lacked approximately 1/8" from setting full down on the pedestal.

The shim plate was drilled with 2-1/8" holes to permit adequate pin clearance. The shim plate gives a flat surface on which the offset is mounted so that the blade will not tilt in its groove or come in contact with the pressure vessel.

Operation of the offset assembly does not change and this change does not effect the drop times or compliance requirements.

SECTION V

NEW TESTS AND EXPERIMENTS

1 July 1984 through 30 June 1985

New experimental programs during this period are as follows:

RUR-243 Experimenter: J. Steven Morris/Jim Carni

Description: An addenum was added to the RUR to include neutron activation analysis of small arms propellant samples.

RUR-247 Experimenter: W. Yelon/H. Kaiser

Description: An addendum was added to the RUR to include the use of U-235 and Pu-239 samples as phase shifters on Beamport B.

RUR-264 Experimenter: Don Alger

Description: The RUR was revised to broaden the scope of the applications of neutron radiographic techniques in research, education and service.

RUR-265 Experimenter: Mark Prelas

Description: An addendum was added to the RUR to include the measurement of ultraviolet fluorescence production efficiencies of Xenon gas at low power levels.

SECTION VI

SPECIAL NUCLEAR MATERIAL ACTIVITIES

1 July 1984 through 30 June 1985

1. SNM Receipts: A total of 16 new fuel elements were received from Babcock and Wilcox (B & W), Lynchburg, Virginia. These had been fabricated by Atomics International, Canoga Park, California, and shipped to B & W after December, 1982. B & W is holding 5 elements, serial numbers M0145 through M0149. Shipment of these to MURR will be completed in 1985.

Shipper	Elements	Grams U	Grams U-235
B & W	M0132, M0133, M0134, M0135, M0136, M0137, M0138, M0140, M0141, M0142, M0143, M0144, M0200, M0201, M0202, M0203	13,272	12,363

2. SNM Shipments: A total of 24 spent fuel elements were shipped to Westinghouse Idaho Nuclear Company, Inc., Idaho Falls, Idaho for reprocessing.

Shipper	Elements	Grams U	Grams U-235
MURR	M073, M075, M076, M079, M082, M090, M091, M092, M093, M094, M095, M096, M097, M098, M099, M0101, M0118, M0119, M0120, M0121, M0151, M0153, M0158, M0159	16,221	14,162

3. Inspections: A routine safeguards inspection was conducted by the Nuclear Regulatory Commission (NRC), Region III office, on 4-7 and 11 March 1985. MURR Special Nuclear Material Control Procedures were reviewed and found adequate to enable MURR to comply with 10CFR70.51(c) requirements (accounting procedures for SNM in possession). Uranium burnup calculations were found in agreement with NRC 742 Material Balance Report. Shipping and receiving procedures and records were found adequate and NRC 741 Nuclear Material

Transaction Reports were found adequately documented and properly filed with NRC. Internal fuel transfers and storage records were reviewed. Inventory of fuel and non-fuel material was physically identified and no discrepancies in inventory records were noted. By letters from NRC, Region III, dated 26 March 1985, no items of noncompliance with NRC requirements were identified during the course of these inspections.

4. SNM Inventory: As of 30 June 1985, MURR was financially responsible for the following DOE owned amounts:

Total U	=	40,647	grams
Total U-235	=	36,147	grams

Included in these totals are 36 grams of U and 34 grams of U-235 non-fuel, DOE owned. In addition to these totals, MURR owns 162 grams of U and 79 grams of U-235. All of this material is physically located at the MURR.

Fuel elements on hand have accumulated the following burnup as of 30 June 1985:

Fuel Element Number	Accumulated Megawatt Days	Fuel Element Number	Accumulated Megawatt Days	Fuel Element Number	Accumulated Megawatt Days
M058	122.78	M0117	98.27	M0141	0
M070	149.03	M0122	133.10	M0142	40.41
M077	147.86	M0123	147.64	M0143	0
M088	146.99	M0124	144.84	M0144	40.41
M0100	145.96	M0125	135.90	M0150	147.82
M0102	145.82	M0126	148.53	M0152	147.82
M0103	122.78	M0127	148.53	M0154	149.01
M0104	145.82	M0128	145.17	M0155	148.59
M0105	138.04	M0129	149.28	M0156	146.76
M0106	129.27	M0130	145.17	M0157	148.59
M0107	138.04	M0131	149.28	M0160	147.64
M0108	129.27	M0132	107.73	M0161	148.36
M0109	107.90	M0133	59.50	M0162	147.64
M0111	107.90	M0134	107.73	M0164	148.36
M0112	99.38	M0135	59.50	M0165	146.99
M0113	95.82	M0136	87.35	M0200	9.61
M0114	99.38	M0137	57.84	M0201	6.56
M0115	95.82	M0138	87.35	M0202	9.61
M0116	98.27	M0140	57.84	M0203	6.56

Average Burnup = 110.13 MWD

SECTION VII

REACTOR PHYSICS ACTIVITIES

1 July 1984 through 30 June 1985

1. Fuel Utilization: During this period, the following elements reached their licensed burnup and were retired.

Serial Number	Core Designation	Date Last Used	MWDs
M070	A-51	10-22-84	149.03
M077	A-52	10-25-84	147.86
M088	A-63	12-31-84	146.99
M0102	85-20	4-25-85	145.82
M0104	85-20	4-25-85	145.82
M0123	85-15	4-07-85	147.64
M0124	85-15	4-07-85	144.84
M0126	85-1	1-17-85	148.53
M0127	85-1	1-17-85	148.53
M0128	85-20	4-25-85	145.17
M0129	85-6	2-14-85	149.28
M0130	85-20	4-25-85	145.17
M0131	85-6	2-14-85	149.28
M0150	A-61	12-13-84	147.82
M0152	A-61	12-13-84	147.82
M0154	A-51	10-22-84	149.01
M0155	A-37	7-26-84	148.59
M0156	A-52	10-25-84	146.76
M0157	A-37	7-26-84	148.59
M0160	A-59	11-29-84	147.64
M0161	A-60	12-06-84	148.36
M0162	A-59	11-29-84	147.64
M0164	A-60	12-06-84	148.36
M0165	A-63	12-31-84	146.99

Due to the requirement of having less than 5 kg of unirradiated fuel in possession, initial criticalities are obtained with four new elements or fewer as conditions dictate. A core designation consists of eight fuel elements of which only the initial critical fuel element serial numbers are listed in the following table. To increase operating efficiency, fuel elements are used in mixed core loadings. Therefore, a fuel element fabrication core number is different from its core load number.

Fabrication Core No.	Serial No.	Core Load Designation	Initial Operating Date
34	M0112	A-37	7-19-84
34	M0114	A-37	7-19-84
34	M0113	A-42	8-23-84
34	M0115	A-42	8-23-84
34	M0116	A-54	10-29-84
34	M0117	A-54	10-29-84
36	M0132	A-55	10-31-84
36	M0134	A-55	10-31-84
36	M0133	A-63	12-20-84
37	M0135	A-63	12-20-84
37	M0136	85-1	1-10-85
37	M0138	85-1	1-10-85
37	M0137	85-11	3-14-85
37	M0140	85-11	3-14-85
37	M0142	85-20	4-23-85
38	M0144	85-20	4-23-85
41	M0200	85-30	6-13-85
41	M0202	85-30	6-13-85
41	M0201	85-32	6-20-85
41	M0203	85-32	6-20-85

2. Fuel Shipping: Twenty-four spent fuel elements were shipped from MURR to Westinghouse Idaho Nuclear Company, Inc., Idaho Falls, Idaho. The identification numbers of these elements are:

M073	M091	M097	M0120
M075	M092	M098	M0121
M076	M093	M099	M0151
M079	M094	M0101	M0153
M082	M095	M0118	M0158
M090	M096	M0119	M0159

3. Fuel Procurement: Babcock and Wilcox, Lynchburg, Virginia is MURR's current fuel assembly fabricator. This work is contracted with the U. S. Department of Energy and administered by E G & G Idaho, Idaho Falls, Idaho. As of 30 June 1985, four fuel assemblies fabricated by B & W had been received and used in cores at 10 MW.

4. Licensing Activities: Changes to the MURR Physical Security Plan were submitted 30 May 1985; reviewed and found acceptable 17 June 1985. A request for an increase in Special Nuclear Material Inventory under our Facility License submitted in December, 1982 is pending. A revision to Technical Specifications 4.4.d requiring two operating parallel pool pumps submitted in February, 1982 is pending.

5. Reactor Characteristic Measurements: Sixty-six refueling evolutions were completed. An excess reactivity verification was performed for each refueling and the average excess reactivity was 2.7%. MURR Technical Specification 3.1(f) requires that the excess reactivity be less than 9.8%.

   Reactivity measurements were performed for 19 evolutions to verify reactivity parameters for the flux trap. Shim blade calibrations were performed at selected rod heights in support of reactivity measurements.

   A physical inspection of the following fuel elements was performed to verify the operational parameters.

   M0156 from Core A-39 during August 1984

   M0150 from Core A-38 during October 1984

   M0165 from Core A-40 during December 1984

   All measurements were within operational requirements.

SECTION VIII

SUMMARY OF RADIOACTIVE EFFLUENTS RELEASED TO THE ENVIRONMENT

Sanitary Sewer Effluent

1 July 1984 through 30 June 1985

Descending Order of Activity Released

Nuclide	Amount (Ci)	Nuclide	Amount (Ci)	Nuclide	Amount (Ci)
S35	1.33E-1	Sm153	1.51E-4	Re188	2.16E-5
H3	1.21E-1	Fe59	1.23E-4	Re186	1.91E-5
Co60	3.87E-2	Ag110M	1.91E-4	Au196	1.83E-5
Zn65	2.95E-2	Rb86	8.64E-5	Nb95	1.76E-5
Cs137	7.44E-3	Co57	7.80E-5	Zr95	1.14E-5
Na24	3.70E-3	Sb122	7.26E-5	Au198	1.09E-5
Cr51	2.49E-3	Mn56	6.96E-5	I131	1.03E-5
Mn54	1.54E-3	Ba139	6.63E-5	Na22	1.01E-5
Sc46	1.10E-3	W187	6.45E-5	Se75	7.93E-6
Sb124	5.90E-4	Ni65	6.16E-5	Sn113	7.35E-6
Sb125	5.89E-4	Zn69M	5.02E-5	Hg203	5.79E-6
As77	4.49E-4	Ba140	4.67E-5	Cs134	3.74E-6
I134	3.52E-4	Ce144	4.66E-5	La140	3.34E-6
Cd109	2.41E-4	Pa233	4.42E-5	Re188	3.12E-6
Ta182	2.36E-4	Ir192	4.39E-5	Hf181	2.88E-6
Co58	2.05E-4	Ba133	3.21E-5	Tc99M	1.64E-6

Stack Effluent

1 July 1984 through 30 June 1985

Descending Order of Activity Released

Nuclide	Amount (Ci)
Ar41	1.39E+3
H3	1.01E+1
I133	2.48E-3
I135	1.91E-3
I131	1.51E-3
I134	1.13E-3
As77	5.20E-4
K40	4.91E-4
I132	4.64E-4
Xe135M	3.53E-4
Cl38	1.66E-4
Ta182	1.21E-4

SECTION IX

SUMMARY OF ENVIRONMENTAL SURVEYS

1 July 1984 through 30 June 1985

Environmental samples are collected two times per year at eight locations and analyzed for radioactivity. These locations are shown in Figure 1. Soil and vegetation samples are taken at each location. Water samples are taken at three of the eight locations. Results of the samples are shown in the following tables.

Detection Limits

Matrix	Alpha	Beta	Gamma	Tritium
Water	0.2 pCi/l	2.5 pCi/l	0.04 pCi/l	9.1 pCi/ml
Soil and vegetation	0.2 pCi/g	2.5 pCi/g	0.04 pCi/g	9.1 pCi/g

1. Sampled during October 1984.

Determined Radioactivity Levels
Vegetation Samples

Sample	Alpha pCi/g	Beta pCi/g	Gamma pCi/g	Tritium pCi/g
1-V-26	<0.2	13.7	< 0.04	< 9.1
2-V-26	<0.2	18.0	< 0.04	< 9.1
3-V-26	<0.2	26.7	< 0.04	< 9.1
4-V-26	0.3	13.0	< 0.04	< 9.1
5-V-26	<0.2	13.5	< 0.04	< 9.1
6-V-26	<0.2	9.9	< 0.04	< 9.1
7-V-26	<0.2	17.8	< 0.04	< 9.1
10-V-26	<0.2	24.2	< 0.04	< 9.1

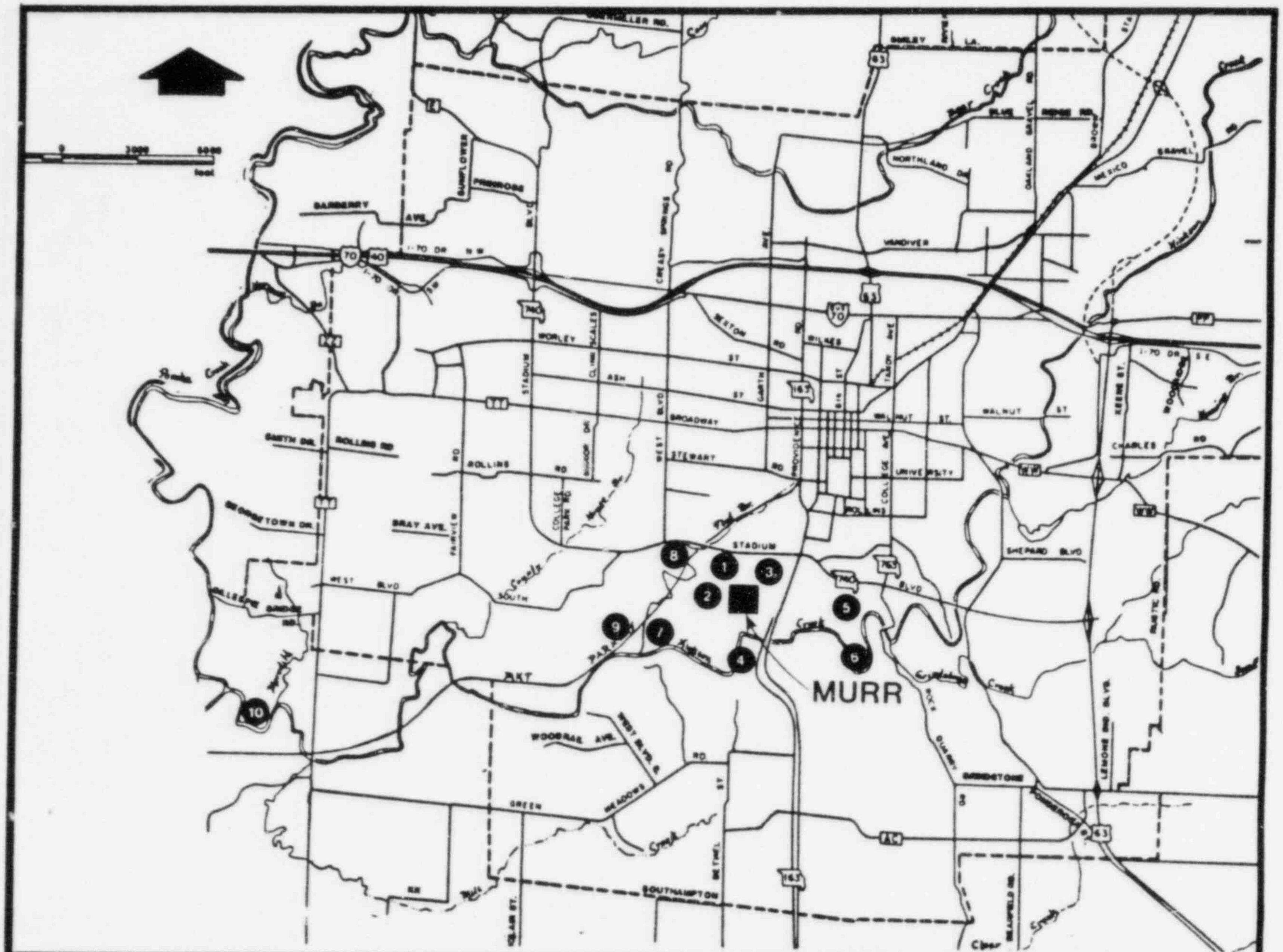

Figure 1. MURR Environmental Program Sample Stations

NOTE: September 1983 City sewerage plants at stations 8 and 9 closed. All waste water now processed at City Waste Treatment Facility at station 10.

Determined Radioactivity Levels
Soil Samples

Sample	Alpha (pCi/g)	Beta (pCi/g)	Gamma (pCi/g)
1-S-26	0.3	3.0	< 0.04
2-S-26	0.2	13.7	< 0.04
3-S-26	0.3	5.7	< 0.04
4-S-26	0.4	8.0	< 0.04
5-S-26	0.5	10.6	< 0.04
6-S-26	0.6	8.1	< 0.04
7-S-26	1.3	18.9	< 0.04
10-S-26	0.6	9.9	< 0.04

Determined Radioactivity Levels
Water Samples

Sample	Alpha (pCi/g)	Beta (pCi/g)	Gamma (pCi/g)	^3H (pCi/ml)
4-W-26	< 0.2	3.7	< 0.04	< 9.1
6-W-26	< 0.2	3.8	< 0.04	< 9.1
10-W-26	< 0.2	9.3	< 0.04	< 9.1

2. Samples during April 1985.

Detection Limits

Matrix	Alpha	Beta	Gamma	Tritium
Water	0.5 pCi/l	1.6 pCi/l	150 pCi/l	11 pCi/ml
Soil*	0.3 pCi/g	0.9 pCi/g	3.2 pCi/g	----
Vegetation*	1.5 pCi/g	4.3 pCi/g	8.4 pCi/g	11 pCi/g

*Gamma and tritium analyses are based on wet weight;
α and β analyses are based on dried weight.

Determined Radioactivity Levels
Vegetation Samples

Sample	Alpha (pCi/g)	Beta (pCi/g)	Gamma (pCi/g)	Tritium (pCi/g)
1-V-27	< 1.5	20.4	< 8.4	< 11
2-V-27	< 1.5	25.3	9.6	< 11
3-V-27	< 1.5	22.9	< 8.4	< 11
4-V-27	< 1.5	19.3	< 8.4	< 11
5-V-27	< 1.5	14.0	< 8.4	< 11
6-V-27	< 1.5	29.7	< 8.4	< 11
7-V-27	< 1.5	21.8	< 8.4	< 11
10-V-27	< 1.5	19.9	< 8.4	< 11

Determined Radioactivity Levels
Soil Samples

Sample	Alpha (pCi/g)	Beta (pCi/g)	Gamma (pCi/g)
1-S-27	0.3	9.4	8.4
2-S-27	0.8	11.7	10.8
3-S-27	0.6	10.2	8.4
4-S-27	< 0.5	6.6	7.8
5-S-27	< 0.5	10.4	5.8
6-S-27	0.4	6.6	6.6
7-S-27	0.7	8.3	6.2
10-S-27	0.4	9.5	11.8

Determined Radioactivity Levels
Water Samples

Sample	Alpha (pCi/g)	Beta (pCi/g)	Gamma (pCi/g)	^3H (pCi/ml)
4-W-27	< 0.5	3.9	< 150	< 11
6-W-27	< 0.5	3.8	< 150	< 11
10-W-27	< 0.5	7.2	< 150	< 11

No gamma peaks above background were observed in any of the gamma analyses.

Radiation and Contamination Surveys

The following table gives the number of surveys performed during FY 84-85.

Radiation	Surface Contamination	Air Samples
366	277	253

Forty-four (44) Radiation Work Permits were issued during the year.

Miscellaneous Items

Eight revisions were made to Health Physics standard operating procedures. A new procedure was added to provide for formal review of unusual unplanned radiation exposure. A second new Health Physics procedure was written to improve use of Radiation Work Permits for better exposure control.

Several actions were taken which contributed to the ALARA effort.

a. A radwaste shipment in May reduced exposure to personnel who work in the basement an estimated 5 manrem per year.

b. A plexiglass beta shield was put in service to reduce exposure in a laboratory when handling low energy gamma emitters which decay by beta decay. An estimated manrem per year to upper body is saved by this unit.

c. A lead shield was installed on a glove box to reduce exposure to females processing low energy gamma emitters used for medical studies. A quantitative value for exposure reduction is not available.

d. Smaller waste containers have been put in use in radiochemistry laboratories to reduce background both for personnel exposure reduction and a more accurate record of isotopes collected for disposal.

e. The radiation exposure rate in the reactor pool was reduced by several hundred mrem/hr (dependent on location) when a used beryllium reflector and much activated metal, which had been stored in the pool, were shipped to a radwaste disposal site. This reduces the potential exposure level should it be necessary to perform repair operations in the reactor pool.

Gross gamma analysis of environmental samples was improved by Reactor Chemistry to the extent that gamma analyses can be calculated for samples that do not exhibit distinct gamma peaks.

Environmental samples were collected around the University radwaste incinerator and analyzed to establish background data for the area.

SECTION X

SUMMARY OF RADIATION EXPOSURES TO FACILITY STAFF, EXPERIMENTERS AND VISITORS

1 July 1984 through 30 June 1985

1. Largest single exposure and average exposure are expressed in millirem.
2. Minimal exposure is defined to be gamma < 10 mrem; beta, < 40 mrem; neutron < 20 mrem.
3. M. E. = Number of monthly units reported with minimal exposure.
4. A. M. E. = Number of monthly units reported with exposure above minimal.
5. A. E. = Average mrem reported for all units above minimal.
6. H. E. = Highest mrem reported for a single unit for the month.

PERMANENT ISSUE FILM-BADGES

Beta, Gamma, Neutron Wholebody Badges: (Six badges are area monitors.)

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
ME	63	66	70	51	60	81	73	80	64	74	67	69
AME	58	56	52	68	67	45	57	52	65	59	69	69
AE	108	91	103	423	101	117	125	139	116	130	123	106
HE	210	240	320	680	320	190	260	260	330	350	410	360

Beta and Gamma Wholebody Badges: (Six badges are area monitors.)

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
ME	47	48	48	51	56	57	59	52	52	53	54	55
AME	4	5	2	5	9	6	7	7	8	5	8	6
AE	50	34	85	66	101	52	34	46	30	60	618	183
HE	80	90	150	140	450	90	60	110	70	200	4470	740

TLD Finger Rings:

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
ME	38	42	38	40	48	47	52	45	48	52	48	51
AME	35	32	35	44	44	38	40	42	37	34	38	37
AE	313	213	233	457	325	486	308	301	253	226	215	269
HE	1640	1250	1310	3160	4010	8170	2830	2390	1720	1670	1740	3470

SPARE ISSUE FILM-BADGES

Beta, Gamma, Neutron Wholebody Badges:

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
ME	39	31	25	36	37	38	44	40	36	33	39	38
AME	5	17	18	13	9	6	3	6	10	12	7	10
AE	76	46	56	158	73	70	147	75	90	60	41	47
HE	200	140	280	560	160	120	380	140	300	130	150	140

Beta and Gamma Wholebody Badges:

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
ME	30	30	29	30	33	32	32	30	30	29	29	32
AME	3	3	3	1	0	0	0	4	1	3	3	1
AE	33	47	27	10	0	0	0	68	420	213	53	30
HE	40	80	40	10	0	0	0	120	420	510	130	30

TLD Finger Rings:

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
ME	16	11	20	12	18	17	19	14	11	13	18	19
AME	6	9	12	9	2	4	1	6	7	7	2	7
AE	195	210	167	338	170	88	30	198	229	217	785	263
HE	570	1030	610	1020	210	130	30	510	560	620	1490	540

DOSIMETERS

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
ME	0	3	2	6	2	2	8	6	5	6	4	4
AME	47	42	44	49	52	52	53	55	57	49	58	55
AE	77	57	64	114	87	87	72	80	79	79	79	62
HE	260	265	270	620	295	295	295	275	325	335	320	380

UNIVERSITY OF MISSOURI

Research Reactor Facility

Research Park
Columbia, Missouri 65211
Telephone (314) 882-4211

August 26, 1985

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Mr. Cecil O. Thomas, Chief
Standardization & Special Projects Branch
Division of Licensing

Reference: Docket 50-186
University of Missouri Research Reactor
License R-103

Subject: Annual Report as required by
Technical Specification 6.1.h(4).

Dear Sir:

Enclosed are two copies of the reactor operations annual report for the University of Missouri Research Reactor. The reporting period covers 1 July 1984 through 30 June 1985. The The remaining twelve copies will be sent in the near future.

Sincerely,

Walt A Meyer Jr

Walt A. Meyer, Jr.
Acting Reactor Manager

JCMK:vs

Enclosures (2)

cc w/report: U.S. N.R.C.
c/o Document Mgmt. Br.
Washington, DC

IE24 Add: Reg Files
1/1