IDAHO STATE UNIVERSITY

College of Engineering
Campus Box 8060
Pocatello, Idaho
83209-8060

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U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Gentlemen:

Attached is the Annual Operating Report for the Idaho State University AGN-201 Nuclear Reactor, License R-110, Docket No. 50-284, for the calendar year 1994.

Respectfully submitted,

R. David Clovis

R. David Clovis
Reactor Supervisor

cc: A. Stephens, Reactor Administrator

Phone:
(208) 236-2902
FAX:
(208) 236-4538

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IDAHO STATE UNIVERSITY
REACTOR ANNUAL OPERATING REPORT
FOR 1994

1. Brief Narrative of Changes:

   a. There were no changes to the facility design or performance characteristics relating to reactor safety during this reporting period. There were changes to Operating Procedure #1, Operating Procedure #2, the Reactor Operations Log Form, the Emergency Plan, and the General Operating Rules, but none of these changes decreased the effectiveness of reactor safety.

   b. Results of major surveillance tests and inspections.

      1) Channel tests on all safety channels were performed and all scram interlocks were tested and found to be satisfactory and within specification.

      2) Power and period calibrations were performed with satisfactory results.

      3) The shield tank was inspected and no leaks or excessive corrosion were noted.

      4) a) The control rod drive mechanisms were inspected and tested with satisfactory results.

         b) Scram times were measured and found to be less than 120 milliseconds.

         c) Control and safety rod worths and run-up times were measured; and from these values the reactivity insertion rates were determined to be less than 0.058% per second for any rod.

         d) The shutdown margin was determined to be greater than 1.68% with the most reactive rod fully inserted.

2. The total operating time for the reactor during 1994 was nearly 143 hours with a total thermal energy output of approximately 72 watt-hours. The monthly breakdown of operation time follows:

Month	Hours	Month	Hours
January	6.5	July	2.5
February	8.8	August	6.0
March	9.1	September	37.8
April	4.9	October	26.0
May	1.3	November	26.5
June	6.5	December	6.6

3. Unscheduled shutdowns:

There were was one unscheduled shutdown in July 7, 1994 due to electronic noise on Safety Chassis Period #1 trip.

4. Safety related maintenance included the following:

a. Adjusted the Nuclear Instrument (NI) Channel #2 period potentiometer.

b. Drift anomalies on NI Channel #2 were corrected by matching the gains of the electronic tubes in the channel.

c. NI Channel #3 failed to trip low during startup checks of August 31, 1994. It was determined that 6CM6 tube had failed. The tube was replaced and the high and low level trips associated with NI Channel #3 were verified.

d. An open in the terminal board circuitry was discovered after annual maintenance was performed on the Fine Control Rod. The open was repaired and the Fine Control Rod was tested satisfactorily.

e. Replaced a capacitor in the power supply and re-connected the damping circuit of NI Channel #2

f. Re-soldered 2 pins of 2 different tube bases of NI Channel #3.

g. Replaced the dashpot of Safety Rod #1.

5. Changes to the Facility:

a. There have been no changes to the facility as described in the application for license.

b. There were changes to the procedures as described in this facility's Technical Specifications. As described in Part 1.a of this report, Operating Procedure #1, Operating Procedure #2, the Reactor Operations Log Form, the Emergency Plan, and the General Operating Rules were revised and are attached to this report.

c. No new or untried experiments or tests were performed during the reporting period.

6. No summary of safety evaluations are submitted at this time, because there were no changes to operating procedures, testing, or experiments to this facility during the 1994 calendar year that effected reactor safety.

7. No radiation effluents were released or discharged to the environment during 1994.

8. Neutron and beta/gamma radiation surveys performed on the exterior walls of the facility indicated that maximum combined contact radiation levels were less than 2 mrem/hr.

9. No person using the facility received a whole body exposure of greater than 100 millirem during 1994.

AGN-201 OPERATING PROCEDURE #1

This procedure details the steps that must be taken to bring the Idaho State University AGN-201 nuclear reactor to an operational state, operate the reactor and shut the reactor down. It must be followed whenever the reactor is started up for the first time of the day. An abbreviated procedure may be used for subsequent runs on the same day. (See O.P. #2)

This procedure explains the steps to be followed to complete the REACTOR OPERATIONS LOG, Form ROL-101. The Log Book should be available and open at the next empty log sheet prior to entering this procedure. The log sheet should be completed while following this procedure.

I. PRE-STARTUP AREA SURVEY

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A. 1. Ente- the current date, time, and the number of the approved experiment(s) to be performed.

2. Enter (sign) the name of the certified observer and Senior Reactor Operator/Reactor Operator and the name of the SRO on call and a phone number where he/she can be reached. Note: If the operator or the observer is an SRO, the latter requirement for a phone number is not required.

B. Start the area tour to ascertain that the reactor is in an operable state and that any abnormalities are recorded. The following steps indicate the minimum observations to be made.

1. Check the telephone for a dial tone. This check indicates operability of emergency communications.

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2. Observe the radiation level indicated on the console radiation detector. Turn on the portable radiation detector and note the battery indication to ensure operability. Also note that the detector calibration due date has not expired. Carry the portable detector for the area survey and note any abnormal readings when the tour is completed.

3. a. Go behind the concrete shield.

   b. Check that the skirt door is closed and locked. Note the shield water temperature and record it when completing the tour checks in step I.B.11.

   c. Note the condition of beam port shielding and installed experiments.

4. Proceed to the top of the reactor and open the thermal column shield door. If Channel #1 detector is not fixed in its lowest position, lower it and extend the solenoid arm to hold it down. Make sure that the cables will not keep it from rising upon energizing the solenoid.

5. Note the condition of shielding in the thermal column. Close the shield doors over the thermal column if the experiment will require operation at power levels above 0.1 watts. (Note: It is advisable to close them in any event unless the experiment requires access to the thermal column.)

6. Establish all barriers required for operation. These include, as a minimum:

   a. The rope across the laboratory door which indicates that personnel dosimetry is required.

   b. The chain across the stairs to the reactor top which indicates that the area is high radiation area.

   c. The chain across the entry to the shielded area behind the reactor which indicates that it is a high radiation area.

   d. The rope from the southeast corner of the reactor brick shielding to the south reactor room wall if south beam port plugs are removed.

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7. Check to be sure that all persons in the laboratory have appropriate personnel dosimetry.

8. Remove the cadmium plug from the Glory Hole.

9. Insert the Ra/Be startup source into the Glory Hole, Thermal Column, or a Beam port as needed for startup.

10. Check that the rear console doors are locked.

11. Return to the console. Complete the tour checks and record any shield irregularities noted during the tour.

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II. PREOPERATIONAL CHECKS

A. Turn on the console power using the key switch. Reset all scrams and energize the rod magnets by pushing the reset button.

B. Magnet Over-Current Relay Checks.

   1. Check the Over-Current relay meter indication. The meter normally indicates between 0.62 and 0.65 ma.

   2. Ensure that the magnet overcurrent scram is operable by rotating the set point indicator toward the meter needle. After contact is made, rotate the set point clockwise to the end of the scale to dislodge the meter needle. The indicator should now indicate zero current indicating that the scram worked.

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3. Return the set point indicator to the proper location. This location should not exceed 120% of the current reading observed above. Note and record the location of the set point indicator.

C. Channel #1 Checks. (The time constant is normally on 5 seconds. Ensure that the Channel #1 Sensitrol is reset prior to starting these checks.)

1. Note the high voltage setting on the Channel #1 high voltage power supply.

2. By setting the signal control switch to "ZERO,' check that the Channel #1 meter does go to zero.

3. While the signal control switch is on "ZERO," check that the Channel #1 sensitrol does trip low.

4. Rotate the Channel #1 range switch to the "100 C/S" range and set the signal control switch to "CALIBRATE." Chec' that the Channel #1 meter reads approximately 0.6 (i.e. 60 C/S). Reset the Channel #1 Sensitrol.

5. Rotate the Channel #1 range switch to "50 C/S." Observe that the Channel #1 Sensitrol trips high as the meter needle goes off scale high.

6. Return the signal control switch to "OPERATE," select the proper range, and reset the Channel #1 Sensitrol.

D. Channel #2 Checks. (Ensure that the Channel #2 Sensitrol is reset prior to starting these checks.)

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1. Check the digital reading of the high voltage power supply for CH #2. Verify it is at 400 V.

2. Rotate the operation switch to the "AMPLIFIER BALANCE," position and see if the meter reads 10^{-11}. Adjust if necessary.

3. While the operation switch is in the "AMPLIFIER BALANCE," position, observe that the Channel #2 Sensitrol has tripped Low.

4. Rotate the operation switch to the "SET 10^{-7}" position. Reset the Channel #2 Sensitrol and the period trips. With a small screwdriver, slowly rotate the "SET 10^{-11}" control clockwise to cause the meter reading to increase at such a rate that the period meter indicated a 4 to 5 second period. Observe that a period trip has occurred. Continue the rotation until the meter reads near full scale (10E-6) and observe that the Channel #2 Sensitrol has tripped high.

5. Using the "SET 10^{-11}" control, return the meter reading to -7. Rotate the operation switch to the "SET 10^{-11}" position and note the meter reading. Adjust if necessary. NOTE: If adjustment is necessary, return the operation switch to "SET 10^{-7}" position and adjust with the SET 10^{-7} control. Repeat the check of the "SET 10^{-11}" position. Repeat as necessary.

6. Return the operation switch to "OPERATE" and reset the Channel #2 Sensitrol and the period trips.

E. Channel #3 Checks. (Ensure that the Channel #3 Sensitrol is reset and that Channel #3 is on an appropriate scale.)

1. Check the digital reading of the high voltage power supply for CH #3. Verify it is at 400 V.

2. Depress the "ZERO CHECK" button and rotate the range switch to the $3x10^{-11}$ range. Continue to depress the "ZERO CHECK" button and adjust the zero if necessary. Note that the Channel #3 Sensitrol tripped low while the button was depressed.

3. Rotate the switch to the appropriate range prior to releasing the "ZERO CHECK" button. Reset the Channel #3 Sensitrol. Rotate the range switch to a more sensitive range so that the meter reads full scale. Note that the Channel #3 Sensitrol tripped high.

4. Select the proper range and reset the Channel #3 Sensitrol.

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F. Verify the "Interlock OK" is energized.

G. Radiation Alarm Test.

1. Check that the alarm on the console radiation monitor is operable by moving the small Cs-137 check source from the shield to the detector.

2. After the alarm sounds, reset the alarm and return the source to the shield.

3. Record the alarm setpoint. The monitor should alarm between 2 to 3 mr/hr.

H. Record any irregularities encountered in the preoperational check in the "comments" space on page 1 of Form ROL-101.

III. PRESTART DATA

A. Turn to page 2 of Form ROL-101 and record the date, time, and experiment number in the space provided.

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B. Record any items of equipment or instruments which are inserted in the reactor Glory Hole, Thermal Column, or reflector ports prior to start up. Be specific enough so that reactivity effects of the additions may be estimated.

C. Estimate what the excess reactivity of the reactor will be. Also estimate the critical rod height for the Fine and Coarse control rod with both the Safety Rods fully inserted. Indicate how this determination was made, such as:

1. Excess reactivity of prior runs, particularly ones with similar loadings. Indicate date of log used if it is not the immediately previous one.

2. Estimates of reactivity effects of loadings if runs with similar loadings are not readily available.

3. Any temperature changes from the run used as a basis.

D. Record the source location. (Note that the location <u>may</u> effect the excess reactivity.)

E. Observe the log sheets for the run immediately prior to this run. In particular note:

1. Date of previous run.

2. Number of the experiment performed.

3. The actual excess reactivity observed in the previous run.

4. The maximum power attained in the previous run.

F. Ensure that everything is ready for start up by performing the following:

1. Turn on both recorders and observe that they are operating properly.

2. Reset all scrams.

3. Turn on the magnet current by pushing the magnet current reset button.

IV. ROD DROP TEST AND FINAL PREPARATION

A. In preparation for the final instrument test, record the readings of Channel #1, Channel #2, and Channel #3 with the control and safety rods down.

B. Raise both Safety Rod #1 and Safety Rod #2.

C. Record the readings of Channel #1, Channel #2, and Channel #3 with both Safety Rods up. The readings of Channel #2 and Channel #3 should have increased approximately 50% to 100%. There are several reasons why such increase may not take place. These include:

1. Cadmium plug still in the Glory Hole.

2. Source in an unusual location.

3. Experimental loadings which affects the readings.

4. Instrument Failure.

Record any explanations of unexpected increase in readings in the "Comments" section of Page 2.

E. Drop the two Safety Rods by depressing the "SCRAM" button. The drop test is satisfactory if:

1. The two Safety Rods drop as indicated by the "ENGAGED" lights going out for these two rods.

2. The meter readings of the three Channels return to the values they had prior to raising the rods.

3. The drive motors automatically return the magnets to the down position and the "DOWN" lights and the "ENGAGED" lights come on for both Safety Rods.

F. Check the position indicators for both the Fine Control Rod and the Course Control Rod. Both should be within 0.05 centimeters of 0.00.

G. Record the planned power level which will be reached and the anticipated reading of Channel #3 at this power level.

H. If the Automatic Reactivity Control System is to be energized during the reactor operation, perform the steps listed in O.P. #3 prior to startup.

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V. STARTUP

A. After ensuring that all scrams are reset and that magnet current is on, the start up may be accomplished as follows: (Note: Continually observe Channel #1 and Channel #3 and switch ranges to keep the indications between 20% and 70% of full scale on each of the meters. Also monitor the reactor period while raising power. Periods longer than 30 seconds are easiest to use but periods as short as 10 seconds are acceptable.)

1a. Raise Safety Rod #1 and Safety Rod #2 in sequence.

1b. Raise the Fine Control Rod and/or the Coarse Control Rod to the approximate estimated critical rod height. Note the behavior of the reactor. Continue to raise the reactor power to 0.01 watts. Record the critical rod height for the Coarse Control Rod and the Fine Control Rod and determine and record the excess reactivity at 0.01 watts. Compare the estimated excess reactivity with the actual excess reactivity. Note the time the power level of 0.01 watts was reached.

1c. If the difference between the estimated excess reactivity and the actual excess reactivity is >0.1% and the cause of this discrepancy is found, fix the discrepancy and continue with the startup. If the cause is not known, then shutdown the reactor in accordance with Step VII and determine the cause. In either case, remark in the Comments Section of the log what action was taken.

2. Adjust the Fine Control Rod and/or the Coarse Control Rod as necessary to achieve the planned reactor power.

3. If the planned power is greater than 0.1 watts, raise the Channel #1 detector by depressing the "RAISE" button after reaching the 10K range on Channel #1. After depressing the "RAISE" button, rotate the Channel #1 range switch counterclockwise two or three "clicks" to prevent a low level trip of the Channel #1 Sensitrol.

4. When the planned power is approached, stop the rise of power by lowering the Fine Control Rod and/or the Course Control Rod.

5. After power has been stabilized, at the desired level, record the following information:

   a. Record the Channel #3 reading and when it was reached.

   b. Stable planned power level.

   c. Console radiation level as indicated by the console radiation monitor.

   d. The readings of Channel #1 and Channel #2.

6. Enter any comments regarding discrepancies or unexpected occurrences that happened during startup.

VI. OPERATIONAL DATA

A. Turn to page 3 of Form ROL-101 and record date, time, and experiment number.

B. Keep a log of all information pertinent to reactor operation. Indicate time, Channel #3 reading, control rod positions, and any operational changes. These changes will include, but are not limited to:

   1. Power level changes.

   2. Insertion or removal of materials or instruments.

   3. Operator and Observer changes (with signatures).

   4. Changes in experiments.

   5. Inadvertent scrams.

   6. Control rod changes.

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C. During extended operation at constant power, an entry should be made at least every 15 minutes in the Operational Data section of the log.

D. If more space is needed for operational data, check the space for "Is a continuation page needed?" and incorporate a continuation page. Enter the date, time, and experiment number on the continuation page.

VII. REACTOR SHUT DOWN

A. At the end of the planned operation, the reactor must be shut down. The normal shutdown method uses the manual scram button. However, many other methods are possible and may be desirable for experimental reasons or to check the operation of various automatic trips. Such methods include, but are not limited to:

1. Depress the manual scram button. (NOTE: This method MUST be used in an emergency situation.)

2. Shut off the console power by depressing the power off button. NOTE: If this method is used, power must be restored to drive the Fine Control Rod down to satisfy shutdown criteria. This method is only to be performed if an SRO with a console key is present.

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3. Increase the sensitivity of either Channel #1 or Channel #3 to produce a high level scram.

4. ONLY if power is less than one watt, insert reactivity and allow power to increase without a range change until a high level trip occurs on either Channel #1 or Channel #3. (NOTE: The power change which occurs should be recorded under "OPERATIONAL DATA.")

5. ONLY if power is less than one half watt, decrease the sensitivity of either Channel #1 or Channel #3 to produce a low level of scram.

6. Depress any Sensitrol reset button.

7. Change the control switch of either Channel #1 or Channel #2 from the "OPERATE" position.

8. ONLY if power is less than one tenth of one watt, kick the reactor to simulate an earthquake. NOTE: This method will have to performed by some one other than the reactor operator at the reactor console.

B. Draw a diagonal line across the unused portion of the Operation Data block and write "NO FURTHER ENTRIES THIS PAGE" along the line just made.

C. After the reactor scram, ensure that the rods have dropped as indicated by the "ENGAGED" lights going out followed by a sudden drop in power. Observe and log the following:

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1. Time and Manner in which the reactor was shut down.

2. All rod drives return to the "DOWN" position as indicated by the "DOWN" lights and the "ENGAGED" lights.

D. **Complete shut down is ensured by completing the following items after all rod drives are in the "DOWN" position:**

1. **Turn off the console power by depressing the "OFF" button.** (NOTE: Channel #1, Channel #2, Channel#3, **and the fixed radiation monitor remain ON.)**

2. **Ensure that all experiments have been removed from the Glory Hole and insert the Cadmium plug. However, if the** pneumatic transfer tube is installed in the Glory Hole, it may remain there providing that the cadmium slug for the transfer system be inserted to the core centerline.

3. Turn off the portable radiation monitor and the console recorders.

4. Ensure that any continuation pages used are bound into the log book.

5. Ensure that Isotope Production and Disposition log entries are made if needed.

6. Ensure that Health Physics log entries are made if needed.

E. The licensed RO and Certified Observer on duty during shut down will sign the Log Book at the bottom of Page 3 of ROL-101. As soon as practical, the Reactor Supervisor will review the operation log and sign.

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AGN-201 OPERATING PROCEDURE #2

This procedure details the steps that must be taken to bring the Idaho State University AGN-201 nuclear reactor to an operating state IF IT HAS PREVIOUSLY BEEN OPERATED DURING THE SAME DAY and shut down. It may be used ONLY if the reactor has been started up and operated successfully previously during the same day.

> CAUTION: If this operation is to the first of the day, use AGN-201 Operating Procedure #1. (O.P. #1)

This procedure explains the steps to be followed to complete the REACTOR OPERATIONS LOG, Form ROL-101. The Log Book should be available and open at the next empty log sheet prior to entering this procedure. The log sheet should be completed while following this procedure and operating the reactor.

I. PRESTART AREA SURVEY

A. 1. Enter the current date, time, and the number of the approved experiment(s) to be performed.

2. Enter (sign) the name of the certified observer and Senior Reactor Operator/Reactor Operator and the name of the SRO on call and a phone number where he/she can be reached. Note: If the operator or the observer is an SRO, the latter requirement for a phone number is not required.

B. Start the area tour to ascertain that the reactor is in an operable state and that any abnormalities are recorded. The following steps indicate the minimum observations to be made.

1. Check the telephone for a dial tone. This check indicates operability of emergency communications.

2. Observe the radiation level indicated on the console radiation detector. Turn on the portable radiation detector and note the battery indication to ensure operability. Also note that the detector calibration due date has not expired. Carry the portable detector for the area survey and note any abnormal readings when the tour is completed.

3. a. Go behind the concrete shield.

b. Check that the skirt door is closed and locked. Note the shield water temperature and record it when completing the tour checks in step I.B.11.

c. Note the condition of beam port shielding and installed experiments.

4. Proceed to the top of the reactor and open the thermal column shield door. If Channel #1 detector is not fixed in its lowest position, lower it and extend the solenoid arm to hold it down. Make sure that the cables will not keep it from rising upon energizing the solenoid.

5. Note the condition of shielding in the thermal column. Close the shield doors over the thermal column if the experiment will require operation at power levels above 0.1 watts. (Note: It is advisable to close them in any event unless the experiment requires access to the thermal column.)

6. Establish all barriers required for operation. These include, as a minimum:

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   a. The strap across the laboratory door which indicates that personnel dosimetry is required.

   b. The chain across the stairs to the reactor top which indicates that the area is a high radiation area.

   c. The chain across the entry to the shielded area behind the reactor which indicates that it is a high radiation area.

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   d. The chain from the southeast corner of the reactor brick shielding to the south reactor room wall if south beam port plugs are removed.

7. Check to be sure that all persons in the laboratory have appropriate personnel dosimetry.

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8. Remove the cadmium plug from the Glory Hole.

9. Insert the Ra/Be startup source into the Glory Hole, Thermal Column, or a Beam port as needed for startup.

10. Check that the rear console doors are locked.

11. Return to the console. Complete the tour checks and record any shield irregularities noted during the tour.

II. PREOPERATIONAL CHECKS

A. Turn on the console power using the key switch. Reset all scrams and energize the rod magnets by pushing the reset button.

3. For subsequent runs on the same day, the remainder of the operational checks may be omitted. Simply print, diagonally across the check boxes on page 1 of ROL-101 the words:

   SECOND (or THIRD, as appropriate) RUN OF THE DAY. See Appendix A.

C. Verify the "Interlock OK" is energized.

D. Radiation Alarm Test.

   1. Check that the alarm on the console radiation monitor is operable by moving the small Cs-137 check source from the shield to the detector.

   2. After the alarm sounds, reset the alarm and return the source to the shield.

   3. Record the alarm setpoint. The monitor should alarm between 2 to 3 mr/hr.

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E. Record any irregularities encountered in the preoperational check in the "comments" space on page 1 of Form ROL-101.

III. PRESTART DATA

A. Turn to page 2 of Form ROL-101 and record the date, time, and experiment number in the space provided.

B. Record any items of equipment or instruments which are inserted in the reactor Glory Hole, Thermal Column, or reflector ports prior to start up. Be specific enough so that reactivity effects of the additions may be estimated.

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C. Estimate what the excess reactivity of the reactor will be. Also estimate the critical rod height for the Fine and Coarse control rod with both the Safety Rods fully inserted. Indicate how this determination was made, such as:

   1. Excess reactivity of prior runs, particularly ones with similar loadings. Indicate date of log used if it is not the immediately previous one.

   2. Estimates of reactivity eff[illegible]f loadings if runs with similar loadings are [illegible]adily available.

   3. Any temperature changes from the run used as a basis.

D. Record the source location. (Note that the location may effect the excess reactivity.)

E. Observe the log sheets for the run immediately prior to this run. In particular note:

1. Date of previous run.

2. Number of the experiment performed.

3. The actual excess reactivity observed in the previous run.

4. The maximum power attained in the previous run.

F. Ensure that every thing is ready for start up by performing the following:

1. Turn on both recorders and observe that they are operating properly.

2. Reset all scrams.

3. Turn on the magnet current by pushing the magnet current reset button.

IV. ROD DROP TEST AND FINAL PREPARATION

A. In preparation for the final instrument test, record the readings of Channel #1, Channel #2, and Channel #3 with all of the control and safety rods down.

B. Raise both Safety Rod #1 and Safety Rod #2.

C. Record the readings of Channel #1, Channel #2, and Channel #3 with both Safety Rods up. The readings of Channel #2 and Channel #3 should have increased approximately 50% to 100%. There are several reasons why such increase may not take place. These include:

1. Cadmium plug still in the Glory Hole.

2. Source in an unusual location.

3. Experimental loadings which affects the readings.

4. Instrument Failure.

D. Record any explanations of unexpected increase in readings in the "Comments" section of Page 2.

E. Drop the two Safety Rods by depressing the "SCRAM" button. The drop test is satisfactory if:

1. The two Safety Rods drop as indicated by the "ENGAGED" lights going out for these two rods.

2. The meter readings of the three Channels return to the values they had prior to raising the rods.

3. The drive motors automatically return the magnets to the down position and the "DOWN" lights and the "ENGAGED" lights come on for both Safety Rods.

F. Check the position indicators for both the Fine Control Rod and the Course Control Rod. Both should be within 0.05 centimeters of 0.00.

G. Record the planned power level which will be reached and the anticipated reading of Channel #3 at this power level.

H. If the Automatic Reactivity Control System is to be energized during the reactor operation, perform the steps listed in O.P. #3 prior to startup.

V. STARTUP

A. After ensuring that all scrams are reset and that magnet current is on, the start up may be accomplished as follows: (Note: Continually observe Channel #1 and Channel #3 and switch ranges to keep the indications between 20% and 70% of full scale on each of the meters. Also monitor the reactor period while raising power. Periods longer than 30 seconds are easiest to use but periods as short as 10 seconds are acceptable.)

1a. Raise Safety Rod #1 and Safety Rod #2 in sequence.

1b. Raise the Fine Control Rod and/or the Coarse Control Rod to the approximate estimated critical rod height. Note the behavior of the reactor. Continue to raise the reactor power to 0.01 watts. Record the critical rod height for the Coarse Control Rod and the Fine control rod and determine and record the excess reactivity at 0.01 watts. Compare the estimated excess reactivity with the actual excess reactivity. Note the time the power level of 0.01 watts was reached.

1c. If the difference between the estimated excess reactivity and the actual excess reactivity is >0.1% and the cause of this discrepancy is found, fix the discrepancy and continue with the startup. If the cause is not known, then shutdown the reactor in accordance with Step VII and determine the cause. In either case, remark in the Comments Section of the log what action was taken.

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2. Adjust the Fine Control Rod and/or the Coarse Control Rod as necessary to achieve the planned reactor power.

3. If the planned power is greater than 0.1 watts, raise the Channel #1 detector by depressing the "RAISE" button after reaching the 10K range on Channel #1. After depressing the "RAISE" button, rotate the Channel #1 range switch counterclockwise two or three "clicks" to prevent a low level trip of the Channel #1 Sensitrol.

4. When the planned power is approached, stop the rise of power by lowering the Fine Control Rod and/or the Course Control Rod.

5. After power has been stabilized, at the desired level, record the following information:

   a. Record the Channel #3 reading and when it was reached.

   b. Initial stable planned power level.

   c. Console radiation level as indicated by the console radiation monitor.

   d. The readings of Channel #1 and Channel #2.

6. Enter any comments regarding discrepancies or unexpected occurrences that happened during startup.

VI. OPERATIONAL DATA

A. Turn to page 3 of Form ROL-101 and record date, time, and experiment number.

B. Keep a log of all information pertinent to reactor operation. Indicate time, Channel #3 reading, control rod positions, and any operational changes. These changes will include, but are not limited to:

   1. Power level changes.

   2. Insertion or removal of materials or instruments.

   3. Operator and Observer changes (with signatures).

   4. Changes in experiments.

   5. Inadvertent scrams.

   6. Control rod changes.

Rev.3

C. During extended operation at constant power, an entry should be made at least every 15 minutes in the Operational Data section of the log.

D. If more space is needed for operational data, check the space for "Is a continuation page needed?" and incorporate a continuation page. Enter the date, time, and experiment number on the continuation pages.

VII. REACTOR SHUT DOWN

A. At the end of the planned operation, the reactor must be shut down. The normal shutdown method uses the manual scram button. However, many other methods are possible and may be desirable for experimental reasons or to check the operation of various automatic trips. Such methods include, but are not limited to:

1. Depress the manual scram button. (NOTE: This method MUST be used in an emergency situation.)

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2. Shut off the console power by depressing the power off button. NOTE: If this method is used, power must be restored to drive the Fine Control Rod down to satisfy shutdown criteria. This method is only to be performed if an SRO with a console key is present.

3. Increase the sensitivity of either Channel #1 or Channel #3 to produce a high level scram.

4. ONLY if power is less than one watt, insert reactivity and allow power to increase without a range change until a high level trip occurs on either Channel #1 or Channel #3. (NOTE: The power change which occurs should be recorded under "OPERATIONAL DATA.")

5. ONLY if power is less than one half watt, decrease the sensitivity of either Channel #1 or Channel #3 to produce a low level of scram.

6. Depress any Sensitrol reset button.

7. Change the control switch of either Channel #1 or Channel #2 from the "OPERATE" position.

Rev. 3

8. ONLY if power is less than one tenth of one watt, kick the reactor to simulate an earthquake. NOTE: This method will have to performed by some one other than the reactor operator at the reactor console.

B. Draw a diagonal line across the unused portion of the Operation Data block and write "NO FURTHER ENTRIES THIS PAGE" along the line just made.

C. After the reactor scram, ensure that the rods have dropped as indicated by the "ENGAGED" lights going out followed by a sudden drop in power. Observe and log the following:

1. Time and Manner in which the reactor was shut down.

2. All rod drives return to the "DOWN" position as indicated by the "DOWN" lights and the "ENGAGED" lights.

D. Complete shut down is ensured by completing the following items after all rod drives are in the "DOWN" position:

1. Turn off the console power by depressing the "OFF" button. (NOTE: Channel #1, Channel #2, and Channel#3, as well as the fixed radiation monitor remain ON.)

2. Ensure that all experiments have been removed from the Glory Hole and insert the Cadmium plug. However, if the pneumatic transfer tube is installed in the Glory Hole, it may remain there providing that the cadmium slug for the transfer system be inserted to the core centerline.

3. Turn off the portable radiation monitor and the console recorders.

4. Make sure that any continuation pages used are bound into the log book.

5. Make sure that Isotope Production and Disposition log entries are made if needed.

6. Make sure that Health Physics log entries are made if needed.

E. The licensed RO and Certified Observer on duty during shut down will sign the Log Book at the bottom of Page 3 of ROL-101. As soon as practical, the Reactor Supervisor will review the operation log and sign.

Rev 3

Date ____________ Time ____________ Experiment No. ______

SRO/RO(signed) ____________ Certified Observer(signed) ____________

SRO on call name ____________ and phone # ____________

CHECK OUT

Telephone OK ______ Console Rad Level ________mr/hr

Water Temp ________C CH#1 Detector Down ______

Shield Irregularities ______________________________

____

Radiation Survey normal ____ Barriers in place ________

Personnel Dosimetry OK ____ Cd out of Glory Hole ______

All scrams reset ________ Magnets on ________

OVER-CURRENT RELAY CHECKS

Relay current ____________mA

Current scram OK ____________

Trip reset to ____________mA

CHANNEL #1 CHECK

CRM High Voltage ____________kV

Zero set OK ____________

Low level scram OK ____________

Calibrate (on 100 cps) OK ______

High level scram OK ____________

CHANNEL #2 CHECK

Ch #2 High Voltage ____________volts

Amp. Balance OK ____________

Low level scram OK ____________

Period scram OK ____________

High level scram OK ____________

Calibrate 10^{-7} & 10^{-11} ____________

CHANNEL #3 CHECK

Ch #3 High Voltage ____________volts

Zero set on $3x10^{-13}$ range ________

Low level scram OK ____________

High level scram OK ____________

Select proper range ____________

Scram interlock OK ____________

Radiation Alarm Setpoint ________mR/hr

Comments ______________________________

____

____

Date ____________ Time ____________ Experiment Number ____________

PRESTART DATA

Loading prior to start up ______________________________

____

Estimated ρ_{excess} ____________ Estimated CRH FCR ________cm CCR ________cm

Basis ____

____

Source location ______________________________________

Previous run data from previous log sheet:

Date ________ Exp. No. ________ ρ_{excess}(actual) ________ Power ____________

Recorders on and operating ______________________________

All scrams reset ______________ Magnets on ______________

ROD DROP TEST DATA

SAFETY ROD POSITIONS	METER READINGS		
	CH #1 (cps)	CH #2 (amps)	CH #3 (amps)
All rods down			
SR #1 & SR #2 up			

Rod Drop Test OK __________ Meter Readings back to "down" value __________

Lower rod limit readings: FCR ______________cm CCR ______________cm

Planned power level __________watts Anticipated CH #3 reading ________amps

INITIAL CRITICALITY DATA AT 0.01 WATTS

Rx. critical with FCR at ________cm and CCR at ________cm ρ_{excess}____________

Power level of 0.01 watts reached at ______________________

PLANNED POWER LEVEL DATA

CH #3 reading of __________amps reached at ______________________

Stable power __________watts Console rad level ______________mr/hr

CH #1 reading ______________cps CH #2 reading ______________amps

Comments ____

____

____

Date ____________ Time ____________ Experiment Number ______________

OPERATIONAL DATA

TIME	CH #3 (amps)	FINE ROD POS.(cm)	COURSE ROD POS.(cm)	REMARKS (loading changes, power level changes, changes in operators or observers, scrams, etc.)

Is a continuation page needed? ______________________________

REACTOR SHUT DOWN

Time ________________ Manner ______________________

All rods down ________ Cadmium inserted in Glory Hole _____

Console power off _____ Console & skirt doors locked ___ ___

Monitors off __________ Are extra pages bound in ________

Isotope Production and Disposition Log entry (yes or no)_____

Health Physics Log entry (yes or no) __________ __________

____
Reactor Operator's signature

____
Reactor Supervisor's signature

____
Certified Observer's signature

Date ______________ Time ______________ Experiment Number ________________

OPERATIONAL DATA

TIME	CH #3 (amps)	FINE ROD POS. (cm)	COURSE ROD POS. (cm)	REMARKS (loading changes, power level changes, changes in operators or observers, scrams, etc.)

EMERGENCY PLAN FOR
THE NUCLEAR FACILITY AT
LILLIBRIDGE ENGINEERING LAB
AT IDAHO STATE UNIVERSITY

April 26, 1994

(Revision 5)

CONTENTS

SECTION 1. INTRODUCTION

This emergency plan shall be used as a plan of action to follow in the event of a nuclear incident at the nuclear facility located at Idaho State University, Pocatello, Idaho.

It shall be used in conjunction with the State of Idaho Radiation Emergency Response Plan for all events involving a radiation accident, i.e., any release of radioactivity which may injure or contaminate a person. The Idaho plan delineates the actions to be taken by the Idaho State Police, Department of Health and Welfare, and the agreements with the local hospitals and the fire department in the event of a radiation accident. Those events which do not involve a radiation accident shall be the responsibility of the local operating staff and the administration of Idaho State University.

The nuclear facility consist of an AGN-201 nuclear reactor manufactured by Aerojet General Nucleonics in 1956. It is owned by Idaho State University and is operated under License Number R-110. The maximum power it is licensed to operate at is 5 watts. The fuel consists of uranium enriched to 19.88% uranium 235.

The AGN-201 reactor system consists of two basic units, the reactor and the control console. The reactor unit includes the core consisting of uranium dioxide dispersed in polyethylene, a graphite reflector, and the lead and water shielding. Fuel loaded control and safety rods are installed vertically from the bottom of the reactor unit, passing by the instruments which measure the power level. The rods are inserted by control mechanisms which provide safe and efficient operation of the reactor. The weight of the reactor unit, with the water shield, is 20,000 pounds; the weight of the console unit is 800 pounds.

The AGN-201 is located in the basement of the Lillibridge Engineering Laboratory at Idaho State University. Refer to Appendix 1 for the floor plans of the laboratory.

SECTION 2. DEFINITIONS

Emergency planning zone - Rooms 14, 19, 20, 22, 23, and 24 on the first level of the Lillibridge Engineering Laboratory.

Nuclear incident - Any unusual circumstances or occurrence that could lead to or cause damage to the reactor and/or sub-critical facility nuclear fuel or nuclear fuel cladding.

Operations area - The area inside room #20 and #23.

Radiation accident - Any release of radioactivity which may injure or contaminate a person.

Operations boundary - The walls, ceilings, and doors of rooms #20 and #23.

Nuclear facility Consists of a AGN-201 nuclear reactor and the sub-critical assembly area.

Operations team - Consists of NRC licensed operators and health physicists.

Nuclear emergency - Any emergency which combines a radiation accident with any nuclear incident.

SECTION 3. ORGANIZATION AND RESPONSIBILITIES

Table 1 is a diagram of the local operating organization and shows the relationship to the State of Idaho radiation emergency response organization. The Idaho plan contains the responsibilities and duties of the auxiliary organizations who are committed to respond to a radiation accident, i.e., Idaho State Police, Department of Health and Welfare, the local fire department and hospitals.

The Idaho State University personnel who will respond to a nuclear incident are the Reactor Administrator, Reactor Supervisor, Radiation Safety Officer, and Campus Security. They will be advised by the School of Engineering faculty. There are no other local support organizations directly committed to respond to a nuclear incident other than the normal response provided by the local fire and police departments.

In order for the emergency plan to function as intended, it is essential that all coordinating personnel at Idaho State University be aware of their areas of responsibility and assure that their facilities and equipment are available and operational. The following is a list of University personnel and their areas of responsibility:

1. The Reactor Administrator and/or Reactor Supervisor are responsible for:
    a. Operations at Idaho State University should a nuclear incident occur.
    b. Notification of the State Police and Idaho Department of

Health and Welfare in the event of a radiation accident.

c. Requests for medical assistance or notification of an applicable hospital to prepare for patient care.

d. Safety regulations and practice within the nuclear facility.

e. Internal operations and assignments.

f. Routine checking of safety equipment and safety within the facility and assuring that employees are knowledgeable in equipment operation.

g. Requests for additional fire fighting assistance, and instructing the fire marshall concerning the hazards of the nuclear facility.

h. Evacuation plans and assembly areas.

i. Maintaining up-to-date notification roster of appropriate personnel and agencies.

j. Personnel accountability procedures at the Lillibridge Engineering Laboratory.

k. In their absence the Radiation Safety Officer shall assume their duties.

2. The Radiation Safety Officer is responsible for:

a. Health physics assistance at Idaho State University.

b. Authorizing volunteer emergency workers to incur radiation exposure in excess of normal occupational limits.

c. Manning check points or control points for surveying personnel and equipment.

d. Health physics at Lillibridge Engineering Laboratory and scheduling of personnel and working times in radiation areas.

e. Monitoring teams and environmental sampling at Idaho State University, analysis of samples, and maintenance of records.

f. Decontamination procedures and control.

g. Health physics for contaminated personnel until they are attended to by the proper medical personnel.

h. Insuring that all necessary health physics information is communicated to the appropriate agencies.

i. Personnel monitoring, personnel radiation records, and for scheduling of personnel for the operations team.

j. In his/her absence the Reactor Supervisor or the Reactor Administrator will assume these duties.

3. Idaho State University Campus Security will be responsible for:

a. Establishing area control and manning of check points.

b. Traffic control and traffic counting.

c. Assistance in communications and information dispersal.

d. Assisting State Police in the event of a radiation accident.

Refer to Appendix 2 for a list of organizations who have indicated they can provide assistance upon request either via the State of Idaho Radiation Emergency Response Plan or as normal duty of their organization.

SECTION 4. EMERGENCY PROCEDURES

Table 2 shows the emergency classification system for potential emergency situations which may occur in order of increasing severity.

E rgency Class	Type of Incident	Purpose
1. Unusual incident	Civil Disturbance Bomb Threat Theft of SNM	To secure the area. Investigate the situation. Alert the police.
2. Personal injury	Fire or Explosion	Same as 1 plus alert firemen and minimize damage.
3. Personal injury with contamination	Nuclear Emergency	Same as 2 plus activate the State Radiation Emergency Plan.

Table 2. Emergency Classification Table.

The emergency planning zone, EPZ, Rooms 14, 19, 20, 22, 23, 24 on the first level of the Lillibridge Engineering Laboratory, see figures 1 through 4. This emergency plan shall apply to the EPZ. There are no postulated accidents for the AGN-201 Reactor which would result in exposure of 1 rem whole body or 5 rem thyroid beyond the operations boundary.

In the event of an incident which requires evacuation of the building, i.e., fire or explosion, all personnel within the EPZ shall proceed to the shop area near the double doors to be accounted for and if radioactive contamination is suspected the potentially contaminated personnel will be separated from all others. In the event of a radiation accident the State of Idaho Emergency Radiation Response Plan will be initiated.

The emergency exposure guidelines are the same as the radiation dose standards for individuals in restricted areas as specified in 10 CFR 20.101. These guidelines are sufficient when the size and postulated radiation accidents are considered for the nuclear facility at Idaho State University.

The facility will maintain emergency procedures for dealing with various emergencies including nuclear emergencies, bomb threats, fires or explosions, theft or attempted theft of special nuclear material, and civil disorder.

The response procedures describe the type of response to be accomplished, the duties and responsibilities of the security organization and the management involved in the response. An up-to-date notification roster will be maintained in the Reactor Supervisor's office, in the School of Engineering administrative office, and the Campus Security office. The notification roster indicates the names and telephone numbers of those who will be notified immediately of any emergency and also the names and telephones numbers of those who may be called upon to assist. Refer to Appendix 2 for the notification roster.

A number of radiation monitoring devices are maintained at the Radiation Safety Office. The Radiation Safety Officer will determine which devices are to be used. A Geiger Counter will be the standard device for monitoring dose rates and contamination levels around the facility. Radiation monitoring devices are also maintained in the Chemistry and Physics buildings in the event that the Radiation Safety Office is not accessible. These devices include pencil dosimeters, hand held Geiger Muller counters, scintillation counters, and thermoluminescent dosimeters. All personnel entering a radiation area or a suspected radiation area shall have some method of determining the radiation field and personal dose. No person shall enter a suspected radiation area unless under the direction of the Radiation Safety Officer. The exception shall be for the police and the fire departments. If it is necessary that the police or firemen enter a radiation area without personal radiation monitoring devices the Radiation Safety Officer shall be informed immediately and will then survey the affected person for contamination and arrange for a whole body assay if necessary.

Nuclear Emergency

A nuclear emergency shall be any emergency which combines a radiation accident with any other nuclear incident. Any emergency which includes a radiation accident is a sufficient condition to initiate the State of Idaho Radiation Emergency Response Plan by calling the Idaho State Police, Region V. Evacuation of the Lillibridge Engineering Laboratory may or may not be required for a nuclear emergency. If the emergency is strictly a radiation accident and not combined with fire or explosion, building evacuation will be ordered if the radiation levels are above 10 mR/hr outside the operations boundary or if there are airborne radioactive materials.

In the improbable event that the nuclear reactor laboratory must be evacuated two exits are accessible from the reactor laboratory itself. These are: (1) through the double doors to the reactor laboratory and (2) an emergency escape hatch located in the roof. Two sets of stairs and an elevator lead to the ground level floor from which three exit points are available; one to the Southeast and two to either side of the display foyer. A ladder leads to an escape hatch in the ceiling of the reactor laboratory opened only from the inside.

The emergency exit sequence shall be: (1) Personnel in adjacent laboratory spaces shall be warned by operators to initiate evacuation; (2) The first person to reach the Emergency Ventilation Cut Out Switch (Located on the south wall, across from the health physicist's office shown in figure 1 will trip all ventilation off the line in the building preventing any further air exchange; (3) If time permits, radiological monitoring equipment will be taken from the reactor laboratory. If this is not possible other monitoring equipment has been stored at the Physical Science Building for emergencies; (4) The building fire alarm will be sounded to evacuate the entire building. The locations of the local fire alarms are at the bottom of the staircase on the south side (or on the way to the staircase on the north side) of the building; (5) The last person leaving the reactor laboratory area will shut all doors. All persons leaving the EPZ area shall proceed immediately to the northeast corner of the building near the large overhead door of the machine shop to be accounted for and be checked for radioactive contamination; (6) Staff personnel shall proceed to the Fire Department Emergency Command Center (if established) and provide information and assistance to the on scene commander; (7) The University Administration will be notified as soon as is practicable. The Reactor Administrator and the Reactor Supervisor will be notified immediately. They will, in turn, determine which State and Federal agencies shall be notified. The Radiation Safety Officer will be responsible for thorough radiation monitoring. The nuclear reactor laboratory will be reentered as radiological levels permit and then only by authorization of the Reactor Supervisor or his designated representative. The reactor system will be checked for damage. Refer to Appendix 3, Emergency Evacuation Plan.

Bomb Threat

1. The person receiving the threat should obtain as much information as possible. Ask the following questions:

   a. Where is the bomb?

   b. What kind of bomb is it?

   c. What time will it go off?

   d. Why are you doing this?

2. Notify:

   a. Idaho State University Campus Security

   b. Pocatello Police Department

3. The security officer, upon being notified of the threat, will proceed immediately and notify the following offices:

   a. Chief of Campus Security

   b. Pocatello Police Department

   c. University Administration

   d. Reactor Administrator

   e. Reactor Supervisor

4. Shut down the reactor.

5. The security officer will record the name and location of the person receiving the threat.

6. The removal or transfer of any radioactive material will be the responsibility of the Reactor Administrator and/or the Reactor Supervisor.

7. School of Engineering staff will assist with any subsequent searches of the Lillibridge Engineering Laboratory.

Fire or Explosion

1. Scram the reactor by pushing the power off button and check that the rods have scrammed by any of the following methods:
   a. Rods engaged lights out.
   b. Decreasing current trace on channel 2 and 3 strip charts.
   c. Period meter pegged low.

2. As soon as the scram is verified evacuate the building.

3. Notify the Pocatello Police Department by the quickest available means, i.e., radio, fire alarm, telephone.

4. The Fire Department will:
   a. Proceed to the area.
   b. Notify Pocatello Police Department and Idaho State University Campus Security for traffic control.

5. ISU Campus Security will notify the campus maintenance department. The maintenance department will provide a person to secure or activate building systems and alarms as necessary.

6. Notify the Reactor Administrator and/or Reactor Supervisor who will in turn notify:
   a. Idaho State University Radiation Safety Officer.

b. Idaho State Radiation Control Section.

c. U.S. Nuclear Regulatory Commission Region IV.

Theft or Attempted Theft of Special Nuclear Material

1. If an indication of a theft or an attempted theft exists in or around Rooms 20 or 23 of the Lillibridge Engineering Laboratory, immediately notify the Campus Security who will in turn notify:

   a. Chief of Campus Security

   b. Pocatello Police Department

   c. Reactor Administrator

   d. Reactor Supervisor

2. The Reactor Administrator and/or the Reactor Supervisor will proceed immediately to the Lab and inspect and inventory all special nuclear material. If a theft or attempted theft of special nuclear material has occurred, the following will be notified immediately:

   a. U.S. Nuclear Regulatory Commission Region IV.

   b. Idaho State Radiation Control Section.

Civil Disorder

1. Notify the Chief of Campus Security.

2. Campus Security will post guards in the basement of the lab.

3. Notify the Pocatello Police Department for riot and incident control.

SECTION 5. EMERGENCY FACILITIES AND EQUIPMENT

The emergency support center will be in the northeast corner of the machine shop near the large overhead door, Figure 2. Emergency control directions will be given from this area.

An ambulance shall be called for any person who may be injured. If that person is also contaminated with radioactive materials, the State of Idaho Emergency Radiation Response Plan shall be initiated by calling the Idaho State Police, Region V, and the receiving hospital shall be informed the injured person is potentially contaminated.

If a person is not injured but contaminated with radioactive materials, the State Plan will be initiated and decontamination procedures will begin under the direction of the Idaho State University Radiation Safety Officer in accordance with the State Plan.

The only emergency communications system in addition to the normal telephones are the hand-held radios which are used by campus security. Emergency communications will have to be by word of mouth if the telephone system is inoperable or the radios used by Campus Security are unavailable.

SECTION 6. MAINTAINING EMERGENCY PREPAREDNESS

The Reactor Administrator and the Reactor Supervisor are responsible to ensure the proper execution of the Emergency Preparedness Plan.

The training of University personnel who are responsible to act under this emergency plan is the responsibility of the Reactor Administrator and the Reactor Supervisor with the assistance of the Technical Safety Office in the area of radiological control. For those personnel and agencies not a part of Idaho State University, training is a responsibility of the Department of Health and Welfare, State of Idaho.

The Idaho State University Reactor Administrator and the Reactor Supervisor will provide a training program at least once a year to train other University personnel who may be called upon to assist in the improbable event of a nuclear incident.

University personnel who would be involved in a nuclear incident will be tested by annual drills. This will be accomplished by the unannounced initiation of a drill by the Reactor Administrator or by the Reactor Supervisor with written permission from the Reactor Administrator. Outside agencies will be contacted in advance and informed of the drill. University personnel will carry through with this action as though it were an actual emergency. Records of these drills will be entered into the facility operating records by the Reactor Supervisor or a licensed Senior Reactor Operator or Reactor Operator.

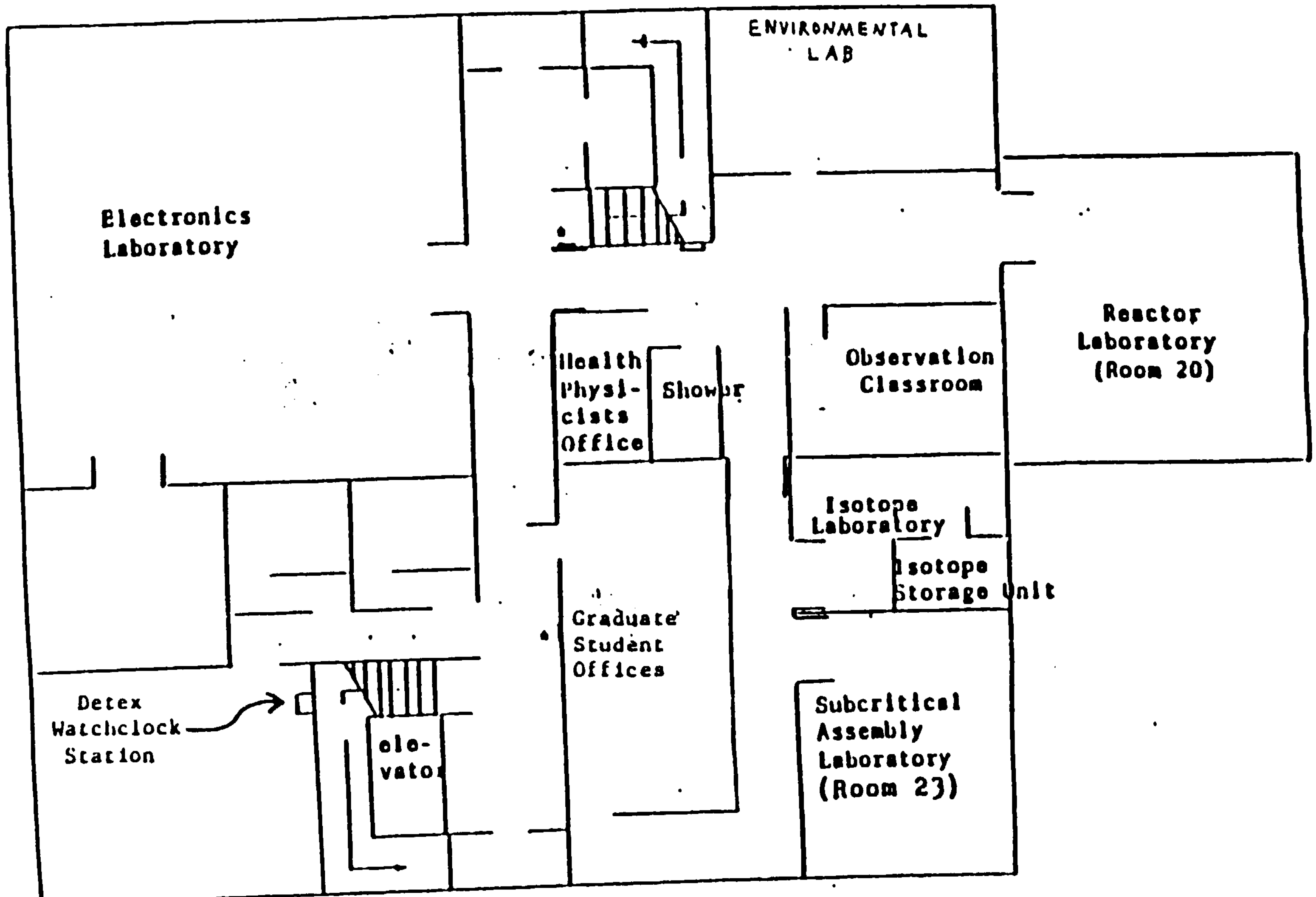
The Emergency Preparedness Plan shall be audited under the cognizance of the Reactor Safety Committee at least once every two years. They shall evaluate the effectiveness of the plan and note the results of the evaluation in their minutes. They shall also approve any changes which may be made to the plan.

Emergency equipment used for fire fighting, radiation detection and air sampling shall normally be checked for proper operation annually, but in no case shall the check be greater than 16 months. Batteries in portable equipment shall be checked prior to each use and annually unless previous experience dictates a more frequent check is required. A complete stock of replacement batteries shall be available for all battery powered emergency equipment. Emergency equipment will be inventoried annually.

APPENDIX 1.

FLOOR PLAN

LILLIBRIDGE ENGINEERING LABORATORY



*Indicates fire-evacuation alarm actuators.

Lillibridge Building First Level Floor Plan (Basement)

Figure 1

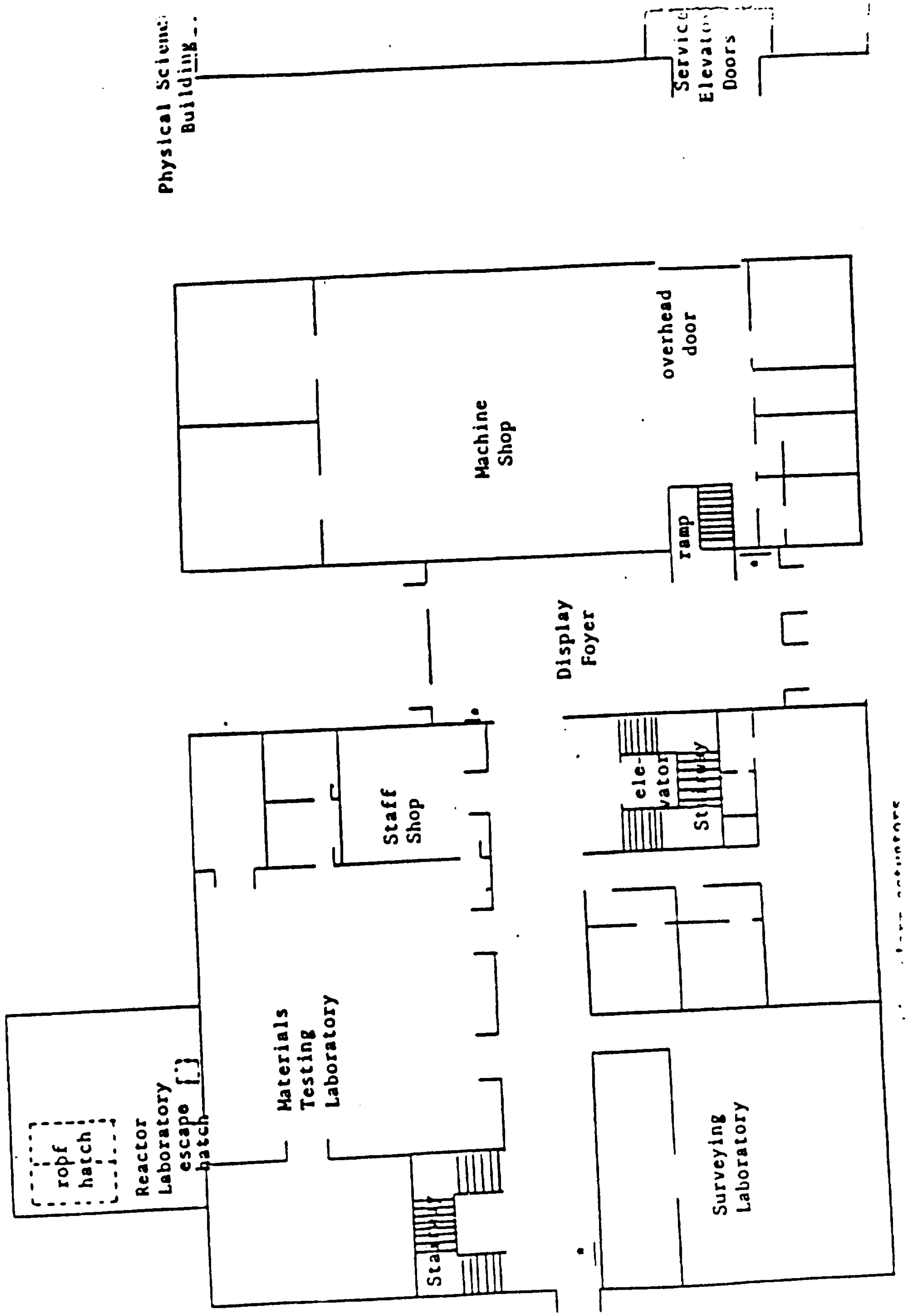
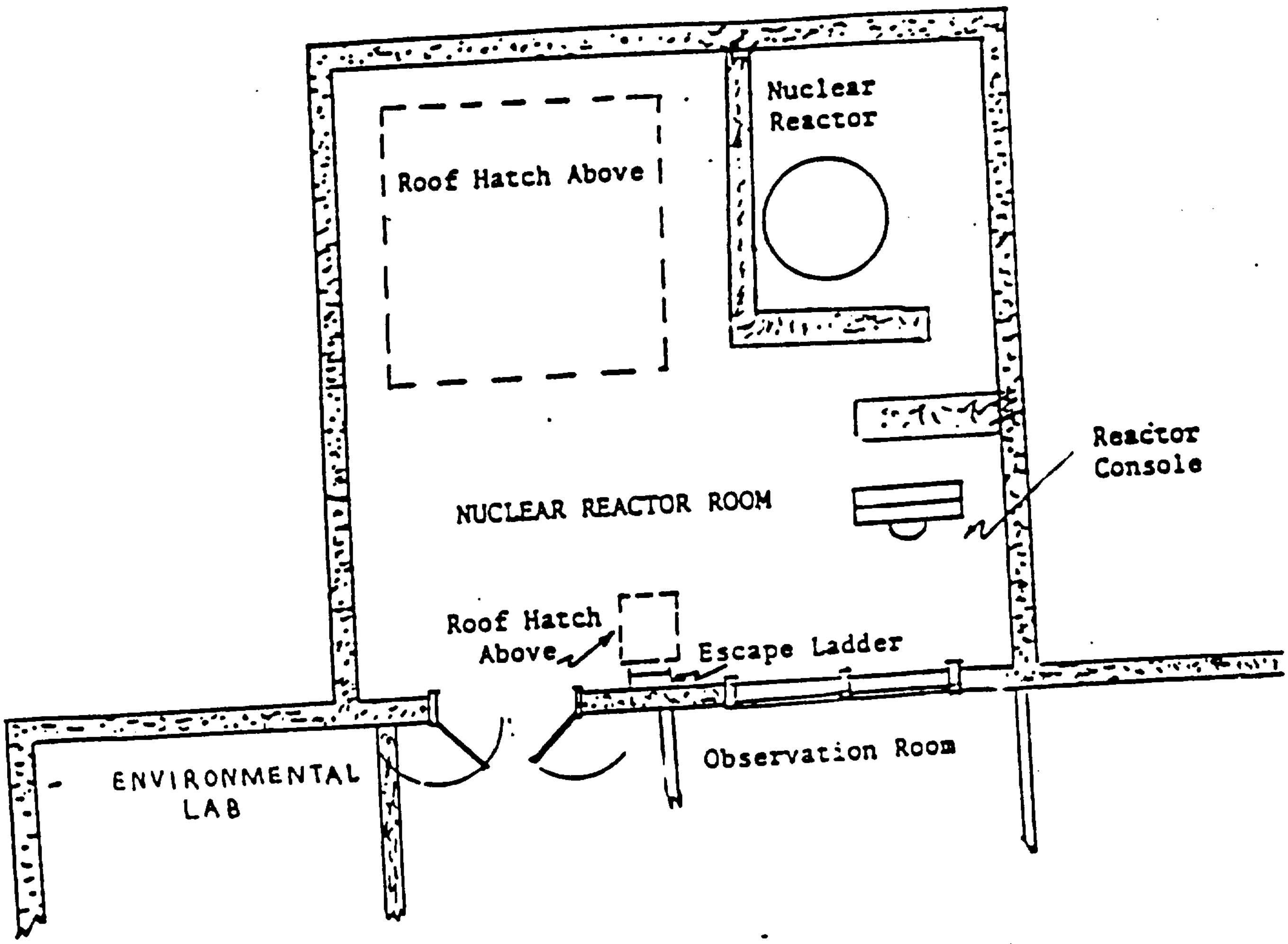
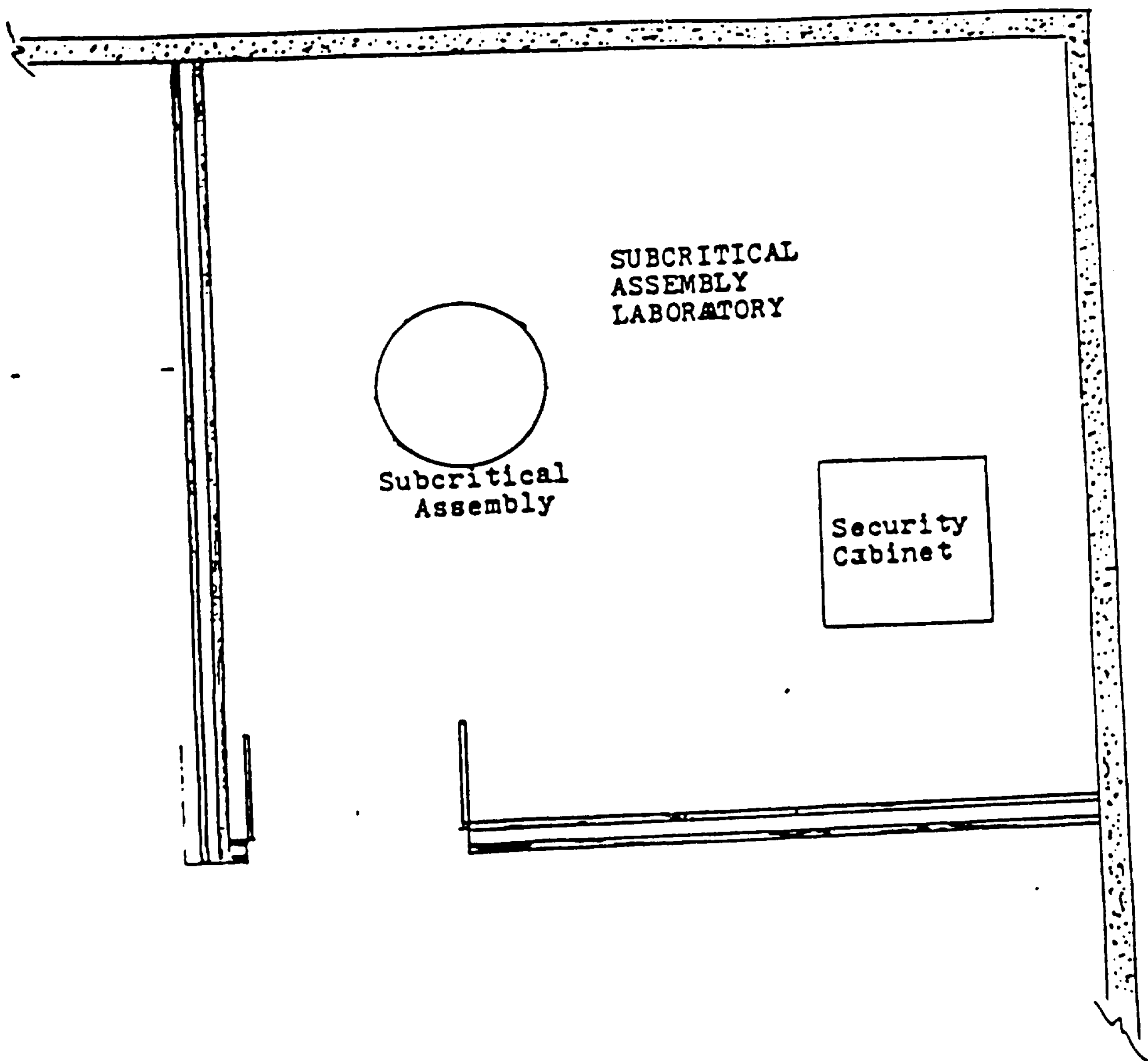


Figure 2
Second Level Building Floor Plan (Ground Level)



Floor Plan of Nuclear Reactor Laboratory

Figure 3



Floor Plan of Subcritical Assembly Lab
Figure 4

APPENDIX 2

NOTIFICATION ROSTER

REACTOR ADMINISTRATOR	A. STEPHENS	HOME: 208-524-0905 WORK: 208-526-4907
REACTOR SUPERVISOR	D. CLOVIS	HOME: 208-233-1173 WORK: 208-236-3637
RADIATION SAFETY OFFICER	T. GESELL	HOME: 208-237-1076 WORK: 208-236-3669
ISU CAMPUS SECURITY		208-236-2515
POCATELLO POLICE DEPARTMENT		911
POCATELLO FIRE DEPARTMENT		911

SUPPORT NOTIFICATION ROSTER

IDAHO STATE POLICE	208-232-1426
BANNOCK REGIONAL MEDICAL CENTER	208-239-1000
POCATELLO REGIONAL MEDICAL CENTER	208-234-0777
ISU ADMINISTRATION	208-236-3440
NUCLEAR REGULATORY COMMISSION	817-860-8100 AFTER 3:15PM(MST) 301-816-5100

UPDATED 6/17/1994

R. David Clovis

Rx. Supervisor

APPENDIX 3.

EMERGENCY EVACUATION PLAN

TO BE FOLLOWED IN THE EVENT OF A NUCLEAR EMERGENCY WHICH HAS POTENTIAL OF CAUSING INJURY

1. The licensed reactor operator is cognizant of the detailed emergency plan. HE/SHE WILL BE IN CHARGE OF EVACUATION.

2. Use the normal room exit and building exits if possible. The escape hatch located in the roof is to be used only if normal exits are blocked by fire or radiation. Make sure exits to lab are closed after all persons are out.

3. The radiological monitoring instrument on the reactor console and the reactor log book will be brought from the laboratory room by the reactor operator.

4. If the radiation levels are above 10 mR/hr outside the operations area of the Nuclear Reactor Laboratory, the reactor operator will order building evacuation.

5. The first person to reach the Emergency Ventilation Cutout Switch (located on the south wall, across from the health physicist's office) will trip all ventilation off the line.

6. The reactor operator shall initiate building evacuation by tripping one of the building fire alarms located at the bottom of the staircase on the south side (or on the way to the staircase on the north side) of the building.

7. The reactor operator shall notify the Reactor Supervisor and/or the Reactor Administrator immediately.

8. The Reactor Supervisor and/or the Reactor Administrator shall be in charge of all building reentry.

GENERAL OPERATING RULES

The purpose of this section is to describe the proper procedures for routine operation of the AGN-201 reactor. The general operating rules that are presented shall be followed by all Senior Reactor Operators (SRO) and Reactor Operators (RO).

1. The Reactor Supervisor and Reactor Administrator are the only persons who may grant explicit permission for each operation of the reactor. Each operation must follow detailed operating procedures.

2. Only persons who hold a SRO license for the Idaho State University (ISU) AGN-201 reactor issued by the United States Nuclear Regulatory Commission (USNRC) are authorized to have keys to the console power switch. Power must be turned on by the SRO, the key removed from the switch and retained by the SRO.

3. The reactor may not be operated at power levels greater than those authorized for the particular experiments in progress and never at power levels greater than five watts.

4. The excess reactivity of the reactor, including the effect of any installed experiments or equipment, shall not exceed 0.55%. If the actual excess reactivity measured at startup exceeds 0.55%, the reactor shall be shutdown immediately and the Reactor Supervisor notified.

5. At least two persons must be present in the Nuclear Reactor Laboratory whenever the reactor is in operation. At least one of those persons, who will be the person in charge, must hold a valid RO or SRO license for the ISU AGN-201 reactor issued by the USNRC. The other person must be a certified "Observer."

6. During operation an authorized operator must remain at the console at all times and devote his or her full attention to operation of the reactor.

7. The above mentioned authorized operator need not be a licensed RO or SRO by the USNRC provided he or she has been trained to the satisfaction of the Reactor Supervisor and operates the reactor under the direct supervision of a licensed RO or SRO.

8. No material of any kind may be inserted into or removed from any of the experimental facilities of the reactor, either prior to or during operation, without explicit authorization and approval of the RO or SRO operating the reactor.

9. Any person desiring access to a High Radiation Area must inform the licensed reactor operator of the reason for entry. The RO or SRO operating the reactor will provide information on the expected radiation levels, provide a portable radiation monitor which must be carried on entry, grant permission if appropriate, and log the names of personnel entering the High Radiation Area in the Reactor Operations Log.

10. In case of any unusual or unexpected incident (such as instrument failure or malfunction, abnormal instrument readings, mechanical problems, etc.) the reactor will be immediately shut down and the Reactor Supervisor or Reactor Administrator informed prior to any further operation.

11. Performance of any maintenance procedure, surveillance procedure, calibration procedure, or a procedure which opens either the primary or secondary containment barrier must have explicit authorization of the Reactor Supervisor and be performed under the supervision of an SRO.

12. Personnel monitoring devices shall be worn by all persons in the Reactor Laboratory whenever the reactor is in operation or when reactor maintenance is being performed.

13. Whenever the Reactor Laboratory is to be left unattended the reactor shall be shut down and the laboratory door locked with the dead bolt.

14. Personnel instructing the graduate or undergraduate lab are not permitted to simultaneously operate the reactor.