A Summary Of The Decommissioning Process of The University Of Utah AGN-201M Reactor No. 107

Final Report

License No. R-25
Docket No. 50-72

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The final report provides a brief summary of the activities that assured the reactor was decommissioned in a safe manner complying with all NRC regulations, stipulations, and in accordance with the NRC approved decommissioning plan, "Decommissioning Plan, University Of Utah, AGN-201M Reactor No.107, License No. R-25, Docket No. 50-72". This document contains the survey results, the final destination records for the reactor parts, fuel transport records and the completed decommissioning procedures as carried out.

Decommissioning Activities

We decontaminated the equipment, structures and portions of the facility and site containing radioactive contaminates to a level that permits the property associated with University of Utah's AGN-201M Nuclear reactor to be released for unrestricted use. A brief description of this plan is presented below. For a more detailed description of the decommissioning plan, see the NRC approved plan. The plan was implemented as follows:

1) Surveyed and disposed of the cement shielding blocks.
2) Conducted defueling operations.
3) Surveyed all components of the reactor core, including the fuel.
4) Surveyed and disposed of the shielding water.
5) Created an NRC approved decommissioning plan for the AGN-201M.
6) Performed a detailed survey of the decommissioning area.
7) Transferred the fuel to the DOE.
8) Disassembled the AGN.
9) Surveyed the remaining parts of the AGN.
10) Disposed of and decontaminated the reactor parts.
11) Scheduled a survey with the NRC to remove all decontaminated parts.
12) Prepared Final report on the decommissioning for the NRC.

When the NRC completes the final survey to confirm our results, the license will be surrendered to them. In the case of the University's AGN facility, the room in which the reactor is

located is under license of the University's TRIGA reactor. In addition, some useful components from the AGN were transferred to the University of Utah TRIGA license (Lic. No. R-126; Doc. No. 50-284) or the Idaho State University reactor license (Lic. No. R-110; Doc. No. 50-284) rather than being disposed.

Results And Major Milestones

The decommissioning process for the AGN-201M closely followed the planned decommissioning activities. However small changes were made as the situation warranted to insure regulatory compliance and radiological safety.

- The preliminary steps for the decommissioning of the AGN-201M reactor began with the survey and disposal of the cement shielding blocks surrounding the reactor. These blocks were found to be non-contaminated and were removed and disposed of on March 25, 1988.

- Defueling operations began and the reactor was defueled on August 18, 1989. During the defueling steps, the Ra-Be neutron source and the fuel were removed and surveyed in detail. At that time, all components in the reactor core were removed and surveyed. The fuel and source were placed into safe storage waiting transfer to the DOE.

- The initial survey of the reactor core components began on September 9, 1989. These surveys showed very little activity on any of the core components.

- On January 9,1989, the AGN-201M's shielding water was analyzed for activity. No activity above background was detected and the water was disposed of by public sewer.

- On July 17, 1990, the "Decommissioning Plan, University Of Utah, AGN-201M Reactor No.107, License No. R-25, Docket No. 50-72", was completed. This plan has received NRC approval for decommissioning, and it contains in detail the steps and procedures that were used to decommission the AGN-201M reactor.

- The reactor fuel was shipped to Martin Marietta Energy Systems, at the Oak Ridge National Laboratory, for the DOE on February 5, 1991.

A considerable delay existed between the completion of the decommissioning plan and the actual decommissioning of the reactor. This delay was due, in part, to the interest of the faculty from University of North Texas State in acquiring the reactor. If the reactor was to be transferred, the decommissioning process would be changed to accommodate the reassembling of the reactor at the new site while maintaining regulatory and safety requirements. North Texas State ultimately decided against acquiring the reactor and decommissioning work following the current plan began again. During the delay instrumentation and personnel changed so it became necessary to duplicate some of the steps performed during defueling operations such as the decommissioning site and core component surveys to assure consistent and reproducible results.

- Another site survey was performed to insure as low as possible a background for component surveys. This survey was performed on March 25, 1993.

- The next step in the decommissioning procedures was the disassembly and survey of the reactor. On April 6-8, 1993, the reactor was disassembled and the interior components were surveyed. Also, all unsealed reactor components that were removed and surveyed during defueling operations were re-surveyed.

Several options existed for the disposal of the AGN reactor components. These were; disposal as low level radioactive waste, disposal as non-radioactive waste to public land fill, and transfer to other reactor licenses i.e., the University of Utah's TRIGA license. The decision varied based on several factors which included: cost of disposal, value of the part, and contamination on the part.

Parts from the core can had alpha contamination from contact with the fuel. Most of these parts were of no value outside the AGN so these parts were disposed of as low level radioactive waste. The graphite reflector was of value for future experiments conducted in the TRIGA reactor program, and was therefore transferred to the University of Utah TRIGA reactor license. Outside of the core can the main graphite reflector and lead shield were also deemed valuable and were moved to the TRIGA reactor license. The control console and two drives were transferred to the ISU reactor license.

The main reactor tank, thermal column, and the access port covers were non-contaminated and will be disposed of in a public land fill pending the NRC's final survey results. Other waste being disposed of as low level radioactive waste are the paint chips from the thermal column, the wood plugs from the access ports, and the trash generated during decommissioning. These pieces

were considered to be constructed from materials that did not allow accurate surveys with a high degree of confidence to be performed.

- After the survey of the reactor components was completed the NRC was contacted to inform them of the progress. The confirmation survey of the parts from the reactor that are to be disposed of in a public land fill will be scheduled and performed by a contractor employed by the NRC.

The NRC final inspection is the last requirement in the decommissioning process. When the NRC has performed a confirmation survey, the remaining reactor parts will be unrestrictedly released.

Supporting Documentation

The attached appendixes contain the documentation which show our compliance with NRC regulations and the decommissioning plan.

In Appendix A, the parts of the AGN-201M are numbered and described along with drawings. The intent is to clearly identify where the various parts are located in the reactor and establish an effective strategy to assure accurate record keeping for surveyed reactor parts.

Appendix B contains the disassembly procedures used during the decommissioning of the reactor. The completed procedure sheets documented the process and demonstrated compliance with the decommissioning plan.

The Appendices C, D, and E together document the final disposition of all non fuel AGN-201M parts. Here each part or related group of parts are photographed and have listed their part numbers and final disposition. Appendix C's parts are transferred to the licenses of other nuclear reactor facilities. Appendix D's parts are disposed of as low level radioactive waste. Finally, Appendix E's parts are released for unrestricted disposal pending NRC approval.

Fuel shipment information is located in Appendix F. The final disposition of the fuel is documented by checklists, approval and transfer forms, and a list of the non-University of Utah individuals involved in the fuel shipping process.

Appendix G contains the results of the radiological surveys conducted during the decommissioning of the AGN-201M reactor. This section contains surveys for:

Facility,
Concrete blocks surrounding the reactor,
Water shield,
Thermal column,
Start up source and fuel,
Core components survey, and
Parts to be unrestrictedly released

The final appendix, Appendix H, contains a list of the detectors used in the decommissioning of the AGN-201M reactor. Listed are the Type, Make, Serial Number, Background, Efficiencies, Calibration Date, and Use of these detectors. Listing this information allows further documentation of the process involved in the decommissioning of the reactor.

Summary of Decontaminating Activities

Due to the low power level and design of the AGN-201M reactor, the activation of materials was almost nonexistent. Parts outside the core can were not activated or contaminated. For components that are located inside the core can, alpha contamination measured on the order of nano-curies was found on the surfaces that were directly in contact with the fuel. This was the only radiological hazard found in the reactor. The exterior components which indicated no contamination will be released to general disposal after direct surveys from the NRC to confirm our results. In the process of decommissioning the AGN-201M reactor, certain items (wood, paint chips) due to their material characteristics and form, had to be considered low level waste even when results from radiation and swipe surveys indicated that these items were not activated or contaminated. Properly transferring selected components of the AGN reactor from its license to our TRIGA reactor license or other facilities allowed extending the usefulness of those components.

APPENDICES:

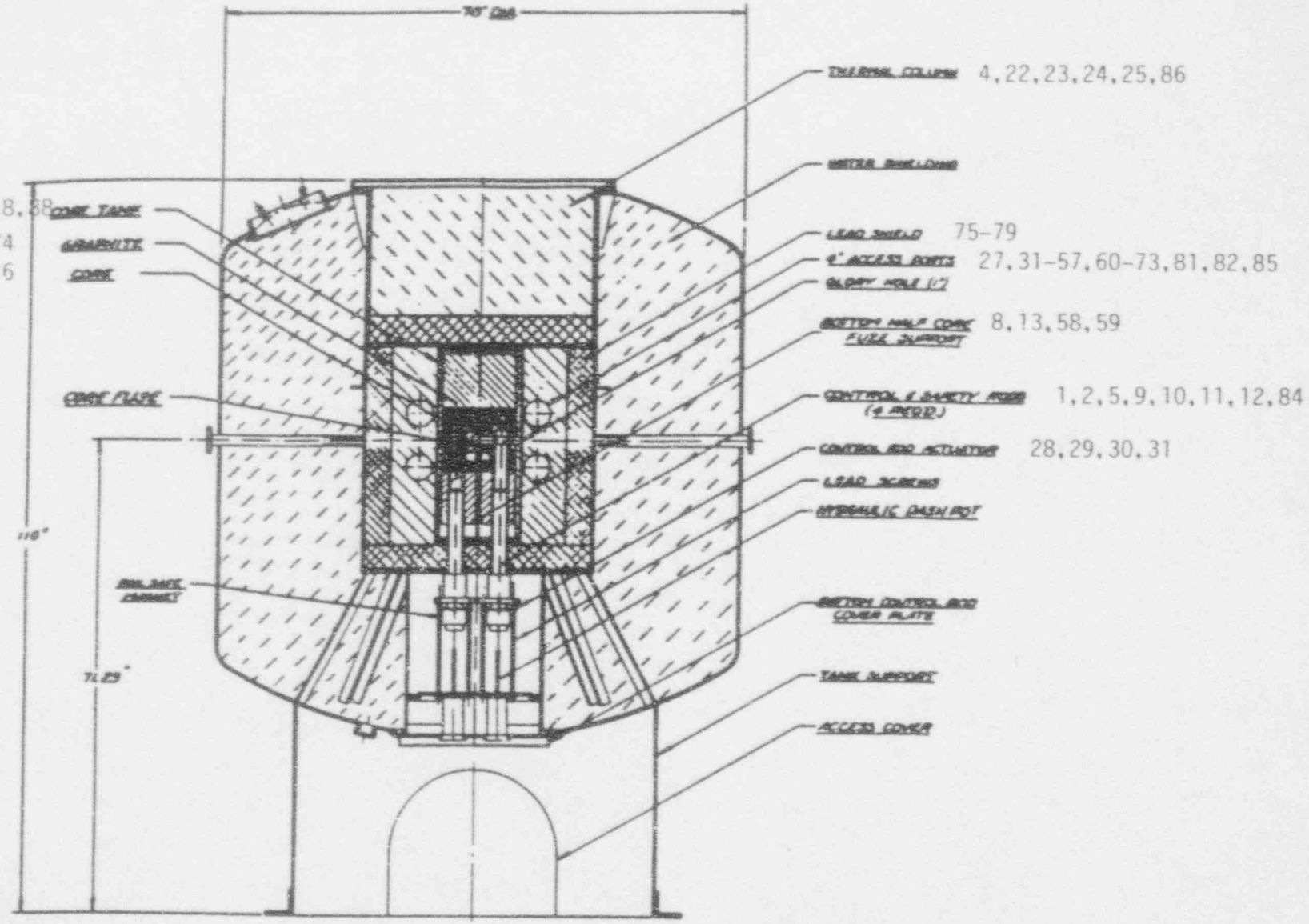
Appendix A:

AGN-201M Parts List And Location

The following is a list of the numbered parts of the AGN-201M reactor. The numbering system was used to facilitate the surveys of the reactors parts. This list gives the part number used in the surveys, a description of the parts, and the parts location in the reactor. Also for greater clarity two figures are included with the part numbers and the parts location in the reactor.

Part #	Description	Location
1	Safety Rod #2 (Empty)	Core Can
2	Course and Fine Control Rod Thimbles	Core Can
3	"O" Ring Core Can Top Plate	Core Can
4	Paint Chips from Thermal Column	Thermal Column
5	Safety Rod #2 Parts	Core Can
6	Core Can Assembly Bolts and Spring	Core Can
7	Assembly Bolts And Washers (Core Can)	Core Can
8	Core Support Rod	Core Can
9	Quantity-2 Safety Rod Thimbles	Core Can
10	Safety #1 with Parts	Core Can
11	Course Control with Parts	Core Can
12	Fine Control Rod with Parts	Core Can
13	Core Support	Core Can
14	Core Can Top Plate	Core Can
15	Core Can Bottom Plate	Core Can
16	Polyethylene Disk	Core Can
17	Graphite Reflector for Interior Core Can	Core Can
18	Aluminum Core Can	Core Can
19	Graphite Reflector Plate	Core Can
20	Graphite Reflector Plate	Core Can
21	Graphite Reflector (Bottom Interior Core Can)	Core Can
22	Internal Thermal Column	Thermal Column
23	External Thermal Column	Thermal Column
24	Top Thermal Column Cover Plate	Thermal Column
25	Bottom Thermal Column Cover Plate	Thermal Column
26	Socket and Wrench	Exterior to Core
27	Glory Hole/Port Covers Assembly with Covers	Glory Hole / Access Port
28	Rod Drive	Below Core Can
29	Rod Drive	Below Core Can
30	Rod Drive	Below Core Can
31	Rod Drive	Below Core Can
32	Wood Plug in Access Port	Access Port
33	Wood Plug in Access Port	Access Port
34	Wood Plug in Access Port	Access Port
35	Wood Plug in Access Port	Access Port
36	Wood Plug in Access Port	Access Port
37	Wood Plug in Access Port	Access Port
38	Wood Plug in Access Port	Access Port

39	Wood Plug in Access Port	Access Port
40	Wood Plug in Access Port	Access Port
41	Wood Plug in Access Port	Access Port
42	Lead Plug in Access Port	Access Port
43	Lead Plug in Access Port	Access Port
44	Lead Plug in Access Port	Access Port
45	Lead Plug in Access Port	Access Port
46	Lead Plug in Access Port	Access Port
47	Lead Plug in Access Port	Access Port
48	Lead Plug in Access Port	Access Port
49	Lead Plug in Access Port	Access Port
50	Lead Plug in Access Port	Access Port
51	Lead Plug in Access Port	Access Port
52	Lead Plug in Access Port	Access Port
53	Lead Plug in Access Port	Access Port
54	Lead Plug in Access Port	Access Port
55	Lead Plug in Access Port	Access Port
56	Lead Plug in Access Port	Access Port
57	Lead Plug in Access Port	Access Port
58	Aluminum Fuse Support	Core Can
59	Alignment Screws	Below Core Can
60	Polyethylene Rod	Glory Hole
61	Graphite Plug in Access Port	Access Port
62	Graphite Plug in Access Port	Access Port
63	Graphite Plug in Access Port	Access Port
64	Graphite Plug in Access Port	Access Port
65	Cadmium Plug	Glory Hole
66	Graphite Plug in Access Port	Access Port
67	Graphite Plug in Access Port	Access Port
68	Graphite Plug in Access Port	Access Port
69	Graphite Plug in Access Port	Access Port
70	Aluminum Access Port Sleeve	Access Port
71	Aluminum Access Port Sleeve	Access Port
72	Aluminum Access Port Sleeve	Access Port
73	Aluminum Access Port Sleeve	Access Port
74	Graphite Reflector Column	Surrounding Core Can
75	Bottom Lead Shield Ring	Below Core Can
76	Bottom Lead Shield Ring w/Access Ports	Surrounding Core Can
77	Top Lead Shield Ring w/Access Ports	Surrounding Core Can
78	Top Lead Shield Ring	Surrounding Core Can
79	Bottom Lead Shield Plate	Surrounding Core Can
80	Fission Gas Canister	Exterior to Reactor
81	Wood Plug in Access Port	Access Port
82	Wood Plug in Access Port	Access Port
83	Associated Core Assembly Bolts	Core Can
84	Control Rod Support Plate	Below Core Can
85	Cadmium Disks	Glory Hole
86	Main Reactor Tank	Main Reactor Tank
87	Reactor Console	Exterior to Reactor


3,6,7,14,15,18,88
17,19,20,21,74
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75–79
27,31–57,60–73,81,82,85
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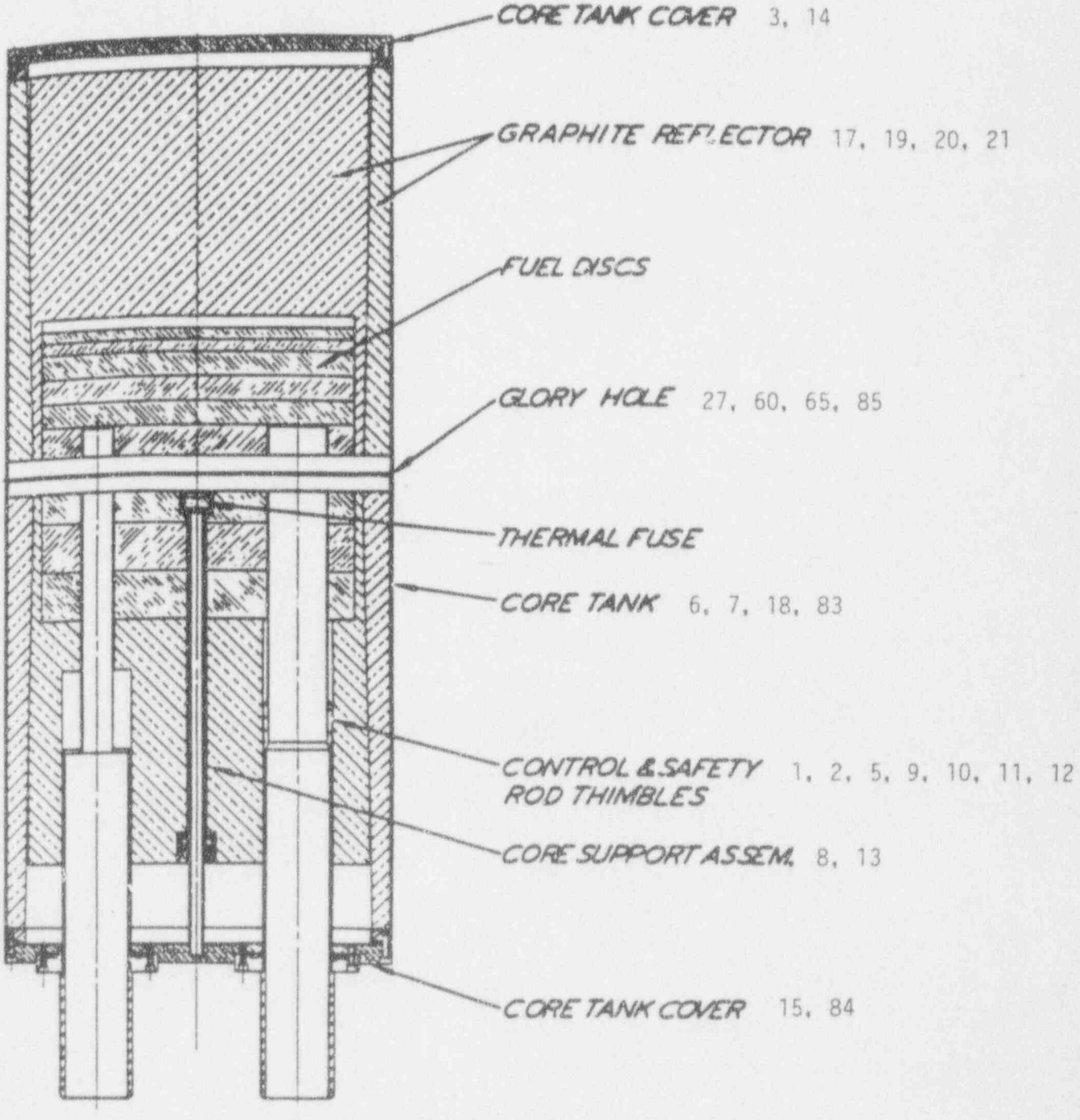
28,29,30,31


CORE TANK COVER 3, 14
GRAPHITE REFLECTOR 17, 19, 20, 21
FUEL DISCS
GLORY HOLE 27, 60, 65, 85
THERMAL FUSE
CORE TANK 6, 7, 18, 83
CONTROL & SAFETY ROD THIMBLES 1, 2, 5, 9, 10, 11, 12
CORE SUPPORT ASSEM. 8, 13
CORE TANK COVER 15, 84

Appendix B:

Completed Disassembly Procedures

The following dissassembly forms are listed in this appendix.

Form:	Status:
Form NEL-103	Completed
Form NEL-104	No Completed Form Exists
Form NEL-105	Completed with additional comments added
Form NEL-106	Completed

Dismantling Plan for the University of Utah AGN-201 Reactor

I. Introduction

The Dismantling Plan for the University of Utah AGN-201 Reactor gives the general procedures to be followed for disassembly of the reactor. These procedures give more specific details regarding the preparation needed prior to disassembly and the actual disassembly steps themselves.

NOTE: Check the items in the appropriate place as each step is accomplished. Maintain one master copy for reference.

II. Preparation Prior to Disassembly

(R) 3/25/93 1. Radiation Protection

a. The following instruments will be checked for proper operation, then placed in the reactor room for use:

(R) 3/25/93 1) Continuous air monitor or high volume air sampler.
(R) 3/25/93 2) Neutron survey meter (~~spherical TMC~~ Neutron survey meter). Model 4-88 S/N 073 DSH
(R) 3/25/93 3) Beta-gamma dose rate survey meter (Cutie Pie or Radector). 18531
(R) 3/25/93 4) Contamination survey meter (thin-window Geiger counter). NE TM-3 - GC217

b. The following supplies will be collected and placed in the reactor room for use as needed.

(R) 3/25/93 1) Filters for air sampling.
(R) 3/25/93 2) Smearing materials for wipe tests.
(R) 3/25/93 3) Containers for air samples and wipe test smears.
(R) NA 4) Shielded storage container for storing the Ra-Be startup source.
(R) 3/25/93 5) Coveralls, lab coats, gloves, and shoe covers.
(R) 3/25/93 6) Radioactive waste containers.
(R) NA 7) Cadmium foil for core can insert.
(R) 3/25/93 8) Respiratory protection equipment.

(R) 3/25/93 2. Work Area and Tools

(R) 3/25/93 a. Survey reactor room area in preparation for proposed activities. DSH
(R) 3/25/93 b. Relocate equipment as necessary to maximize working area room.
(R) 3/25/93 c. Collect the following tools and place in reactor room:

(R) 3/25/93 1) Hand Tools (socket and Allen wrenches) required for disassembly.
(R) NA 2) Handling tool for removing the Ra-Be source.
(R) 3/25/93 3) Lifting lugs and rigging for thermal column, core tank, and upper graphite reflector.
(R) NA 4) Cart for transporting the core can to the designated storage area.

(R) 3/25/93 d. The following items will also be placed in the reactor room:

(R) 3/25/93 1) Plastic bags for packing components.
(R) 3/25/93 2) Labels for dismantled components.
(R) 3/25/93 3) Camera with flash and film for photographically documenting the procedure at key stages.

III. Detailed Disassembly Procedures

NOTE: The assembly part numbers are correlated with the part listing on drawing number E-2-000100.

(R) 3/25/93 1. The Health Physicist will make a pre-disassembly radiological survey. He will also initiate special access procedures, personnel and equipment monitoring procedures and other procedures needed to keep radiation exposure as low as reasonably achievable. An operational check will be made of radiation monitoring equipment present. If all equipment responds properly, the operation will proceed.

(R) 4/1/93 2. The Reactor Supervisor will brief the disassembly group on each step prior to its accomplishment, with clarification made, if necessary, of the tasks to be performed.

(R) NA 3. Insure that the temporary cadmium rod is in the glory hole and well fixed.

(R) NA 4. Remove bottom cover plate (2-000169). The gasket (2-000593) should come off with the cover. Bag the cover plate thumb screws (H-1007-10) and label.

(R) 4/6/93 5. Insure that the control and safety rods have indeed been removed earlier, as declared. Label rods and store in approved fuel storage locations.

Safe Rod Assembly:	2-000550 I
Safe Rod Assembly	2-000550 II
Coarse Control Rod Assembly	2-000550 III
Fine Control Rod Assembly	2-000550 IV

(R) NA 6. Remove the three dash pots (2-000510), label and store for future shipment.

(R) NA 7. Remove the four control rod drive mechanisms.

a. Console power off (neutron detection channels 1, 2, & 3 remain on).

(R) b. Disconnect rod drive power plugs. Identify and label each.

c. Remove (2 each) jam nuts (1/4-28) from the tie bolts and carefully lower each rod drive frame assembly until free. Identify and label each frame. Bag the jam nuts and label.

(R) NA 8. Insert cadmium in the control and safety rod holes in the core can.

(R) 4/6/93 9. Remove the top cover plate (2-000226). The gasket (2-000591) should come off with the cover. Bag the eight cover plate bolts (H-1069-12) and label.

(R) NA 10. Drain the thermal column.

(R) a. Obtain permission from the Health Physicist to drain thermal column water to sewer (a water sample will have been previously taken and analyzed for radioactivity as a basis for release of the water).

b. Pump water to sewer until thermal column is as dry as possible.

NOTE: The entries for health physics records will be made in the Waste Log, including: date/time; estimated water volume dumped; gross sample results in μCi/ml, % of applicable mpc, estimated activity dumped.

(R) 4/6/93 11. Remove the thermal column (2-000139):

NOTE: Thermal column could weigh 2,000 to 2,400 pounds.

(R) 4/6/93 a. Unbolt thermal column from reactor tank (16 each 3/4 inch bolts).

(R) 4/6/93 b. Attach lifting sling ~~and dynamometer~~ to crane and thermal column.

(R) 4/6/93 c. Lift thermal column from well (the dynamometer will indicate the weight of the lead-lined thermal column). _____ lbs.

(R) 4/6/93 d. Remove thermal column from reactor and move to an appropriate space on the floor. Set thermal column on ~~absorbent paper~~. Plastic.

(R) 4/6/93 e. Label thermal column. Bag the 16 each 3/4 inch hold-down bolts and label.

(R) NA 12. Remove the Ra-Be neutron source (H-3018) from the graphite reflector. Leak test the source and place it in the storage container.

(R) NA 13. Conduct a core survey. Since the core tank will not be opened at this time, an off gas sample will not be taken. A direct radiation survey and smear survey of the core tank top will be made.

(R) NA 14. Remove cadmium rod from glory hole (operator monitor neutron detector channels 1 through 3, H.P. representative monitor portable neutron survey meter response). Only a slight increase in reading may be noted. (Log any reading change.)

	BEFORE	AFTER
CRM:	_____	_____
LOG:	_____	_____
LINEAR:	_____	_____

(R) NA 15. Remove glory hole tube.

a. Remove glory hole flange (2-000419) (2 each) by removing (4 each) socket HD machine screws, 1/4-20 X 1/2 (H-1023-8).

(R) b. Remove glory hole flange "O" ring (H-4009) (2 each).

c. Remove glory hole tube (2-000422). Extreme care should be taken when removing this tube. It should not be bent (straight pull) and if binding is excessive, it may be necessary to lift the core tank slightly to relieve the bind.

COMMENTS:

NOTE: The Health Physicist will monitor very closely the removal of the core can. All radiation and criticality monitors will be checked for proper operation just prior to the removal of the core, and surveys of radiation levels from the core can will be made continuouslv during removal.

(C) N/A 16. Core Can Removal (2-000114):

a. Make a refernce mark on the core can and graphite reflector for reassembly orientation.

(C) b. Attach lifting frame with cap screws (sock HD., 10 X 24) to core tank.

c. Attach lifting frame and dynamometer to hoist. The dynamometer will monitor lifting loads.

NOTE: Hoist must be positioned with care to insure vertical alignment. Any deviation from the vertical will cause binding of the core tank in the reflector and shielding of the reactor. The unit being lifted weighs approximately 250 pounds. Tension should be applied with the hoist and the core tank lifting frame should be manipulated until any excess force is relieved. Tension is then again applied. The misuse of the electrical hoist could cause damage to the reactor reflector, if binding occurs and force is applied. A man will stand by the hoist circuit breaker (Panel B, Breaker #5) in the event of an "up" button failure of the hoist. Binding should be expected for approximately 4 inches until the thimbles have cleared the lower housing.

(C) d. Lift the core tank from the reactor.

(C) N/A 17. Place an appropriate piece of cadmium in glory hole.

(C) N/A 18. Conduct radiation survey to determine direct radiation levels from the core can and removable surface contamination on the exterior surface of the can.

19. Transfer the core to its storage container.

a. Remove lifting frame.

b. Seal and label core can container and hold in Reactor Room.

(C) 4/8/93 20. Health Physics will perform a radiation survey of accessible internal surfaces to ascertain direct (induced) radiation levels and removable contamination levels.

NOTE: This concludes the nuclear portion of the disassembly process. The remaining disassembly will be conventional mechanical and electrical, with radiation surveys made as directed by the Health Physicist.

(C) 4/8/93 21. Remove the four eight access port cover assembly (2-000476):

(C) 4/8/93 a. Remove the eight access port cover assembly (2-000476)

(C) 4/8/93 b. Use a pole to push from one end, while another person is at the other end of the port, remove the port fillers (2 wood (2-000342), 4 lead (2-000341), 2 graphite (2-000340) each).

(C) 4/8/93 c. Remove access port flanges (2-000418) (8 each) by removing (4 each) screws (H-1023-8) (socket HD mach., 1/4 - 20 1/2).

(C) 4/8/93 d. Remove access port flange "0" rings (H-4008) (8 each).

(C) 4/8/93 e. Remove access port tubes (2-000420) (4 each).

(C) 4/8/93 f. Conduct health physics survey on the access port tubes.

(C) 4/8/93 g. Label all parts and store.

(C) 4/8/93 22. Remove the outer graphite shield (2-000140).

(C) N/A a. Make alignment marks in the graphite shield and lead shield ring #1.

(C) 4/8/93 b. Screw in lifting eyes.

NOTE: The lifting eye size will be determined and acquired sometime after the

thermal column has been removed.

(K) 4/8/93 c. Attach sling to hoist. (The graphite reflector will weigh ~700 pounds.)
(K) 4/8/93 d. Slowly raise graphite shield until clear of reactor.
_____ e. Actual reflector weight: _____lbs.
(K) 4/8/93 f. Transfer to appropriate storage area and label.

(K) 4/8/93 23. Remove the four lead shield rings.
(K) N/A a. Make alignment marks on the first lead shield and reactor structure for reassembly.
(K) 4/8/93 b. Screw in lifting eyes. (perhaps the graphite reflector eyes can be used.)
(K) 4/8/93 c. Attach sling and dynamometer to hoist.
(K) 4/8/93 d. Slowly raise lead ring; monitor for binding until clear of reactor.

NOTE: Lead rings 1 and 4 weigh 600 pounds, ring 2 weighs ~900 pounds, and ring 3 weighs ~800 pounds.

(K) 4/8/93 e. Transfer to an appropriate storage area and label.
(K) 4/8/93 f. Place alignment marks on next ring, and repeat process for all four rings.

Ring #1	(2-000123)	Actual Weight _____lbs.
Ring #2	(2-000122)	Actual Weight _____lbs.
Ring #3	(2-000121)	Actual Weight _____lbs.
Ring #4	(2-000123)	Actual Weight _____lbs.

(K) 4/8/93 24. Remove the core support plate (2-111253).
(K) N/A a. Place alignment marks on core support plate (top and bottom).
(K) 4/8/93 b. From beneath reactor, remove hold-down bolts (H-1114-96) (4 each, right-hand thread). Do not change position of tension nuts (H-2017).

CAUTION: Control rod drive tie bolts are still attached to core support plate. Take care not to bend or break bolts.

(K) 4/8/93 c. Manually lift plate from the top and transfer to floor area for storage.

(K) 4/8/93 25. Remove the lead base plate shield (2-000124).
(K) N/A a. Make alignment marks on the lead base and reactor structure.
(K) 4/8/93 b. Screw in lifting eyes.
(K) 4/8/93 c. Attach sling and dynamometer to hoist. (This piece should weigh slightly less than the thermal column.)
(K) 4/8/93 d. Slowly raise lead base plate; watch for binding until clear of reactor.
Actual weight: _____lbs.
(K) 4/8/93 e. Transfer to floor area for storage.

COMMENTS:

(K) NA 26. Drain the shield water tank (2-000655).
_____ a. Obtain permission from the Health Physicist to drain shield water to sewer (a water sample will have been taken and analyzed for radioactivity as a basis for release of the water).
(K) _____ b. Connect hose to drain valve (H-3009) at bottom of shield tank and drain water to sewer. Reactor manhole cover should be off.

NOTE: Entries will be made in the Waste Log, including: date/time; estimated quantity dumped; activity of sample; estimated activity dumped.

_____ c. Close drain valve and remove hose.

REMARKS:

(K) NA 27. Reactor electrical and instrumentation disassembly:

The electrical and instrumentation cables will be disconnected in the following general sequence. They will be identified for future reassembly, surveyed, and packaged for transportation.

a. Nuclear Channel #1:
   1) Detector channel H.V. off.
   2) Ratemeter main power off.
   3) Open and remove access manhole cover.
   4) Remove detector dry well from reactor tank shield water.
   5) Disassemble dry well.
   6) Disconnect and tag pre-am (2) and H.V (1) cables.
   7) Transfer components to clean area for radiological survey (gross smears), and packing.

b. Nuclear Channels #2 and #3:
   1) Disconnect and tag H.V. cables at battery supply pack (rear of control console).
   2) Remove detector dry wells from reactor tank shield water.
   3) Disassemble dry wells.
   4) Disconnect and tag signal and H.V. cables.
   5) Transfer components to clean area for radiological survey and packing.

c. Main distribution cable:
   1) Main power switch (left side reactor console) off.
   2) Disconnect and tag P-15 (control console).
   3) Disconnect and tag P-16 (control console).

d. Miscellaneous:
   1) Disconnect and tag monitor cable at control console. Pull it to storage beneath reactor tank.
   2) Disconnect and tag main power cable.
   3) Remove the EARTHQUAKE SCRAM ASSEMBLY ball (H3005), bag and label.
   4) Remove the THERMO SWITCH (E-10035).
      a. Label electrical leads.
      b. Disconnect electrical leads.
      c. Label thermo switch and bag for shipment.

28. Console

The console will be retained in its present location until final disposition.

University of Utah Nuclear Engineering Laboratory
AGN-201 Reactor Defueling Procedure

I. Introduction

This document gives the general procedures to be followed for defueling the AGN-201 reactor. These procedures give details regarding the preparations, monitoring, setup, general procedures and specific defueling procedures.

NOTE: Check and date each item in the appropriate place as each step is accomplished. Maintain one master copy for reference.

II. Preparation Prior to Defueling

_____ 1. Radiation Protection

a. The following instruments will be checked for proper operation, then placed in 1205-E for use:

_____ 1) High-volume air sampler.
_____ 2) Neutron survey meter (Texas Nuclear Bonner Sphere).
_____ 3) Beta/gamma dose rate survey meter (Eberline).
_____ 4) Contamination survey meter (TBM-3S).

b. The following supplies will be collected and placed in the reactor room for use as needed.

_____ 1) Filters for high-volume air sampling.
_____ 2) Smearing materials for wipe tests.
_____ 3) Containers for air filters and wipe test smears.
_____ 4) Shielded storage container for storing the Ra-Be neutron source.
_____ 5) Coveralls, lab coats, gloves, and shoe covers.
_____ 6) Radioactive waste containers.
_____ 7) Cadmium foil for core can insert.
_____ 8) Respiratory protection equipment (retain at first-aid station unless required).

_____ 2. Work Area and Tools

_____ a. Survey reactor room area in preparation of defueling activities.
_____ b. Relocate equipment as necessary to maximize working area room.
_____ c. Collect the following tools and place in reactor room:

_____ 1) Hand Tools required for disassembly (socket and Allen wrenches).
_____ 2) Handling tool for removing the Ra-Be source.
_____ 3) Lifting lugs and rigging for thermal column, core tank, and upper graphite reflector.

_____ d. The following items will also be placed in 1205-E:

_____ 1) Plastic bags for storing components.
_____ 2) Camera with flash and film for photographically documenting the procedure at key stages.

III. Detailed Disassembly Procedures

NOTE: The assembly part numbers are correlated with the part listing on drawing number E-2-000100. The ventilation system and air sampler should be operating during all disasssembly procedures.

_____ 1. A representative from the Radiological Health Department will perform a pre-defueling radiological survey.

_____ 2. The Reactor Supervisor will initiate special access procedures, personnel and equipment monitoring procedures and other procedures as needed to keep personnel radiation exposures as low as reasonably achievable (ALARA). An operational check will be made of radiation monitoring equipment. If all equipment responds properly, the operation may proceed. The Reactor Supervisor will brief personnel involved in the defueling operation on each step prior to its completion, with clarification made, as necessary, of the tasks to be performed.

_____ 3. Insure that the temporary cadmium rod is in the glory hole and well fixed.

_____ 4. Remove the top cover plate (2-000226). Drain the thermal column.

_____ a. Obtain permission from the Health Physicist to drain thermal column water to sewer (a water sample will have been previously taken and analyzed for radioactivity as a basis for release of the water).

_____ b. Pump water to sewer until thermal column is as dry as possible.

NOTE: The entries for health physics records will be made in the Waste Log, including: date/time; estimated water volume dumped; gross sample results in μCi/ml, % of applicable mpc, estimated activity dumped.

_____ 5. Remove the thermal column (2-000139):

NOTE: Thermal column is estimated to weigh 2,400 pounds.

_____ a. Unbolt thermal column from reactor tank (16 each 3/4 inch bolts).

_____ b. Attach lifting sling to crane and thermal column.

_____ c. Remove thermal column from reactor and move to an appropriate space on the floor. Set thermal column on plastic sheet or absorbent paper.

_____ d. Label thermal column. Bag the 16 each 3/4 inch hold-down bolts and label.

_____ 6. Place borated paraffin over Ra-Be source and perform radiation survey of thermal column cavity. Replace top cover plate and secure to flange at top of reactor tank until ready for removal of neutron source. Survey exterior surface of top plate cover for radiation level and possible contamination; mark area as a radiation hazard as appropriate.

_____ 7. Remove and survey each lead brick from thermal column. Use paper towels to dry the lead and dispose of towels as low-level contaminated waste. Should any surface of a brick yield a dose rate greater than 3 times the background rate, label and segregate from unactivated bricks; place bricks on polyethylene sheeting until a confirmatory survey by a Radiological Health Dept. representative indicates release of the bricks for unrestricted use. Any activated or contaminated bricks will be retained by UUNEL.

_____ 8. Remove bottom cover plate (2-000169). The gasket (2-000593) should come off with the cover. Bag the cover plate thumb screws (H-1007-10) and label.

_____ 9. Insure that the control and safety rods have indeed been removed earlier, as declared. Label rods and store in approved fuel storage locations.

Safe Rod Assembly:	2-000550 I
Safe Rod Assembly	2-000550 II
Coarse Control Rod Assembly	2-000550 III
Fine Control Rod Assembly	2-000550 IV

_____ 10. Remove the three dash pots (2-000510), label and store for future disposition.

_____ 11. Remove the four control rod drive mechanisms.

_____ a. Console power off (neutron detection channels 1, 2, & 3 remain on).

_____ b. Disconnect rod drive power plugs. Identify and label each.

_____ c. Remove (2 each) jam nuts (1/4-28) from the tie bolts and carefully lower each rod drive frame assembly until free. Identify and label each frame. Bag the jam nuts and label.

_____ 12. Insert neutron absorber in the control and safety rod holes in the core can.

_____ 13. Remove the top cover plate (2-000226). The gasket (2-000591) should come off with the cover. Bag the eight cover plate bolts (H-1069-12) and label.

_____ 14. Remove the Ra-Be neutron source (H-3018) from the graphite reflector. Wipe test the source and place it in the storage container. Survey storage container.

_____ 15. Conduct a core survey. Since the core tank will not be opened at this time, an off gas sample will not be taken. A direct radiation survey and smear survey of the core tank top and environs will be made.

_____ 16. Remove cadmium rod from glory hole (operator monitor neutron detector channels 1 through 3, H.P. representative monitor portable neutron survey meter response). Only a slight increase in reading may be noted. (Log any reading change.)

BEFORE	AFTER

CRM: _____ _____
LOG: _____ _____
LINEAR: _____ _____

_____ 17. Remove glory hole tube.

_____ a. Remove glory hole flange (2-000419) (2 each) by removing (4 each) socket HD machine screws, 1/4-20 X 1/2 (H-1023-8).

_____ b. Remove glory hole flange "0" ring (H-4009) (2 each).

_____ c. Remove glory hole tube (2-000422). Extreme care should be taken when removing this tube. It should not be bent (straight pull) and if binding is excessive, it may be necessary to lift the core tank slightly to relieve the bind.

COMMENTS:

NOTE: The Health Physicist will carefully monitor the removal of the core can. All radiation and criticality monitors will be checked for proper operation just prior to the removal of the core, and surveys of radiation levels from the core can will be made continuously during removal.

_____ 18. Core Can Removal (2-000114):

_____ a. Attach lifting frame with cap screws (sock HD., 10 X 24) to core tank.

_____ b. Attach lifting frame and to hoist.

NOTE: Hoist must be positioned with care to insure vertical alignment. Any deviation from the vertical will cause binding of the core tank in the reflector and shielding of the reactor. The unit being lifted weighs approximately 250 pounds. Tension should be applied with the hoist and the core tank lifting frame should be manipulated until any uneven tension is relieved. Tension is then again applied. The misuse of the electrical hoist could cause damage to the reactor reflector, if binding occurs and force is applied. A man will stand by the hoist circuit breaker (Panel B, Breaker #5) in the event of an "up" button failure of the hoist. Binding should be expected for approximately 4 inches until the thimbles have cleared the lower housing.

_____ d. Lift the core tank from the reactor.

NOTE OF INTEREST: Other facilities have measured a loss of reactivity after removing the core tank : U.S Naval Postgraduate School and Colorado State University).

_____ 19. Place an appropriate piece of neutron absorber (Cd or In) in glory hole.

_____ 20. Conduct radiation survey to determine direct radiation levels from the core can and removable surface contamination on the exterior surface of the can.

_____ 21. Transfer the core to its storage container.

_____ a. Remove lifting frame.

_____ b. Seal and label core can container and hold in Reactor Room.

_____ 22. Health Physics will perform a radiation survey of accessible internal surfaces to ascertain direct (induced) radiation levels and removable contamination levels.

NOTE: This concludes the nuclear portion of the disassembly process. The remaining disassembly will be conventional mechanical and electrical, with radiation surveys made as directed by the Health Physicist.

NEL-105

Procedure for Removal of AGN Control Rods

Precautions: Be sure proper ventilation and air sampling equipment is in operation during this procedure. Use gloves as necessary when handling potentially contaminated materials.

1. Remove the nuts securing the control rod drive assembly to the AGN structure taking care to support the assembly as the last nut is removed. ✓ JB

2. Carefully lower the control rod avoiding binding and remove the assembly from the crawl space beneath the reactor. ✓ JB

3. Survey the rod and record radiation levels in spaces provided below. Wipe the exterior surface of the fuel cladding to determine if surface contamination exists. Note below any removable contamination discovered. ✓ JB

Instrument: DRM-35
Serial No.: 087129
Calibration Date: 12/22/88

	CR1	CR2	Fine	Coarse	Bak
Max. level @ contact	.065 mR/hr	.065 mR/hr	.02 mR/hr	22000 cpm .065 mR/hr	80 MR
Max. level @ 1 foot	.035 mR/hr	.030 mR/hr	.025 mR/hr	9000 cpm .040 mR/hr	

4. Unscrew the fueled control rods from the remainder of the assembly and place in the temporary storage container. Survey the drive assemblies for any residual contamination or activation. Note below any elevated radiation levels. Set the drive assemblies aside for future use as necessary. ✓ JB

5. Repeat steps 1 through 4 for each control rod. Insert borated paraffin between the control rods and secure container lid when all fuel has been loaded. ✓ JB

6. Load borated paraffin into the reactor core through the control rod guide tubes assuring that the paraffin will remain in place. ✓ JB

7. Place the temporary storage container in the Middle Fuel Storage Pit and secure until ready for shipment to DOE. ✓ JB

8. Comments: Wipes: (Background = 40 cpm)
- Fuel Cladding
Fine Rod: no detectable contam.
SR1: " " "
SR2: " " "
Coarse Rod: " " "
- Drive Assembly
no detectable contamination
" " "
" " "
" " "

* Detectable contamination observed on some portion of the control rods or drive assemblies. The fueled control rods were sealed in cover,

Date Procedure Started: 5/2/89

Date Procedure Finished: 5/2/89 JB Rosenin

Procedure reviewed and approved on behalf of the Reactor Safety Committee by:

AGN Reactor Supervisor: [signature] — 28 Apr 89

Written on back of NEL-105

... plastic and placed in a temporary steel barrel. The barrel was secured in the middle fuel storage pit and will remain there pending transfer of fuel to DOE.

John S. Bennion

Procedures for Removal of Ra-Be Neutron Source from AGN-201 Reactor

Precautions: Be sure proper ventilation and air sampling equipment are operating during this procedure. Gloves and personnel dosimetry must be worn throughout this procedure.

1. Remove the top cover plate from the reactor and remove the borated paraffin covering the Ra-Be source.

2. Using a remote swiping tool, obtain a wipe of the top of the source and the area immediately surrounding the source. Minimize the exposure time and use the AGN tank to provide as much shielding as possible.

3. Analyze the wipe with both a contamination survey meter and gamma spectroscopy. Record the results below.

Survey Instrument: TBM-3S
Serial Number: 087129
Calibration Date: 12/22/88

Background: 50
Gross Counts: 70
Net Counts: 20 cpm

Comments: completed 5/4/89.

Gamma Spectroscopy (Attach spectrum):

Instrument: Intrinsic Ge

Visible Peaks:
observed Co-60, Mn-54, and K-40 peaks only (all are background)

Radium Daughter Products: ___yes ✓ no

Comments: completed 5/4/89

4. If any evidence of leakage of the neutron source exists, notify the Reactor Supervisor. Otherwise, follow the remaining items of the procedure.

5. Place the neutron source transfer container next to the AGN reactor on the upper floor of the reactor room.

6. Make sure a strong neutron absorbing material such as boron or cadmium has been inserted

into the core through at least two control rod guide tubes.

Absorbing material: cadmium mass: 35.1 grams

7. Transfer the source from the AGN reactor to the transfer container using a remote handling tool and secure container. Wipe the source while transferring to container. Also wipe and survey the location of the reactor containing the source. Record data below.

Survey Instrument: Victoreen 450P
Serial Number: #172
Calibration Date: 6 February 89

	Source Wipe	Reactor Wipe
Background		
Gross Counts		
Net Counts		

Radiation level @ contact at source location: ______________ mr/hr

Gamma Spectroscopy (Attach spectrum): * [illegible]

Instrument: ______________________________

Peaks:

Comments:

8. Place lid on and secure neutron source container. Perform external radiation survey of container. Mark container with radiation hazard signs and label with source activity. Store in MEB 1205-A (Irradiation Facility Room).

External radiation survey of container:

Survey Instrument: Victoreen 450P.
Serial Number: 172
Calibration Date: 6 Feb 89

Eberline SN#289 Calibrated: 1/27/89 115 mr/hr max @ contact [initials] 5/8/89

Maximum dose rate @ contact: (2" from surface) 69 mr/hr
Maximum dose rate @ 3 feet: 2.5 mr/hr

9. Replace and secure top cover plate of reactor. [initials] 8 may 89

Surveys Performed by:

[signature] Date: 5/8/89

Procedure reviewed and approved on behalf of the Reactor Safety Committee by:

AGN Reactor Supervisor: [signature] Date: 8 MAY 89

Appendix C:

Parts Transferred To Other Reactor Licenses

The following are a set of pictures of the AGN-201M's parts that have been transferred to other reactor's licenses. The forms that these pictures are on, contain a brief description, a summary of the radiological survey, and the specific reactor license that these parts are being transferred to.

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

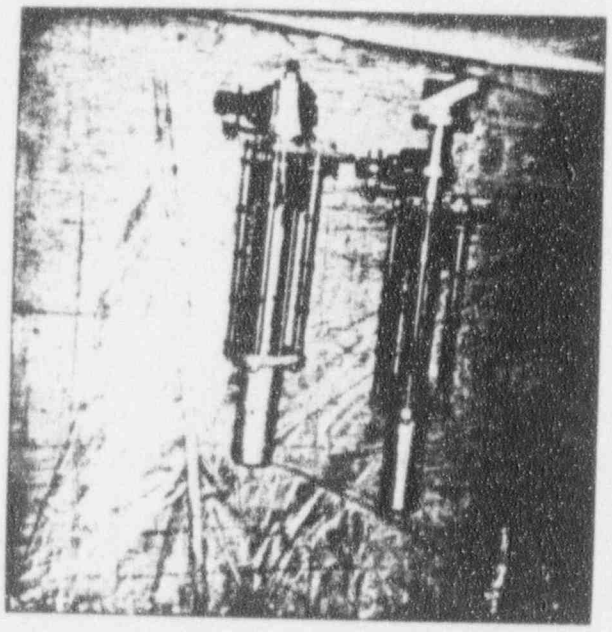
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #28 - Rod Drive
Part #29 - Rod Drive

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell S. Hall Date: 6/30/93

Part Disposal (or Transfer):

The two rod drives shown here were transferred from License No. R-25, Docket No. 50-72, to Idaho State University's Nuclear Facility, License No. R-110, Docket No. 50-284.

R. David Clovis 6/30/93

Reactor Supervisor: D.M. Slaughter Date: 6/30/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

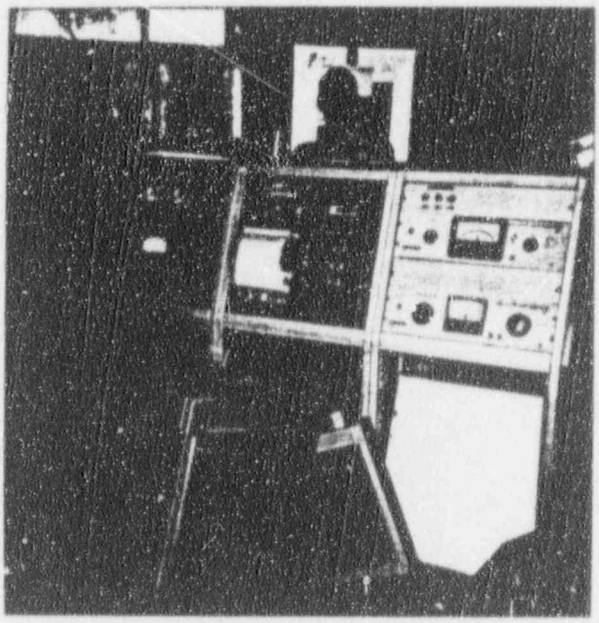
Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

Memorandum

To: D.M. Slaughter, Reactor Supervisor Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:
Part #87 - Reactor Console

Radiological Survey Results:
Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell S. Hall Date: 6/30/93

Part Disposal (or Transfer):
The reactor console shown here was transferred from License No. R-25, Docket No. 50-72, to Idaho State University's Nuclear Facility, License No. R-110, Docket No. 50-284.

Reactor Supervisor: R. David Clark 7/1/93 ROC 6/30/93 Date: 6/30/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

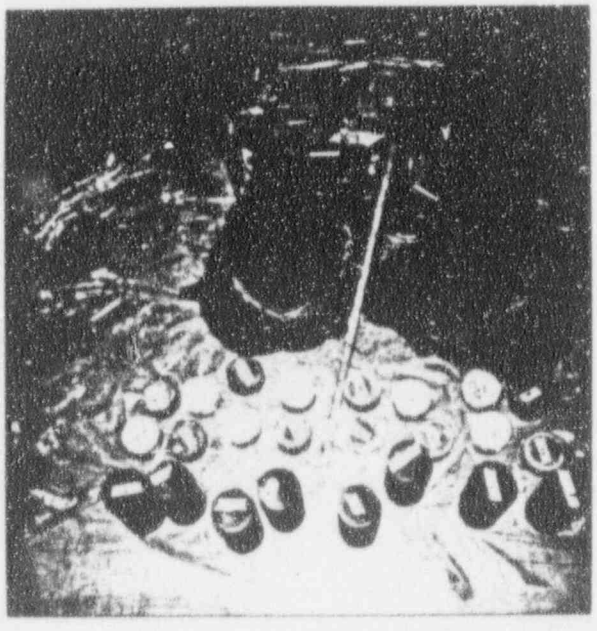
Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

Memorandum

To: D.M. Slaughter, Reactor Supervisor Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #17 - Graphite Reflector from Top of Core Tank
Part #21 - Graphite Reflector from Bottom of Core Tank
Part #18 - Graphite Reflector from Bottom of Core Tank
Part #19 - Graphite Reflector Side Plate from Core Tank
Part #20 - Graphite Reflector Side Plate from Core Tank
Part #s 61,62,63,64,66,67,68,69 - Graphite Plugs for Access Port
Part #s 42,43,44,45,46,47,48,49, 50,51,52,53,54,55,56,57 - Lead Shielding Plugs in Access Port

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell S. Hall Date: 6/30/93

Part Disposal (or Transfer):

The graphite reflectors from both the top and bottom of the core tank, the graphite reflector side plates from the core tank, the graphite plugs for the access port and the lead shielding plugs in the access port have been transferred from License No. R-25, Docket No. 50-72, to UUNEL's TRIGA License No. R-126, Docket No. 50-407.

Reactor Supervisor: D.M. Slaughter Date: 6/30/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

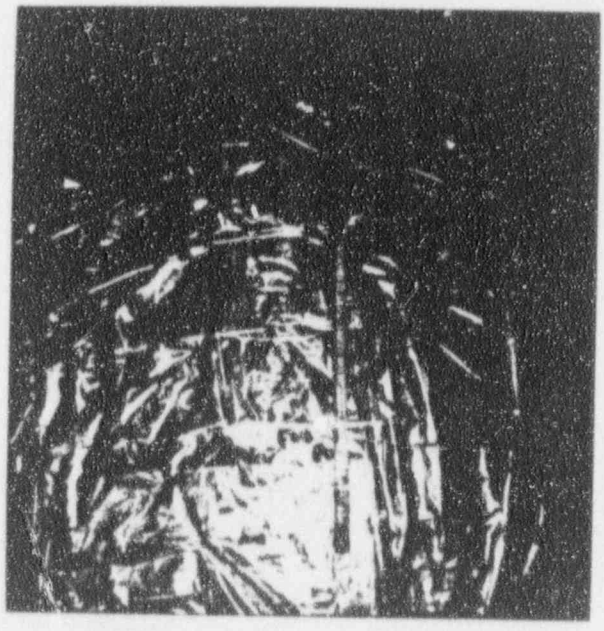
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:
Part #65 - Cadmium Foil

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell S Hall Date: 6/21/93

Part Disposal (or Transfer):

The cadmium foil shown here were transferred from License No. R-25, Docket No. 50-72, to UUNEL's TRIGA License No. R-126 Docket No.50-407.

Reactor Supervisor: D.M. Slaughter Date: 6/30/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

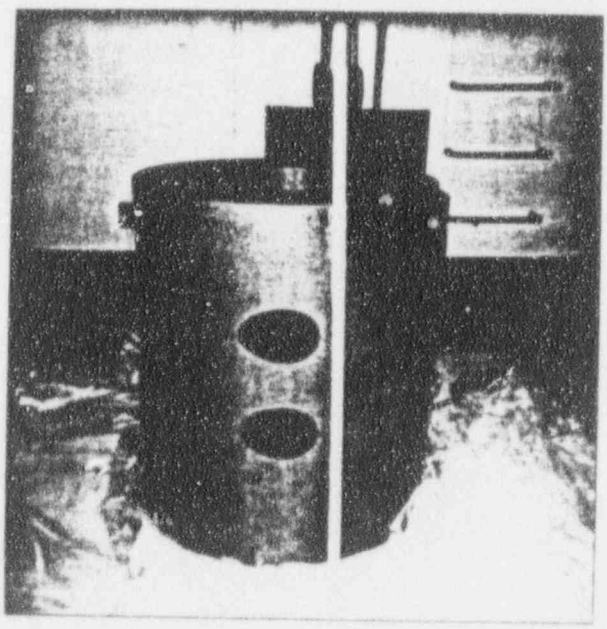
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:
Part #74 - Main Graphite Reflector

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected. Survey results are attached.

HP Technician: Darrell S. Hall Date: 6/30/93

Part Disposal (or Transfer):

The main graphite reflector shown here were transferred from License No. R-25, Docket No. 50-72, to UUNEL's TRIGA License No. R-126 Docket No.50-407.

Reactor Supervisor: D.M.S. Date: 6/30/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

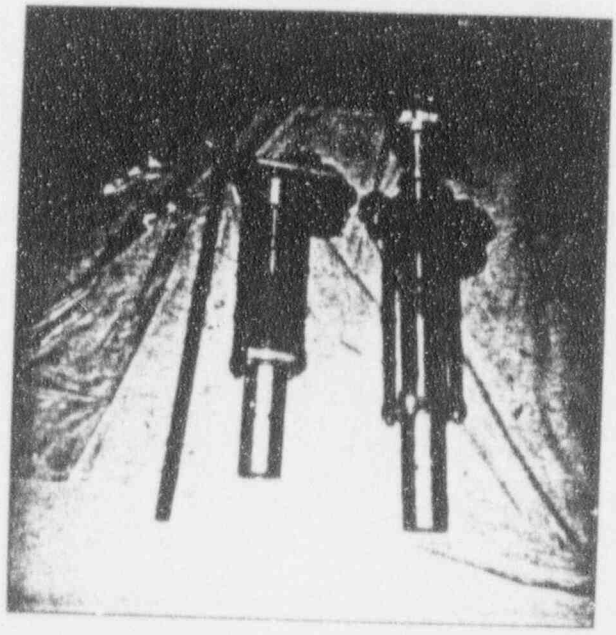
Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

Memorandum

To: D.M. Slaughter, Reactor Supervisor **Date: June 8, 1993**

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:
Part #30 - Rod Drive
Part #31 - Rod Drive

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell S Hall Date: 6/30/93

Part Disposal (or Transfer):

The two Rod Drives shown here were transferred from License No. R-25, Docket No. 50-72, to UUNEL's TRIGA License No. R-126 Docket No.50-407.

Reactor Supervisor: D.M. Slaughter Date: 6/30/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

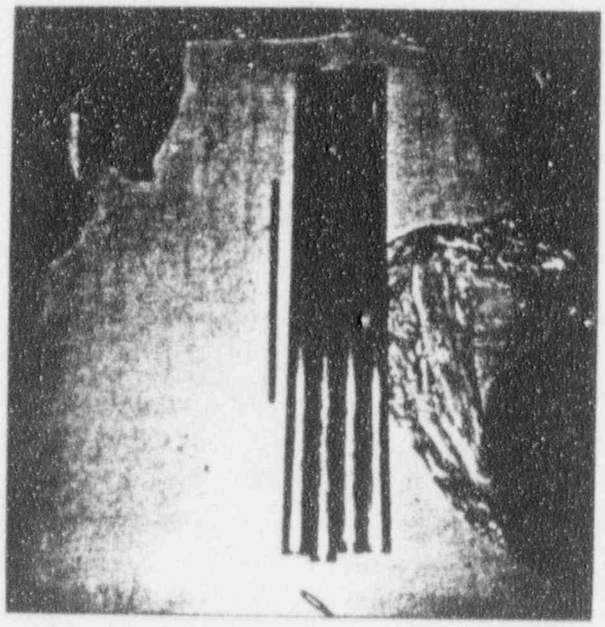
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #70 - Aluminum Sleeve for Access Port
Part #71 - Aluminum Sleeve for Access Port
Part #72 - Aluminum Sleeve for Access Port
Part #73 - Aluminum Sleeve for Access Port

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell S. Hall Date: 6/30/93

Part Disposal (or Transfer):

The four aluminum sleeves for access ports shown here were transferred from License No. R-25, Docket No. 50-72, to UUNEL's TRIGA License No. R-126 Docket No.50-407.

Reactor Supervisor: D M Slaughter Date: 6/30/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

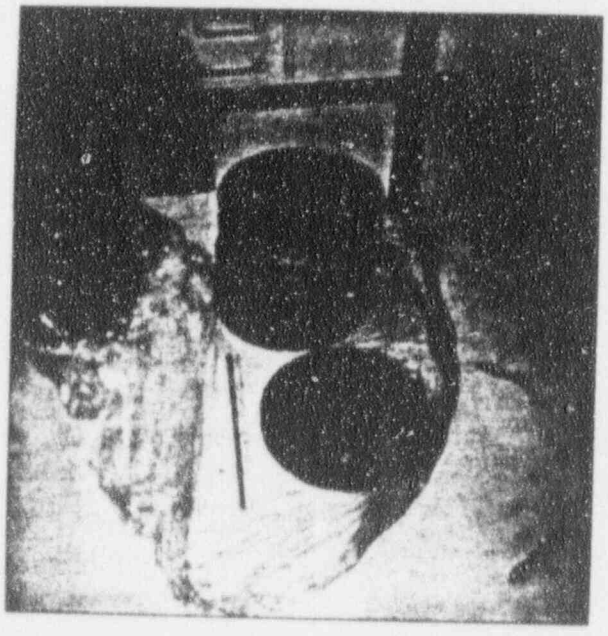
Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

Memorandum

To: D.M. Slaughter, Reactor Supervisor **Date: June 8, 1993**

From: AGN (DS) Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #75 - Lead Shielding Ring
Part #76 - Lead Shielding Ring
Part #77 - Lead Shielding Ring
Part #78 - Lead Shielding Ring
Part #79 - Lead Shielding Ring

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Donald S. Hall Date: 6/30/93

Part Disposal (or Transfer):

The five lead shielding rings shown here were transferred from License No. R-25, Docket No. 50-72, to the UUNEL's TRIGA License No. R-126, Docket No. 50-407.

Reactor Supervisor: D.M. Slaughter Date: 6/30/93

Appendix D:

Parts To Be Disposed Of As Radiological Waste

The following are a set of pictures of the AGN-201M's parts that have been set aside to be disposed of as radiological waste. The forms that these pictures are on contain a brief description, a summary of the radiological survey, and the method of disposal of the parts.

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

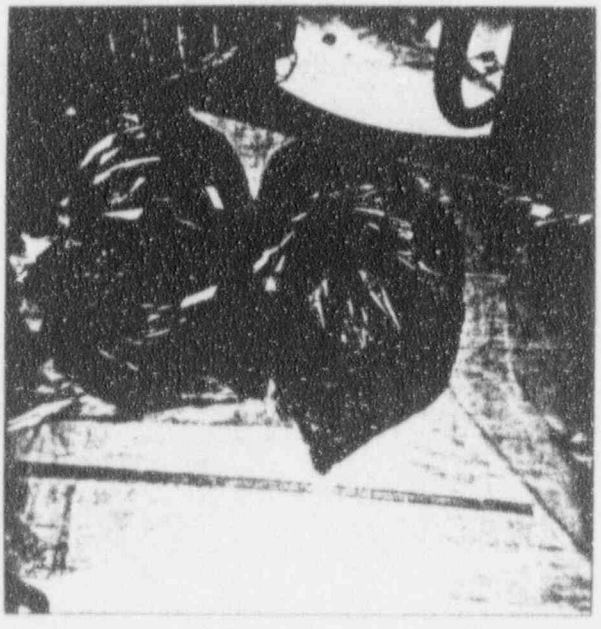
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:
Generated Decommissioning Waste

Radiological Survey Results:

The Direct Survey of the decommissioning waste showed nonremovable contamination from activation products. Activity was measured at 10mCi. Survey results are attached.

HP Technician: Darrell S Hall Date: 7/1/93

Part Disposal (or Transfer):

The aforementioned parts were segregated, packaged and labeled by the AGN Decommissioning Staff, prior to collection for disposal by the Radiological Health Department, under approved procedures outlined in the Radiation Safety Manual.

Reactor Supervisor: D C M. J Date: 7/1/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

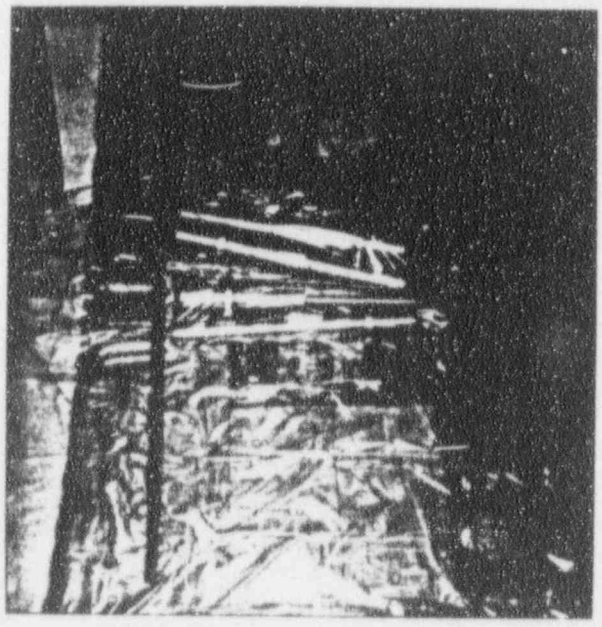
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #2 - Safety Rod Guide Tubes
Quantity-2
Part #9 - Control Rod Guide Tubes
Quantity-2

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. Alpha contamination was detected on both parts at .07nCi from U-235 and U-238. Survey results are attached.

HP Technician: Darrell Hall Date: 7/8/93

Part Disposal (or Transfer):

The aforementioned parts were segregated, packaged and labeled by the AGN Decommissioning Staff, prior to collection for disposal by the Radiological Health Department, under approved procedures outlined in the Radiation Safety Manual.

Reactor Supervisor: D.M. Slaughter Date: 7/8/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location

Part Description:

Part #6 - AGN Screws & other parts
Part #7 - AGN Screws & other parts
Part #8 - Core Support
Part #13 - Core Support
Part #83 - AGN Screws & other parts

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. All parts were alpha contaminated. Parts 6, 7, and 83 at .07nCi, part 8 at .1nCi, and part 13 at .134nCi. All parts were contaminated with U-235 and U-238 isotopes. Survey results are attached.

HP Technician: Darrell Hall Date: 7/8/93

Part Disposal (or Transfer):

The aforementioned parts were segregated, packaged and labeled by the AGN Decommissioning Staff, prior to collection for disposal by the Radiological Health Department, under approved procedures outlined in the Radiation Safety Manual.

Reactor Supervisor: D M Slaughter Date: 7/8/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

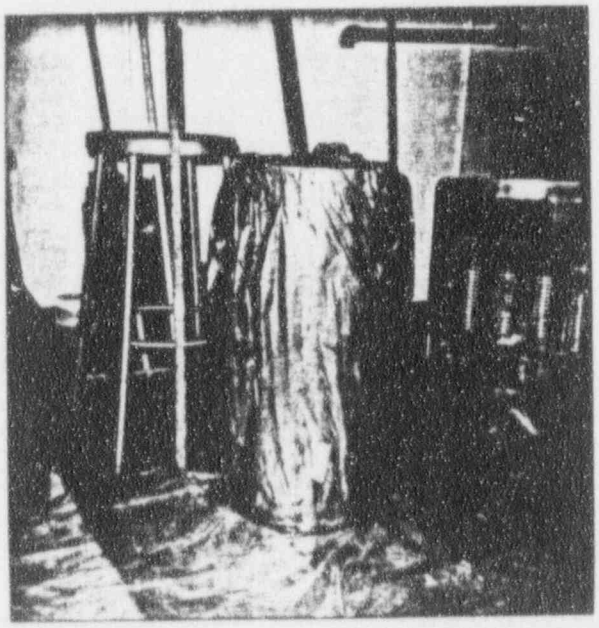
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:
Part #18 - Core Can

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts: survey results indicate alpha contamination of .07nCi from U-235 and U-238. Survey results attached.

HP Technician: Darrell Hall Date: 7/8/93

Part Disposal (or Transfer):

The aforementioned parts were segregated, packaged and labeled by the AGN Decommissioning Staff, prior to collection for disposal by the Radiological Health Department, under approved procedures outlined in the Radiation Safety Manual.

Reactor Supervisor: Don Slaughter Date: 7/9/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

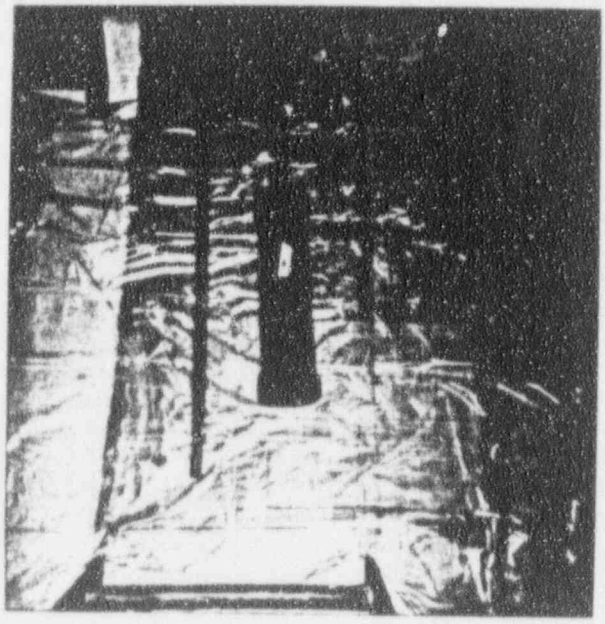
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #80 - Vacuum Cylinder for Core Gas Sampling

Radiological Survey Results:

Direct survey, LSC and Alpha wipes were performed on these parts. The exterior contained no contamination, while the interior was alpha contaminated with .27nCi. Survey results are attached.

HP Technician: Darrell Hall Date: 7/8/93

Part Disposal (or Transfer):

The aforementioned parts were segregated, packaged and labeled by the AGN Decommissioning Staff, prior to collection for disposal by the Radiological Health Department, under approved procedures outlined in the Radiation Safety Manual.

Reactor Supervisor: D.M. Slaughter Date: 7/9/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

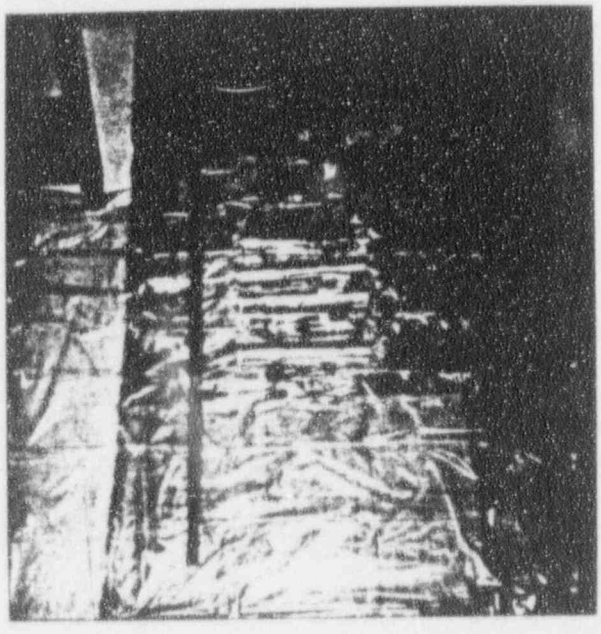
Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

Memorandum

To: D.M. Slaughter, Reactor Supervisor **Date: June 8, 1993**

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #1 - Safety Control Rod #2
Part #5 - Safety Control Rod #2 and Spring Assembly
Part #10 - Safety Control Rod #1 and Spring Assembly
Part #11 - Course Rod and Spring Assembly
Part #12 - Fine Control Rod and Spring Assembly

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. Contamination is specified as follows: Part 1 showed alpha contamination at .272nCi, Part 5 had alpha at .075nCi, Part #11 alpha contamination at .12 and Part #12 showed alpha contamination at .04nCi. Survey results are attached.

HP Technician: Darrell Hall Date: 7/8/93

Part Disposal (or Transfer):

The aforementioned parts were segregated, packaged and labeled by the AGN Decommissioning Staff, prior to collection for disposal by the Radiological Health Department, under approved procedures outlined in the Radiation Safety Manual.

Reactor Supervisor: D.C.M. Slaughter Date: 7/9/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

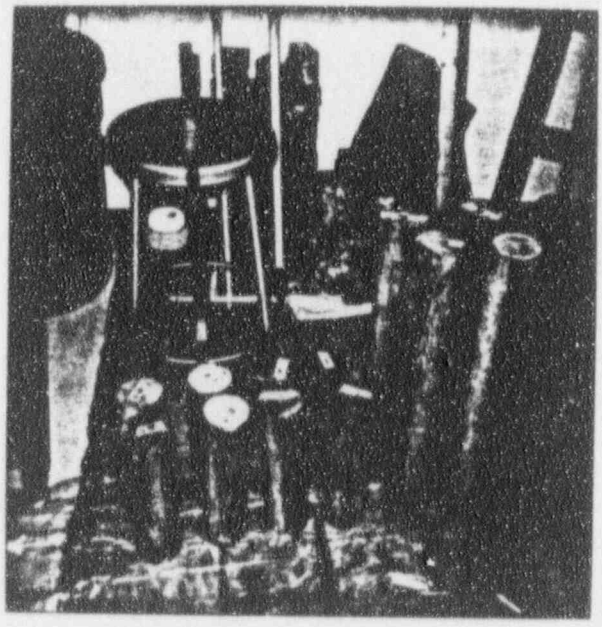
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #s 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 81, 82
- Wooden Access Port Plugs

Radiological Survey Results:

Direct survey, LSC and Alpha wipes were performed on these parts. No removable contamination was detected, but due to the absorbing nature of the wood the parts must be considered contaminated by activation products at 10mCi. Survey results are attached.

HP Technician: Donnell Hall Date: 7/8/93

Part Disposal (or Transfer):

The aforementioned parts were segregated, packaged and labeled by the AGN Decommissioning Staff, prior to collection for disposal by the Radiological Health Department, under approved procedures outlined in the Radiation Safety Manual.

Reactor Supervisor: D.M. Slaughter Date: 7/9/93

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location

Part Description:

Part #4 - Paint Chips from Thermal Column

Radiological Survey Results:

Direct survey, LSC and Alpha wipes were performed on these parts. No removable contamination was detected, but due to the absorbing nature the parts, they must be considered contaminated by activation products at 10mCi. Survey results are attached.

HP Technician: Darrell Hall Date: 7/8/93

Part Disposal (or Transfer):

The aforementioned parts were segregated, packaged and labeled by the AGN Decommissioning Staff, prior to collection for disposal by the Radiological Health Department, under approved procedures outlined in the Radiation Safety Manual.

Reactor Supervisor: D.M. Slaughter Date: 7/9/93

Appendix E:

Parts To Be Disposed Of As Unrestricted Waste

The following are a set of pictures of the AGN-201M's parts that have been set aside to be disposed of as unrestricted waste The forms that these pictures are on contain a brief description, a summary of the radiological survey, and the method of disposal of the parts.

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

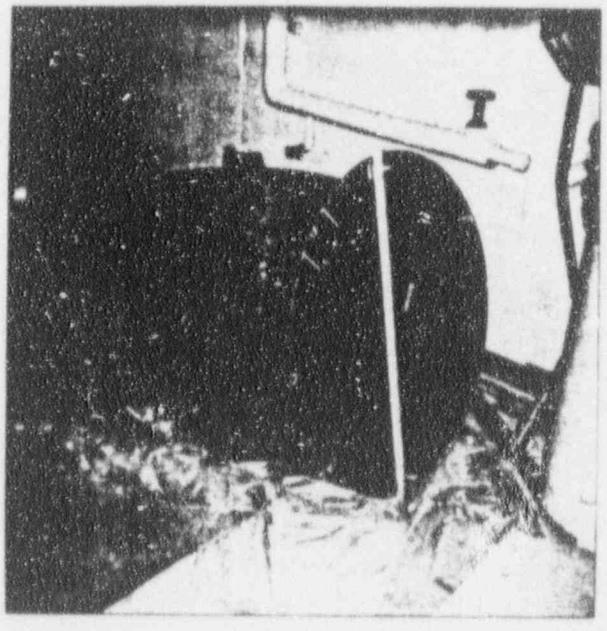
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #22 - Interior Steel Thermal Column
Part #23 - Exterior Steel Thermal Column
Part #24 - Top of Thermal Column Cover Plate
Part #25 - Bottom of Thermal Column Cover Plate

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell Hall Date: 7/9/97

Part Disposal (or Transfer):

The aforementioned parts were disposed of through non-contaminated waste.

Reactor Supervisor: D.M. Slaughter Date: 3/11/94

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

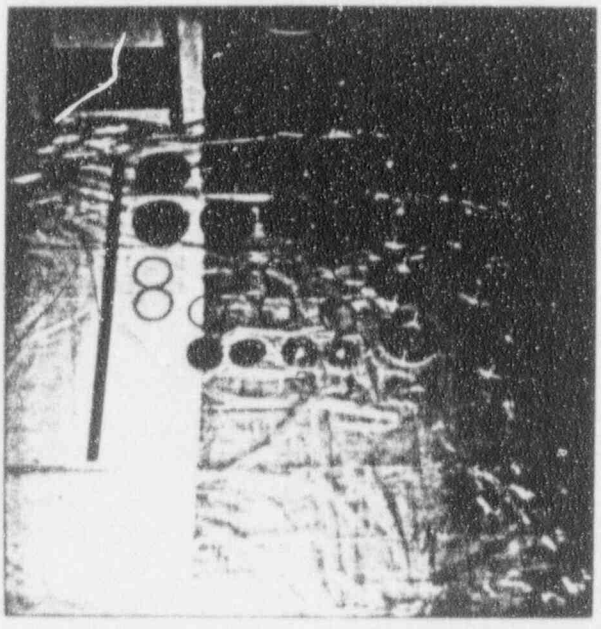
Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

Memorandum

To: D.M. Slaughter, Reactor Supervisor Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part # 27 - Port Covers and Glory Hole Covers With "O" Ring and Bolts

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell Hall Date: 7/9/93

Part Disposal (or Transfer):

The port and glory hole covers as well as the "O" ring and bolts were disposed of through non-contaminated waste.

Reactor Supervisor: D M Slaughter Date: 3/11/94

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

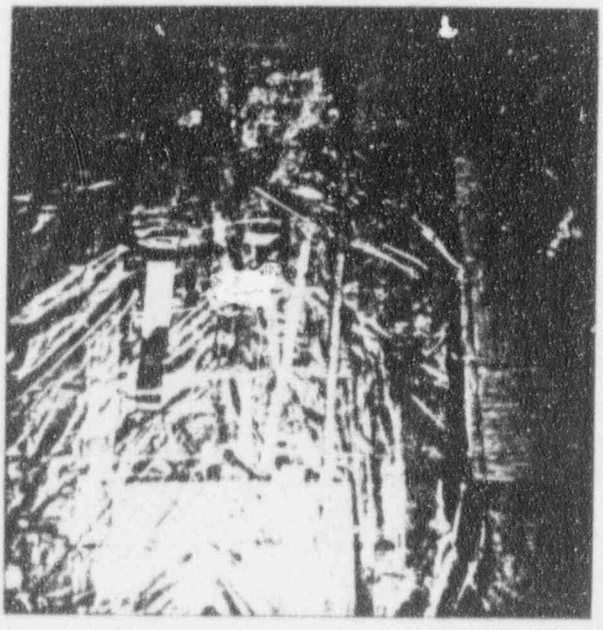
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #58 - Aluminum Fuse Support
Part #59 - Alignment Pins
Part #60 - Polyethelane Rod

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell Hall Date: 7/9/93

Part Disposal (or Transfer):

The parts listed above were disposed of through non-contaminated waste.

Reactor Supervisor: [signature] Date: 3/11/94

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

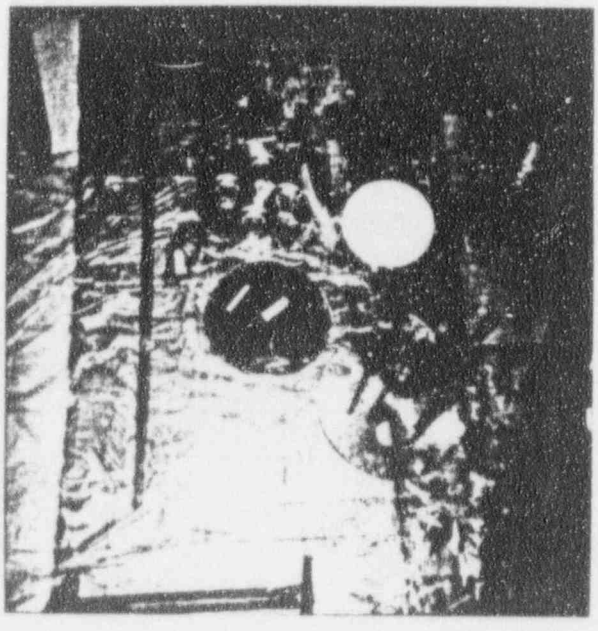
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:

Part #13 - "O" Ring for Core Tank
Part #14 - Core Tank Cover (upper)
Part #15 - Core Tank Cover (lower)
Part #16 - Polyethelane Disk
Part #84 - Control Rod Support Plate

Radiological Survey Results:

Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell Wall Date: 7/9/93

Part Disposal (or Transfer):

The "O" ring, core tank covers, polyethelane disk and the control rod support plate were all disposed of through non-contaminated waste.

Reactor Supervisor: D.M. Slaughter Date: 3/11/94

UNIVERSITY OF UTAH
NUCLEAR ENGINEERING

Mechanical Engineering Department
3209 MEB
Salt Lake City, UT 84112

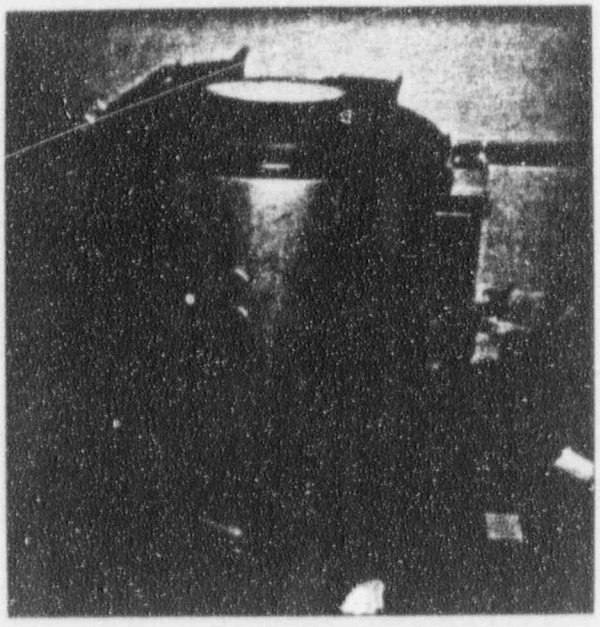
Memorandum

To: D.M. Slaughter, Reactor Supervisor

Date: June 8, 1993

From: AGN Decommissioning Staff

Subject: Part Status and Location



Part Description:
Part #86 - Main Reactor Tank

Radiological Survey Results:
Alpha, Beta, and Gamma contamination surveys were conducted on these parts. No contamination was detected: survey results are attached.

HP Technician: Darrell S. Hall Date: 3/11/94

Part Disposal (or Transfer):
The main reactor tank was disposed of through non-contaminated waste.

Reactor Supervisor: D.M. Slaughter Date: 3/11/94

Appendix F:

Fuel Shipment Information

This appendix contains a copy of the paper work associated with the transfer of the AGN-201M's fuel from the University of Utah's reactor laboratory to the DOE at Oak Ridge Tennessee. This section is broken into three subsections these are

1) Fuel Transfer Check Lists

2) Fuel Transfer Forms

3) Fuel Transfer Correspondence List

This break down is designed to show clearly the tracking, procedures, and correspondence necessary for the transport of the AGN-201M's fuel.

1. Fuel Transfer Check Lists

The following forms NEL-110, NEL-117, and NEL-118, are listed in this section. These forms demonstrate the document control procedures used during the fuel transfer and the final check lists performed to insure safety during the fuel shipment to the DOE.

AGN Fuel Shipment
Document Control

The following documents pertaining to the shipment of the special nuclear material (SNM) from the AGN-210M training reactor (NRC License No. R-25) will be maintained on file for a minimum period of three years after shipment as required by 10 CFR 71.135.

1. Approved DOE Scrap Declaration No. ID-90-1 (Forms OR-658A, B, C, and D)
2. Manufacturer's Quality Excellence Program and Other Procurement Documents
3. DOE 7A, Type A Qualification (Mound Report)
4. NRC Approval of QA Program for AGN Fuel Shipment
5. NRC-Approved QA Program for AGN Fuel Shipment
6. Y-12 Plant Authorization To Ship
7. Form NEL-111, Primary Container Loading Procedure and QA Checklist: UU-AGN-1/1
8. Form NEL-112, Primary Container Loading Procedure and QA Checklist: UU-AGN-2/1
9. Form NEL-113, Primary Container Loading Procedure and QA Checklist: UU-AGN-3/1
10. Form NEL-114, Shipping Container Loading Procedure and QA Checklist: UU-AGN-1
11. Form NEL-115, Shipping Container Loading Procedure and QA Checklist: UU-AGN-2
12. Form NEL-116, Shipping Container Loading Procedure and QA Checklist: UU-AGN-3
13. Form NEL-117, Hazardous Material Shipment Checklist and Transfer
14. Form NEL-118, Hazardous Material Shipment Checklist and Transfer
15. Shipping Papers
16. DOE/NRC Form 741, Nuclear Material Transaction Report

Form reviewed and approved by:

Director, UUNEL: _____ Date: 5 Feb 91

Radiation Safety Officer: _____ Date: 2/5/91

Reactor Administrator: _____ Date: 2-5-91

AGN Fuel Shipment
Hazardous Material Shipment Checklist and Transfer

Date: 2/5/91 Shipment No.: ZWW - FZF - 1

Shipping Container Identification and Description:

UU-AGN-1 and UU-AGN-2 (two packages); USA DOT 7A, Type A (DOT Spec. 17H, 55-gallon steel drums); Gross Weight: 75 lbs. each package

Contents:

UN2918: Radioactive Material, Fissile, n.o.s.

Carrier: T.S.M.T

Vehicle No.: # 384 # 448141

Driver: Timothy L. Smith

Current Chauffeur's License: 497561470

	Check:	Comments:
Review Of Physical Security Plan:	✓	
Medical Certificate:	✓	
Special State Permits:	✓	To be obtained by driver
Carrier Certificate of Insurance:	✓	
Driver Logs:	✓	
Placards:	✓	
Exclusive Use Instructions:	✓	
Emergency Response Instructions:	✓	
Tie Downs/Blocking:	✓	
Final Post-Loading Radiation Survey:	✓	
External Radiation Survey of Vehicle:	✓	
Bill of Lading:	✓	
Shipping Papers Signed:	✓	
Consignee Notified and Authorized to Receive Shipment:	✓	

Vehicle Seal No.: 33887 Left Door

Comments: 44045 Right Door.

Final Inspection: By L. Ruf attended ESO Date/Time: 2/5/91/3:00 pm

Material Transfer:

Material Released By: [signature] Date/Time: 5 Feb 91 - 1500 MS

Material Received By: [signature] Date/Time: 4/5/91 2:50 PM

Campus Security Escort: [signature]

Form reviewed and approved by:

Director, UUNEL: [signature] Date: 5 Feb 91

Radiation Safety Officer: [signature] Date: 2/5/91

Reactor Administrator: [signature] Date: 2-4-91

Form NEL-118

AGN Fuel Shipment
Hazardous Material Shipment Checklist and Transfer

Date: 2/5/91 Shipment No.: ZWW - FZF - 2

Shipping Container Identification and Description:

UU-AGN-3 (one package): USA DOT 7A, Type A (DOT Spec. 17H, 55-gallon steel drum); Gross Weight: 75 lbs.

Contents:

UN2918: Radioactive Material, Fissile, n.o.s.

Carrier: Tri-State Motor Transit TSMT

Vehicle No.: 245 / 448368

Driver: James Elmer Jones

Current Chauffeur's License: N.C. 217107

	Check:	Comments:
Review Of Physical Security Plan:	✓	
Medical Certificate:	✓	
Special State Permits:	✓	To be obtained by driver
Carrier Certificate of Insurance:	✓	
Driver Logs:	✓	
Placards:	✓	
Exclusive Use Instructions:	✓	
Emergency Response Instructions:	✓	
Tie Downs/Blocking:	✓	
Final Post-Loading Radiation Survey:	✓	
External Radiation Survey of Vehicle:	✓	
Bill of Lading:	✓	
Shipping Papers Signed:	✓	
Consignee Notified and Authorized to Receive Shipment:	✓	

Vehicle Seal No.: 84270 Left Door

Comments: 84245 Right Door

Final Inspection: By L. Hardy, Health PSO. Date/Time: 2/5/91 / 3:00pm

Material Transfer:

Material Released By: Gary W. Sanquist Date/Time: 5 Feb 91 - 1500 EST

Material Received By: James Elmer Jones Date/Time: 02-05-91 1730 EMS

Campus Security Escort: Doris Bird

Form reviewed and approved by:

Director, UUNEL: Gary W. Sanquist Date: 5 Feb 91

Radiation Safety Officer: [illegible] Date: 2/5/91

Reactor Administrator: Mostafa K. Dehmesh Date: 2-4-91

2. Fuel Transfer Forms

The following forms are included in this section, Uranium Scrap Declaration ID-90-1, DOE/NRC FORM 741 Nuclear Materials Transactions Report, correction to DOE/NRC FORM 741, and the Bill Of Lading of the fuel shipment.

United States Department of Energy
Oak Ridge Operations Office
REQUEST FOR URANIUM SCRAP DISPOSITION

RECEIVED
OCT 09 1990

REQUEST NO.

SECTION I - (TO BE COMPLETED BY SCRAP GENERATOR)

INSTRUCTIONS

(1) PREPARE IN QUADRUPLET; RETAIN 4TH COPY AND FORWARD THE ORIGINAL AND 2 COPIES TO THE DOE OPERATIONS OFFICE ADMINISTERING THE SCRAP GENERATING CONTRACT. (AN ADDITIONAL COPY SHOULD BE PREPARED & FORWARDED TO THE DOE OFFICE HAVING JURISDICTION OVER THE GENERATING SS ACCOUNTABILITY STATION WHEN DIFFERENT FROM THE CONTRACTING OFFICE.)
(2) IT IS IMPERATIVE THAT A COMPLETE AND CONCISE DESCRIPTION OF THE SCRAP BE FURNISHED WITH EACH REQUEST. FORMS OR-658C AND OR-658D MUST BE UTILIZED FOR THIS PURPOSE. COMPLETED FORMS OR-658C AND OR-658D SHOULD BE ATTACHED TO, AND IDENTIFIED BY DECLARATION NUMBER IN BLOCK 3 ON, THIS FORM. FORM OR-658B, URANIUM SCRAP SHIPPING DATA, SHOULD ALSO BE COMPLETED AND ATTACHED TO THIS REQUEST FORM. ANY NUMBER OF SCRAP DECLARATIONS MAY BE MADE BY UTILIZING THE SAME FORMS OR-658A AND OR-658B.
(3) IF A NEGATIVE STATEMENT IS INDICATED FOR ITEM 4 BELOW, GIVE FULL DETAILS ON REVERSE SIDE OF THIS FORM.

1. TO:
U. S. Department of Energy
OAK RIDGE OPERATIONS OFFICE
POST OFFICE BOX "E"
OAK RIDGE, TENNESSEE 37830
ATTN: CENTRAL SCRAP MANAGEMENT OFFICE

2. FROM:
University of Utah
Dept. of Mechanical Engineering
MEB 3209
Salt Lake City, UT 84112

3. DECLARATION NUMBERS ATTACHED;

ID-90-1

4. SCRAP IS AVAILABLE FOR IMMEDIATE DELIVERY TO A REPROCESSOR. ☐ YES ☐ NO

REQUESTOR HEREBY CERTIFIES THAT THE SCRAP COVERED BY THIS REQUEST WILL BE IN CONFORMANCE WITH ALL APPLICABLE REGULATIONS AND THAT THE REQUIRED SHIPPING DATA ARE DETAILED ON FORM OR-658B WHICH HAS BEEN ATTACHED HERETO.

5. DATE April 27, 1990

6. SIGNATURE OF REQUESTOR
Keith R. Brown

7. NAME AND TITLE
K. R. Brown
University Reactor Assist. Pr

SECTION II - CONCURRENCE OF COGNIZANT DOE OPERATIONS OFFICE

THE DESCRIPTIVE AND ALL OTHER DATA ON ATTACHED FORMS OR-658B, OR-658C, OR-658D HAVE BEEN CHECKED AND RE-VIEWED FOR COMPLETENESS AND ACCURACY. THIS OFFICE HEREBY CERTIFIES THAT DOE HAS THE FINANCIAL RESPONSIBILITY FOR THE RECOVERY AND/OR OTHER DISPOSITION OF THE URANIUM SCRAP COVER BY THIS REQUEST.

1. DATE
5-10-90

2. SIGNATURE
Dennis Bell

3. DOE OPERATIONS OFFICE
S&MM Branch
Idaho Operations Office

SECTION III - FOR USE BY THE OSMO IN REPLYING TO COGNIZANT ERDA OPERATIONS OFFICES

SLIGHTLY IRRADIATED MATERIAL

The uranium scrap described in Scrap Declaration No. ID-90-1 should be shipped to the Oak Ridge Y-12 Plant for recovery. Y-12 should receive the material in Project No. F-GE-0221-05C. Please call Dixie Bopp at FTS 626-2506 for an authorization to ship. Courtesy copy of the 741 document should be sent to John Miller, ORO-CSMO.

CC: A. King, Y-12
D. Bopp, Y-12

DATE 10-1-90

SIGNATURE John H. Miller

TITLE ORO-CSMO

FORM OR-658A (REV. 3/78)

United States Department of Energy
Oak Ridge Operations Office
URANIUM SCRAP SHIPPING DATA

SHIPPING METHOD CODES

A - COMMERCIAL VEHICLE (ARMED ESCORT)
B - COMMERCIAL VEHICLE (LTL)
C - GOVERNMENT VEHICLE (ARMED ESCORT)
D - OTHER METHODS (SPECIFY IN REMARKS)

DECLARATION NO. AND/OR SCRAP LOT NO.	SHIPPING COSTS FROM PRESENT LOCATION OF SCRAP TO:			SHIPPING METHOD CODE	NUMBER OF SHIPMENTS REQUIRED		NUMBER OF SHIPPING CONTAINERS/SHIPMENT		TOTAL NO. TRANSPORT INDEX UNITS/SHIPMENT	
	ERWIN, TN.	OAK RIDGE, TN.	WESTERLY, R.I.		FISSILE II	FISSILE III	FISSILE II	FISSILE III	FISSILE II	FISSILE III
ID-90-1		$250		D						

REMARKS

D = Commercial Carrier

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United States Department of Energy
Oak Ridge Operations Office

URANIUM SCRAP DECLARATION

1. LOCATION OF SCRAP: University of Utah — RIS: ZMV

2. DECLARATION NO.: ID-90-1 — SHEET 1 OF 1

3. SECURITY CLASSIFICATION OF SCRAP: ☒ UNCLASSIFIED ☐ CONFIDENTIAL BY ☐ SHAPE ☐ COMPOSITION

4. SHIPPING CONTAINER DATA (LOADED)

SERIAL NUMBER	TYPE CODE	SECURITY SEAL NO.	GROSS WT (POUNDS)
UU-AGN 1	F		200 Max
UU-AGN-2	F		200 Max
UU-AGN-3	F		200 Max

CONTAINERS: 3 — TOTAL WEIGHT:

5. PRIMARY (INNER) CONTAINER DATA

IDENTIFICATION NO.	TYPE CODE	WEIGHT (GRAMS) GROSS	TARE	NET
20481	3			
20474	"			
20475	"			
20470	3			
20442	"			
20476	"			
20478	3			
20473	"			
20469	"			
20386	"			
20395	"			
20391	"			
20387	"			
20393	"			
20389	"			
20394	"			
20390	"			
20388	"			
20392	"			
20396	"			
20385	"			

CONTAINERS: 21 — TOTAL NET WT.:

6. SCRAP CODE, SNM CONTENT & GENERATING PROJECT

ANSI CODE	GRAMS URANIUM	WT. % U-235	GRAMS U-235	PROJECT NUMBER
C04	148.7*	19.5	29.0	JKT03000D0
"	492.3*	"	96.0	
"	492.3*	"	"	
C04	148.7*	19.5	29.0	
"	492.3*	"	96.0	
"	"	"	"	
C04	297.4*	19.5	58.0	
"	"	"	"	
"	"	"	"	
"	18.5	"	3.6	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
"	"	"	"	
TOTAL U: 3380.8*		AVERAGE: 19.5	TOTAL U235: 659.2	

SHIPPING CONTAINER TYPE	CODE
DOT-6L (55 GAL)	A
DOT-6L (110 GAL)	B
DOT-6M (55 GAL)	C
DOT-6M (110 GAL)	D
DOT-SP (SPECIFY IN BLOCK 7)	E
OTHER (SPECIFY IN BLOCK 7)	F

PRIMARY CONTAINER TYPE	CODE
1 QT PLASTIC BOTTLE	1
2 QT PLASTIC BOTTLE	2
PLASTIC BAG OR WRAPPING	3
# 2 SEALED METAL CAN	4
# 3 OR LARGER SIZED METAL CAN	5
OTHER (SPECIFY IN BLOCK 7)	6

7. REMARKS

*Calculated values

F = 6J or 17H DOT spec. - 55 gal. steel drums with liners.

CSMO LOT NO.

F9

FORM-OR-658C (REV. 3/78)

United States Department of Energy
Oak Ridge Operations Office

DECLARATION NO. ID-90-1

SHEET 1 OF 1

DESCRIPTION OF DECLARED URANIUM SCRAP

SHIPPING CONT. SERIAL NO.	PRIMARY CONT. I. D. NO.	SCRAP DESCRIPTION
UU-AGN-1		3- AGN Reactor core fuel disks: right-circular cylinders of 25.6 cm diameter. Fuel is 19.5% enriched UO_2 particles homogeneously dispersed in polyethylene. #20481: 1 cm thick, total disk mass = 652 g #20474: 4 cm thick, total disk mass = 2157 g #20475: 4 cm thick, total disk mass = 2164 g
UU-AGN-2		3- AGN Reactor core fuel disks: same description as above. #20470: 1 cm thick, total disk mass = 657 g #20442: 4 cm thick, total disk mass = 2051 g #20476: 4 cm thick, total disk mass = 2065 g
UU-AGN-3		3- AGN Reactor core fuel disks: same description as above. #20478: 2 cm thick, total disk mass = 1267 g #20473: 2 cm thick, total disk mass = 1269 g #20469: 2 cm thick, total disk mass = 1273 g 12- AGN Safety and control rod fuel disks: right-circular cylinder of 4.7 cm diameter and 4 cm high, each disk is 79 g. Fuel is 19.5% enriched UO_2 particles homogeneously dispersed in polyethylene. #20386 #20395 #20391 #20387 #20393 #20389 #20394 #20390 #20388 #20392 #20396 #20385

F10

INSTRUCTIONS: THE DECLARATION NUMBER SHOWN IN THE UPPER RIGHT HAND CORNER OF THIS FORM SHOULD BE THE SAME NUMBER AS THAT SHOWN ON THE CORRESPONDING FORM OR-658C. THE SHIPPING AND PRIMARY CONTAINERS SHOULD BE LISTED IN THE SAME SEQUENCE AS LISTED IN THE CORRESPONDING FORM OR-658C. THE SCRAP DESCRIPTION MUST IDENTIFY ALL KNOWN CONSTITUENTS BY NAME AND AMOUNTS PRESENT AND MUST IDENTIFY THE PHYSICAL DIMENSIONS OF ALL ITEMS OTHER THAN POWDERS OR LIQUIDS.

REMARKS

CSMO LOT NO.

ORM OR-658D (REV. 3/78)

DOE/NRC FORM 741
(7-80) Previous editions are obsolete.
MANDATORY DATA COLLECTION
AUTHORIZED BY 10 CFR 30, 40, 50, 70,
75, 150, Public Laws 93-703, 93-438, 95-91

U.S. DEPARTMENT OF ENERGY AND U.S. NUCLEAR REGULATORY COMMISSION

NUCLEAR MATERIAL TRANSACTION REPORT

Approved by OMB
038-R0478
Approved by GAO
B-180225 (R0040)
Expires 6-30-83

1. Shipper's RIS	2. Receiver's RIS	3. Transaction No.	4. Correction No.	5. Processing Code	6. Reserved	7. Action Code	8. Data Code
ZWW	FZF	X2 GMS (27 Feb 91)		Shipper A / Receiver		Shipper A / Receiver	

Documentation: Page 2 of 2 pages

9. A. Name and address of shipper — C. License No. R-25
University of Utah
Nuclear Engineering Laboratory
1205 Merrill Engineering Building
Salt Lake City, UT 84112
C. Attention: G. M. Sandquist, Director
D. Telephone: (801) 581-7372

10. A. Name and address of receiver — B. License No.
Martin Marietta Energy Systems, Inc.
Y-12 Plant, P.O. Box 2009
Oak Ridge, TN 37831
C. Attention: A. King, Nuc. Mat. Rep.
D. Telephone: (615) 574-2572

11. No. of data lines
12. Nature of transaction
13. A. Shipped for account of — B. RIS: JSG
14. A. Shipped to account of — B. RIS: FZF

No.	Distribution of copies
1	ZWW
2	FZF(A. King)
3	FZF-QFA(J. Miller)
4	FZF-ZWW
5	JSG(M.A. Thom)
6	
7	
8	
9	

16. Transfer authority - contract, RM draft, or order numbers: C85-110763

17. Material type and description: ACN reactor fuel disks comprised of 19.5% enriched UO_2 particles homogeneously dispersed in a polyethylene matrix.

18. Export or import transfers: A. License No. / B. U.S. Port exit/entry

19. Transportation profile

Line	B. Carrier identification	C. Transfer point
1	TRSM	
2		
3		
4		
5		

19. Package identification

A. Model ID	B. Number
7A	1

20. Action date

	Month	Day	Year
A. Shipment	2	5	91
B. Shipper's correction			
C. Receipt			
D. Receiver's measurement			
E. Receiver's correction			

21. A. Miscellaneous
DOE Scrap Declaration No. ID-90-1.
Y-12 should receive this material in Project No. F-GE-0221-05C.
Y-12 Authorization No. PRL-987

B. Condon Note Attached: Yes ☐ No ☐
C. Condon Note Attached: Yes ☐ No ☐

22. Total gross weight: ~~<100 LBS, 22 Feb 91~~ 75 LBS, 25 Feb 91
23. Total volume

24. Shipper's data

Line No.	Type	Identification (Batch name)	No. of items	Project number	Material type	Comp/Facility code	Prog code	Owner code	Country control number	Key meas point	Meas ident	Gross weight	Net weight	Element weight	Element limit of error	Weight % isotope	Isotope weight	Isotope limit of error
1			1	J-KT-0300-000	20	C00		G	USUS0000			~~<100 lb.~~ 75 LB - 25 Feb 91	10.5 lb.	1086 grams		19.57%	217 grams	

22 Feb 91 GMS

24. Shipper's data — Signature of authorized official and date signed: Gary M Sandquist, 5 Feb 1991

25. Receiver's data — 1. Signature of authorized official and date signed

18 U.S.C., Section 1001, Act of June 25, 1948, 62 Stat. 749, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U.S. Government Printing Office: 1981-341-879/1471

DOE/NRC FORM 741
(7-80) *Previous editions are obsolete.*
MANDATORY DATA COLLECTION
AUTHORIZED BY 10 CFR 30, 40, 50, 70, 75, 150, Public Laws 83-703, 93-438, 95-91

U.S. DEPARTMENT OF ENERGY AND U.S. NUCLEAR REGULATORY COMMISSION

NUCLEAR MATERIAL TRANSACTION REPORT

Approved by OMB 038-R0478
Approved by GAO B-180225 (R0040)
Expires 6-30-83

1. SHIPPER'S RIS	2. RECEIVER'S RIS	3. TRANSACTION NO.	4. CORRECTION NO.	5. PROCESSING CODE (Shipper)	5. PROCESSING CODE (Receiver)	6. RESERVED	7. ACTION CODE (Shipper)	7. ACTION CODE (Receiver)	8. DATA CODE	DOCUMENTATION
ZWW	FZF	1		A			A			PAGE 1 OF 2 PAGES

9. A. NAME AND ADDRESS OF SHIPPER — B. LICENSE NO. R-25

University of Utah
Nuclear Engineering Laboratory
1205 Merrill Engineering Building
Salt Lake City, UT 84112

C. ATTENTION: G. M. Sandquist, Director
D. TELEPHONE: (801) 581-7372

10. A. NAME AND ADDRESS OF RECEIVER — B. LICENSE NO.

Martin Marietta Energy Systems, Inc.
Y-12 Plant, P.O. Box 2009
Oak Ridge, TN 37831

C. ATTENTION: A. King, Nuc. Mat. Rep.
D. TELEPHONE: (615) 574-2572

11. NO. OF DATA LINES:
12. NATURE OF TRANSACTION:
13. A. SHIPPED FOR ACCOUNT OF — B. RIS: JSG
14. A. SHIPPED TO ACCOUNT OF — B. RIS: FZF

NO.	DISTRIBUTION COPIES
1	ZWW
2	FZF(A. King)
3	FZF-QFA(J.Mille
4	FZF-ZWW
5	JSG(M.A. Thom)
6	
7	
8	
9	

16. TRANSFER AUTHORITY - CONTRACT, NM DRAFT, OR ORDER NUMBER: C85-110763

16. EXPORT OR IMPORT TRANSFERS: A. LICENSE NO.
B. U.S. PORT EXIT/ENTRY

17. MATERIAL TYPE AND DESCRIPTION:
AGN reactor fuel disks comprised of 19.5%-enriched UO_2 particles homogeneously dispersed in a polyethylene matrix.

18. TRANSPORTATION PROFILE / 19. PACKAGE IDENTIFICATION

A.	B. CARRIER IDENTIFICATION	C. TRANSFER POINT	A. MODEL ID	B. NUMBER
1	TRSM		7A	2
2				
3				
4				
5				

20. ACTION DATE

	MONTH	DAY	YEAR
A. SHIPMENT	2	5	91
B. SHIPPER'S CORRECTION			
C. RECEIPT			
D. RECEIVER'S MEASUREMENT			
E. RECEIVER'S CORRECTION			

21. A. MISCELLANEOUS
DOE Scrap Declaration No. ID-90-1.
Y-12 should receive this material in Project No. F-GE-0221-05C.
Y-12 Authorization No. PRL- 987

B. Canister Note Attached: Yes ☐ No ☐
C. Carrier Note Attached: Yes ☐ No ☐

22. TOTAL GROSS WEIGHT: ~~200~~ LBS, 22 Feb 91 / 150 LBS, 25 Feb 91 (initialed)

23. TOTAL VOLUME (Waste Transfers Only):

24. SHIPPER'S DATA

LINE NO. A	TYPE OF INV. CHANGE B	IDENTIFICATION (BATCH NAME) C	NO. OF ITEMS D	PROJECT NUMBER E	MATERIAL TYPE F	COMP FACILITY CODE G	PROC CODE H	OWNER CODE I	COUNTRY CONTROL NUMBER J	KEY MEAS POINT K	MEAS IDENT L	GROSS WEIGHT M	NET WEIGHT N	ELEMENT WEIGHT O	ELEMENT LIMIT OF ERROR P	WEIGHT % ISOTOPE Q	ISOTOPE WEIGHT R	ISOTOPE LIMIT OF ERROR S
1			2 (22 Feb 91, initialed)	J-KT-0300-010	20	C00		G	USU90000			~~200~~ lb. / 150 25 Feb 91 (initialed)	21.5 lb.	2210 grams		19.57%	442 grams	

24. SHIPPER'S DATA — SIGNATURE OF AUTHORIZED OFFICIAL AND DATE SIGNED: Gary M. Sandquist, 5 Feb 1991

25. RECEIVER'S DATA — SIGNATURE OF AUTHORIZED OFFICIAL AND DATE SIGNED:

18 U.S.C., SECTION 1001, ACT OF JUNE 25, 1948, 62 STAT. 749, MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION

F12

Correction Of DOE/NRC FORM 741

The Following corrections need to be made to DOE/NRC FORM 741 Nos. ZWW-FZF-1 & ZWW-FZF-2.

Corrections to ZWW-FZF-1:

(1) Block 22. TOTAL GROSS WEIGHT: Add" 150 lb. ".
(2) Block 24. Item D. NO. OF ITEMS: Add " 2 ".
(3) Block 24. Item M. GROSS WEIGHT: Change from " < 200 lb. " to " 150 lb. ".

Corrections to ZWW-FZF-2:

(4) Block 22. TOTAL GROSS WEIGHT: Add" 75 lb. ".
(5) Block 24. Item D. NO. OF ITEMS: Add " 1 ".
(6) Block 24. Item M. GROSS WEIGHT: Change from " < 100 lb. " to " 75 lb. ".

FOR HELP IN CHEMICAL EMERGENCIES INVOLVING SPILL, LEAK, FIRE OR EXPOSURE CALL TOLL-FREE 1-800-424-9300 DAY OR NIGHT

THIS MEMORANDUM

is an acknowledgment that a bill of lading has been issued and is not the Original Bill of Lading, nor a copy or duplicate, covering the property named herein, and is intended solely for filing or record.

Shipper's No. ZAW

Carrier's No. 403971

Tri-State Motor Transit (NAME OF CARRIER) SCAC _____ Date 2/5/91

TO: Consignee Martin Marietta Energy Systems for U.S. DOE	FROM: Shipper University of Utah Nuclear Engineering Laboratory for U.S. DOE
Street Y-12 Plant, P.O. Box 2009	Street 1205 Merrill Engineering Building
Destination Oak Ridge, TN Zip 37831	Origin Salt Lake City, UT Zip 84112
Route: I-15, I-84, I-80, U-77, State 2, I-29, I-435, I-70, I-270, I-255, I-64, I-435, I-70, I-270, I-255, I-64, I-57, I-24, I-65, I-265, I-40, State 2: 1844 mi.	Vehicle Number 245 / 448368

No. Shipping Units	HM	Kind of Packages, Description of Articles (IF HAZARDOUS MATERIALS - PROPER SHIPPING NAME)	HAZARD CLASS	I.D. Number	WEIGHT (subject to correction)	RATE	LABELS REQUIRED (or exemption)
1	RQ	Radioactive Material, Fissile, n.o.s.					
		UN2918 (Radionuclides); Weight: 1089.2 g Uranium, Enriched Urandium (less than 20%); Solid Metal Oxides;					
		10.8 mCi; Radioactive Yellow III labels applied; Radioactive Placard required; ~~[illegible]~~ Transport Index 50;					
		Fissile Class III; 217.2 g U-235, 870.5 g U-238, 1.5 g U-234; ~~[illegible]~~ Seal No. E-5173;					
		USA DOT 7A, Type A (DOT Spec 17H).					
		Notes: 1. In Case of Emergency, Contact University of Utah Police Department @ (801) 581-7944. Instruct dispatcher to notify responsible personnel listed on Nuclear Reactor Call List.					
		2. Transportation hereunder is for U.S. Department of Energy, and the actual total transportation charges paid to the carrier(s) by the consignor or consignee are assignable to, and are to be reimbursed by, the Government.					
		3. Letter of Instructions Attached.					
		4. Warning - Fissile Class III Shipment. Do Not Load More Than 1 Package per Vehicle.					
		5. See Attached Sheet.					

Remit C.O.D. to:
Address:
City: State: Zip:

COD Amt: $

C.O.D. FEE: Prepaid ☐ Collect ☐ $

NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

$ _____ Per _____

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

_____ (Signature of Consignor)

FREIGHT CHARGES: PREPAID [X] COLLECT ☐

RECEIVED, subject to the classifications and tariffs in effect on the date of issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destination and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment.
Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Per _____

PLACARDS REQUIRED: RADIOACTIVE

PLACARDS SUPPLIED: ☐ YES [X] NO — FURNISHED BY CARRIER

DRIVERS SIGNATURE: [illegible]

SPECIAL INSTRUCTIONS:

SHIPPER: UNIVERSITY OF UTAH - NUCLEAR ENGINEERING

PER: [illegible]

DATE: 5 FEB 1991 — MST

CARRIER: [illegible]

PER: [illegible]

DATE: 02-05-91

FORM # 9-BLS-C (3 PLY) REV. 1/86

FOR HELP IN CHEMICAL EMERGENCIES INVOLVING SPILL, LEAK, FIRE OR EXPOSURE CALL TOLL-FREE 1-800-424-9300 DAY OR NIGHT

THIS MEMORANDUM

is an acknowledgment that a bill of lading has been issued and is not the Original Bill of Lading, nor a copy or duplicate, covering the property named herein, and is intended solely for filing or record

Shipper's No. ZNW

Carrier's No. 403972

Tri-State Motor Transit (NAME OF CARRIER) SCAC _____ Date 2/5/91

TO: Consignee	Martin Marietta Energy Systems, Inc. for U.S. DOE	FROM: Shipper	University of Utah Nuclear Engineering Laboratory for U.S. DOE
Street	Y-12 Plant, P.O. Box 2009	Street	1205 Merrill Engineering Building
Destination	Oak Ridge, TN Zip 37831	Origin	Salt Lake City, UT Zip 84112
Route:	1844mi. - I-15,I-84,I-80,U-77,State 2,I-29,I435,I-70,I-270,I-255,I-64, I-57,I-24,I-65,I-265,I-40,State 58	Vehicle Number	384 / 448141

No. Shipping Units	HM	Kind of Packages, Description of Articles (IF HAZARDOUS MATERIALS - PROPER SHIPPING NAME)	HAZARD CLASS	I.D. Number	WEIGHT (subject to correction)	RATE	LABELS REQUIRED (or exemption)
2	RQ	Radioactive Material, Fissile, n.o.s.					
		UN2918 (Radionuclides); Weight: 1108.4 g Uranium each container, Enriched Uranium (less than 20%); Solid Metal Oxides;					
		11.1 mCi each container; Radioactive Yellow III labels applied; Radioactive Placard required; Transport Index 0.2 // Transport Index 25;					
		Fissile Class III; 221 g U-235, 885.7 g U-238, and 1.7 g U-234 each container; Seal Nos. // Seal Nos. E-5171 and E-5172;					
		USA DOT 7A, Type A (DOT Spec 17H).					
		Notes: 1. In Case of Emergency, Contact University of Utah Police Department @ (801) 581-7944. Instruct dispatcher to notify responsible personnel listed on Nuclear Reactor Call List.					
		2. Transportation hereunder is for U.S. Department of Energy, and the actual total transportation charges paid to the carrier(s) by the consignor or consignee are assignable to, and are to be reimbursed by, the Government.					
		3. Letter of Instructions Attached.					
		4. Warning - Fissile Class III Shipment. Do Not Load More Than 2 Packages per Vehicle.					
		5. See Attached Sheet.					

Remit C.O.D. to:
Address:
City: State: Zip:

COD Amt: $

C.O.D. FEE: Prepaid ☐ Collect ☐ $

NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding
$ _____ Per _____

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
_____ (Signature of Consignor)

FREIGHT CHARGES PREPAID ☒ COLLECT ☐

RECEIVED, subject to the classifications and tariffs in effect on the date of issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destination and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment.
Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation
Per _____

PLACARDS REQUIRED: RADIOACTIVE

SPECIAL INSTRUCTIONS:

PLACARDS SUPPLIED: ☐ YES ☒ NO - FURNISHED BY CARRIER
DRIVERS SIGNATURE: [signature]

SHIPPER: Utah St Univ - Nuclear Engr Lab
PER: [signature]
DATE: 5 Feb 1991 - 1500 MST

CARRIER: Tri-State
PER: [signature]
DATE: 2/5/91

FORM # 9-BLS-C (3 PLY) REV. 1/86

3. Fuel Transfer Correspondence List

During the shipping procedures the following personnel were involved with the shipment of the AGN-201M's fuel. These People were

J. H. Miller
Oak Ridge Operations Office
CSMO
P.O. Box 2001
Oak Ridge, TN 37831

M. A. Thom
EG&G Idaho, Inc.
P.O. Box 1625
Idaho Falls, ID 83415-3126

Adolphus King
Martin Marietta Energy Systems, Inc.
P.O. Box 2009
Oak Ridge, TN 37831-8169

Bob Berry
EG&G Idaho, Inc.
P.O. Box 1625
Idaho Falls, ID 83415-4113

A. J. Vinnola, Jr.
EG&G Idaho, Inc.
Fuel Manager
P.O. Box 1625
Idaho Falls, ID 83415-7112

Appendix G:

Survey Results

The following are the results of the surveys conducted during the decommissioning of the AGN-201M reactor. Included in this appendix are the survey results from:

1) Preliminary Defueling Surveys.

2) Concrete Block Surveys.

3) AGN Water Survey.

4) Thermal Column Survey.

5) The Fuel Surveys.

6) The Core Component Surveys.

7) Facility Survey For Continued Decommissioning Activities.

8) AGN Component Surveys.

9) The Surveys For Parts To Be Released For Unrestricted Use.

These different sections will allow easy identification of the parts of the reactor and the final disposition of those parts.

1. Preliminary Defueling Surveys

RADIOLOGICAL HEALTH DEPARTMENT Mail Code 05409
100 Orson Spencer Hall, University of Utah

TO: John Bennion DATE: 5/17/89

FROM: Nolan Smith

SUBJECT: AGN Contamination Survey

Main Office:
581-6141
Dosimetry
-4135

Other Locations:
Biology Bldg.
Room B-06
Ext. 5734
Medical Center
Room 4A-439
Ext. 4209
Building 502
Ext. 7485

I have surveyed the exterior of the AGN reactor using both direct metering and swipes and have found no removable contamination. This includes the floor immediately surrounding the reactor. Swipes were taken on the top, sides and base while direct measurement were mainly taken on the floor. I also surveyed the control rod mechanisms and found them free of external contamination. For the survey I used a TBM-3 geiger counter, serial # 092332, which has an overall efficiency for Cl-36 (a medium energy beta emitter) of approx. 22%

G3

33.77 2σ±

SAMPLE 5
POS A8
487 HR
ELT 12.00 MIN
CH 1
5.00 CPM
89.30 2σ± — Back
ST 1.00 MIN
CH 2
18.00 CPM
47.11 2σ±

Wipe samples taken from AGN cubicle - NEL 11/6/92

SAMPLE 6
POS A9
488 HR
ELT 14.32 MIN
CH 1
15.00 CPM
51.60 2σ± — side
ST 1.00 MIN
CH 2
10.00 CPM
63.20 2σ±

Bkg. 26 ± 10
Ch 1 = 9 ± 6
ch 2 = 17 ± 8

SAMPLE 7
POS A0
510 HR
ELT 16.82 MIN
CH 1
13.00 CPM
55.28 2σ± — Front
ST 1.00 MIN
CH 2
16.00 CPM
50.00 2σ±

Berkman LS-7000 # 7700259

SAMPLE 8
POS A1
495 HR
ELT 19.22 MIN
CH 1
11.00 CPM
60.18 2σ± — Top
ST 1.00 MIN
CH 2
15.00 CPM
51.60 2σ±

SAMPLE 9
POS A2
492 HR
ELT 21.53 MIN
CH 1
12.00 CPM
57.66 2σ± — cable tube
ST 1.00 MIN
CH 2
13.00 CPM
55.28 2σ±

2. Concrete Block Surveys

University of Utah Nuclear Engineering Laboratory
AGN-201M Decommissioning Project

Concrete Block Surveillance Procedure

Introduction

This report details the procedure to be followed during the removal of the concrete block used as shielding for the University of Utah Nuclear Engineering Laboratory (UUNEL) AGN-201M nuclear reactor. The removal of the block is a necessary first step in the decommissioning process of the AGN reactor. Surveillance of the block is required to preclude the release of potentially contaminated material from UUNEL. This procedure has been developed by the staff of UUNEL in collaboration with and the approval of the University of Utah Radiological Health Department (UURHD) following guidelines established by the U.S. Nuclear Regulatory Commission.

Safety Considerations

The removal of the concrete block requires transferring the block from its present location onto wooden pallets while monitoring the block to assure contaminated block is not removed from UUNEL. It has been estimated that there are approximately 5700 block enclosing the AGN reactor as shielding. Moving such a large number of blocks presents a great potential for injury to personnel and laboratory equipment. Therefore, at any time work is in progress in laboratory, the safety of personnel must be of primary concern. Carelessness, horse-play, and unsafe procedure will not be tolerated of the personnel engaged in the block removal and surveillance project. In addition, the overhead crane is not to be operated without the permission and/or presence of UUNEL staff. Furthermore, the TRIGA reactor tank will be covered with plastic sheeting whenever blocks are moved to prevent contamination of TRIGA tank water by concrete dust.

General Procedure

The block will be monitored with portable survey meters, viz. Technical Associates Model TBM-3S "friskers." Readings will be made such that the bottom surface of the detector is nominally one inch from the surface of the block. In order to reduce variability in the readings, only one person will be allowed to perform the survey portion of the procedure per shift. The survey will be performed during the transfer of block onto the pallets as follows.

Each pallet is to be loaded with five to seven layers of block (depending upon the lifting capacity of the overhead crane and other safety considerations) with each layer comprised of 15 blocks compactly arranged. The first stage of the survey involves passing the frisker over 15 blocks (i.e., one pallet layer) in situ. Any blocks with readings found to be in excess of the maximum allowable activity will be marked and set aside for retention within UUNEL. Blocks with an acceptable

activity level, which is defined in the next section, will be loaded onto the pallets in such a way that the surface of the block which was surveyed in the first stage is placed face down on the pallet or previously loaded layer of block. The second stage of the survey therefore involves passing the frisker over this surface of the block; any blocks with readings in excess of the maximum will again be marked and set aside. Following the loading of each layer, a record will be made on the special survey form prepared by UURHD (see attached sheet) in which the pallet number, number of block, maximum reading (in cpm), and the number of blocks set aside are recorded. In this manner, individual pallets will be loaded. Plastic sheeting will be used to cover loaded pallets to prevent accidental contamination. A radiation safety technician from UURHD will be contacted to perform an independent survey of loaded pallets to verify and assure blocks exceeding the criteria of acceptability are not released from UUNEL.

Upon completion of the block transfer and surveillance, and the final independent survey by UURHD, the sealed utility door located on the west wall of the reactor room will be opened to allow for the removal of approved block. The overhead crane will be used to aid in the transfer of the pallets from UUNEL onto flatbed trucks. Following removal of the loaded pallets, the utility door will be resealed as quickly as possible to minimize TRIGA reactor downtime. Steps will be taken to assure adequate security of the UUNEL during the entire period the utility entrance is breached.

Acceptable Activity Limits

The criterion for the rejection of concrete block as contaminated material as recommended by the Radiological Health Department is a measurable count rate in excess of twice the average area background count rate on the day of measurement. The average area background in the vicinity of the present location of the block runs between 100 to 150 cpm on the TBM-3S. Blocks exceeding a count rate of 250 cpm on any surface will be rejected as contaminated material. These blocks will be marked and set aside. Blocks with a count rate at or below 250 cpm will be stacked on pallets and will be removed from UUNEL.

Final Disposition

Once the blocks have been surveyed, and only those at or below the acceptable activity limit have been transferred onto pallets, they will be subjected to a final survey to be performed by UURHD. Following approval by UURHD that the block meet the criteria of acceptability, the block will be transferred to the University of Utah Broad Form License No. UT18-00001. The block will subsequently be released from UUNEL to a preapproved contactor for final disposition.

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: IRM-35 Serial #: 087129
Bkg for meter: 90 cpm Calibration Date: 1/20/87
110 ground

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
1	15	110	0
	15	120	0
	15	100	0
	15	110	0
	15	110	0
	15	120	0
2	15	110	0
	15	110	0
	15	110	0
	15	110	0
	15	110	0
	15	110	0
	15	110	0
3	15	110	0
	15	110	0
	15	100	0
	15	120	0
	15	110	0
	15	111	1
	15	110	0
	15	115	0

SURVEYED BY: [illegible] DATE: 1/25/87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: RM-35 Serial #: 057129
Bkg for meter: 120 cpm Calibration Date: 10/87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
7	12	100	0
	15	100	0
	15	100	0
	15	100	0
	15	108	0
	5	103	0
	15	106	0
	5	100	0
	5	108	0
	10	100	0

SURVEYED BY: [illegible] DATE: 1/29/87

~~11/9/87~~

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-3S Serial #: 087129
Bkg for meter: 140 cpm Calibration Date: 9/15/87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
1	90	220	0
2	90	230	0
3	90	190 or 200	0

SURVEYED BY: Henry Lindsley DATE: 11/9/87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-3S Serial #: 087129
Bkg for meter: 150 cpm Calibration Date: 9/15/87

Buck ground = 150
Level = 100 ground = 150

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
4	L2 15	220	0
	L3 15	200	0
	L4 15	200	0
	L5 15	200	0
	L6 15	170	0
5	L1 15	180	0
	L2 15	200	0
	L3 15	200	0
	L4 15	200	0
	L5 15	200	0
	L6 15	180	0
6	L1 15	180	0
	L2 15	200	0
	L3 15	180	0
	L4 15	180	0
	L5 15	180	0
	L6 15	180	0

SURVEYED BY: JEFF BUHLER DATE: 11.11.87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-3s Serial #: 047129
Bkg for meter: ~~80~~ cpm Calibration Date: 9-15-87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
1	L1 ~~15~~	160	~~2~~
	L2 15	160	~~0~~
	L3 15	160	~~2~~
	L4 15	160	~~0~~
	L5 15	160	~~0~~
	L6 15	160	~~0~~
8	L1 15	140	0
	L2 15	140	~~0~~
	L3 15	150	~~0~~
	L4 15	140	~~2~~
	L5 15	140	~~0~~
	L6 15	180	0
9	L1 15	~~160~~ 160	2
	L2 15	140	~~0~~
	L3 15	140	~~0~~
	L4 15	120	~~0~~
	L5 15	140	0
	L6 15	150	~~0~~
18	L1 15	130	~~0~~
	L2 15	60	~~0~~
	L3 15	140	~~0~~

BACKGROUND (AVE 60 GROUND 60

SURVEYED BY: Henry Lindsley DATE: 11/12/87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-3S Serial #: 087129
Bkg for meter: 100 cpm Calibration Date: 9-15-87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
10	L4 15	140	0
	L5 15	140	0
	L6 15	~~140~~ 160	0
H.L. 11	L1 15	140	0
	L2 15	160	0
	L3 15	120	0 11/12/87
	L4 15	140	0 11-13-87
	L5 15	140	0
	L6 15	140	0
12 J.B	L1 15	140	0
	L2 15	140	0
	L3 15	140	0
	L4 15	140	0
	L5 15	140	0
	L6 15	140	0
13	L1 15	140	0
	L2 15	140	0
	L3 15	140	0
	L4 15	140	0
	L5 15	120	0
	L6 15	120	0

CAVE 6C GREENLAND 100 BACKGROUND

SURVEYED BY: Henry Lindsley and Jeff Buhler DATE: 11/12/87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-3S Serial #: D87129
Bkg for meter: 80 cpm Calibration Date: 9/15/87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
14	L1 15	120	0
	L2 15	140	0
	L3 15	120	0
	L4 15	120	0
	L5 15	120	0
	L6 15	140	0
15	L1 15	120	0
	L2 15	160	0

11/13/87
11-16-87

BACKGROUND 11/16/87
CAVE 80
GROUND 60

SURVEYED BY: Henry Lindsley DATE: 11/13/87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-3 Serial #: 057129
Bkg for meter: 60 cpm Calibration Date: 9/15/87

Mark for Palet	Number of Blocks		Maximum Reading (cpm)	Number Set Aside (above background)
15	L3	15	120	0
	L4	15	110	0
	L5	15	120	0
	L6	15	150	0
16	L1	15	120	0
	L2	15	120	0
	L3	15	140	0
	L4	15	140	0
	L5	15	140	0
	L6	15	120	0
17	L1	15	120	0
	L2	15	120	0
	L3	15	140	0
	L4	15	120	0
	L5	15	140	0
	L6	15	120	0
11	L1	15	120	0
	L2	15	120	0
	L3	15	120	0
	L4	15	140	0
	L5	15	140	0

Background = 80 + Ground = 60

11/16/87

SURVEYED BY: Henry Lindsley
Jeff Buhler

DATE: 11/16/87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-3 Serial #: 087129
Bkg for meter: 60 cpm Calibration Date: 9/15/87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
18	L6 15	120	0
19	L1 15	120	0
	L2 15	140	0
	L3 15	140	0
	L4 15	160	0
	L5 15	150	0
	L6 15	160	0

SURVEYED BY: Henry Lindsley Jeff Buhl DATE: 11/16/87

Special Form for Concrete Block Pallet Survey
for the AGN Reactor Decommissioning

Meter used: TBM 35 Serial #: 06164
Bkg for meter: ~~50~~ 100 cpm Calibration Date: 6/25/87
Averaged beta detection efficiency: .22 (counts/disintegration)

Pallet Number	Side Monitored Facing:	Maximum Reading (cpm)
#3	E	100
#4	E	100
#4	top	120
#4	W	100
#3	E	100
#11	N	120
#12	N	120
#13	N	170
#11	E	170
#12	E	150
#13	E	100
#11	S	100
#12	S	100
#13	S	170
#13	W	120
#12	W	120
#11	W	100
#17	N	100
#16	N	100
#16	E	100
#17	E	100
#17	S	120

SURVEYED BY: Christy M. Fox DATE: 11/16/87

Special Form for Concrete Block Pallet Survey
for the AGN Reactor Decommissioning

Meter used: Ludlum 25 Serial #: 06614
Bkg for meter: 100 cpm Calibration Date: 6/25/87
Averaged beta detection efficiency: .22 (counts/disintegration)

Pallet Number	Side Monitored Facing:	Maximum Reading (cpm)
#1	N	100
#1	E	100
#1	W	100
#2	N	100
#2	E	100
#2	S	100
#2	W	100
#~~15~~ 18	N	100
#~~15~~ 18	E	150
#~~15~~ 18	S	100
#~~15~~ 18	W	100
#8	N	100
#8	E	100
#8	W	100
#9	N	100
#9	E	100
#9	W	100
#5	E	100
#6	E	130
#7	E	100
#7	W	100
#8 CM7 11/16/87	W	100

SURVEYED BY: Christy M. Egan DATE: 11/16/87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-3S Serial #: 087129
Bkg for meter: 100 cpm Calibration Date: 9/15/87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
20	L1 15	160	~~0~~
	L2 15	120	~~0~~
	L3 15	120	0
	L4 15	110	0
	L5 15	120	~~0~~
	L6 15	120	0
21	L1 15	120	0
	L2 15	120	0
	L3 15	120	0
	L4 15	140	0
	L5 15	140	0
	L1 15	120	0
22	L1 15	120	0
	L2 15	120	0
	L3 15	120	0
	L4 15	no	0
	L5 15	130	0
	L6 15	150	0

Background ave = 100, ground = 60

SURVEYED BY: Henry Lindsley
Jeff Buhler

DATE: 11/15/87

Special Form for Concrete Block Pallet Survey
for the AGN Reactor Decommissioning

Meter used: TBM35 Serial #: 061164
Bkg for meter: 100 cpm Calibration Date: 6/25/87
Averaged beta detection efficiency: .22 (counts/disintegration)

Pallet Number	Side Monitored Facing:	Maximum Reading (cpm)
# 16	S	100
# 17	W	100
# 18	W	120
# 10	S	100 — Christy M. Fejes 11/16/87
# 10	E	100
# 10	N	120 bkg 120 11/20/87
# 10	W	170 max
# 14	S	120
# 14	E	120
# 14	N	120
# 14	W	120
# 22	S	120
# 22	E	180 max
# 22	N	100
# 22	W	120
# 22	top	180 max
# 20	N	100
# 20	W	170
# 20	E	170
# 20	S	120
# 24 21 Cont	top	140

SURVEYED BY: Christy M. Fejes DATE: 11/20/87

Special Form for Concrete Block Pallet Survey
for the AGN Reactor Decommissioning

Meter used: TBM-GS Serial #: 066164
Bkg for meter: 120 cpm Calibration Date: 6/25/87
Averaged beta detection efficiency: .22 (counts/disintegration)

Pallet Number	Side Monitored Facing:	Maximum Reading (cpm)	
20	N	120	
20	W	140	
20	E	120	
19	N	100	
19	E	100	
19	S	140	
19	W	140	
19	top	180 max	Christy M. Fejes 11/20/87
20	top	120	
15	W	100	bkg 100 11/28/87
15	N	100	
15	E	120	
15	S	100	
7	top	120	
18	top	100	
10	top	120	
17	top	100	
12	top	120	
2	top	120	
18	E	120	
13	top	120	
20	E	80	

SURVEYED BY: Christy M. Fejes DATE: 11/28/87

Special Form for Concrete Block Pallet Survey
for the AGN Reactor Decommissioning

Meter used: Ludlum Serial #: 066164
Bkg for meter: 80-140 cpm Calibration Date: 6/25/87
Averaged beta detection efficiency: .22 (counts/disintegration)

Pallet Number	Side Monitored Facing:	Maximum Reading (cpm)
None 20	N	100
2x6 20	W	120
20	S	80
18	top	80
#9	top	140
#4	top	100
#7	S	120
#7	N	120
#6	N	80
#6	S	180 max
#5	top	120
#4	N	100
#4	S	120
#3	top	80
#9	S	100
#8	top	120
#8	S	120
#10	top	180 max
#10	S	120
#11	top	100
#16	top	120

SURVEYED BY: Christy M. Fiss DATE: 11/28/87

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM-35 Serial #: 087129
Bkg for meter: 90 cpm Calibration Date: 12/9/87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
4	L4 15	100	0
	L5 15	100	[illegible]
	L6 15	110	0
5	L1 15	[illegible]	[illegible]
	L2 15	120	0
	L3 15	110	0
	L4 15	120	[illegible]
	L5 15	120	[illegible]
	L6 15	130	[illegible]
6	L1 15	110	0
	L2 15	100	[illegible]
	L3 15	105	[illegible]
	L4 15	100	0
	L5 15	100	0
	L6 15	110	[illegible]
[illegible]	L1 15	106	[illegible]
	L2 15	110	[illegible]

SURVEYED BY: [signature] DATE: 1/27/88

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: T BM3S Serial #: 087129
Bkg for meter: _____ cpm Calibration Date: 12/30/87

Mark for Palet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
P1	15	100	0
	15	80	
	15	120	
	15	80	
	15	100	
	15	100	
P2	15	120	
	15	120	
	~~15~~ 15	100	
	5	100	

SURVEYED BY: T.V VINH TANG DATE: 03/02/88

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: Ludlum 3 Serial #: 066164
Bkg for meter: 70 cpm Calibration Date: 6/25/87
Averaged beta detection efficiency: .20 (counts/disintegration)

Mark for Pallet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
7	27 ~~Do~~ W side	70	
	N. side	70	
	east side	70	
	so. side	70	
	top	70	
16 blocks for short side 8	east	70	
	so	70	
27 blocks for long side 3	west	70	
	north	70	
	west	100	
	east	70	
	south	70	
4	west	70	
	south	70	
	east	70	
	north	70	
1	north	70	
—	west	70	
9	north	70	
	west	70	

SURVEYED BY: Kristy M. Flynn DATE: 3/25/88

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM 3S Serial #: 092332
Bkg for meter: 50 cpm Calibration Date: 1/4/88
Averaged beta detection efficiency: .20 (counts/disintegration)

Mark for Pallet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
6	N side	100	•
	Top	100	
	E side	100	
	S side	100	
	W side	100	
2	N side	90	
	E side	100	
	S side	100	
	W side	112	
	Top	70	

SURVEYED BY: Nolan J Smith DATE: 3/25/88

Special Form for Concrete Blocks Survey
for the AGN Reactor Decommissioning

Meter used: TBM35 Serial #: 066164
Bkg for meter: 70 cpm Calibration Date: 6/25/88
Averaged beta detection efficiency: .20 (counts/disintegration)

Mark for Pallet	Number of Blocks	Maximum Reading (cpm)	Number Set Aside (above background)
9	west	100	*
	south	100	
	east	90	
	north	70	
10	top	100	
	west	70	
* blocks	south	100	
18 short side	north	70	
23 long side			
4	top	120 max	
3	top	100	
9	top	100	
5	top	70	
1	top	110	
1	east	70	

SURVEYED BY: Christy Jr. Fleja DATE: 3/25/88

3. AGN Water Survey

Background

46764

Water 1 - 47278

2 - 46025

3 - 46732 2-4 - 46388

4 - 46407

Background

45834

46246 46040

net = 348

Activity = $\frac{348}{533}$ = 0.56 nCi/l

John S. Bennion

Analysis of AGN Shielding Water

September 22, 1989

Counted sample of water from AGN tank on HPGe detector for 30 minutes. No observable photopeaks besides Co-60 and Mn-54 background and K-40. Sample was taken on 9/2/89 and counted the same day.

John S. Bennion

4. Thermal Column survey

THE UNIVERSITY OF UTAH

Memorandum

26 February 1990

To: Gary Sandquist, Director
Nuclear Engineering Laboratory

From: Byron Hardy, Health Physicist
Radiological Health

Re: Survey of AGN thermal Column

On 23 February 1990, I performed a spot check for evidence of residual contamination on the lead shielding (bricks) which had been removed from the AGN reactor. Using a calibrated TBM-3 contamination survey meter I found no detectable radioactive contamination on bricks originating in the AGN reactor.

Radiological Health Department
100 Orson Spencer Hall
Salt Lake City, Utah 84112
(801) 581-6141

5. Fuel Surveys

THE UNIVERSITY OF UTAH

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
MEB 3008
SALT LAKE CITY, UTAH 84112

5 May 89

To: RSC.
From: AGN Reactor Supervisor

Robert Huffman, Asst RSO performed a radiation surveillance for removal of the RaBe neutron source from the AGN-201 Core. Asst RSO (RJH) and AGN RS (GMS) agreed to delay a physical wipe test and count of the RaBe source until disposal by Rad Health to reduce personnel exposure (ALARA). Source will be stored in a dry, shielded container pending disposal

Gary Sandquist

Ra-Be Neutron Source

5/17/89 - Moved source container from shielded location on upper level of reactor room near AGN to lower level against the TRIGA tank in the NE corner to provide shielding. Concrete blocks were placed around container to prevent access to the hot spot where surface radiaton dose is approx. 120 mr/hr. Radiation levels were as follows:

Max surface dose of concrete shield: 3 mr/hr
Max dose at three feet:
Max dose on tope surface of shield: 2 mr/hr

The movement of the source was recorded by the EPA's PIC detector. Before movement the reading was approx. 16 μr/hr. (Normal background is approx. 9.8 - 10.4 μr/hr) Transfer of the container by crance to the lower level resulted in a spike which decreased as the source was placed on the lower level. (Background reading regained) The lower level provides much more shielding as the line of sight to the detector must pass through the foundation, ground, etc. When transferred behind the tank, the PIC reading was back to normal.

Leak Tested 8/22/89 - Nolan Smith RHD

John S. Bennion

RADIOLOGICAL HEALTH DEPARTMENT Mail Code 05409
100 Orson Spencer Hall, University of Utah

TO: John Bennion / Reactor Lab DATE: 9/14/89

FROM: Nolan Smith

SUBJECT: Source Leak Test and Calibration

Main Office:
581-6141
Dosimetry
-4135

Other Locations:
Biology Bldg.
Room B-06
Ext. 5734
Medical Center
Room 4A-439
Ext. 4209
Building 502
Ext. 7485

This memo is to inform you that:

1) the wipe taken on the 10 mCi Ra, Be start-up source showed no sign of any leakage, and

2) The "Dosimeter" Area Monitor was calibrated and found to be within limits for exposure rate measurements.

G36

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 8/24/89

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mrem/hour (@ surface) α	β	γ	Total
1	SR-1 Fuel Disk # 20386	2	D							16 mR/hr β,γ
1	"	3	D	2465	28397	41620dpm				
1	"	3	WA	503	495	724 dpm/entire surface				
2	SR-1 fuel disk # 20345	2	D							16 mR/hr β,γ
2	"	3	D	24849	24841	36350dpm				
2	"	3	WA	504	496	724 dpm/entire surface				
3	SR-1 fuel disk # 20391	2	D							16 mR/hr β,γ
3	"	3	D	22989	22981	35810dpm				
3	"	3	WA	631	623	910 dpm/entire surface				

DETECTOR USED: REMARKS:

(1) Background counting rate at 1205 MEB (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.

(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:
α background = 8cpm
β,γ background = 0.02 mR/hr

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: CB7129 Calibration Date: 6/23/89
Other: 2=Ludlum Model 19 # 7950 cal. 7/28/89
3=Ludlum α-scint. Model 43-1 # PR02132

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm² wipe counted with an alpha detector.
WG = 100-300 cm² wipe counted with a portable G-M.
WL = 100-300 cm² wipe counted with a liquid scintillation counter (^{3}H).
WGS = 100-300 cm² wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: _____

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 8/24/89

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mrem/hour (@ surface) α	β	γ	Total
4	SR-1 Fuel Disk #20387	2	D							16 mR/hr B,Y
4	"	3	D	25138	25130	36290 dpm				
4	"	3	WA	772	766	1111 dpm/entire surface				
5	#20110 Core Fuse	2	D							12 mR/hr B,Y
5	"	3	D	56087	56079	80700 dpm				
5	"	3	WA	671	663	953 dpm/entire surface				

DETECTOR USED: REMARKS:

(1) Background counting rate at _____ (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.
(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: _____ Calibration Date: _____
Other:

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm^2 wipe counted with an alpha detector.
WG = 100-300 cm^2 wipe counted with a portable G-M.
WL = 100-300 cm^2 wipe counted with a liquid scintillation counter (^3H).
WGS = 100-300 cm^2 wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: _____

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 8/25/89

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mrem/hour (@ surface) α	β	γ	Total
1	SR-2 Fuel Disk #20393	2	D					15 mR/hr	β,γ	
1	"	3	D	23542	23535	38080 dpm				
1	"	3	WA	1124	1117	1618 dpm/entire surface				
2	SR-2 Fuel Disk #20389	2	D					15 mR/hr	β,γ	
2	"	3	D	21871	21864	30530 dpm				
2	"	3	WA	547	550	787 dpm/entire surface				
3	SR-2 Fuel Disk #20394	2	D					16 mR/hr	β,γ	
3	"	3	D	25407	25400	37620 dpm				
3	"	3	WA	939	932	787 dpm/entire surface				

DETECTOR USED: REMARKS:

(1) Background counting rate at 1205 MEB (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.

(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:
α background = 7 cpm
β,γ background = 0.02 mR/hr

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: _____ Calibration Date: _____
Other: 2 = Ludlum Model 19 # 7950 cal, 7/28/89
3 = Ludlum α-scintillation probe Model 43-1 # PR02152

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm² wipe counted with an alpha detector.
WG = 100-300 cm² wipe counted with a portable G-M.
WL = 100-300 cm² wipe counted with a liquid scintillation counter (^{3}H).
WGS = 100-300 cm² wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: _____

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 8/25/89

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mrem/hour (@ surface) α	β	γ	Total
4	SL2-2 Fuel Disk # 20390	2	D							15 mR/hr β,γ
4	"	3	D	21490	21483	30990 dpm				
4	"	3	WA	1232	1225	1773 dpm/entire surface				
5	Coarse Red Fuel Disk # 20388	2	D							16 mR/hr β,γ
5	"	3	D	24739	24732	35730 dpm				
5	"	3	WA	451	444	649 dpm/entire surface				
6	Coarse Red Fuel Disk # 20392	2	D							16 mR/hr β,γ
6	"	3	D	22290	22283	31910 dpm				
6	"	3	WA	487	480	649 dpm/entire surface				

DETECTOR USED: REMARKS:

(1) Background counting rate at _____ (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.

(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: _____ Calibration Date: _____
Other:

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm^2 wipe counted with an alpha detector.
WG = 100-300 cm^2 wipe counted with a portable G-M.
WL = 100-300 cm^2 wipe counted with a liquid scintillation counter (^3H).
WGS = 100-300 cm^2 wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: Tom Bessin

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 8/25/89

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mrem/hour (@ surface) α	β	γ	Total
7	Coarse Rod Fuel Disk # 20396	2	D							15 mR/hr B,γ
7	"	3	D	29093	29086	44550 dpm				
7	"	3	WA	764	757	1100 dpm/entire surface				
8	Coarse Rod Fuel Disk # 20385	2	D							16 mR/hr B,γ
8	"	3	D	26912	26905	40480 dpm				
8	"	3	WA	647	640	930 dpm/entire surface				

DETECTOR USED: REMARKS:

(1) Background counting rate at _____ (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.

(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: _____ Calibration Date: _____
Other:

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm^2 wipe counted with an alpha detector.
WG = 100-300 cm^2 wipe counted with a portable G-M.
WL = 100-300 cm^2 wipe counted with a liquid scintillation counter (^3H).
WGS = 100-300 cm^2 wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: _____

AGN Core Surveys (Fuel)
August 24-25, 1989

1. Core Fuse
2. Safety Rod #1 (SR1)
3. Safety Rod #2 (SR2)
4. Coarse Rod #3 (CR3)

August 24, 1989
Core Fuse #20110 6.8 g
fixed alpha 72104, 40069 cpm
removable 691,639,682 cpm
Ludlum α # PRO2152
scalar # 33640
eff. Pu-239 = 69.5%
β,γ 12 mR/hr @ contact
#1:= TBM - 3S = 087129
α background = 8 cpm; β,γ = 0.02 mR/hr

SR1: Order of removal.

1. #20386 wt - 79g.
removable α 509, 488, 513 cpm = 724 dpm (entire surface)
fixed α 28925, 27884 cpm = 41620 dpm
#1 β,γ - 18 mR/hr @ contact
#2:= Ludlum #7950
Model 19
calibrated 7/28/89

2. #20395 wt - 79g.
removable α 496, 526, 491 = 726 dpm (entire surface)
fixed α 25263, 24435 = 36350 dpm
#2 β,γ - 16 mR/hr @ contact #2

3. #20391 wt. 79g.
removable α 658, 610, 625 = 910 dpm (entire surface)
fixed α 24885, 21093 = 35810 dpm

#3 β,γ - 16 mR/hr @ contact #2

4. #20387 wt. 79g.
removable α 735, 784, 797 = 1111 dpm (entire surface)
fixed α 225224, 25052, = 36290 dpm
#4 β,γ - 16 mR/hr @ contact #2

August 25, 1989 #2 back = 0.02 mR/hr α back = 7 cpm

SR2: Order of Removal:

1. #20393 wt. 79g.
removable α 1109, 1118, 1146 = 1618 dpm (entire surface)
fixed α 20618, 26465 = 38080 dpm
#1 β,γ - 15 mR/hr max. @ contact #2

2. #20389 wt. 79g.
removable α 547, 558, 536, = 787 dpm (entire surface)
fixed α 25391, 18350 = 36530 dpm
#2 β,γ - 15 mR/hr max. @ contact #2

3. #20394 wt. 79g.
removable α 976, 974, 866 = 1350 dpm (entire surface)
fixed α 24660, 26145 = 37620 dpm
#3 β,γ - 16 mR/hr max. @ contact #2

4. #20390 wt. 79g.
removable α 1195, 1261, 1241 = 1773 dpm (entire surface)
fixed α 21440, 21540 = 30990 dpm
#4 β,γ - 16 mR/hr max. @ contact #2

Coarse: Order of Removal:

1. #20388 wt - 79g.
removable α 455, 456, 443 = 649 dpm (entire surface)
fixed α 24831, 24647 = 35730 dpm
#5 β,γ - 16 mR/hr max. @ contact #2

2. #20392 wt. 79g.
removable α 463, 513, 486 = 701 dpm (entire surface)
fixed α 25650, 18930 = 36910 dpm
#6 β,γ - 16 mR/hr max. @ contact #2

3. #20396 wt. 79g.
removable α 4759, 778, 756 = 1100 dpm (entire surface)
fixed α 30960, 27225 = 44550 dpm
#7 β,γ - 15 mR/hr max. @ contact #2

4. #20385 wt. 79g.
removable α 665, 661, 614, = 930 dpm (entire surface)
fixed α 28134, 25690 = 40480 dpm
#8 β,γ - 16 mR/hr max. @ contact #2

back α = 8cpm
β,γ = 0.02 mR/hr (#2)

John S. Bennion

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 2-11-89

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mrem/hour (@ surface) α	β	γ	Total
1	Fission Det.	TAGM	D							5 mR/hr BG
1	"	"	Ludlum	D	2	-2	0			
1	"	"	"	WA	4	0	0			0
2	Fuel Disk #20415	Eberline	D							14 mR/hr BG
2	"	Ludlum	D	24471	24167	34466				
2	"	Ludlum	WA	42	34	69				
3	Fuel Disk #20471	Eberline	D							15 mR/hr BG
3	"	Ludlum	D	15657	15653	15250				
3	"	"	WA	64	60	102				

DETECTOR USED: REMARKS:

(1) Background counting rate at Fuel Disk (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.

(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:

TAGM: 0.01 mR/h @ 30 cpm
Eberline: 0.01 mR/h
Ludlum: 4 cpm

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: 027137 Calibration Date: 1/25/89
Other: Ludlum #PR02152 with a scaler #33640 calibrated
Eberline RO-2A #1203 calibrated 7/18/89

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm² wipe counted with an alpha detector.
WG = 100-300 cm² wipe counted with a portable G-M.
WL = 100-300 cm² wipe counted with a liquid scintillation counter (^{3}H).
WGS = 100-300 cm² wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: [signature]

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 6/3/87

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mrem/hour (@ surface) α	β	γ	Total
4	Front Disk # 26472	Eberline	D							14 mR/h
4	"	Ludlum	D	20417	20413	37720				
4	"	"	WA	71	67	104				
5	Front Disk # 26442	Eberline	D							15 mR/h
5	"	Ludlum	D	13707	13703	26370				
5	"	"	WA	62	58	112				
6	Front Disk # 26465	Eberline	D							15 mR/h
6	"	Ludlum	D	43667	43663	76330				
6	"	"	WA	452	448	721				

DETECTOR USED: REMARKS:

(1) Background counting rate at MEB 1205 (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.

(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: _____ Calibration Date: _____
Other:

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm² wipe counted with an alpha detector.
WG = 100-300 cm² wipe counted with a portable G-M.
WL = 100-300 cm² wipe counted with a liquid scintillation counter (^3H).
WGS = 100-300 cm² wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: _____

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 5/30/91

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mrem/hour (@ surface) α	β	γ	Total
7	Fuel Disk #20473	Eberline	D							14 mR/h 5,7
7	"	Ludlum	D	61334	61330	107:90				
7	"	"	WA	532	528	886				
8	Fuel Disk #20478	Eberline	D							14 mR/h 5,7
8	"	Ludlum	D	46124	46120	73550				
8	"	"	WA	580	576	1085				
9	Fuel Disk #20470	Eberline	D							13 mR/h 5,7
9	"	Ludlum	D	40359	40355	58550				
9	"	"	WA	198	194	286				

DETECTOR USED: REMARKS:

(1) Background counting rate at _____ (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.

(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: _____ Calibration Date: _____
Other:

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm^2 wipe counted with an alpha detector.
WG = 100-300 cm^2 wipe counted with a portable G-M.
WL = 100-300 cm^2 wipe counted with a liquid scintillation counter (^3H).
WGS = 100-300 cm^2 wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: _____

Form NEL-101
RSC Approval: 5/25/88

AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form #: _____
Survey Date: 5/12/91

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm^2	mrem/hour (@ surface) α	β	γ	Total
10	Smear disk #1-2481	Eberline	D							.4 mR/h
10	"	Ludlum	D	4312	4322	6315				
10	"	"	WA	192	188	364				
"	Polyethylene disk	TAGM	D	60	0	<MDA				
"	"	Ludlum	D	60	55	79				
"	"	"	WA	17	12	18				

DETECTOR USED: REMARKS:

(1) Background counting rate at _____ (location) was:
_____ cpm = _____ dpm = _____ mrem/hr.
(2) Background counting rate for this instrument was:
_____ cpm = _____ dpm. The LLD at 95% confidence level was:
_____ net dpm = _____ net μCi. No wipes wipes showed removable contamination above the LLD, except from the following items:

(3) Survey Instrument Codes:
TAGM = Technical Associates portable G-M with pancake probe (thin window):
Serial #: _____ Calibration Date: _____
Other:

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
WA = 100-300 cm^2 wipe counted with an alpha detector.
WG = 100-300 cm^2 wipe counted with a portable G-M.
WL = 100-300 cm^2 wipe counted with a liquid scintillation counter (^{3}H).
WGS = 100-300 cm^2 wipe counted with a gamma spectrometer.

SURVEY PERFORMED BY: _____

AGN Surveys
August 30, 1989

Fission Plate

1. Max. β,γ @ contact #1 = 8mR/hr
fixed α = 2 cpm gross = 0 net
removable α = 0
wt - 2506 g.

2. #20475 wt. - 2164g.
β, γ (#3) 14 mR/hr, 15 mR/hr
fixed α 15994, 23948 = 34460 dpm
removable α 27, 48 = 69 dpm/100cm²

3. #20471 wt. - 2157g.
β, γ (#3) 15 mR/hr max. on contact
fixed α 13765, 17549 = 25250 dpm
removable α 57, 71 = 102 dpm/100cm²

4. #20476 wt. - 2065g.
β, γ (#3) 14 mR/hr max. on contact
fixed α 26215, 15619 = 37720 dpm
removable α76, 65 = 109 dpm/100cm²

5. #20442 wt. - 2051g.
β, γ (#3) 15 mR/hr max. on contact
fixed α 9085, 18328 = 26370 dpm
removable α 78, 45 = 112 dpm/100cm²

6. #20469 wt. - 1273g.
β, γ (#3) 15 mR/hr max. on contact
fixed α 53049, 34284 = 76330 dpm
removable α 501, 402 = 721 dpm/100cm²

7. #20473 wt. - 1269g.

β, γ (#3) 14 mR/hr max. on contact
fixed α 46848, 75819 = 109090 dpm
removable α 461, 602 = 866 dpm/100cm^2

8. #20478 wt. - 1267g.

β, γ (#3) 14 mR/hr max. on contact
fixed α 51117, 41131 = 73550 dpm
removable α 754, 406 = 1085 dpm/100cm^2

9. #20470 wt. - 657g.

β, γ (#3) 13 mR/hr max. on contact
fixed α 40024, 40694 = 58550 dpm
removable α 197, 199 = 286 dpm/100cm^2

10. #20481 wt. - 652g.

β, γ (#3) 14 mR/hr max. on contact
fixed α 43894, 42357 = 63157 dpm
removable α 173, 211 = 304 dpm/100cm^2

α background at 5 cpm

#3:= Eberline Ion Chamber
Model RD-2A
Serial # 1263
Calibrated 7/28/89

Polyethylene disc 473g. background 0.02
β, γ (#1) 0.03, 0.02 mR/hr gross
fixed α 0 net, 47 net, 3 net, 55 cpm
removable α 9 net, 18 net, 10 net

John S. Bennion

Inspection of AGN Fuel

June 15, 1990

All containers secure

Radiation levels at surface of containers:

Black can: 0.2 mR/hr max.

Bottom core: 1.5 mR/hr max.

Top core: 1.8 mR/hr max.

Fission plate: 0.9 mR/hr max.

Radiation levels, Disk # 20470

@ contact

Beta shield closed: 1.4 mR/hr

Beta shield open: 28 mR/hr

@ 1 foot

Beta shield closed: 0.2 mR/hr

Beta shield open: 4.0 mR/hr

Instrument:

Eberline E-5008 Geiger Counter

SN 1015

Calibrated 12/18/89

John S. Bennion

6. Core Component Surveys

Background Readings

September 9, 1989

α counter: 6 cpm

4 cpm 4 cpm

3 cpm

(#1) TBM - 35 #087129 Calibrated 6/23/89

40 - 60 cpm = 0.015 - 0.02 mR/hr

(#2) Ludlum Model 19 #7950 Calibrated 7/28/89

(#3) Eberline Model RD-2A #1263 Calibrated 7/28/89

AGN Core Can

External Surface

β, γ (#1): 0.03 mR/hr gross count

fixed α: 8 cpm gross/entire surface 6 dpm/entire surface

removable α:

	gross	DPM
1 top	6 cpm, 2 cpm net	3 dpm/100-300cm^2
8 bottom	3 cpm	< MDA
9 middle	11 cpm	10 dpm/100cm^2
2 top	5 cpm	1 dpm/100cm^2
10 middle	7 cpm	4 dpm/100cm^2
5 bottom	4 cpm	< MDA
3 top	5 cpm	1 dpm/100cm^2
11 middle	4 cpm	<MDA
4 top	10 cpm	9 dpm/100cm^2
12 middle	12 cpm	12 dpm/100cm^2
6 bottom	6 cpm	3 dpm/100cm^2
inside of glory hole	10 cpm gross	9 dpm/entire inside surface

Bottom Flange

β,γ (#1): 0.03 mR/hr gross max. on contact

removable: 12 cpm gross = 12 dpm/flange surface

Top Flange

β,γ (#1): 0.03 mR/hr gross max. on contact

removable α: 10 cpm gross = 9 dpm/flange surface

α background check: 7 cpm, 3 cpm, 7 cpm, 8 cpm, = 6 cpm

Internal Core Can Surveys

β,γ (#1) Top half = 0.01 mR/hr max. on contact gross

Bottom half = 0.025 mR/hr max. on contact gross

fixed α: N/A

removable α:

	gross	DPM
1 top	5 cpm	<MDA
2 middle	6 cpm	< MDA
2 top	8 cpm	3 dpm/100cm^2
10 middle	3 cpm	<MDA
12 middle	12 cpm	9 dpm/i00cm^2
4 top	4 cpm	< MDA
3 top	5 cpm	1 dpm/100cm^2
11 middle	4 cpm	<MDA
7 bottom	ó cpm	<MDA
6 bottom	2 cpm	<MDA
8 bottom	4 cpm	<MDA
5 bottom	8 cpm	3 dpm/100cm^2

Bottom Flange (interior wipe) = 6 cpm gross <MDA

Top Flange (interior wipe) = 13 cpm gross 10 dpm /entire surface

α background check: 10 cpm, 2 cpm, 7 cpm, 4 cpm, = 6 cpm

Bottom Cover Plate

β, γ (#1) inside - 0.02 mR/hr max on contact gross

outside - 0.025 mR/hr max on contact gross

fixed α: inside - 8 cpm gross 3 dpm/entire surface

(entire surface) outside - 6 cpm gross <MDA

removable α: inside - 12 cpm gross 9 dpm/entire surface

outside - 3 cpm gross <MDA

Top Cover Plate

β, γ (#1) inside - 0.03 mR/hr max on contact gross
outside - 0.03 mR/hr max on contact gross
fixed α: inside - 4 cpm gross <MDA
outside - 5 cpm gross <MDA
removable α: inside - 7 cpm gross 1 dpm/300cm²
outside - 3 cpm gross 1 dpm/300cm²

Control and Safety Rod Guide Tubes

SR1

external surveys

β, γ (#1) 0.03 mR/hr max on contact gross
fixed α: 5 cpm gross <MDA
removable α: 6 cpm gross <MDA

internal surveys

β, γ N/A
fixed α: N/A
removable α: 4 cpm gross <MDA

CR

external surveys

β, γ (#1) 0.04 mR/hr max on contact gross
fixed α: 10 cpm gross 6 dpm/entire surface
removable α: 4 cpm gross <MDA

external surveys

β, γ N/A
fixed α: N/A
removable α: 7 cpm gross 1 dpm/entire surface

SR2

external surveys

β, γ (#1) 0.03 mR/hr max on contact gross
fixed α: 6 cpm gross <MDA
removable α: 14 cpm gross 10 dpm/entire surface

internal surveys

β, γ N/A
fixed α: N/A

removable α: 9 cpm gross 13 dpm/entire surface

FR

external surveys

β, γ (#1) 0.04 mR/hr max on contact gross

fixed α: 10 cpm gross 4 dpm/entire surface

removable α: 6 cpm gross <MDA

internal surveys

β, γ (#1) N/A

fixed α: N/A

removable α: 7 cpm gross <MDA

Thimble

β, γ (#1) 0.05 mR/hr

fixed α: 69 cpm/entire surface 89 dpm/entire surface

removable α: 69 cpm gross 89 dpm/ entire surface

Control and Safety Rods

SR1 Fuel Cladding

external surveys

β, γ (#1) 0.03 mR/hr max on contact gross

fixed α: 4 cpm gross <MDA

removable α: 11 cpm gross 7 dpm/entire surface

internal surveys

β, γ (#1) N/A

fixed α: N/A

removable α: 90 cpm 119 dpm/entire surface

Spring

β, γ (#1) 0.03 mR/hr max on contact gross

fixed α: 14 cpm gross 10 dpm

removable α: 40 cpm gross 47 dpm

End Plug

β, γ (#1) 0.03 mR/hr max on contact gross

fixed α: 3 cpm gross <MDA

removable α: 8 cpm gross 1 dpm/entire surface

Washer

β, γ (#1) 0.03 mR/hr max on contact gross

fixed α: 5 cpm gross <MDA

removable α: 6 cpm gross <MDA

SR2 Fuel Cladding

external surveys

β, γ (#1) 0.03 mR/hr max on contact gross

fixed α: 5 cpm gross <MDA

removable α: 6 cpm gross <MDA

α background check: 3 cpm, 4 cpm, 5 cpm, 7 cpm = 5 cpm

internal surveys

β, γ (#1) N/A

fixed α: N/A

removable α: 96 cpm gross 131 cpm/inside surface

Washer

β, γ (#1) 0.02 mR/hr max

fixed α: 3 cpm gross <MDA

removable α: 5 cpm gross <MDA

Graphite

β, γ (#1) 0.04 mR/hr max on contact gross

fixed α: 12 cpm gross 10 dpm/outside surface

removable α: 12 cpm gross 10 dpm/outer surface

Spring

β, γ (#1) 0.02 mR/hr max on contact gross

fixed α: not counted (may injure detector)

removable α: 9 cpm gross 6 dpm/outer surface

End Plug

β, γ (#1) 0.02 mR/hr max on contact gross

fixed α: 4 cpm gross <MDA

removable α: 5 cpm gross <MDA

John S. Bennion

AGN Surveys

9/12/89 Background

2,5,3 cpm: average: 3 cpm

Ludlum Model 1000 sn: 33640 and an α probe PR021524

TBM-35 sn: 087129 back= 0.03 mR/hr

AGN poly disc

β,γ (#1): 0.04 mR/hr

removable α (inscribed side): 19 cpm

removable α (non inscribed side): 12 cpm

fixed α (inscribed side): 40 cpm

Washed with micro solution

fixed α (inscribed side): 6 cpm

fixed α (non-inscribed side): 6 cpm

All wipes approx. 100 cm^2

AGN graphite reflector #8

removable α: 7 cpm

After wiping with acetone: 5 cpm

β,γ: < MDA

graphite reflector #6

removable α: 5 cpm

After wiping with acetone: 7 cpm

β,γ: < MDA

graphite reflector

removable α: 6 cpm

After wiping with acetone: 8 cpm

β,γ: < MDA

Background check: 6,3,6,6 cpm: average 5 cpm

graphite #5

removable α: 3 cpm

After wiping with acetone: 6 cpm

β,γ: < MDA

graphite #4

removable α: 3 cpm

After wiping with acetone: 3 cpm

β,γ: < MDA

graphite #3

removable α: 9 cpm

After wiping with acetone: 4 cpm

β,γ: < MDA

graphite #2

removable α: 5 cpm

After wiping with acetone: 7 cpm

β,γ: < MDA

graphite #1

removable α: 11 cpm

After wiping with acetone: 6 cpm

β,γ: < MDA

10/4/89

Fuse Support U-235 approx. 90 dpm removable 9/7/89

Control Rod 1 - Identify

9/7/89 - 130 removable α contamination

Ludlum α probe sn: PR021524 Model 43-1

Scaler sn: 33640

Background: 3,4,4: average: 4 cpm

exterior surface: 5 cpm - 4 cpm = 1 cpm net

interior decontaminated by Byron L. Hardy

Xetec sn: 11964/021819 Model 318-A2 w/ext 6 M Probe

Calibrated 7/13/89

Interior count rate: less than detectable (<1 cps)

β,γ: < MDA

TBM 35 Background #087129 cal. back= .025mR/hr

Fuse Support

Decontaminated by Bryon L. Hardy

removable α: 2 cpm gross < MDA

fixed α: 14 cpm gross

β,γ (TRM-35): 0.04 mR/hr gross = 0.015 mR/hr max on contact

2nd Decontamination

fixed α: 8 cpm gross over surface

removable α: 5 cpm gross

β,γ: .05 mR/hr max gross

3rd Decontamination - soak in dilute HNU_3

β,γ - .05 mR/hr max gross - unremovable

Control Rod 2 (identify)

9/7/89: 120 dpm removable α

Decontaminated by Byron L. Hardy

interior:

removable α: 5 cpm gross = 1 cpm net

fixed α: 2 cps max (Xetec)

2nd Decontamination by Bryon L. Hardy

fixed α: less than detectable with Xetec

removable α: 6 cpm gross

exterior:

fixed α: 3 cpm gross

removable α: 2 cpm gross

β,γ: < MDA

Course Rod

interior: removable α: 8 cpm gross

fixed α: < MDA (<1 cps)

β,γ: < MDA

exterior: removable α:

11/21/89

Fine Rod

sealed in plastic:

no detectable contamination:

4 polyethylene discs

1 graphite disc

1 spring

1 fastening plug

Coarse Rod

background

Ludlum Model 43-1, Ludlum Model 1000 4,3,4 xetec 0-1 cps background

clading:

interior α: 5,6,7 gross

exterior removable α: 11,6,5

interior β,γ: 2 cps max - Xetec # 11964, model 318A, cal. 7/13/89

exterior β,γ: 1 cps max

Spring

removable α: 5,2,5 gross

β,γ: max 1 cps

fixed α: 5,4,4 gross

Washer

removable α: 3,7,4 gross

β,γ: 0 cps

fixed α: 4,3,5

Graphite

removable α: 2,6,6 gross

β,γ - 1 cps max

fixed α: 5,7,4

End Cap

removable α: 4,5,6 gross

β,γ: 0 cps

fixed α: 6,5,3 gross

Course Rod Sealed in Plastic.

Background

α: 6,2,4 ave. 4 cpm Ludlum Alpha Probe (model 43-1) sn: FR021524

β,γ: 0-1 cps Xetec

SR1

Graphite

β,γ: 1 cps max gross

removable α: 4,4 cpm gross

fixed α: 4,5 cpm gross

Spring

β,γ: 1 cps max gross

removable α: 4,3 cpm gross

fixed α: 4,4 cpm gross

Washer

β,γ: 0 cps

removable α: 2,5,6 cpm gross

fixed α:

End Cap

β,γ: 0 cps

removable α: 6,4 cpm gross

fixed α: 2,5 cpm gross

Cladding

external removable α: 7,4,4 cpm gross/entire surface

internal removable α: 5,5 cpm gross/entire surface

β,γ int. & ext.: max reading 1 cps gross

fixed α ext: 4,5 cpm gross

SR1 Components Sealed in Plastic.

Core Reflector

Bottom:

removable α (entire surface): 14,13,12 cpm gross

Top:

removable α (entire surface): 12,7,9 cpm gross

Bottom (surface adjacent to fuel only):

removable α: 10,9,16 cpm gross

SR2

Cladding

external removable α: 4,4 cpm gross/entire surface

internal removable α: 64,70,46 cpm gross/entire surface

β,γ

fixed α ext:

11/24/89

background α: 4,4,5 cpm

β,γ: 0-1 cps

SR2 Cladding Sealed in Plastic-will either dispose or decontaminated waste

End cap, graphite, washer - previously sealed in plastic

spring:

β,γ: 0 cps Xetex #11964

removable α: 4,5 cpm gross

fixed α: 5,3 cpm gross

Spring was sealed in plastic.

Aluminum Core Support (approx. 14" long, hollow)

removable α: 15,10 cpm gross

Contaminated-sealed in plastic.

Screws, miscellaneous hardwood sealed in plastic.

John S. Bennion

Form NEL-101
RSC Approval: 5/25/88

AGN REACTOR DECOMMISSIONING & DISASSEMBLY
AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab Survey Form # _____
Survey Date 5-4-89

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS dpm	NET cpm	NET dpm 100 cm²	mRem/hour (@ surface) γ	β	n	Total
1	See Back	GFPC	SPC	<MDA	<MDA	0				
2	"	GFPC	SPC	<MDA	<MDA	0				
3	"	GFPC	SPC	<MDA	<MDA	0				
4	"	GFPC	SPC	<MDA	<MDA	0				
5	"	GFPC	SPC	<MDA	<MDA	0				
6	"	GFPC	SPC	<MDA	<MDA	0				
7	"	GFPC	SPC	<MDA	<MDA	0				
8	"	GFPC	SPC	<MDA	<MDA	0				
9	"	GFPC	SPC	<MDA	<MDA	0				
10	"	GFPC	SPC	<MDA	<MDA	0				
11	"	GFPC	SPC	<MDA	<MDA	0				
12	"	GFPC	SPC	<MDA	<MDA	0				

DETECTOR COUNTING YIELD USED:

REMARKS: High voltage ~ 2150 Volts
Argon Flow ≈ 1 bubble/sec
assume E_{gamma} ≈ 0.165 @ E_{gamma} = 1 MeV
Background count (mdA) ≈ 31.0 cpm

(1) Background counting rate at _____ was _____ cpm = _____ dpm = _____ mRem/hr. Direct radiation levels from the (area, item(s)) surveyed (were, were not) ≤ background radiation levels. Exceptions: _____.

(2) Background counting rate for this instrument was _____ cpm = _____ dpm. The LLD at 95% confidence level was _____ net dpm = _____ net μCi. No wipes above the LLD, except from the following items: _____.

(3) Survey Instrument Codes:
TAGM = Technical Associates portable GM with pancake probe (thin window).
Serial # _____
GFPC GAS-Flow proportional counter

(4) Survey Type Codes:
D = Dirct Survey over the entire surface of the object.
SG = 100-300 cm² wipe counted with a portable GM.
SL = 100-300 cm² wipe counted with a liquid scintillation counter (^{3}H).
SGS = 100-300 cm² wipe counted with a gamma spectrometer.
SPC - 100-300 cm² wipe counted with a gas flow proportional counter. Shelf #4

SURVEY PERFORMEDBY: Garrett Smith

Form NEL-101
RSC Approval: 5/25/88

AGN REACTOR DECOMMISSIONING & DISASSEMBLY
AGN COMPONENT RADIATION SURVEY RECORD FORM

Survey Location AGN Reactor, Nuclear Engineering Lab. Survey Form # _____
Survey Date _____

ITEM NO.	GENERAL DESCRIPTION	SURVEY INSTR(3)	SURVEY TYPE(4)	GROSS cpm	NET cpm	NET dpm 100 cm²	mRem/hour (@ surface) γ	β	n	Total
13	See Back	GFPC	SPC	<MDA	<MDA	0				
14	"	"	"	<MDA	<MDA	0				
15	"	"	"	<MDA	<MDA	0				
16	"	"	"	<MDA	<MDA	0				
17	"	GFPC	SPC	<MDA	<MDA	0				
18	"	"	"	<MDA	<MDA	0				
19	"	"	"	<MDA	<MDA	0				
20	"	"	"	<MDA	<MDA	0				
21	"	"	"	<MDA	<MDA	0				
22	"	GFPC	SPC	<MDA	<MDA	0				
23	"	GFPC	SPC	<MDA	<MDA	0				

DETECTOR COUNTING YIELD USED:

REMARKS: High Voltage - 2150 Volts
Argon Flow ≈ 1 bubble/sec
Assume $E_{\beta max}$ ≈ 0.165 @ 1 MeV
Background count 38 cpm

(1) Background counting rate at _____ was _____ cpm = _____ dpm = _____ mRem/hr. Direct radiation levels from the (area, item(s)) surveyed (were, were not) ≤ background radiation levels. Exceptions: _____.

(2) Background counting rate for this instrument was _____ cpm = _____ dpm. The LLD at 95% confidence level was _____ net dpm = _____ net μCi. No wipes above the LLD, except from the following items: _____.

(3) Survey Instrument Codes:
TAGM = Technical Associates portable GM with pancake probe (thin window).
Serial # _____
GFPC - Gas Flow proportional counter

(4) Survey Type Codes:
D = Direct Survey over the entire surface of the object.
SG = 100-300 cm² wipe counted with a portable GM.
SL = 100-300 cm² wipe counted with a liquid scintillation counter (^{3}H).
SGS = 100-300 cm² wipe counted with a gamma spectrometer.
SPC = 100-300 cm² wipe counted with a gas flow proportional counter Shelf #4

SURVEY PERFORMEDBY: Warren Smith

From Back of Form NEL-101

Item	General Description
1	Lead Shield East 100cm^2 T.C. out/Fuel in
2	Lead Shield West 100cm^2 T.C. out/Fuel in
3	Lead Shield North 100cm^2 T.C. out/Fuel in
4	Lead Shield South 100cm^2 T.C. out/Fuel in
5	Bottom of AGN Thermal Column, just after removal of T.C., fuel, and source in
6	Sidewall of Thermal Core Receptacle, East Fuel in, Thermal Core out
7	Sidewall of Thermal Core Receptacle, West Fuel in, Thermal Core out
8	Sidewall of Thermal Core Receptacle, North Fuel in, Thermal Core out
9	Sidewall of Thermal Core Receptacle, South Fuel in, Thermal Core out
10	Graphite Reflector Rim North, Thermal Core out, Fuel in
11	Graphite Reflector Rim South, Thermal Core out, Fuel in
12	Graphite Reflector Rim East, Thermal Core out, Fuel in
13	Graphite Reflector Rim West, Thermal Core out, Fuel in
14	Fuel Cover, Thermal Core out, Fuel in
15	Ra-Be Source in core just after removed 5/4/89
16	Control Rod 1 (CR1) Fuel Element
17	Control Rod 2 (CR2) Fuel Element
18	Fine Control Rod Wipe
19	Spring Assay Wipe (CR2)
20	Course Control Rod Spring Assay Wipe
21	CR1 Spring Assay Wipe
22	Fine Control Rod Spring Assay Wipe
23	Course Control Rod Fuel Wipe

John S. Bennion

7. Second Facility Survey

RPR 50C. CONTAMINATION WIPE TEST RESULTS

User: Sandquist - AGN Group #: 156 Date: 3/25/93 Task #: N/A

Bldg/Room(s): 1205-E ME13 Isotopes used: ^{3}H Activation Products

COUNTING INSTRUMENT DATA

Model, serial #: LS-7000 #7200259 Program/Setup: S-2

Preset: 1 minutes or — counts Units of Readout: CPM

Data attached ☐ Counting Channel: [1] [2] [3]

or entered here: Background: 9±6 1719

Isotope: ^{3}H Efficiency: 0.03 —

Expected Net Response to 1 RCL: 60

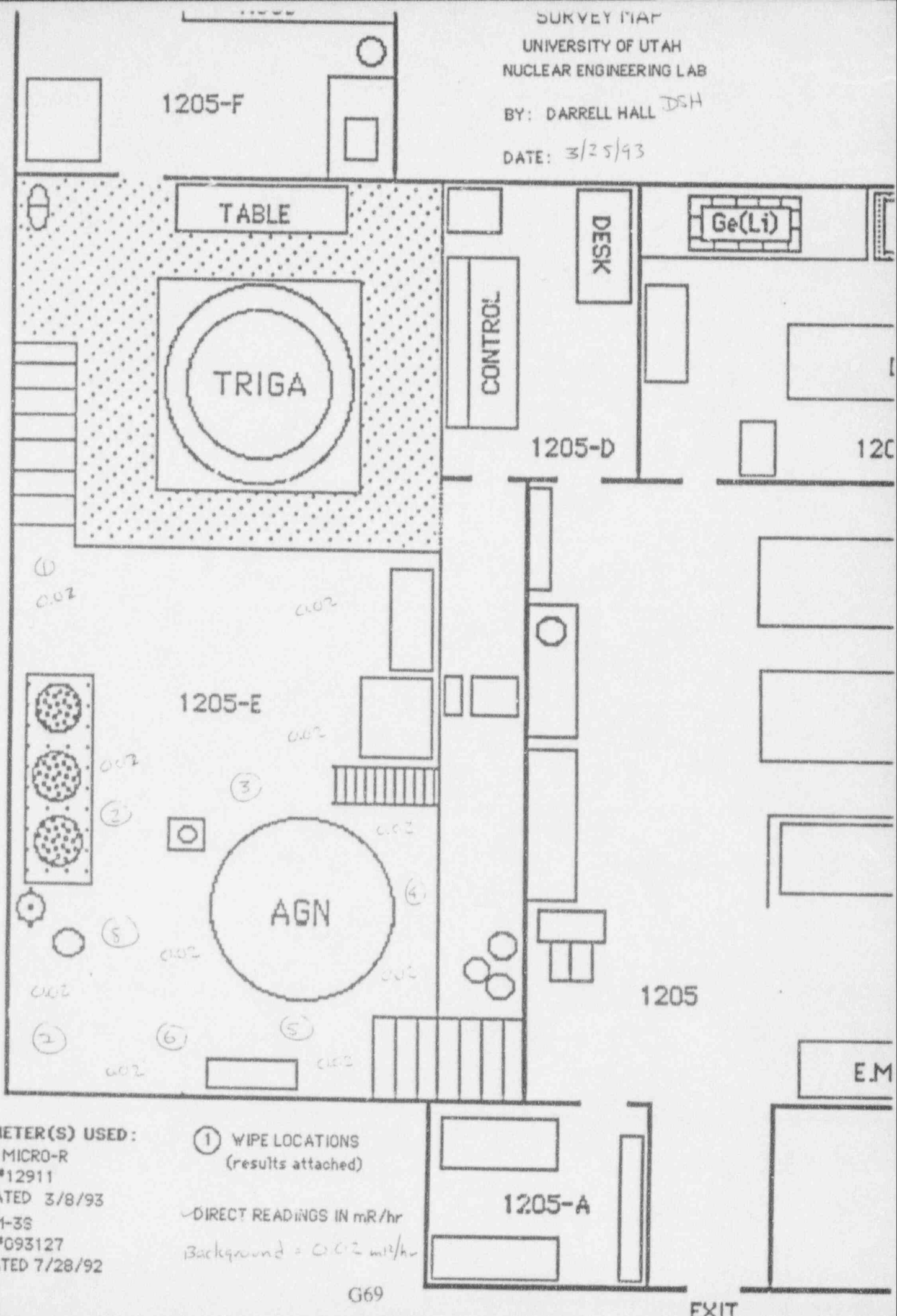
Isotope: ^{32}P Efficiency: 0.60 0.60

Expected Net Response to 1 RCL: 120

WIPE TEST COUNTING RESULTS

[A] Enter "100" for a 100 cm^2 wipe or "300" for a 300 cm^2 wipe.
[B] Net response in each channel in same units as recorded above.
If the net response in any channel exceeds that expected for 1 RCL of any isotope:
[C] enter the likely nuclide and
[D] enter the multiple of the RCL.

Line	Object or Location	[A] Area (cm^2)	[B] Net Channel Response [1]	[2]	[3]	[C] Likely Isotope	[D] Multiple of RCL
1	Line numbers	300	Ø	Ø			
2	correspond to survey	300	Ø	Ø			
3	numbers on N.L.	300	Ø	Ø			
4	survey map dated	300	Ø	Ø			
5	3/25/93	300	Ø	Ø			
6		300	Ø	Ø			
7		300	Ø	Ø			
8		300	Ø	Ø			
9							
10							
11							
12							
13							
14							



SURVEY METER(S) USED:
- LUDLUM MICRO-R
  SERIAL #12911
  CALIBRATED 3/8/93
- T.A. TBM-3S
  SERIAL #093127
  CALIBRATED 7/28/92

(1) WIPE LOCATIONS
(results attached)

DIRECT READINGS IN mR/hr

Background = 0.02 mR/hr

NEL 120J-E

3/25/93

CAL 780 MEM

PRG A

CNT CH H12	1TIMES
SCR	NO
AQC	NO
CALC	1
PST	1.00 MIN
CH 1	2.00 2σ%
	0 L
	317 U
CH 2	2.00 2σ%
	397 L
	655 U

SAMPLE	1
POS	6
	21 H#
ELT	2.37 MIN
CH 1	
	6.00 CPM
	81.33 2σ%
ST	1.00 MIN
CH 2	
	15.00 CPM
	51.60 2σ%

SAMPLE	2
POS	7
	20 H#
ELT	4.63 MIN
CH 1	
	2.00 CPM
	99.99 2σ%
ST	1.00 MIN
CH 2	
	13.00 CPM
	55.38 2σ%

SAMPLE	3
POS	8
	28 H#
ELT	6.88 MIN
CH 1	
	7.00 CPM
	75.42 2σ%
ST	1.00 MIN
CH 2	
	18.00 CPM
	47.11 2σ%

SAMPLE	4
POS	9
	45 H#
ELT	9.25 MIN
CH 1	
	4.00 CPM
	99.99 2σ%
ST	1.00 MIN
CH 2	
	17.00 CPM
	48.47 2σ%

SAMPLE	5
POS	10
	30 H#
ELT	11.50 MIN
CH 1	
	12.00 CPM
	57.66 2σ%
ST	1.00 MIN
CH 2	
	18.00 CPM
	47.11 2σ%

SAMPLE	6
POS	11
	42 H#
ELT	16.40 MIN
CH 1	
	8.00 CPM
	70.50 2σ%
ST	1.00 MIN
CH 2	
	15.00 CPM
	51.60 2σ%

SAMPLE	7
POS	12
	27 H#
ELT	18.65 MIN
CH 1	
	3.00 CPM
	99.99 2σ%
ST	1.00 MIN
CH 2	
	13.00 CPM
	55.38 2σ%

SAMPLE	8
POS	13
	33 H#
ELT	21.00 MIN
CH 1	
	7.00 CPM
	75.42 2σ%
ST	1.00 MIN
CH 2	
	18.00 CPM
	47.11 2σ%

8. AGN Component Surveys

Part #	Direct Counting	Alpha cpm	LSC cpm	Description
1	0.02 mR/hr			Safety Rod #2 (Empty)
2	0.02 mR/hr			Course and Fine Control Rod Thimbles
3	0.02 mR/hr	0	0/0	"O" Ring Core Can Top Plate
4	0.02 mR/hr			Paint Chips from Thermal Column
5	0.02 mR/hr			Safety Rod #2 Parts
6	0.02 mR/hr			Core Can Assembly Bolts and Spring
7	0.02 mR/hr			Assembly Bolts And Washers (Core Can)
8	0.02 mR/hr			Core Support Rod
9	0.02 mR/hr			Quantity-2 Safety Rod Thimbles
10	0.02 mR/hr			Safety #1 with Parts
11	0.02 mR/hr			Course Control with Parts
12	0.02 mR/hr			Fine Control Rod with Parts
13	0.02 mR/hr			Core Support
14	0.02 mR/hr	0	0/0	Core Can Top Plate
15	0.02 mR/hr	0	0/0	Core Can Bottom Plate
16	0.02 mR/hr	0	0/0	Polyethylene Disk
17	0.02 mR/hr	0	0/0	Graphite Reflector for Interior Core Can
18	0.02 mR/hr			Aluminum Core Can
19	0.02 mR/hr			Graphite Reflector Plate
20	0.02 mR/hr			Graphite Reflector Plate
21	0.02 mR/hr	0	0/4	Graphite Reflector (Bottom Interior Core Can)
22	0.02 mR/hr	0	-	Internal Thermal Column

23	0.02 mR/hr	0	0/0	External Thermal Column
24	0.02 mR/hr	0	0/0	Top Thermal Column Cover plate
25	0.02 mR/hr	1	0/0	Bottom Thermal Column Cover plate
26	0.02 mR/hr	0	0/0	Socket and Wrench
27	0.02 mR/hr	0	0/0	Glory Hole/Port Covers Assembly with Covers
28	0.02 mR/hr	0	0/0	Rod Drive
29	0.02 mR/hr	2	0/0	Rod Drive
30	0.02 mR/hr	0	0/0	Rod Drive
31	0.02 mR/hr	0	0/0	Rod Drive
32	0.02 mR/hr	0	0/0	Wood Plug in Access Port
33	0.02 mR/hr	0	0/0	Wood Plug in Access Port
34	0.02 mR/hr	0	0/0	Wood Plug in Access Port
35	0.02 mR/hr	0	0/0	Wood Plug in Access Port
36	0.02 mR/hr	0	0/0	Wood Plug in Access Port
37	0.02 mR/hr	2	0/0	Wood Plug in Access Port
38	0.02 mR/hr	0	0/0	Wood Plug in Access Port
39	0.02 mR/hr	0	0/0	Wood Plug in Access Port
40	0.02 mR/hr	0	0/0	Wood Plug in Access Port
41	0.02 mR/hr	0	0/0	Wood Plug in Access Port
42	0.02 mR/hr	0	0/0	Lead Plug in Access Port
43	0.02 mR/hr	0	0/0	Lead Plug in Access Port
44	0.02 mR/hr	0	0/0	Lead Plug in Access Port
45	0.02 mR/hr	0	0/0	Lead Plug in Access Port
46	0.02 mR/hr	0	0/0	Lead Plug in Access Port

47	0.02 mR/hr	0	0/0	Lead Plug in Access Port
48	0.02 mR/hr	0	0/0	Lead Plug in Access Port
49	0.02 mR/hr	0	0/0	Lead Plug in Access Port
50	0.02 mR/hr	0	0/0	Lead Plug in Access Port
51	0.02 mR/hr	0	0/0	Lead Plug in Access Port
52	0.02 mR/hr	0	0/0	Lead Plug in Access Port
53	0.02 mR/hr	0	0/0	Lead Plug in Access Port
54	0.02 mR/hr	0	0/0	Lead Plug in Access Port
55	0.02 mR/hr	0	0/0	Lead Plug in Access Port
56	0.02 mR/hr	0	0/0	Lead Plug in Access Port
57	0.02 mR/hr	0	0/0	Lead Plug in Access Port
58	0.02 mR/hr	0	0/0	Aluminum Fuse Support
59	0.02 mR/hr	0	0/0	Alignment Screws
60	0.02 mR/hr	0	0/0	Polyethylene Rod
61	0.02 mR/hr	0	0/0	Graphite Plug in Access Port
62	0.02 mR/hr	0	0/0	Graphite Plug in Access Port
63	0.02 mR/hr	0	0/0	Graphite Plug in Access Port
64	0.02 mR/hr	0	0/0	Graphite Plug in Access Port
65	0.02 mR/hr	0	0/0	Cadmium Plug
66	0.02 mR/hr	0	0/0	Graphite Plug in Access Port
67	0.02 mR/hr	0	0/0	Graphite Plug in Access Port
68	0.02 mR/hr	0	0/0	Graphite Plug in Access Port
69	0.02 mR/hr	0	0/0	Graphite Plug in Access Port
70	0.02 mR/hr	0	0/0	Aluminum Access Port Sleeve

71	0.02 mR/hr	0	0/0	Aluminum Access Port Sleeve
72	0.02 mR/hr	0	0/0	Aluminum Access Port Sleeve
73	0.02 mR/hr	0	0/0	Aluminum Access Port Sleeve
74	0.02 mR/hr	2	0/0	Graphite Reflector Column
75	0.02 mR/hr	0	0/0	Bottom Lead Shield Ring
76	0.02 mR/hr	0	0/0	Bottom Lead Shield Ring w/Access Ports
77	0.02 mR/hr	1	0/0	Top Lead Shield Ring w/Access Ports
78	0.02 mR/hr	0	0/0	Top Lead Shield Ring
79	0.02 mR/hr	0	0/0	Bottom Lead Shield Plate
80	0.02 mR/hr	0	0/0	Fission Gas Canister
81	0.02 mR/hr	0	0/0	Wood Plug in Access Port
82	0.02 mR/hr	0	0/0	Wood Plug in Access Port
83	0.02 mR/hr	0	0/0	Associated Core Assembly Bolts
84	0.02 mR/hr	0	0/0	Control Rod Support Plate
85	0.02 mR/hr	0	0/0	Cadmium Disks
86	0.02 mR/hr	see below	see below	Main Reactor Tank
87	0.02 mR/hr			Reactor Console

9. Unrestricted Component Survey

Parts to be released as unrestricted waste.

Core Can Cover, Top

Part # 14	Direct Counting	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	exterior
B	0.02 mR/hr	0	0/0	interior

Core Can Cover, Bottom

Part # 15	Direct Counting	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	exterior
B	0.02 mR/hr	1(0)	0/0	interior

Polyethylene Disk

Part # 16	Direct Counting	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	Opposite Disk Sides
B	0.02 mR/hr	0	0/0	Opposite Disk Sides

Thermal Column, Interior (22) And Exterior (23)

Part # 22/23	Direct Counting	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	1/4 of Wall, Interior (22)
B	0.02 mR/hr	0	0/0	1/4 of Wall, Interior (22)
C	0.02 mR/hr	0	0/0	1/4 of Wall, Interior (22)
D	0.02 mR/hr	0	0/0	1/4 of Wall, Interior (22)

E	0.02 mR/hr	0	0/0	Interior Floor (22)
F	0.02 mR/hr	0	0/0	1/4 of Wall, Exterior (23)
G	0.02 mR/hr	0	0/0	1/4 of Wall, Exterior (23)
H	0.02 mR/hr	0	0/0	1/4 of Wall, Exterior (23)
I	0.02 mR/hr	0	0/0	1/4 of Wall, Exterior (23)
J	0.02 mR/hr	0	0/0	Exterior Floor (23)

Thermal Column Cover Plate

Part # 24/25	Direct Counting	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	Top (24)
B	0.02 mR/hr	0	0/0	Bottom (25)

Access Port And Glory Hole Parts

Part # 27	Direct Counting	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	Access Port Sleeve
B	0.02 mR/hr	0	0/0	Access Port Sleeve
C	0.02 mR/hr	0	0/0	Access Port Sleeve
D	0.02 mR/hr	0	0/0	Access Port Sleeve
E	0.02 mR/hr	0	0/0	Access Port Sleeve
F	0.02 mR/hr	0	0/0	Access Port Sleeve
G	0.02 mR/hr	0	0/0	Access Port Sleeve
H	0.02 mR/hr	0	0/0	Access Port Sleeve

I	0.02 mR/hr	0	0/0	Access Port Cover
J	0.02 mR/hr	0	0/0	Access Port Cover
K	0.02 mR/hr	0	0/0	Access Port Cover
L	0.02 mR/hr	0	0/0	Access Port Cover
M	0.02 mR/hr	0	0/0	Access Port Cover
N	0.02 mR/hr	0	0/0	Access Port Cover
O	0.02 mR/hr	0	0/0	Access Port Cover
P	0.02 mR/hr	0	0/0	Access Port Cover
Q	0.02 mR/hr	0	0/0	Access Port And Glory Hole "O"-Rings
R	0.02 mR/hr	0	0/0	Glory Hole Sleeve
S	0.02 mR/hr	0	0/0	Glory Hole Cover
T	0.02 mR/hr	0	0/0	Glory Hole Cover
U	0.02 mR/hr	0	0/0	Glory Hole Sleeve
V	0.02 mR/hr	0	0/0	Associated Bolts And Nuts

Alignment Screws

Part # 59	Direct Counting	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	Core Can Alignment Screw
B	0.02 mR/hr	0	0/0	Core Can Alignment Screw

Part #'s	Direct Counting	Alpha cpm	LSC cpm	Description
3	0.02 mR/hr	0	0/0	Core Can "O"-Ring
58	0.02 mR/hr	1(0)	0/0	Aluminum Fuse Support
60	0.02 mR/hr	0	0/0	Polyethylene Rod

Control Rod Support Plate

Part # 84	Direct Couating	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	Interior Side With Rods
B	0.02 mR/hr	0	0/0	Exterior Side

Reactor Main Tank

Part # 86	Direct Counting	Alpha cpm	LSC cpm	Description
A	0.02 mR/hr	0	0/0	1/4 Base Plate, Interior Of Bottom Section
B	0.02 mR/hr	0	0/0	1/4 Base Plate, Interior Of Bottom Section
C	0.02 mR/hr	0	0/0	1/4 Base Plate, Interior Of Bottom Section
D	0.02 mR/hr	0	0/0	1/4 Base Plate, Interior Of Bottom Section
E	0.02 mR/hr	1(0)	0/0	1/4 Wall, Interior Of Bottom Section
F	0.02 mR/hr	1(0)	0/0	1/4 Wall, Interior Of Bottom Section
G	0.02 mR/hr	0	0/0	1/4 Wall, Interior Of Bottom Section
H	0.02 mR/hr	0	0/0	1/4 Wall, Interior Of Bottom Section
I	0.02 mR/hr	0	0/0	1/4 Rod Drive Cylinder Plus Ceiling
J	0.02 mR/hr	0	0/0	1/4 Rod Drive Cylinder Plus Ceiling
K	0.02 mR/hr	0	0/0	1/4 Rod Drive Cylinder Plus Ceiling
L	0.02 mR/hr	0	0/0	1/4 Rod Drive Cylinder Plus Ceiling
M	0.02 mR/hr	0	3/0	1/8 Base Plate
N	0.02 mR/hr	0	0/0	Bottom Section Door Both Sides
O	0.02 mR/hr	0	0/0	1/8 Bottom Section
P	0.02 mR/hr	0	0/0	1/8 Bottom Part Of Big Cylinder

Q	0.02 mR/hr	0	0/0	1/8 Bottom Of Big Cylinder Wall
Q1	0.02 mR/hr	0	0/0	Top Access Port On Temperature Gage Side
Q2	0.02 mR/hr	1(0)	0/0	Top Access Port On Temperature Gage Side
R	0.02 mR/hr	0	0/0	1/8 Top Of Big Cylinder Wall
R1	0.02 mR/hr	0	0/0	Bottom Access Port On Temperature Gage Side
R2	0.02 mR/hr	1(0)	0/0	Bottom Access Port On Temperature Gage Side
S	0.02 mR/hr	0	0/0	1/8 Base Plate
T	0.02 mR/hr	0	0/0	1/8 Bottom Section
U	0.02 mR/hr	0	0/0	1/8 Bottom Part Of Big Cylinder
V	0.02 mR/hr	0	0/0	1/8 Bottom Of Big Cylinder Wall
W	0.02 mR/hr	0	0/0	1/8 Top Of Big Cylinder Wall
X	0.02 mR/hr	1(0)	0/0	1/8 Base Plate
Y	0.02 mR/hr	0	0/0	1/8 Bottom Section
Z	0.02 mR/hr	0	0/0	1/8 Bottom Part Of Big Cylinder
AA	0.02 mR/hr	0	0/0	1/8 Bottom Of Big Cylinder Wall
BB	0.02 mR/hr	0	0/0	1/8 Top Of Big Cylinder Wall
BB1	0.02 mR/hr	0	2/0	Glory Hole
CC	0.02 mR/hr	0	0/0	1/8 Base Plate
DD	0.02 mR/hr	0	0/0	1/8 Bottom Section
EE	0.02 mR/hr	0	0/0	1/8 Bottom Part Of Big Cylinder
FF	0.02 mR/hr	0	0/0	1/8 Bottom Of Big Cylinder Wall
GG	0.02 mR/hr	0	0/0	1/8 Top Of Big Cylinder Wall
HH	0.02 mR/hr	0	0/0	1/8 Base Plate
II	0.02 mR/hr	0	0/0	1/8 Bottom Section And Part Of Big Cylinder

JJ	0.02 mR/hr	1(0)	0/0	Bottom Section Door Both Sides
KK	0.02 mR/hr	0	0/0	1/8 Bottom Of Big Cylinder Wall
KK1	0.02 mR/hr	0	0/0	Bottom Access Port
KK2	0.02 mR/hr	0	0/0	Bottom Access Port
LL	0.02 mR/hr	0	0/0	1/8 Top Of Big Cylinder Wall
LL1	0.02 mR/hr	0	0/0	Top Access Port
LL2	0.02 mR/hr	0	0/0	Top Access Port
MM	0.02 mR/hr	0	27/0	1/8 Base Plate
NN	0.02 mR/hr	0	0/0	1/8 Bottom Section
OO	0.02 mR/hr	0	0/0	1/8 Bottom Part Of Big Cylinder
PP	0.02 mR/hr	0	0/0	1/8 Bottom Of Big Cylinder Wall
QQ	0.02 mR/hr	0	0/0	1/8 Top Of Big Cylinder Wall
RR	0.02 mR/hr	0	0/0	1/8 Base Plate
SS	0.02 mR/hr	0	0/0	1/8 Bottom Section
TT	0.02 mR/hr	0	0/0	1/8 Bottom Part Of Big Cylinder
UU	0.02 mR/hr	0	0/0	1/8 Bottom Of Big Cylinder Wall
UU1	0.02 mR/hr	0	0/0	Glory Hole
VV	0.02 mR/hr	0	0/0	1/8 Top Of Big Cylinder Wall
WW	0.02 mR/hr	1(0)	0/0	1/8 Base Plate
XX	0.02 mR/hr	0	0/0	1/8 Bottom Section
YY	0.02 mR/hr	0	0/0	1/8 Bottom Part Of Big Cylinder
ZZ	0.02 mR/hr	0	0/0	1/8 Bottom Of Big Cylinder Wall
AAA	0.02 mR/hr	0	0/0	1/8 Top Of Big Cylinder Wall
BBB	0.02 mR/hr	0	0/0	1/4 Top Of Big Cylinder

CCC	0.02 mR/hr	0	0/0	1/4 Top Of Big Cylinder
DDD	0.02 mR/hr	0	0/0	1/4 Top Of Big Cylinder
EEE	0.02 mR/hr	0	0/0	1/4 Top Of Big Cylinder
FFF	0.02 mR/hr	0	0/0	1/4 Interior Cylinder Wall
GGG	0.02 mR/hr	0	0/0	1/4 Interior Cylinder Wall
HHH	0.02 mR/hr	0	0/0	1/4 Interior Cylinder Wall
III	0.02 mR/hr	0	0/0	1/4 Interior Cylinder Wall
JJJ	0.02 mR/hr	0	0/0	Interior Cylinder Floor

Appendix H:

Survey Instruments And Operation Data

The following survey instruments were used during the decommissioning process of the AGN 201M reactor.

Liquid Scintillation Counter.
- Make: Beckman LS-7000
- Serial Number: 7700259
- Background: Ch. 1 = 9+-6 cpm / Ch. 2 = 17+-8 cpm
- Efficiencies: (wipes) H-3 = .03 / C-14 = .04 / P-32 = .60 / I-125 = .35
- Calibration Date: Calibrated monthly
- Instrument Used: Preliminary Defueling (console wipes), Facility Survey, AGN Components, Unrestricted Release

Windowless Gas Flow Proportional Counter.
- Make: Ludlum Model 2200 scalar
- Serial Number: 19788
- Background: 0-5 cpm
- Efficiencies: (wipes) alpha = .35
- Calibration Date: 5/21/93
- Instrument Used: Core Components , AGN Components, Unrestricted Release

Thin Window G-M.
- Make: Technical Associates TBM-3S
- Serial Number: 093127
- Background: 50+-20 cpm
- Efficiencies: C-14 = .05 / P-32 = .27
- Calibration Date: 728/92, 7/26/93
- Instrument Used: AGN Components, Unrestricted Release

Thin Window G-M.
- Make: Technical Associates TBM-3S
- Serial Number: 087129
- Background: 60-150 cpm
- Efficiencies: C-14 = .04 / P-32 = .23
- Calibration Date: 12/22/88 (blocks), 6/23/89 (defueling)
- Instrument Used: Concrete Blocks, Defueling, Core Components

Thin Window G-M.
- Make: Technical Associates TBM-3S
- Serial Number: 066164
- Background: 70-140 cpm
- Efficiencies: Cl-36 = .22
- Calibration Date: 6/25/87
- Instrument Used: Concrete Blocks

Thin Window G-M.
Make: Technical Associates TBM-3S
Serial Number: 092332
Background: 50 cpm (blocks)
Efficiencies: Cl-36 = .22
Calibration Date: 12/22/88
Instrument Used: Preliminary Defueling, Concrete Blocks

Pressurized Ion Chamber
Make: Victoreen 450P
Serial Number: 172
Background: N/A
Efficiencies: N/A
Calibration Date: 2/6/89
Instrument Used: Defueling

Micro R Meter
Make: Ludlum Model 19
Serial Number: 7950
Background: .03 mR/hr
Efficiencies: N/A
Calibration Date: 7/28/89
Instrument Used: Defueling, Core Components

Ludlum Alpha Scintillation
Make: Ludlum 43-1 PRO#02132
Serial Number: 33640
Background: 0-1 cpm
Efficiencies: alpha 31%
Calibration Date:
Instrument Used: Defueling

High Purity Ge Crystal
Make: EG&G ORTEC
Serial Number: 25-P-K72
Background: 10 nCi
Efficiencies: Varies with energy
Calibration Date: at each use
Instrument Used: AGN Shield Water Survey

EPA Detectors: The following detectors have their background and efficiencies determined by the EPA. These detectors are rotated out every year and are no longer on site.

Ion Chamber
Make: Eberline
Serial Number: 289
Background: N/A
Efficiencies: N/A
Calibration Date: 1/22/89
Instrument Used: Defueling

Ion Chamber

Make: Eberline E-5008
Serial Number: 1015
Background: N/A
Efficiencies: N/A
Calibration Date: 12/18/89
Instrument Used: Defueling

Ion Chamber

Make: Eberline RD-2A
Serial Number: 1263
Background: N/A
Efficiencies: N/A
Calibration Date: 7/28/89
Instrument Used: Defueling, Core Components