West Virginia University

Vice-President for Academic Affairs & Research
304 293-5701/2641
Morgantown, West Virginia 26506

May 23, 1983

Mr. Cecil O. Thomas, Chief
Standardization and Special Projects Branch
Division of Licensing
Mail Stop 340
United States Nuclear Regulatory Commission
Washington, DC 20555

RE: License R-58, Docket No. 50-129

Dear Mr. Thomas:

This is to officially request termination of NRC License R-58, Docket No. 50-129 which is currently held by West Virginia University in conjunction with its formerly owned AGN-211P Nuclear Reactor (Serial No. 103). Following receipt of the NRC's January 22, 1980 letter authorizing West Virginia University to dismantle the reactor, the facility was disassembled according to approved procedures.

The reactor fuel elements, all control/safety rods, electromechanical rod drive mechanisms, and some peripheral hardware have been sent to the University of Oklahoma. The remaining parts of the reactor (control console, superstructure, etc.) were junked. Prior to shipment and/or disposal of reactor components, radiation surveys and wipe tests were conducted to ensure that no radioactive contamination existed as a result of reactor operations. Also, Rooms B-30 and B-31 in Hodges Hall, which were the site of the AGN-211 P Reactor Facility, were surveyed and certified to be free of radioactive contamination by the University's Radiation Safety Office. At present, these rooms are being utilized as a physics research laboratory.

We are simultaneously requesting an NRC site inspection visit from the Region II Administrator, Mr. John T. Collins for purposes of license termination. Also enclosed are copies of the letter to Mr. Collins, the results of radiation surveys and wipe tests of reactor components and at the facility site, and other correspondence and paperwork which document the decommissioning efforts to date.

West Virginia University would like to obtain closure on the R-58 reactor license termination process prior to Dr. G. L. Blackshaw's departure from the University on June 30, 1983. He has been Acting Reactor Director for nearly ten years and is familiar with many facets of the reactor facility. He has recently been talking with Ms. Pat Anderson of the NRC concerning steps to be taken to effect license termination. Please direct any questions you might have to either:

Dr. G. L. Blackshaw
Acting Reactor Director
College of Engineering
West Virginia University
Morgantown, West Virginia 26506
Phone: (304) 293-4821

A020
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1/1

or,

Dr. Steven T. Slack
University Radiation Safety Officer
Room G-210
University Hospital
West Virginia University
Morgantown, West Virginia 26506
Phone: (304) 293-341

Thank you.

Sincerely,

William E. Collins

William E. Collins
Vice President
Academic Affairs and Research

WEC:bam

cc: G. L. Blackshaw
S. T. Slack
John T. Collins - NRC Region II Administrator

This 24 day of May, 1983, William E. Collins, a person known to me personally, appeared before me, a Notary Public, swore that he is the person named herein and affixed his signature to this letter.

My commission expires December 21, 87

Wilma Louise Squires

Notary Public in and for Monongalia County, West Virginia

West Virginia University

Vice-President for Academic Affairs & Research
304 293-5701/2641
Morgantown, West Virginia 26506

May 23, 1983

Mr. John T. Collins
Regional Administrator - Region II
United States Nuclear Regulatory Commission
101 Marietta Street
Atlanta, Georgia 30303

Re: License R-58, Docket No. 50-129

Dear Mr. Collins:

This is to officially request an NRC site inspection visit for the purpose of terminating NRC License R-58, Docket No. 50-129 which is currently held by West Virginia University in conjunction with its formerly owned AGN-211P Nuclear Reactor (Serial No. 103). The attached letter to Mr. Cecil O. Thomas of the NRC should clarify our actions with respect to this request and be considered an official addendum to this request. Also are enclosed are copies of all material being sent to Mr. Thomas. As noted in the letter to Mr. Thomas, you should contact either Dr. Blackshaw or Dr. Slack concerning special details related to the reactor facility and/or your site visit.

Thank you.

Sincerely,

William E. Collins
Vice President -
Academic Affairs and Research

WEC:bam

cc: G. L. Blackshaw
S. T. Slack
Cecil O. Thomas, NRC Chief

This _____ day of _____, 1983, William E. Collins, a person known to me personally, appeared before me, a Notary Public, swore that he is the person named herein and affixed his signature to this letter.

My commission expires _____.

_____
Notary Public in and for Monongalia County, West Virginia

West Virginia University | MEDICAL CENTER
MORGANTOWN, WEST VIRGINIA 26506

School of Medicine
Department of Radiology
Division of Medical Physics and Radiation Safety
Telephone: 304-293-3413

May 20, 1983

TO: G. Lansing Blackshaw

FROM: Donald C. Turner, Donald C. Turner
Radiation Health Technician

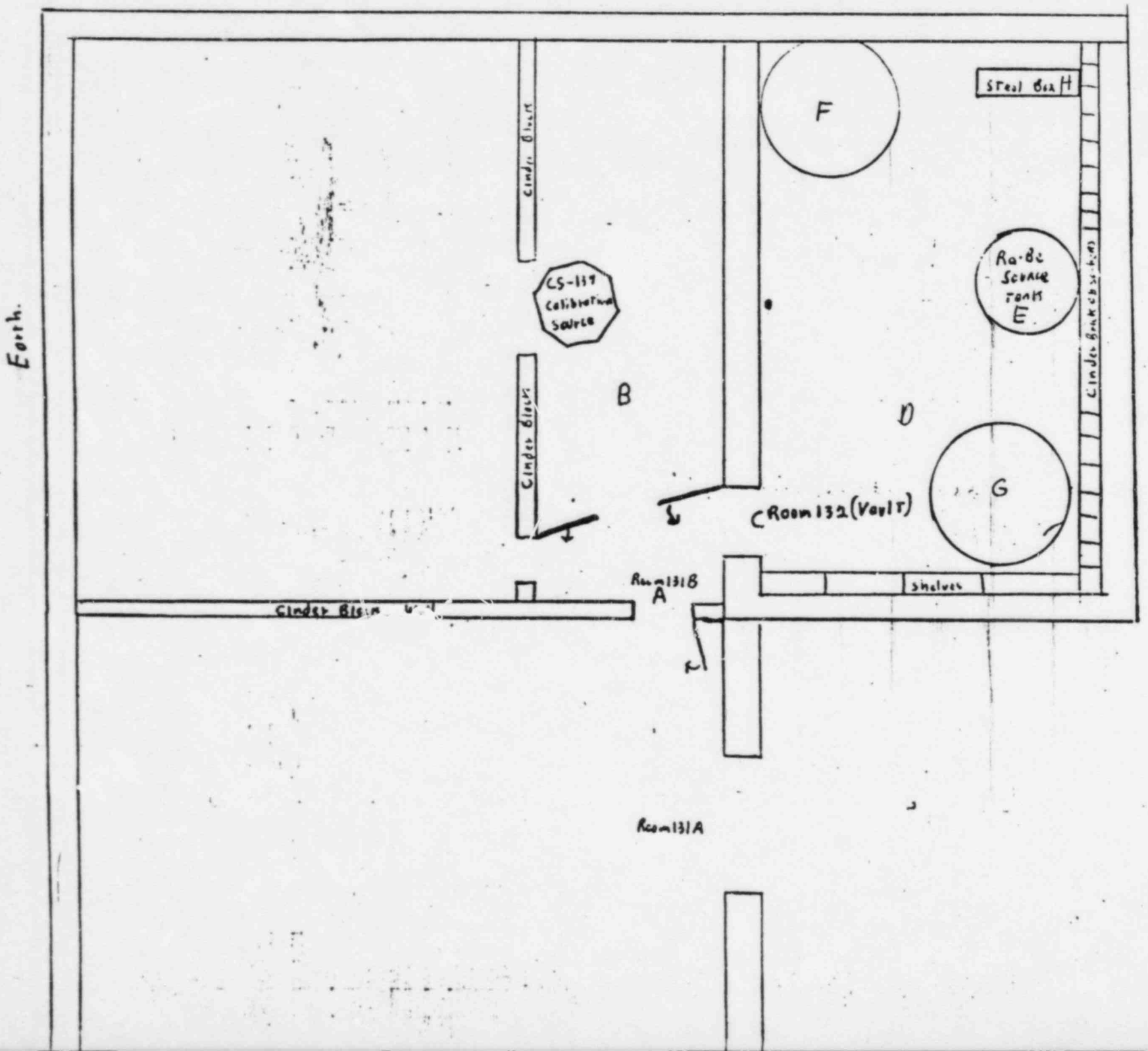
RE: Contamination levels in the vault

I have reviewed the wipe test records on the Hodges Hall Vault (Room 132 Hodges) and conclude that the room is mildly contaminated, (See Attachments). It is certain that the contamination predates the storage of the reactor components in the room. The reactor components were individually wipe tested before and after storage, and no contamination was found. See Memos (01 April 1980, 10 August 1982, and 18 November 1982). There is some tritium contamination on the shelves, floor and walls of the room and there is a little higher energy contamination. The overall contamination level is less than 1×10^{-3} microcuries per hundred square centimeters. The vault was the University storage area for radionuclides for a number of years and it is not surprising that there is some contamination present.

DCT/tds

Summary of Vault AREA Wipe Tests

	Date.	A (Low E / High E)	B	C	D	E	F	G	H	Bg.
1	10/3/78	21.0								
2										
3	4/25/80				42.1 / 16.0	18.5 / 11.4	12.8 / 2.9	18.6 / 11.0		11.5 / 18.9
4										
5	8/28/80		52.4 / 9.0	231.7 / 10.8			63.3 / 13.1	32.8 / 10.0		14.9 / 17.0
6										
7										
8	26 Feb 1982	16.0 / 3.0	15 / 5	607.6 / 8.1						
9	30 Mar 82	19.8 / 10.5								
10	29 April 82	28.0 / 8.2	31.4 / 6.8		25.6 / 8.5	23.0 / 6.4				
11										
12	03 June 1982	28.5 / 4.0								
13										
14										
15	28 July 1982		16.0 / 6.4							
16										
17	09 Aug 1982							14.5 / 5.2		
18										
19	20 Aug 1982	14.4 / 5.2								
20										
21	03 Sept 1982	19.6 / 4.2	17.8 / 4.2							
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										


Earth.
Cinder Block
CS-137 Calibration Source
B
Cinder Block
Cinder Block
F
Steel Box H
Ra-Be Source tank E
Cinder Blocks
D
G
C Room 132 (Vault)
Room 131B
A
Shelves
Room 131A

West Virginia University | MEDICAL CENTER
MORGANTOWN, WEST VIRGINIA 26506

School of Medicine
Department of Radiology
Division of Medical Physics and Radiation Safety
Telephone: 304-293-3413

May 19, 1983

TO: G.L. Blackshaw

FROM: Donald C. Turner, Donald C. Turner
Radiation Health Technician

RE: Summarized Data on Wipe Tests Performed at Old Reactor Site.

Between 11 June 1980 and 07 February 1983 eleven wipe tests were performed in the old reactor site room. Only area H (See Attached Floor Plan) shows any significant counts that cannot be attributed to variations in the calibration of the Liquid Scintillation Counter over the years. Area H is the Hood where Dr. Montano has been doing radionuclide work since May 1980. I conclude that there is no contamination present that is traceable to the reactor nor has there ever been any.

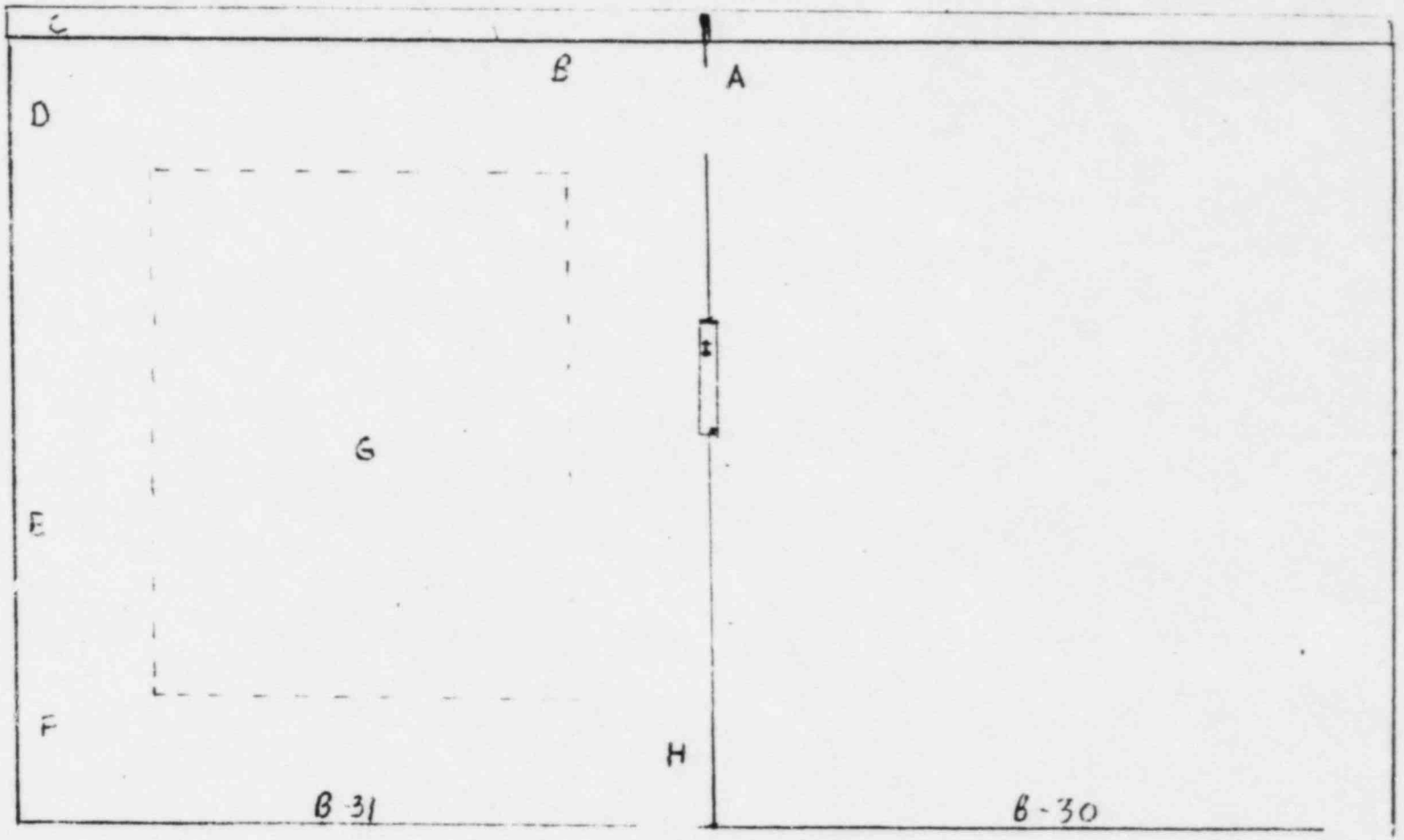
DCT/tds

Scattered Wipe Tests of Old Reactor Room

Bg		Date	A	B	C	D	E	F	G	H	I
	1	9-28-78	17 / 15								
	2	7-14-79						32.8 / 33.3			
14.1 / 13.5	3	6-11-80		24.9 / 13.4			14.6 / 12.7		14.6 / 12.7	51.2 / 12.0	8.6 / 13.3
	4	11-30-81				14.9 / 6.3			27.0 / 6.4		
	5	15 Dec 81							21.2 / 6.7	16.5 / 6.4	13.1 / 8.1
19 / 11	6	26 Jan 82							15.6 / 7.3		18 / 8
	7	30 March 82			15.0 / 4.0				15.0 / 14	16.5 / 7.2	
15.7 / 6.7	8	03 June 82								33.1 / 5.2	
	9	19 Aug 82									
	10	04 Oct 82									
	11	11 Nov 82							15.5 / 3.2		
15.0 / 6.4	12	30 Nov 82							15.7 / 5.7	12.0 / 7.5	
14.2 / 5.3	13	07 Feb 83				15.3 / 5.4			14.5 / 5.9		
	14										
	15										
	16										
	17										
	18	Wipe Tests were counted in a Scale Liquid Scintillation Counter									
	19	having 2 Windows (Tritium / P-32)									
	20										
	21	(0.5–9 MeV / 2.5–17.0 MeV)									
	22										
	23										
	24										
	25										
	26										
	27										
	28										
	29										
	30										
	31										

EFFICIENCY LINE NO. 2931

AREAS surveyed from 9-23-75 to ~~09~~ June 1983



B-31 is site of old Reactor (dotted area on compass Reactor Location)

West Virginia University MEDICAL CENTER
MORGANTOWN, WEST VIRGINIA 26506

School of Medicine
Department of Radiology
Division of Medical Physics and Radiation Safety
Telephone: 304-293-3413

November 18, 1982

TO: G. Lansing Blackshaw

FROM: Donald C. Turner Donald C. Turner

RE: Results of Reactor Fuel and shipping barrel leak test.

Enclosed are two copies of the leak test performed on the reactor fuel elements and the shipping container. I certify that the leakage is less than the .005 micorcuries required for shipment of the elements. I also certify that the shipping container is free of contamination.

DCT/tds

LEAKAGE TEST

Counter Efficiency Thorium 230 10%

WIPE TEST LOCOTION	Gross C.P.M.	B/G	Net C.P.M.	Net D.P.M.	Net uCi	Initial	Date
C-5	20	17	3	2.9	1.3×10^{-6}	DCT	18 NOV 1982
B-5	18	17	1	.97	4.36×10^{-7}	DCT	18 NOV 1982
B-4	15	17	—	—	< .0005	DCT	18 NOV 1982
D-3	14	17	—	—	< .0005	DCT	18 NOV 1982
20514 20519 20517	12	17	—	—	< .0005	DCT	18 NOV 1982
20516 20515	32	17	15	14.56	6.5×10^{-6}	DCT	18 NOV 1982

INSTRUMENT USED (Relevant settings) Gas Flow Proportional Counter attached to LCS-1 Eberline Swiss at 2300 Volts. Using P-10 gas

Radionuclide U-235 Dept. Engineering Bldg. Engineering Rm. CE Vault

Source I.D. Reactor Fuel Use Reactor Fuel

Type of Container Barrel 55 gal Activity 30×10^{-3} Ci

Form ____ Liquid ____ Solid X Gas ____ Powder ____

Person Responsible Lance Blackshear and Stephen Slack.

Remarks I Did test for alpha particle emission Above Background Less than .0005 uCi and therefore there is no reason why the fuel element may not be shipped.

DPM = CPM ÷ Efficiency uCi = DPM x 4.55×10^{-7}

$$MDA = 3\sqrt{\frac{CPM}{Bg}} \cdot 3\sqrt{\text{count time}} \cdot 3\sqrt{\frac{17}{1}} = \pm 12.37$$

Donald C. Turner 18 Nov 1982

Signature of Technician Date

assum 10% for U-235

LEAKAGE TEST

Ru-226 75%

Counter Efficiency Co-57 - 123%

WIPE TEST LOCOTION	Gross C.P.M.	B/G	Net C.P.M.	Net D.P.M.	Net uCi	Initial	Date
C-5	244.5	255.9	—	—		DCT	18 Nov 1982
B-5	251.5	255.9	—	—		DCT	18 Nov 1982
B-4	247.4	255.9	—	—		DCT	18 Nov 1982
D-3	253.3	255.9	—	—		DCT	18 Nov 1982
20516 20546 20597	301.1	255.9	45.2	452	2.03×10^{-4} uCi	DCT	18 Nov 1982
20576 20575	318.5	255.9	62.5	625	2.8×10^{-4} uCi	DCT	18 Nov 1982

INSTRUMENT USED + RELEVANT SETTINGS ABCD Well Counter Auto Log Gain 0.56 Thresh. 0.20
Window 9.80 Count Time 10 minutes

Radionuclide U-235 Dept. Engineering Bldg. Engineering Rm. Vault C-E

Source I.D. Reactor Fuel Use Reactor Fuel

Type of Container 55 gal DRUM Activity 30×10^{-3} @ Ci

Form ____ Liquid ____ (Solid ✓) Gas ____ Powder ____

Person Responsible Laurie Blackshaw and Stephan Slack

Remarks This test shows leakage of less than .0005 uCi therefore there is no reason why these fuel elements may not be shipped

DPM = CPM ÷ Efficiency uCi = DPM x 4.55×10^{-7}

$$MDA = 3\sqrt{\frac{\frac{CPM}{Bg}}{\text{count time}}} = 3\sqrt{\frac{255.4}{10}} = \pm 15.17$$

Paul C. Turner 18 Nov 1982

Signature of TECHNICIAN Date

assume U-235 - 10%

Ra-226 - 75%

LEAKAGE TEST

Counter Efficiency Co-57 123%

WIPE TEST LOCOTION	Gross C.P.M.	B/G	Net C.P.M.	Net D.P.M.	Net uCi	Initial	Date
DRUM # 1	260.3	255.9	< MDA	—	< .000544	DCT	18 NOV 1982
DRUM # 2	247.8	255.9	—	—	< .0005 —	DCT	18 NOV 1982
INSTRUMENT USED (RELEVANT SETTINGS) Window 9.30 Count Time 10 minutes			ABBOT Well Counter Autogamma Gain 0.56 Threshold 0.28				

Radionuclide _____ Dept. _____ Bldg. _____ Rm. _____

Source I.D. _____ Use _____

Type of Container _____ Activity _____

Form _____ Liquid _____ Solid _____ Gas _____ Powder _____

Person Responsible _____

Remarks The Drums are free of Contamination and OK for shipment

DPM = CPM ÷ Efficiency uCi = DPM x 4.55 x 10^{-7}

$$MDA = 3\sqrt{\frac{CPM_{Bg}}{\text{count time}}} = 3\sqrt{\frac{255.9}{10}} = \pm 15.17$$

Donald C Turner 18 NOV 1982

Signature of TECHNICIAN Date

Report on Leak Tests of Reactor Rods

The fuel elements of the reactor were wiped on 14 November 1980 when they were packed in the barrel for shipment to the University of Oklahoma. All of the elements were wiped on the outside of the plastic which covers them. No alpha contamination was detected on any of these elements. On one element (B-3) on which the paint had slaughed off I took a wipe on the bare uranium. I detected an alpha activity of 2.03×10^{-5}uCi. This is not enough to be considered significant leakage. The drum that the elements were removed from was checked for contamination and no leakage was found in it either. (See attached copy)

I conclude that there is no significant leakage and that the elements may be safely shipped.

Donald C. Turner

Donald C. Turner
Radiation Health Technician

cc
Duane Blackburn

Steve Stark

	C/M	Net C/M	eff	uCi detected
Radium source .0063uCi	2682.1	2674.9	19.1%	6.3×10^{-3}
#20599	8.3	1.1		< MDA
#20502	7.8	0.6		< MDA
#20591-20592 C-5	7.4	0.2		< MDA
205100 E-5	6.3	---		< MDA
#20593-20594 C-3	4.2	---		< MDA
#20589-20590 B-3	4.3	---		< MDA
Unpainted Surface B-3	15.8	8.6		2.03×10^{-5}
Drum # 1 Inside (empty)	3.3	---		< MDA
Background	7.2	0.0		===

MDA = Minimum Detectable activity $3\sqrt{\frac{\text{Bg CPM}}{\text{count time}}}$

West Virginia University MEDICAL CENTER
MORGANTOWN, WEST VIRGINIA 26506

School of Medicine
Department of Radiology
Division of Medical Physics and Radiation Safety
Telephone: 304-293-3413

10 August 1982

TO: G. Lansing Blackshaw

FROM: Donald C. Turner
Radiation Health Technician

RE: Results of Reactor fuel and shipping barrel leak test.

Enclosed are two copies of the leak tests performed on the reactor fuel "rods" and the shipping container. There is no detectable leakage. I certify that the leakage is less than the .005 microcuries required for shipment of the fuel. I certify that the shipping container is free of significant contamination (i.e. Its just like any other normal barrel).

DCT/tds

Ra-226 - 75.64%
Co-57 26.15%

SEALED SOURCE LEAKAGE TEST

Counter Efficiency _____

Instrument Used	Gross C.P.M.	B/G	Net C.P.M.	Net D.P.M.	Net uCi	Initial	Date
AGBelt Ratemeter Gamma Well Counter C5	250.8	253.55	—	—	<.000[illegible]	DCT	10 Aug 1982
E5	251.9	253.55	—	—	<.000[illegible]	DCT	10 Aug 1982
C3	246.6	253.55	—	—	<.000[illegible]	DCT	10 Aug 1982
B3	251.3	253.55	—	—	<.000[illegible]	DCT	10 Aug 1982
E3	246.5	253.25	—	—	<.000[illegible]	DCT	10 Aug 1982
D5	252.2	253.55	—	—	<.000[illegible]	DCT	10 Aug 1982
Co-57 Standard	4902.2	253.55	4648.65	17774.0 (calculated)	.00[illegible]	DCT	10 Aug 1982

Radionuclide Uranium Dept. Radiation Safety Bldg. Hodges Rm. 138

Source I.D. _____ Use Fuel for Reactor

Type of Container _____ Activity _____

Form ____ Liquid ____ Solid ✓ Gas ____ Powder ____

Person Responsible Lance Blackshaw - Stephen Slack

Remarks Ten minute count of the swabs shows no activity above instrument background. I conclude that the leakage is much less than .005 uCi and that we may ship the fuel without violating our NRC license.

DPM = CPM ÷ Efficiency uCi = DPM x 4.55 x 10^{-7}

$$MDA = 3\sqrt{\frac{CPM_{Bg}}{\text{count time}}} = 3\sqrt{\frac{253.55}{10}} = 15.105$$

Conrad C. Turner 11 Aug 1982
Signature of Technician Date

Contamination + LEAKAGE TEST

Counter Efficiency Co-57 24.15%

WIPE TEST LOCOTION	Gross C.P.M.	B/G	Net C.P.M.	Net D.P.M.	Net uCi	Initial	Date
DRUM LID OUTSIDE	257.9	253.55	4.35	< MDA	< .0005	DCT	10 Aug 82
Barrel EXTERIOR	250.1	253.55	—	< MDA	< .0005	DCT	10 Aug 82
DRUM Lid Interior	242.9	253.55	—	< MDA	< .0005	DCT	10 Aug 82
Barrel Interior	260.7	253.55	7.15	< MDA	< .0005	DCT	10 Aug 82
Barrel Interior	243.8	253.55	—	< MDA	< .0005	DCT	10 Aug 82

INSTRUMENT USED [Relevant settings] Abbott Autogamma well counter. Gain 0.56. base 0.20 Window 9.80. Count Time 10 minutes

Radionuclide URANIUM Dept. Radiation Safety Bldg. Hodges Rm. 138

Source I.D. _____ Use Reactor Fuel

Type of Container 55 gal DRUM (STEEL) Activity _____

Form ____ Liquid ____ Solid ✓ Gas ____ Powder ____

Person Responsible Stephen Slack, Lanie Blackshaw

Remarks The net counts are not significantly different from instrument Background. I certify the this barrel is free of significant contamination for shipping purposes.

DPM = CPM ÷ Efficiency uCi = DPM x 4.55 x 10^{-7}

$$MDA = 3\sqrt{\frac{CPM_{Bg}}{\text{count time(min)}}} = 3\sqrt{\frac{253.55}{10}} = 15.105$$

Donald C. Turner 10 Aug 1982

Signature of Technician Date

West Virginia University | MEDICAL CENTER
MORGANTOWN, WEST VIRGINIA 26506

School of Medicine
Department of Radiology
Division of Medical Physics and Radiation Safety
Telephone: 304-293-3413

April 1, 1980

TO: Lance Blackshaw

FROM: Donald C. Turner
Radiation Safety Technician

RE: Results of Wipe tests of reactor room and reactor components taken during the dismantlement period

All wipe tests were taken using Q tips. A 100 sq cm area of each component was wiped and an identification number was placed on each component as it was removed from the room. In addition varying volumes of sludge and rust and dirt were collected and analyzed as the opportunity presented itself.

All samples were counted for 100 minutes each in a Nuclear Chicago Automatic Gamma Well Counter with the following settings; Gain=8, Attenuator=25, Base= 50 kev, Window=Integral (Energy range 50 kev through 2000 kev).

The purpose of using an integral window was to determine if there was any discernable radiation above background. If so other methods were to be used to determine the specific gamma ray energy and the radionuclide identity. As it turned out only two samples showed any significant activity above background these will be discussed in more detail below.

		100 MINUTE COUNTS	Bg	Net Counts	Net CPM
1	Wipe #11 Right Detector	7540	7513	27	.27
2	Long pipe Right Detector	7602	7513	89	.89
3	#2 Demineralizer Hose	7327	7513	—	
4	#3 Plexiglass Holder	7531	7513	18	.18
5	Demineralizer Bead Sample	7391	7513	—	
6	Demineralizer TANK	7585	7513	72	.72
7	Graphite Rod F1	7523	7513	10	.10
8	F3	7453	7513	40	.40
9	F5	7601	7513	88	.88
10	E6	7458	7513	45	.45
11	F6				
12	E2	7474	7671		
13	E7	7458	7671		
14	E1	7556	7671		
15	F7	7655	7671		
16	Console	7513	7671		
17	Air Blower	7450	7671		
18	Air Monitor	7554	7671		
19	Plastic Cover #8	7487	7671		
20	Plastic Cover #7				
21	Ledge in Tank (Middle)	7504	7671		
22	Ledge in Tank (TOP)	7459	7671		
23	Graphite Rod B1	7475	7671		
24	B2	7298	7671		
25	C2	7657	7671		
26	C1	7484	7671		
27	D2	7408	7671		
	D1	7536	7671		
	B6	7313	7671		
	B7	7519	7671		
	C7	7322	7671		

EFFICIENCY LINE No. 2636

			100 Minute Counts	Bg	Net Counts	Net CPM			
	1	2	3	4	5	6	7	8	9
1		C6	7430	7671					
2		D6	7478	7671					
3		D7	7526	7671					
4		A6	7485	7671					
5		A5	7582	7671					
6		A4	7368	7671					
7		A3	7451	7671					
8		A2	7354	7671					
9	#9 Float								
10	#10 Float		7370	7671					
11	#11 Plexiglass Rod		7450	7671					
12		A1	7457	7671					
13		A7	7461	7671					
14	Rod Housing		7485	7671					
15	Rod Housing		7315	7671					
16	Rod Housing		7620	7671					
17	Rod Housing		7432	7671					
18	Air Sample		7562	7513	49	2.872 .49			
19	Cesium Source	32 min. 999542							
20	.1 uCi April 11, 1973	999999	999999 (32.12 minutes)	7513	992486	30899.31			
21									
22									
23	Demineralizer Bead Sample	Glass Tube	8927	9360					
24	Demineralizer Bead Sample	Glass Tube	9163	9360					
25	Bg Empty Holder		7513						
26	Bg Plastic Tube		7671	7671					
27	Bg Glass Tube		9128						
28	Bg Glass Tube		9310	9360					
29	Reactor Jelly Glass Tube		9239	9360					
30	Reactor Dirt Glass Tube		11385	9360	2025	20.25			
31	Graphite Rod	WASH WATER	8971	9360					

EFFICIENCY, LINE No. 2038

		100 Min. Counts.	Bg	Net counts	Net CPM.
1	Reactor Water	8906	9360	—	
2	Reactor Paint	7526	7447	79	.79
3	Reactor Dried Water Settlement	7628	7447	179	1.79
4	Reactor Floor Dirt	8183	7447	736	7.36
5	Saw Dust	7479	7447	32	.32
6	Empty Tube	7388	7447	—	
7	Cesium Standard	999999 32.20	7447	992552	30824.596
8	Empty	7471	7447	21	.21
9	Empty	7423	7447	—	
10	Graphite (March 13, 1980)	7498	7589	—	
11	Concrete BACK	7644	7589	55	.55
12	Concrete Front	7880	7589	291	2.91
13	Graphite WIPE	7494	7589	—	
14	Graphite WIPE	7382	7589	—	
15	Aluminum	7669	7589	80	.80
16	Cesium Standard .1 μCi	999999 32.18	7589	992410	30839.341
17					
18	Background (Bg)	7584	7589	—	
19					
20					
21					
22					
23					
24					
25					
26					
27					
31					

EFFICIENCY, LINE No. 2636

Analysis of an anomaly found in the dirt taken from

location 2 of the reactor room floor.

At the time of the removal of the last of the core components of the reactor, the floor of the room was swept. An gamma analysis of this dirt showed a net CPM of 20 CPM above background. This sample weighed 4 grams and we calculated a 4 CPM gram above background.

We then placed this sample in front of a Germanium Lithium Crystal Multi-channel analyzer [Tracor Northern TN-]705 (2000 volts positive, coarse gain 50, fine gain]2.0, LLD 47, ULD 1000)]. We took sample readings and background readings for 50,000 seconds.

The net difference in the integrated total for all channels for sample and background was 35,596 counts. Indicating that there was a detectable gamma activity in the sample.

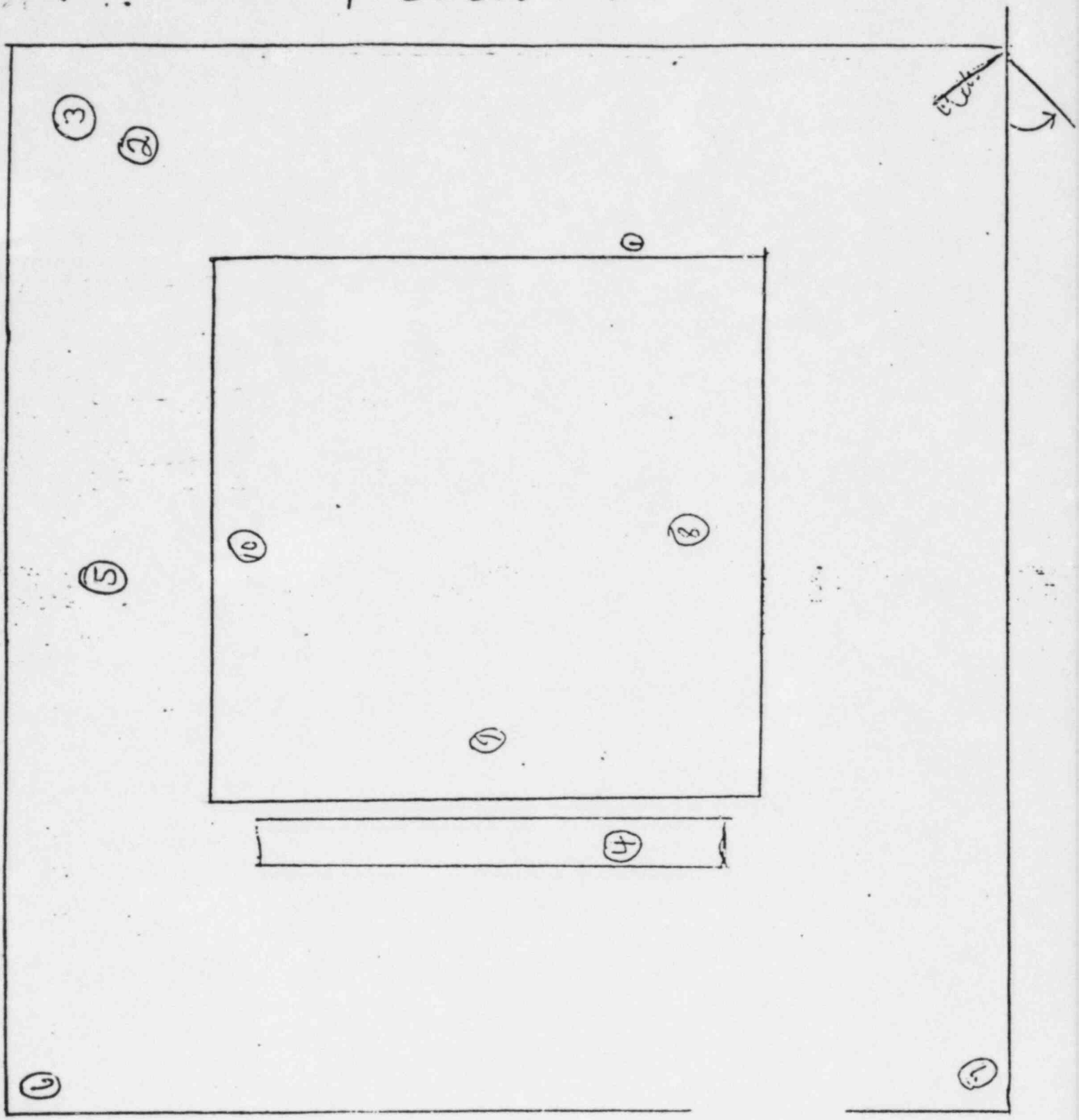
We then compared the results of the counts for various regions of the spectrum. The sample was found to have a higher activity in all regions of the spectrum. There is no area of the spectrum which seems to be safely responsible for the difference. We thus conclude that this sample of dirt contains no unusual radionuclide contaminants, but that it is merely a variation in the background. A check of the literature indicates that it is not unusual to find variations of an order of magnitude in background samples.

Comparison of Integrated Readings of Reactor Dirt and Background

	CHANNEL	DIRT	BACKGROUND	Net Counts
1	35-168	2187254	2166472	20782
2	168-257	457515	452631	4884
3	257-437	307715	300016	7699
4	437-678	170445	167337	3108
5	678-973	110262	108359	107974
6	973-1023	18318	18146	172
7	TOTAL:			
★	35-1023	3237960	3202364	35596

EFFICIENCY LINE No 2636

Reactor Room



Summary:

The only results which varied by more than three standard deviations from the background were the air sample #18 page 2, the Reactor Floor dirt Glass tube # 30 page 2, Reactor Floor Dirt #4 Page 3; and Concrete Rubble taken from the floor in the front of the room location 9 of the map Page 3 #12.

The air sample ran for 7 cycles and pulled 350,000 liters of air through the filter. This works out to a net activity of 6.3×10^{-13} uCi liter. It can be ignored.

The other samples are just dirt and rubble and the variations just reflect variations in the background radionuclide level. There is no evidence of any contamination by fission by products (see analysis of Reactor floor dirt). I conclude that there is no reason why the room could not be turned over to Dr. Montano to use as a part of his laboratory.

West Virginia University | MEDICAL CENTER, MORGANTOWN, WEST VIRGINIA 26506

School of Medicine
Department of Radiology
Division of Medical Physics and Radiation Safety
Telephone: 304-293-3413

February 6, 1980

TO: Lance Blackshaw

FROM: Donald C. Turner
Radiation Safety Technician

RE: Results of Reactor Water Analysis taken on 30 Jan 1980.

Water samples from the reactor were counted in alpha, beta and gamma counters between 30 Jan and 01 Feb 1980.

I. All samples were counted for 10 minutes each in a Nuclear Chicago Automatic Gamma Well Counter with the following settings: Gain = 8, Attenuator = 25, Base = 50 kev Window = Integral (Energy Range 50 kev through 2000 kev)

II. A Beckman LS. 9000 Liquid Scintillation Counter with automatic quench correction and H numbers to assure quality control. Lower limit 0 upperlimit 655 program 1.

III. Alpha Counter:
An Eberline Laboratory Counting System LCS-1 at 1700V 0-2kv.

Attachment.

		Gross cpm	Net cpm
I.	Background	78.0	0
	Reactor Sample	71.9	0
	^{137}Cesium Standard	31158.2	31086.3

Counter Efficiency = 9.69.
Minimum Detectable Activity 8.37 cpm
^{137}Cs Standard .1uCi April 1971

II.	Background	28.00	0
	Reactor Water	29.0	1

III.	Background	1.0	0
	Reactor Water	1.0	0
	^{226}Radium Stand.	2527.6	2526.6

^{226}Ra = .0063 uCi

Since these tests show that as far as radionuclide contamination is concerned the reactor water is the same as Monongahelia County tap water, I conclude that it would be safe to discard the water.

College of Engineering
304 293-4821

Morgantown, West Virginia
26506

November 29, 1982

West Virginia
University

Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
United States Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Crutchfield:

RE: License R-58, Docket No. 50-129

On November 19, 1982 West Virginia University (WVU0 sent the last of the fuel elements for its AGN-211 Reactor (Serial No. 103) to the University of Oklahoma. This was permissible under NRC's dismantling order for the reactor dated January 22, 1980. At this time disposal of all reactor components has been completed with the exception of the Ra-Be start-up source.

The University of Oklahoma, which had been authorized to possess the WVU reactor fuel under an amendment to its R-53 license, received from WVU all the reactor fuel (12 elements - 800.12 g ^{235}U), reflector elements, all control/safety rods, plus electromechanical rod drive mechanisms and some peripheral hardware. WVU junked the remaining parts of the reactor (control console, superstructure, etc.) following radiation surveys and wipe tests to ensure that no radioactive contamination existed.

WVU now plans to conduct a radiation survey of the former reactor and fuel storage sites in preparation for what I assume will be a final NRC inspection visit. The single remaining loose end is the fate of the Ra-Be start-up source (believed to be about 100 millicuries in strength). Although not specifically mentioned in the reactor license, it should probably be incorporated into an existing NRC license at WVU to provide a short-term solution for termination of the reactor license.

This letter is primarily for information purposes; however, if you would wish to make suggestions regarding License No. R-58 termination procedures, please do so. By the way, Peter Erickson has been most

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helpful throughout the entire duration of the reactor dismantling/ disposal procedure. Without his expert guidance, we would not have been able to accomplish what we have done to date.

Sincerely,

G. Lansing Blackshaw

G. Lansing Blackshaw
Associate Dean - Academic Affairs
Acting Reactor Director

GLB:bam

cc: Peter Erickson - NRC
Dr. Steve Slack - WVU Radiation Safety Officer
Dr. Curtis J. Tompkins - Dean of Engineering
Dr. William E. Collins - Vice President for Academic Affairs and Chairman of WVU Radiation Safety Committee

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

January 22, 1980

Docket No. 50-129

Dr. G. Lansing Blackshaw
College of Engineering
West Virginia University
Morgantown, West Virginia 26506

Dear Dr. Blackshaw:

The Commission has issued the enclosed Order that authorizes you to dismantle the AGN-211P Reactor in accordance with your application dated September 27, 1979, as supplemented November 30, 1979. The dismantling plan replaces the Technical Specifications in their entirety.

The related Safety Evaluation, Environmental Impact Appraisal, and Negative Declaration are also enclosed.

A copy of the Order and Negative Declaration are being filed with the Office of the Federal Register for publication.

Sincerely,

Robert W. Reid

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosures:
1. Order Authorizing Dismantling
2. Safety Evaluation
3. Environmental Impact Appraisal
4. Negative Declaration

cc: w/enclosures
See next page

West Virginia University

cc: w/enclosure(s)

Office of the Governor
State of West Virginia
Charleston, West Virginia 25305

West Virginia University
Department of Political Science
ATTN: Committee of State Officials
on Suggested State Legislation
Morgantown, West Virginia 26505

cc: w/enclosure(s) & incoming dtd.:
9/27/79 and 11/30/79

State Department of Health
ATTN: State Director of Health
State Office Building No. 1
1800 Washington Street, East
Charleston, West Virginia 25305

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

7590-01

WEST VIRGINIA UNIVERSITY

DOCKET NO. 50-129

ORDER AUTHORIZING DISMANTLING OF FACILITY
AND DISPOSITION OF COMPONENT PARTS

By application dated September 27, 1979, as supplemented November 30, 1979, the West Virginia University (the licensee) requested authorization to dismantle the AGN-211P Reactor (Serial No. 103) (the facility), a research reactor located in Morgantown, West Virginia, and to dispose of the component parts, in accordance with the plan submitted as part of the application. A "Notice of Proposed Issuance of Orders Authorizing Dismantling of Facility, Disposition of Component Parts, and Termination of Facility License" was published in the Federal Register on October 29, 1979 (44 FR 62087). No request for a hearing or petition for leave to intervene was filed following notice of the proposed action.

The Nuclear Regulatory Commission (the Commission) has reviewed the application in accordance with the provisions of the Commission's rules and regulations and has found that the dismantling and disposal of component parts in accordance with the licensee's dismantling plan will be in accordance with the regulations in 10 CFR Chapter I, and will not be inimical to the common defense and security or to the health and safety of the public. The basis for the findings is set forth in the concurrently issued Safety Evaluation by the Office of Nuclear Reactor Regulation.

The Commission has prepared an environmental impact appraisal for this action. Based on that appraisal, the Commission has determined that this action will not result in any significant environmental impact and that an environmental impact statement need not be prepared.

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Accordingly, West Virginia University is hereby authorized to dismantle the AGN-211P Reactor (Serial No. 103) covered by Facility License No. R-58, as amended, and dispose of the component parts in accordance with their dismantling plan and the Commission's rules and regulations.

After completion of the dismantling and decontamination, the submission of a report on the radiation survey to confirm that radiation levels in the facility area meet the values defined in the dismantling plan and inspection by representatives of the Commission, consideration will be given to whether a further order should be issued terminating Facility License No. R-58.

For futher details with respect to this action see (1) the application for authorization to dismantle facility and dispose of component parts dated September 27, 1979, as supplemented November 30, 1979, (2) the Commission's related Safety Evaluation, (3) the Commission's Environmental Impact Appraisal, and (4) the Commission's Negative Declaration dated 01/22/80 (which is also being published in the Federal Register). All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D. C. A copy of items (2) and (3) may be obtained upon request addressed to the United States Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 22nd day of January, 1980.

FOR THE NUCLEAR REGULATORY COMMISSION

W. P. Gammill

William P. Gammill, Acting Assistant
Director for Operating Reactor Projects
Division of Operating Reactors

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING ORDER AUTHORIZING DISMANTLING OF FACILITY AND DISPOSITION OF COMPONENT PARTS

WEST VIRGINIA UNIVERSITY

AGN-211P REACTOR

DOCKET NO. 50-129

Introduction

By application dated September 27, 1979, as supplemented November 30, 1979, the West Virginia University (the licensee) requested authorization to dismantle the AGN-211P (Serial No. 103) Reactor and dispose of its component parts in accordance with its dismantling plan.

Discussion

The AGN-211P Reactor is a small research reactor designed to operate at a maximum power of 75 watts. The reactor core consists of a matrix array of 12 fuel elements that are surrounded by 30 graphite reflector elements. The fuel and graphite elements are held vertically in a steel grid plate. The entire core is situated at the bottom of a ten-foot deep water-filled tank. The fuel elements consist of 20% enriched UO_2 pellets fused in a polyethylene moderator. The total fuel loading is 800 grams of U235.

All fuel has been removed from the reactor and is now stored onsite in the locked shielded "Isotopes Storage Vault" in three separate steel containers. The Ra-Be neutron startup source is stored in the Isotopes Storage Vault in a water-filled drum. The fuel assemblies were surveyed when removed from the core. Surface contamination was determined to be less than 1000 dpm/100 cm^2 (removable) and activation of 4 MR/hr or less at 1 cm. The startup source will be transferred to a Department of Transportation (DOT) approved shipping container and remain in the Isotopes Storage Vault until shipped offsite.

Pool water measurements show activity levels consistent with tap water with no detectable activity associated with reactor operations. Control rods, safety rods, guide tubes and other components removed from the reactor structure show no detectable activation or contamination.

Evaluation

The licensee proposes to transfer reactor pool water (not radioactive) to the storm drains, to disassemble the reactor components and to remove those components, the reactor tank and concrete shield blocks from the reactor room.

Usable components, which may be transferred to another university, will be decontaminated, if necessary, and stored in the Isotopes Storage Vault. Non-usable components will be decontaminated, if necessary, and disposed of as scrap. Disposable components are the graphite thermal column, steel water tank and concrete shield blocks.

Radioactive contamination and activation of reactor components are expected to be at or near background because fuel elements exhibited very low contamination and the stainless steel control rod blades and other components that were removed exhibited no detectable contamination or activation. All work will be accomplished under the supervision of the Univeristy Radiation Safety Office. Releasing the pool water to the storm drains is acceptable since the pool water has been shown to be free from radioactive contamination.

The licensee proposes to store the fuel, the startup source and usable reactor hardware in the Isotopes Storage Vault until they are shipped to another authorized licensee. If the fuel, startup source and reactor components are not shipped to another licensee, the fuel and startup source will be shipped to the Oak Ridge National Laboratory. Other reactor components would be either used at the University for non-nuclear related activities or scrapped if not sent to another licensee for reuse in a reactor. Components that are put to use in non-reactor operations will be surveyed for contamination and activation. The licensee will assure that contamination of all components put to other use or disposed of as scrap is less than values given in Regulatory Guide 1.86 and that activation is not above natural background.

The physical security plan will remain in effect until the fuel is shipped offsite.

Following completion of the dismantling activities, the NRC will inspect the facility to confirm that it has been dismantled in accordance with the dismantling plan.

Conclusion

We have concluded, based on the considerations discussed above, that dismantling the AGN-211P Reactor and disposing of component parts as described in the dismantling plan will not be inimical to the common defense and security or to the health and safety of the public.

Dated: January 22, 1980

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

ENVIRONMENTAL IMPACT APPRAISAL BY THE OFFICE OF NUCLEAR REACTOR REGULATION SUPPORTING ORDER AUTHORIZING DISMANTLING OF FACILITY AND DISPOSITION OF COMPONENT PARTS WEST VIRGINIA UNIVERSITY AGN-211P REACTOR DOCKET NO. 50-129

Introduction

The West Virginia University (the licensee) AGN-211P Reactor operated at a maximum of 75 watts and was used primarily for research and the teaching and training of students in various fields of nuclear technology. The licensee estimates that the reactor operated for about 100 hours each year at 75 watts over a 12-year period. The reactor has not operated since February 1971, and the University has no need for it now. Therefore, the reactor will be dismantled and component parts reused at another facility or disposed of.

All fuel and the radioactive startup source have been removed from the reactor and are stored onsite in the University's Isotopes Storage Vault. The fuel and startup source will be shipped to the Department of Energy (DOE) Oak Ridge facility or to another licensee for reuse. All reactor components remaining are expected to be near background levels of radiation (activation and contamination) because of the low power and short operating history of the reactor. Checks of some of the internal reactor components confirm this assumption.

Facility

No changes to the structure of the building, electrical services, water lines or sewer lines are required in the dismantling of the reactor.

Environmental Effects of Disassembly and Disposal

The reactor components are near background levels in radioactive contamination and activation because of the low power, short operation history of the reactor. If contamination is found, it will be reduced to acceptable levels (less than values specified in Regulatory Guide 1.86) by decontamination. The reactor components will be transferred to another licensee for reuse in another reactor or will be used by the University for non-reactor related activities. The unusable reactor components will be scrapped. The fuel and startup source will be transferred to another licensee or to the DOE Oak Ridge facility.

A description of the disassembly operation is provided in the licensee's September 27, 1979 submittal. There will be no significant exposure to personnel or the generation of radioactive wastes during the dismantling operation because all components are at very low levels of radioactivity. The fuel and startup source will be packaged in accordance with U. S. Department of Transportation (DOT) requirements prior to shipment offsite. Other components will be decontaminated prior to shipment, if necessary, and would therefore require no special, DOT approved, shipping containers.

Alternatives to Dismantling of the Reactor and Disposal of Components

The reactor has not been used for some time and is of no present or future value to the University. It occupies space which can be used by the University for other purposes.

Long Term Effects of Dismantling and Disposal of the Reactor Components

Upon removal of the reactor components, the West Virginia University reactor facility rooms will be used for other purposes. The reactor fuel will be used by another licensee or reprocessed at the DOE Oak Ridge facility. The reactor components will be put to use by another licensee or used in non-reactor related projects at the West Virginia University.

Costs and Benefits of Facility Dismantling and Alternatives

The costs of dismantling and transfer of reactor components to another licensee are estimated to be less than $20,000. There is no reasonable alternative to the proposed dismantling and disposal of the reactor.

Conclusion

We conclude that there will be no significant environmental impact associated with the dismantling of the facility and the disposal of its component parts, and that no environmental impact statement is required to be written for the order authorizing dismantling of the AGN-211P Reactor and disposal of the component parts.

Dated: January 22, 1980

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

7590-01

NEGATIVE DECLARATION

FOR THE

WEST VIRGINIA UNIVERSITY RESEARCH REACTOR

DOCKET NO. 50-129

The U. S. Nuclear Regulatory Commission (the Commission) has considered the order authorizing dismantling of facility and disposition of component parts for the West Virginia University (the licensee) AGN-211P Reactor operated under Facility License No. R-58. The order authorizes the licensee to disassemble the reactor which operated at power levels up to 75 watts (thermal), and to dispose of the component parts.

The U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, has prepared an environmental impact appraisal for this research reactor. On the basis of this appraisal, we have concluded that an environmental impact statement for this particular action is not warranted because there will be no significant environmental impact attributable to the proposed actior The environmental impact appraisal is available for public inspection at the Commission's Public Document Room at 1717 H Street, N.W., Washington, D. C.

Dated at Bethesda, Maryland this 22nd day of January, 1980.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert W. Reid

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

8002060243
PDR

College of Engineering
Morgantown, West Virginia
26506

September 27, 1979

West Virginia University

Mr. William Gammill
Acting Assistant Director for Operating
Reactor Projects
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Re: License R-58, Docket No. 50-129

Dear Mr. Gammill:

In conformance with 10CFR50.82 and Regulatory Guide 1.86, West Virginia University requests the following:

1. That NRC authorize the University to dismantle the AGN-211P (Serial No. 103) Reactor according to the Dismantling Plan presented below.

2. That NRC authorize the University to temporarily store the reactor fuel and graphite reflector elements, control and safety rods, rod drive assembly, air monitor, water demineralizer, ion chamber and BF_3 detectors, steel core and rod drive assembly structural supports including the core grid plate, and the control console at the reactor site.

3. That NRC authorize the University to dispose of all reactor hardware other than that cited in Item 2. without further restriction. This would primarily include the graphite thermal column, steel water tank, and concrete shielding blocks.

4. That NRC authorize removal of any and all restrictions on future University uses for disposition of the reactor high-bay area room.

5. That prior to expiration of the current Possession Only license on June 19, 1980, NRC authorize one of the following:

   a. Shipment of all components cited in Item 2. to a suitably licensed party.

   b. Shipment of fuel to Oak Ridge and disposal of all other components in Item 2. without further restriction.

6. That the referenced NRC license be terminated upon completion of Items 1. through 5.

Justification

The AGN-211P reactor at West Virginia University has not been operated since February 1971. In early 1972, it was decided to apply for a Possession Only type license from the Atomic Energy Commission with the ultimate objective being disposal and transfer of the reactor to an interested and suitably licensed party. A Possession Only license was granted via Amendment No. 6 to the referenced license on June 13, 1973. Through the years, the University has attempted without success to effect transfer of the reactor to Northwestern University, the University of Missouri, and North Texas State University. At this time, only North Texas State University remains a viable client; however, they have yet to secure the necessary permits to possess and construct the reactor.

West Virginia University now has a rapidly expanding fossil fuel based energy research program funded by numerous Federal and State supported research grants and contracts. Space for research facilities is at a premium, and the AGN-211P Reactor high-bay area is desperately needed to accommodate research activities. We are at the stage where certain research activities may have to be reduced in scope or even cancelled if proper laboratory facilities cannot be developed. In this context, the University requests that reactor dismantling, disposal, and license termination be approved in two major steps:

1. Immediate NRC authorization and approval be granted for Items 1. through 4. This would free the reactor room (high-bay area) for construction of urgently needed energy research facilities. Rationales and procedures to accomplish this will be noted below.

2. Upon completion of Items 1. through 4., either Item 5a. or 5b. be carried out prior to the June 19, 1980 license expiration date (Amendment No. 7 to referenced license), and that Item 6. be effected, i.e. license termination.

Details concerning each of the requested items now follow:

Item 1. - Dismantling Plan

The AGN-211P Reactor (Serial No. 103) in its original operating configuration consisted of a matrix array of 12 fuel elements and 30 graphite reflector elements standing vertically in a steel grid plate. This core matrix was situated at the bottom of a 10' deep water-filled rectangular steel tank, having 5' x 5' cross-sectional

dimensions and walls approximately 5/8" thick. Four control-safety rod boral-stainless steel blades were vertically inserted into spaces between fuel elements in the core. These rods were electromagnetically coupled to rod drive mechanisms, and were spring loaded to permit greater than "1g" acceleration into the core under scram conditions. A 1" diameter "glory hole" tube also penetrated the center of the core to permit access of various foil and sample materials to the region of maximum neutron flux. When operating, the reactor had a maximum licensed power of 75 watts.

Surrounding and abutting the steel tank is a 4' thick concrete block biological shield. The tank and shield blocks rest on a reinforced floor level concrete pad. There is an opening through one side of this shield to permit placement of a 5' thick graphite thermal column (approximately 170 ft^3 of graphite in all). This thermal column is in turn shielded on its outer face by an 18" thick moveable sliding concrete shield.

The reactor facility proper is located in Rooms B-31 and G-31 in the basement of Hodges Hall on the Downtown Campus of West Virginia University. This room combination, constituting the reactor high-bay area, has a floor dimension of 25' x 20' and a height of 24'. There are three access doors to the high-bay area. Two of the doors which lead to hallways in Hodges Hall cannot be unlocked from the outside. Entrance can only be attained by entering Room B-30 (formerly the location of the reactor control console which is now stored in B-31) and then proceeding through a locked internal access door from Room B-30 to Room B-31. Access to the high-bay area is controlled by the University Radiation Safety Office, administered by Dr. Stephen T. Slack, University Radiation Safety Officer.

For reference purposes, an "overhead" view of the fuel-reflector element matrix configuration is presented in Figure 1., and a sketch of a typical reactor fuel element is shown in Figure 2. The fueled portion of the fuel element consists of a solid homogeneous mixture of 20% enriched UO_2 pellets fused in a polyethylene moderator. Total ^{235}U loading for the 12 fuel elements in the core is 800 grams. Each fuel element has 2 7/8" x 3" cross-sectional dimensions and an overall length of 30 1/4".

The history of activities at the AGN-211P Reactor site since the cessation of reactor operations in February 1971 is as follows. In February 1972, electrical power to safety and control rod drive motors was disconnected. A Possession Only license for the reactor was issued to West Virginia University on June 13, 1973 via Amendment No. 6 to License R-58, Docket No. 50-129---with an expiration date of June 19, 1979. On April 25, 1974, Mr. Don Burke (AEC-Atlanta) arrived unannounced at the University for an AGN-211P Reactor facility inspection. Through a lack of satisfactory communication channels at the University, we were unaware

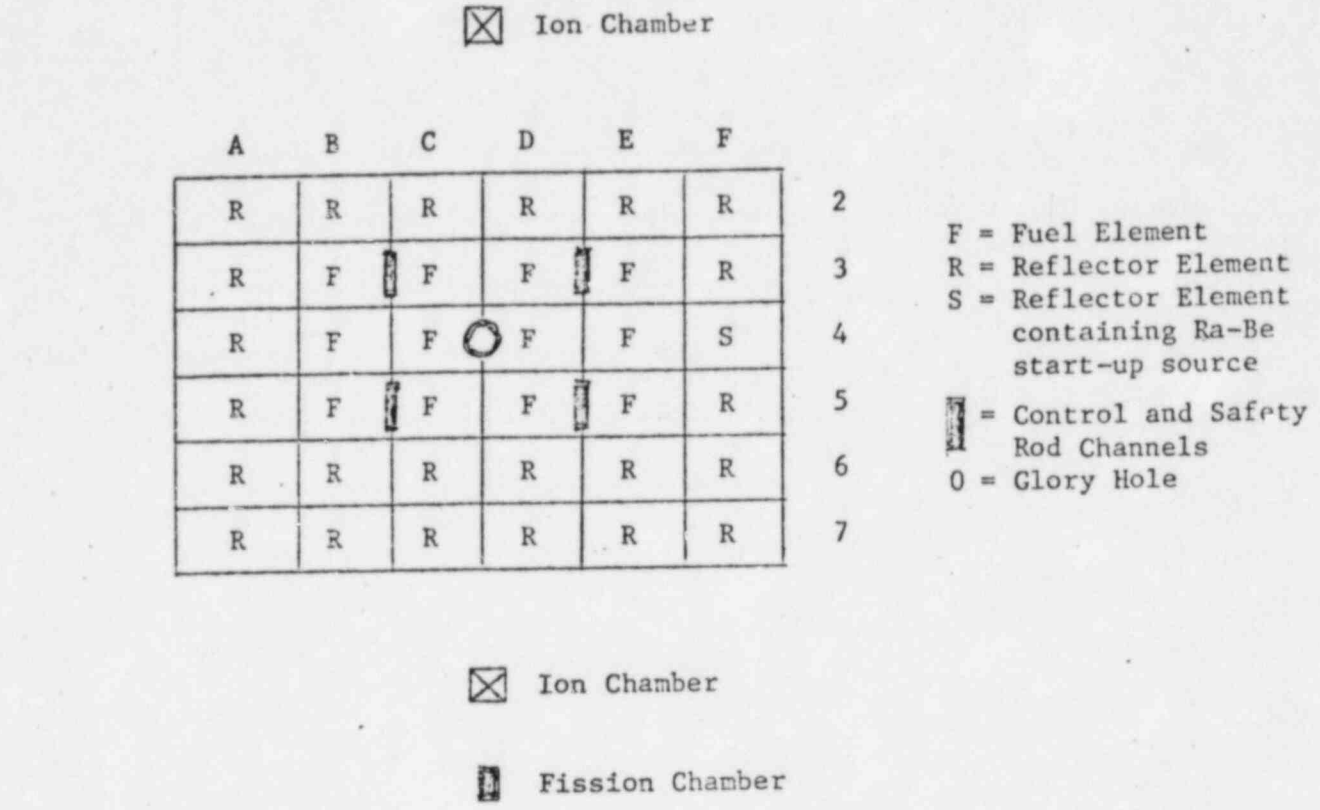

Figure 1. Overhead View of AGN-211P Reactor Fuel and Reflector Element Matrix Showing Location of Neutron-Power Level Detectors

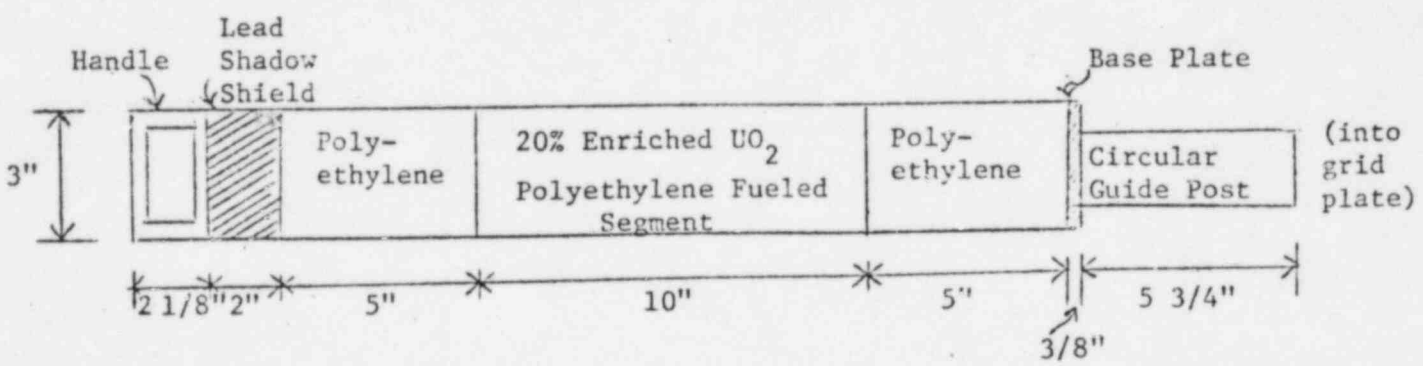

Figure 2. Side View of AGN-211P Reactor Fuel Element

that the Possession Only license had been granted; and, in fact, were cited for several items of non-compliance. The foremost item of non-compliance was that steps to absolutely guarantee subcriticality and inoperability of the reactor had not been taken. Basically, we had not been aware that official permission had been given under the Possession Only license to remove fuel and/or reflector elements to put the core in a subcritical configuration.

On April 25, 1975, fuel elements D-4 and E-4 were removed from the core in Mr. Burke's presence (Refer to Figure 1. for element identification). These were wipe tested and survey monitored. At-surface survey meter readings on the fuel elements were 4.0 mR/hr.* and wipe tests showed surface contamination to be less than 1000dpm/100 cm^2. Fuel elements D-4 and E-4 were doubly-wrapped and sealed in 4 mil thick polyethylene sheet and stored in a locked 1/4" thick steel box located in the high-bay area next to the concrete block shield. (Access to the storage box is controlled by the University Radiation Safety Office.) In addition to removing the fuel elements, all mechanical linkages between the rod drive motors and the control and safety rods were removed. Calculations assured us that the reactor was less than 0.25% $\Delta k/k$ subcritical with the fuel elements removed. In fact, the removal of one fuel element was sufficient to assure subcriticality with all rods out of the core.

On July 19, 1978, element F-4, which is a graphite reflector element containing the neutron start-up neutron source, was removed from the reactor. It was vertically braced in the center of a 55 gallon covered plastic drum which was filled with water, and stored in Room 132 of Hodges Hall. Calculations indicated and neutron survey meter readings verified that the maximum neutron dose rate at the outer perimeter of the drum was 10 mrem/hr. Room 132 was formerly a radioisotopes storage vault utilized by the Department of Physics. Its inner floor dimensions are 8' x 10' with a ceiling height of 10'. The walls are 2' thick high density concrete. Access to the vault, again controlled solely by the Radiation Safety Office, is through a 2 1/8" thick solid oak door with a 1/4" thick lead plate running through its middle. The door is key locked, and can also be bolt locked and secured using a heavy duty Master lock or its equivalent. It should be noted that the isotopes vault is not presently being used for radioactive materials storage, other than the neutron start-up source which is presently located in it.

---

*Although it is difficult assess accurately, a conservative estimate would be that the reactor sporadically operated at 75 watts power for 100 hours per year over a 12-year period. Translating this to a continuous operation of the order of one watt per year for 12 years, followed by a shutdown period of 8.5 years, gives a present ^{235}U activity of 55μCi/gm. This is approximately 20 times higher than the natural radioactivity of ^{235}U.

On July 25 and 27, 1979 the remaining ten fuel elements were removed from the core, wipe tested, and stored in two 55 gallon sealed steel drums in the reactor high-bay area. We interpreted this to be permissible under Conditions 2.C.(3) and 2.C.(4) of Amendment No. 6 of the referenced license which read:

> Condition 2.C.(3) "The reactor shall be changed by removal of fuel element(s) and, if required, graphite reflectors such that the reactor is at least 0.25% Δk/k subcritical with all control rods fully withdrawn from the core."
>
> Condition 2.C.(4) "Fuel element(s) removed from the core shall be stored in a locked enclosure within the facility and the key for this enclosure shall be under the control of the person responsible for administration of the reactor."

Removal of two fuel elements had guaranteed 0.25% Δk/k subcriticality with all rods removed. Removal of all fuel elements resulted in a $k_{eff} = 0$ core. There appeared to be no prohibition of this if the elements were stored at the reactor site.

Fuel elements C-3, C-5, D-5, E-3, and E-5 were labeled and stored in one drum; and fuel elements B-3, B-4, B-5, C-4, and D-3 were labeled and stored in the other. Each element was wipe tested, doubly wrapped in 4 mil polyethylene sheet (which was sealed with reinforced tape), and vertically placed in a 3/4" plywood matrix structure especially built to properly space and support the elements in the drums. The drum lids were modified so that they could be secured with steel bands and locked with heavy duty Yale padlocks. Keys to these locks are possessed by Dr. G. Lansing Blackshaw, Acting Reactor Director and Dr. Stephen Slack, University Radiation Safety Officer. Wipe tests of all removed fuel elements indicated removeable contamination of well under 1000dpm/100 cm^2. Radiation surveys at the outside surface of the drums presently show maximum readings of 2mR/hr.

In order to remove fuel elements B-3, B-5, E-3, and E-5, it was necessary to remove the control rods from the core. The control rod blades slide in channels attached to these elements and removal of these elements was not possible without taking out the control rods. Six fuel elements had already been extracted when the first of these elements, E-3, was removed--so the possibility of criticality was non-existent. The control blades and rod couplings to the rod drive mechanism housing were wipe tested and showed no evidence of radioactive contamination. In conjunction with removal of the control rods, the rod drive mechanism housing also had to be decoupled from the steel superstructure. At present the control blades and rod couplings are stored in the high-bay areas, whereas the rod drive mechanism housing is covered for dust protection purposes and stored in the radioisotopes storage vault. We have interpreted the storage vault (Room 132) and the high-bay area

(Rooms B-31 and G-31) in Hodges Hall to be included in the definition of the "reactor site."

To summarize, the present status of the AGN-211P Reactor is this: All fuel has been removed and is in on-site locked storage with access controlled by the Acting Reactor Director and/or the University Radiation Safety Officer. The control rods and rod drive mechanism are also stored at the reactor site, as well as the reflector element containing the neutron start-up source. The remaining 29 graphite elements are still located in the grid, under water, in the steel tank. Wipe tests have demonstrated removeable contamination of less than 1000dpm/100 cm^2 on all fuel elements. No other components show any evidence of contamination.

At this stage the University requests that disassembly of the remaining in-place reactor hardware be authorized. Wipe tests of these components (with the exception of the graphite reactor elements), radiation surveys, and monthly air and water sampling clearly indicate that there is no contamination present. Air samples indicate no measurable activity above background, which ranges from 1.0×10^{-8} µCi/l to 8.0×10^{-8} µCi/l for the Morgantown, West Virginia area---dependent upon the date the sample was taken. Water in the reactor tank has consistently shown a lack of detectable extraneous activity during the past five years, measuring the order of 10^{-5} µCi/cc, again dependent on instrument background. Reactor pool water measurements have been totally consistent with tap water samples run as blanks for comparison purposes.

Since there are no fueled components left in the reactor, we request that disassembly be permitted in an order which makes logistical sense, given the physical environment of Rooms B-31 and G-31. This would be:

a. A sump pump to transfer reactor tank water to Hodges Hall storm drains. Approximately 1500 gallons of water will be discarded.

b. Remove the graphite reflector elements.

c. Remove the ion-chamber instrumentation from the reactor tank.

d. Remove the reactor air monitor and water demineralizer.

e. Remove all reactor steel structural supports and braces attached to the reactor tank.

f. Remove the moveable concrete thermal column shield.

g. Remove the thermal column graphite.

h. Remove the steel reactor tank.

i. Remove the concrete shield blocks.

All work will be carried out under the combined supervision of the Acting Reactor Director and the Radiation Safety Office. Air monitoring and wipe tests of all components will be performed on a continuous basis. To date, the monitoring of all individuals involved with reactor fuel removal has shown that no personnel radiation exposure occurred; and checks of gloves, rags, etc. used in fuel and components handling has indicated that they are free of radioactive contamination. If evidence of contamination exists (although none is expected), all parts, components, etc. will be decontaminated to acceptable levels before they are transferred to storage or sent to disposal.

Items 2. and 3. - Storage and Disposal

In order to permit research usage of Rooms B-31 and G-31 in Hodges Hall and to allow North Texas State University sufficient time to acquire the necessary permits to possess and reconstruct the AGN-211P Reactor, it is requested that West Virginia University be allowed to store the usable and potentially transferrable components of the reactor in Room 132 Hodges Hall (the previously noted isotopes storage vault), and dispose of the non-usable components. At present the usable components are deemed to be the fuel and reflector elements, control and safety rods, rod drive assembly and housing, air monitor, water demineralizer, ion chamber and BF_3 detectors, the structural steel components, the fuel-reflector element grid plate, and the control console and cables. Disposable components are the graphite thermal column, steel water tank, and concrete shielding materials--all of which would be scrapped.

The fuel storage drums containing five fuel elements each will be placed in opposite corners on the floor of the isotopes storage vault. The metal box containing the other two fuel elements will be located in one of the other vault corners. With this arrangement, criticality would be impossible. Shelves presently exist in the room to hold the graphite reflector elements. The door to the vault will be both key-locked and bolt-locked, with the bolt lock secured with a padlock. Only the Acting Reactor Director and the Radiation Safety Officer will have keys to the vault.

A radiation hazard warning sign will be posted on the door to the storage vault. Appropriate radioactive materials tags will be placed on the fuel storage containers and the barrel holding the neutron start-up source located within the vault. An alarm system will be installed at the vault site to detect unauthorized entry.

Output from this system will be directly coupled to West Virginia University Security Police headquarters so that unauthorized intrusion into the vault would be immediately discovered. Authorized entry to Room 132 by either the Acting Director or the Radiation Safety Officer and his staff members would be preceded by a telephone call to Security Police headquarters for notification and identification purposes. A quarterly radiation and environmental survey of the vault will be performed, and results logged and reported according to the provisions of Section C.3. of Regulatory Guide 1.86.

Item 4. - Unrestricted Use of Room B-31 and G-31 Hodges Hall (High-Bay Area)

Upon storage and disposal of all reactor hardware, the high-bay area will be thoroughly wipe tested and surveyed for sources of contamination. Responsibility for this will be vested in the University Radition Safety Office, where equipment exists for this type of monitoring. Rooms B-31 and G-31 are expected to be free of contamination, as past surveys have indicated. If the final radiation survey results support this, a report will be sent to NRC as specified in Section 4 of Regulatory Guide 1.86, with a request that Rooms B-31 and G-31 be made immediately available for unrestricted use. It should be noted that the arrangement of all research equipment to be installed will be such that access to the rooms by NRC inspectors will be possible.

Item 5. - Ultimate Disposal of the Usable Reactor Components

Two options are noted here. Item 5.a. provides for the contingency that North Texas State University may still procure the necessary authorization to acquire the reactor. If so, they or any other bona fide client (in terms of proper NRC authorization) will be sent the usable components of the AGN-211P Reactor. March 1, 1980 will be the deadline date for this option to be viable. If 5.a. proves unfeasible, then Item 5.b. provides that the fuel and neutron source bearing graphite reflector element will be shipped to Oak Ridge. Any reactor components usable for non-nuclear related activities will be retained by the University, and the remainder scrapped. In either 5.a. or 5.b. the fuel will be shipped in containers approved by NRC and DOT, and in accordance with the transportation regulations of these agencies.

Item 6. - Termination of Referenced License

Following completion of either of the two options in Item 5., a final radiation survey will be made of Room 132 Hodges, the radioisotopes storage vault . If contamination exists, it will be removed to the acceptable levels as noted in Table I of Regulatory Guide 1.86; however, none is expected to occur. A report will be made

to NRC, at which time approval will be sought to terminate License R-58, Docket No. 50-129. This will be done prior to the license expiration date of June 19, 1980.

Safety Evaluation of Reactor Dismantling and Disposal

Since AGN-211P Reactor fuel has already been removed from the reactor system and stored in three separate containers, there is no danger of criticality. No significant radiation hazards other than low-level radiation at the fuel storage container surfaces have been detected to date, nor are any anticipated. Dismantling, transfer to storage, and disposal of components will be performed under the supervision of qualified, trained individuals--the Acting Reactor Director and the University Radiation Safety Officer. Gloves and film badges will be worn by all personnel participating in the dismantling operations. As noted previously, radiation monitoring procedures will be continuously carried out. All electrical connections and services to the reactor system have long since been severed, so electrical hazards are non-existent. Normal safety precautions associated with the movement of heavy materials, e. g. concrete shielding blocks, will be observed. Ultimately, all nuclear materials associated with the reactor will be removed from the University. There is some chance that certain non-contaminated components may be retained for non-nuclear use. These might include control console instrumentation, electrical cables and connectors, control rod drive motors, electromagnetic couplers, etc. This would depend upon whether an institution is found that can accept the reactor.

Environmental Impact Appraisal of Reactor Dismantling and Disposal

No changes in Hodges Hall building structure, electrical services, water lines, or sewer lines will be associated with dismantling operations. It has been noted that adequate reactor fuel and component storage facilities already exist. An alarm system will have to be installed in the storage vault, Room 132 Hodges Hall. Evidence to date indicates that no radioactive contamination of the high-bay area, storage vault, or non-fuel components is to be expected. If hardware contamination does exist, it will be reduced to acceptable levels. Shipment of fuel materials will be in accordance with NRC and DOT regulations.

West Virginia University has not had use for the AGN-211P Reactor since early 1971. Future use is out of the question, and the space currently occupied by the reactor is urgently needed for energy-related activities. Dismantling and disposal costs will be borne by the University. In the event that usable components, including the fuel, can be transferred to another institutions, the costs

associated with packaging and shipment will be paid by that institution.

In brief, no significant environmental impact is anticipated.

We believe that all our activities undertaken with respect to reactor fuel and control-safety rod removal have been permissible under conditions and interpretations of License R-58, Docket No. 59-129. Expeditious NRC approval of Items 1. through 4. in this request will greatly help the University obtain laboratory facilities space which is immediately needed to properly conduct research work under existing grants and contracts. If further information is required, or you wish to discuss technical or regulatory aspects of this request, please contact Dr. G. Lansing Blackshaw, College of Engineering, West Virginia University, Morgantown, West Virginia 26506: Phone (304) 293-4821.

West Virginia University certifies that this request has been prepared in conformity with Title 10, Code of Federal Regulations, Parts 20, 50, and 70, where applicable, and NRC Regulatory Guide 1.86, where applicable. The licensee also solemnly affirms that all information contained herein is true and correct to the best of our knowledge and belief.

West Virginia University, Licensee
Morgantown, West Virginia

G. Lansing Blackshaw

G. Lansing Blackshaw
Assistant Dean of Engineering
Acting Reactor Director

Ray Koppelman

Ray Koppelman
Vice President - Energy Studies,
Graduate Programs, and Research
Chairman, University Radiological
Safety Committee

State of West Virginia

County of Monongalia

Subscribed and sworn to before me this 27th of September, 1979.

Olive I. Snyder

Notary Public

My Commission expires 11/18/86

College of Engineering

Morgantown, West Virginia
26506

November 30, 1979

West Virginia University

Mr. William Gammill
Acting Assistant Director for Operating
Reactor Projects
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Re: License R-58, Docket No. 50-129

Dear Mr. Gammill:

Mr. Peter Erickson from your Division recently called me to ask some specific questions regarding West Virginia University's September 27, 1979 request to dismantle and dispose of its AGN-211P (Serial No. 103) Reactor. Presumably, these requests for additional information had come from members of your staff. The paraphrased questions and responses follow:

Question: What is your most sensitive radiation survey instrument?

Response: The University Radiation Safety office has informed me that a Model E-520 Eberline portable gamma probe Geiger counter (with readout) is sensitive to detecting radiation levels as low as 0.02 mR/hr. This is capable of discriminating true sources of low-level radiation from background and noise fluctuations.

Question: You did not specifically mention contingencies for handling possibly irradiated reactor components (other than fuel elements). What do you plan to do?

Response: We have detected no discernible radiation from any of the components removed from the reactor with the exception of the fuel elements, which was noted in the dismantling request. In particular, the glory hole guide tube, the control and safety rod blades, and the steel "blade guide channels" attached to four of the fuel elements show absolutely no evidence of being radioactive. These would have been located in regions of maximum neutron flux during periods of reactor operation. We see only background fluctuations on the E-520 meter. In brief, we expect no irradiated materials problems with which to contend.

Question: What do you intend to do about the Ra-Be neutron start-up source in the graphite reflector element which is presently stored in a 55-gallon water-filled plastic drum, which in turn is located inside the storage vault?

Response: This is unsatisfactory on a long-term basis. Our initial reaction was to construct a 1" thick rectangular cross section lead "cover sleeve" for the source bearing element to attenuate the soft gammas resulting from Ra decay; and then imbed this sleeve in a 55-gallon steel drum filled with paraffin. We now believe that this approach will be both time consuming and costly in terms of materials procurement and labor, and will still not result in a container which meets DOT and NRC shipping regulations.

We thus intend to immediately proceed to secure a DOT approved shipping container for the neutron source bearing element, and transfer the element from the water-filled drum to the shipping container within the confines of the storage vault. A portable electrically operated overhead crane can be set up in the vault to accomplish this. Maximum radiation exposure to any personnel involved in this element transfer will be 5 mrem. This will be determined by a combination of pencil dosimeters and area survey monitors. Dr. G. L. Blackshaw will be both in charge of and the most active participant in the operation.

Once transfer to the shipping container is accomplished, the container will be stored in the vault until the decision has been reached to send the reactor fuel to Oak Ridge or to North Texas State University. (See Item 5 on page 1 and Justification on page 2 of the September 27, 1979 letter.)

Sincerely,

C. Lansing Blackshaw

C. Lansing Blackshaw
Assistant Dean of Engineering
Acting Reactor Director

Copies to: Dr. Ray Koppelman
Dr. Steve Slack