

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

0500016040Y
221AID L22357
College of Engineering
Department of Mechanical Engineering
Nuclear Engineering Program
107 Nuclear Engineering Lab
Ames, Iowa 50011-2241
515 294-5840
FAX 515 294-7224

October 30, 1996

50-116

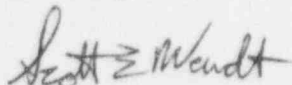
Charles J. Haughney
Spent Fuel Project Office
NMSS
US Nuclear Regulatory Commission
Washington, DC 20555

Dr. Mr. Haughney:

This letter is to inform you of an impending shipment of spent nuclear fuel by Iowa State University. The information required by 10CFR73.72 is attached. The governor's designees in the states in which the shipment will pass will be notified in writing per 71.97(c) and (d).

Please feel free to contact me (515) 294-0539 if you have any questions.

Sincerely,



Scott E. Wendt
Reactor Manager

SEW:bs

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NMOS

NOTIFICATION OF SPENT FUEL SHIPMENT

Shipper

Mechanical Engineering Dept.
Iowa State University
Ames, IA 50011

Contact: Scott E. Wendt
107 Nuclear Engr. Lab.
515-294-0539
Fax: 515-294-7224

Carrier

Tri-State Motor Transit Co.
P.O. Box 113
Joplin, MO 64802-0113
800-641-7500

Receiver

Westinghouse Savannah River
Savannah River Site, Bldg 244-H
Aiken, SC 29808

Contact: Matt Beckum
803-557-9642

This notification is being furnished in
compliance with NRC regulations to Part 73

DESCRIPTION

Radioactive Material, fissile, n.o.s., UN2918

ADDITIONAL INFORMATION FOR A PART 73 SHIPMENT OF SPENT FUEL

The street address of the point of origin is:

112A Nuclear Engineering Laboratory
Iowa State University
Ames, IA 50011

and the route to be used within that state is:

Bissell Road to Union Drive.
Union Drive to Sheldon Avenue.
Sheldon Avenue to Lincoln Way.
Lincoln Way to Elwood Drive.
Elwood Drive to US-30.
US-30 to I-35.
I-35 to I-80.
I-80 to I-280.
I-280 to Iowa/Illinois border.

The shipment is scheduled to be transported through (or into) the following additional states using the routes indicated:

Illinois:

I-280 to I-74
I-74 to I-474
I-474 to I-74
I-74 to I-55
I-55 to I-74
I-74 to I-57
I-57 to I-24
I-24 to Illinois/Kentucky border

Kentucky:

I-24 to Kentucky/Tennessee border

Tennessee:

I-24 to Tennessee/Georgia border

Georgia:

I-75 to I-285
I-285 to I-20
I-20 to Georgia/South Carolina border

South Carolina

I-20 to SC-19
SC-19 to Savannah River Site

Schedule information is attached as a separate sealed item. It must be protected against unauthorized disclosure until 11-24-96.

This notification is being provided by:

Organization: Mechanical Engineering Department
Iowa State University
107 Nuclear Engineering Laboratory
Ames, IA 50011
Tel: 515-294-0539
Fax: 515-294-7224

By: Scott Wendt, Reactor Manager

Scott Wendt
(Signature)

Shipment identification number:

R59-090196A

Shipment

Scott Wendt 10-30-96

Today's Date
Mo/Day/Year

- Schedule Information for a Part 73 Shipment of Spent Fuel is provided in a separate enclosed envelope marked "Safeguards Information." The contents must be protected against unauthorized disclosure until January 1, 1997.

Physical Description of shipment:

The shipment will consist of 72 aluminum clad plates from the Iowa State University UTR-10 reactor (Argonaut type). Each plate is three inches wide, 26 inches tall and .125 inches thick. The fuel material is UAlx with U-235 enriched to approximately 93%. The average mass of U-235 per plate is approximately 22g.

APPENDIX A AGREEMENT
SPENT NUCLEAR FUEL ACCEPTANCE CRITERIA

No. _____ UNDER CONTRACT NO. DE-FG02-87ER75360
WITH _____ Iowa State University

THIS AGREEMENT, entered into this 1 st day of September, 1987, constitutes an agreement by the U.S. Department of Energy (hereinafter called DOE) to receive under the terms and conditions of Contract No. DE-FG02-87ER75360, the specification material described herein. This agreement provides a detailed description of the material to be delivered to DOE in accordance with this contract and also enumerates the specifications and requirements which the Customer must meet. Failure of the material delivered hereunder to comply with the specifications and requirements given in this agreement will result in the material being non-specification material. A separate Appendix A Agreement will be required for each element, subassembly, or assembly which is different in Description. All dimensions must be given in meters or centimeters and all weights in grams or kilograms.

A. Definitions

The following definitions are applied to the Specification Material described in this Agreement:

The Fuel Element - The smallest integral unit of clad fuel (or blanket) containing source or special nuclear material (e.g., plate, tube, rod, disc, etc.).

Subassembly - If used, is a group of elements, combined in a structural unit, which is grouped with other subassemblies to form the larger unit called the assembly.

Assembly - A group of elements or subassemblies combined in a structural unit. The assembly is usually that fuel structure which is removed from the reactor as an individual unit.

B. Form and Composition of Specification Material

1. Drawing Identification

The following drawing(s), four (4) copies of which are attached and which are incorporated herein by reference thereto, constitute(s) a comprehensive illustration of the fuel elements, subassemblies, and assemblies to be delivered under this Contract as charged to the reactor, in sufficient detail and accuracy under this Contract.

Drawing No. / English Title	Drawing No. / English Title
R1-C-121, Full load fuel plate	
R1-C-122, Half load fuel plate	
ISU-NE-96-01, ISU Fuel Plate Holder	

Appendix A Agreement

2. Material Description

The following summarizes the description of fuel elements, subassemblies, assemblies and assemblies modified after discharge. Where dimensions are required, the nominal dimensions, as charged to the reactor, must be used and the best estimate of the maximum change in these dimensions because of irradiation must be given. Weights must be dry, unirradiated weights with the expected range of weights also to be included. Where isotopic weights of SNM are required, tolerances shall be specified.

(a) Fuel 'Element' Description

Fuel element type (plate, disc, rod, tube, etc.)	Plate
Nominal dimensions (include clad and bond, cm)	66.04 x 7.62 x 0.203
Active length of fuel element (cm)	60.96
Nominal total weight of fuel element (g)	Full load = 291.50 Half load = 282.46 Quarter load = 278.00
Nominal weight of SNM before irradiation (g)	Full load = 23.9083 Half load = 11.6500 Quarter load = 5.8550
Total U (g \pm g uncertainty)	Full load = 23.9083 ± 0.3617 Half load = 11.6500 ± 0.1697 Quarter load = 5.8550 ± 0.1202
U-235 (g \pm g uncertainty)	Full load = 22.2900 ± 0.3300 Half load = 10.8700 ± 0.1697 Quarter load = 5.465 ± 0.1061
Total Pu (g \pm g uncertainty)	Full load = $0.0 \pm 2.7e-10$ Half load = $0.0 \pm 1.4e-10$ Quarter load = $0.0 \pm 6.8e-11$
Pu-239 (g \pm g uncertainty)	Full load = $0.0 \pm 2.7e-10$ Half load = $0.0 \pm 1.4e-10$ Quarter load = $0.0 \pm 6.8e-11$
Thorium (g \pm g uncertainty)	Full load = $5.55e-14 \pm 1.1e-14$ Half load = $2.77e-14 \pm 5.55e-15$ Quarter load = $1.38e-14 \pm 2.78e-15$
Chemical form of SNM (e.g., UO_2 , UAl_x -alloy, UC, etc.)	UAl_4

Appendix A Agreement

Weight of SNM (g)	Full load = 34.660 Half load = 16.995 Quarter load = 8.541
Fabricated form of SNM (pellets, slugs, ribbons)	Homogeneous intermetallic fuel meat
Alloy or dispersing material (Al, SS, etc.)	Aluminum
Alloy or dispersing material weight (g)	Full load = 95.85 Half load = 47.92 Quarter load = 23.94
Cladding material (Al, SS, etc.) & method of sealing	Aluminum Metallurgical solid phase bond
Clad thickness (cm), weight (g)	0.0508 cm \pm 0.0127 cm Full load = 161.46 Half load = 217.54 Quarter load = 245.52
Bonding material, if any (Na, Al-Si, etc.)	N/A
Bond thickness (cm), weight (g)	N/A
Spacers, inactive material (MgO, SS, etc.)	N/A
Spacer dimensions (cm), weight (g)	N/A
Other materials contained in the fuel element: (include dimensions and weights)	N/A

Appendix A Agreement

(b) 'Subassembly' Description

Number of elements	N/A
Over-all subassembly dimensions (cm)	N/A
Total subassembly weight (g)	N/A
Casing Material (Zr, Al, etc.)	N/A
Casing dimensions (cm), weight (g)	N/A
Side plate material	N/A
Side plate dimensions (cm), weight (g)	N/A
Spacer material	N/A
Spacer dimensions (cm), weight (g)	N/A
End box material	N/A
End box dimensions (cm), weight (g)	N/A
Braze or weld material	N/A
Braze or weld dimensions (cm), weight (g)	N/A
Other structural material contained in subassembly (include dimensions and weight)	N/A

(c) Full 'Assembly' Description

Number of subassemblies/elements	6 or 7
Over-all dimensions (cm)	8.255 x 8.255 x 86.6775
Over-all weight (g)	3106 or 3444
Casing Material (Zr, Al, etc.)	Al 6065
Casing dimensions (cm), weight (g)	8.255 OD x 87.00, 1078
Side plate material	N/A
Side plate dimensions (cm), weight (g)*	N/A
Spacer material	N/A
Spacer dimensions (cm), weight (g)	NA, NA
End box material	N/A
End box dimensions (cm), weight (g)	N/A
Braze or weld material	Al 4043
Braze or weld dimensions (cm), weight (g)	0.7 x 11, 70
Other structural material in assembly (include dimensions and weight)	N/A

* Side plate weight shall account for any slot volume(s).

Do the fuel elements contain Sodium (Na)? Yes ☐ No ☒

Appendix A Agreement

C. Fuel Identification

Each separately removable unit in a shipment batch must be identified by a durable tag or by embossing.

Identification of the Units to be delivered under this Appendix A Agreement are as follows (NOTE: Customer shall list actual assembly identification numbers):

The fuel has been disassembled into individual plates. Each plate has a unique serial number engraved in 1/8 inch numerals. The plates will be placed in aluminum tubes (6 or 7 per can). Each aluminum tube has a unique serial number engraved and painted in 2 inch letters and numerals.

D. Fuel Irradiation Specifications

1. Fuel Irradiation History - General Summary

The fuel was in the core for a period of 11 231.5 days. Of that time, the reactor was critical for a total of 8673.5 hours. During the time critical, the fuel experienced a total burnup of 87.7 MWd/MTU. This burnup consumed a total of 396.2 milligrams of U-235.

2. Post-Irradiation Specifications

The average and maximum SNM content post-irradiation is to be specified in grams per assembly. The best available value should be given and the uncertainty stated. The irradiation history for each assembly is to be provided according to Section F.

SNM Material	Average (g)	Maximum (g)	Uncertainty (\pm g or \pm %)
Total U	23.1673	24.2674	$\pm 10\%$
Total Pu	2.702e-10	2.702e-10	$\pm 20\%$
Total Np	2.0785e-11	2.0785e-11	$\pm 20\%$
Total Th	3.435e-12	3.435e-12	$\pm 20\%$
U-232	6.686e-16	6.686e-16	$\pm 20\%$
U-233	5.612e-15	5.612e-15	$\pm 20\%$
U-235	21.6311	22.620	$\pm 10\%$
U-236	5.825e-06	5.825e-06	$\pm 20\%$
Pu-239	2.695e-10	2.695e-10	$\pm 20\%$
Pu-241	9.207e-16	9.207e-16	$\pm 20\%$

Appendix A Agreement

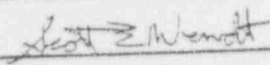
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3. Specifications for Failed/Warped Fuel Units

1. Fuel elements or assemblies distorted beyond specified dimensional limits must be considered on an individual basis. The Customer should provide DOE with complete dimensional information for each failed/warped unit at least 60 days before delivery.
2. If material normally removed from the element or subassembly by the Customer cannot be removed due to fuel failure, warpage, or other reasons, the Customer must notify DOE at least 60 days before delivery giving complete dimensional, material, and weight information. Detailed structural drawings are also required by DOE.

E. Correspondence

1. Customer Contact

Laboratory/ Research Center/University	Iowa State University
Reactor Name	UTR-10
City, State, Country	Ames, Iowa, USA
Customer Name	Scott E. Wendt
Customer Signature	
Title	Reactor Manager
Phone Number	(515) 294-0539
Fax Number	(515) 294-7224
Date	July 24, 1996

2. Department of Energy Contact

All correspondence or inquiries regarding this document and the information contained herein shall be directed to:

U.S. Department of Energy
Savannah River Operations Office
Reactors & Spent Fuel Division
P.O. Box A
Aiken, SC 29801

Phone and facsimile inquiries may be made to:

Phone: (803)-557-3759

Fax: (803)-557-3763