IAEA/ANL
Interregional Training Course

Technical and Administrative Preparations Required for Shipment of Research Reactor Spent Fuel to Its Country of Origin

Argonne National Laboratory
Argonne, IL
13 - 24 January 1997

Lecture L.6.1a

Preparing for Shipments of Spent Nuclear Fuel to the Savannah River Site

Appendix A Agreement
Spent Nuclear Fuel Acceptance Criteria

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APPENDIX A AGREEMENT
SPENT NUCLEAR FUEL ACCEPTANCE CRITERIA

No. _____ UNDER CONTRACT NO. _____
WITH _____

THIS AGREEMENT, entered into this _____ day of _____, 19____, constitutes an agreement by the U.S. Department of Energy (hereinafter called DOE) to receive under the terms and conditions of Contract No. _____, 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. Correspondence

1. Customer Contact

Laboratory/ Research Center/University	
Reactor Name	
City, State, Country	
Customer Name	
Customer Signature	
Title	
Phone Number	
Fax Number	
Date	

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

B. 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.

C. Form and Composition of Specification Material

1. Drawing Identification
   The following drawing(s), five (5) 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. If available, include fuel specification report.

Drawing No. / English Title
Assembly:
Fuel Plates/Tubes:
Side Plates:
End Boxes:
Spacers:
Compact:
Materials and Engineering:
Other:

NOTE: If fuel is to be cropped (cut), drawings should indicate the location of the cut(s).

2. Material Description

The following tables summarize the description of fuel elements and assemblies to be delivered under this contract. Where dimensions are required, the nominal dimensions from the fuel element and assembly drawings must be used. If changes in dimensions have occurred due to cropping or other modification, the best estimate of the maximum change in these dimensions must be given. Weights must be dry, unirradiated weights with the expected range of weights also to be included. Where isotopic weights of uranium are required, tolerances shall be specified. Separate Appendix As are required for each different fuel element or assembly. For example, plates with different length, assemblies with different number of plates, U-235 content or uranium enrichment, and standard or control assemblies.

(a) Fuel 'Assembly' Description

1. Number of elements per assembly	
2. Fuel element type (curved or flat plate, disc, rod, tube, etc.)	
3. Chemical form of fuel meat (e.g., U_3O_8-Al, UAl_x-alloy, UC, U_3Si_2-Al,etc.)	
4. Over-all dimensions (cm)[a]	
5. Over-all weight (g)[a]	
6. Maximum Enrichment (%)	
7. Weight of Total U	
8. Weight of Total U^{235}	
7. Canning Material (Zr, Al, etc.)[b]	
8. Canning dimensions (cm), weight (g)[b]	
9. Method of can sealing (screw, weld, etc.)[b]	
10. Casing Material (Zr, Al, etc.)	
11. Casing dimensions (cm), weight (g)[a]	
12. Side plate material	
13. Side plate - dimensions (cm), weight/plate (g)[a,c]	
14. Side plate slot dimensions (cm)	
15. Spacer material	
16. Spacer - number of spacers, dimensions (cm), weight/spacer (g),	
17. End box (bottom fitting) material	
18. End box (bottom fitting) dimensions (cm), weight (g)	
19. Braze or weld material	
20. Braze or weld dimensions (cm), weight (g)	
21. Other structural material in assembly e.g. dummy plates, thermocouples, etc. (include quantity, dimensions, and weight (g))	

(a) Is the assembly cropped? Yes No
(circle one)

If yes, all dimensions and weights should be indicated in terms of the cropped assembly and drawings identifying the cropping location should be provided.

(b) When canning of fuel is required, describe can using these entries.

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

Do the fuel elements contain Sodium (Na)? Yes No
(circle one)

(b) Fuel 'Element' Description *(If more than one type of element per assembly, divide the space to describe each type of element or duplicate this page as necessary.)*

1.	Nominal dimensions of element (include clad and bond, cm)*	
2.	Nominal dimensions of fuel meat (cm)	
3.	Chemical form of fuel meat (e.g., U_3O_8-Al, UAl_x-alloy, UC, U_3Si_2-Al, etc.)	
4.	Nominal total weight of fuel element (g)	
5.	Weight of fuel meat (g ± g uncertainty)	
6.	Weight of dispersed phase material (UAl_x, U_3O_8, U_3Si_x, etc.) (g)	
7.	Weight of total U (g ± g uncertainty)	
8.	Weight of U-235 (g ± g uncertainty)	
9.	Matrix material weight (g)	
10.	Cladding material & method of sealing	
11.	Clad thickness (cm), total clad weight (g)	
12.	Bonding material, if any (Na, Al-Si, etc.)	
13.	Bond thickness (cm), weight (g)	
14.	Other materials contained in the fuel element: (include dimensions and weights)	

* For curved plate type elements, state dimensions for flat form.

D. 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):**

_____

_____

_____

_____

_____

E. Fuel Irradiation Specifications

1. Fuel Irradiation History - General Summary

_____

_____

_____

_____

_____

2. Post-Irradiation Specifications

The average and maximum special nuclear material (SNM) post-irradiation content 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 G.

SNM Material	Average (g)	Maximum (g)	Uncertainty (± g or ± %)
Total U			
Total Pu			
Total Np			
U-235			
U-236			
Pu-239			
Pu-241			

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 120 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 120 days before delivery giving complete dimensional, material, and weight information. Detailed structural drawings are also required by DOE.

F. Cask and Basket Identification

The specific cask and basket type being shipped under this Appendix A must be identified.

Cask	Basket	Number of Assemblies/Cask

G. Fuel Irradiation History - Assembly Specific Data

The irradiation history for each assembly is to be provided according to the format specified below. Additional tables may attached (if necessary). The unique ID number **must** match the number on the assembly.

Assembly	Pre-Irradiation		Post-Irradiation											
a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.
Unique ID No.	U grams	U-235 grams	U grams	U-235 grams	U-236 grams	Np-237 grams	Pu grams	Pu-239 grams	Pu-241 grams	Time In Reactor (days)	Cooling Time (days)	Power Level mwd/ assembly	Exposure Burnup %	Decay Heat (Watts) as of: _____

UNITED STATES OF AMERICA

BY: UNITED STATES DEPARTMENT OF ENERGY

BY: ---------- BY: ----------

TITLE:---------- TITLE:----------

DATE:---------- DATE:----------