1 of 1

DECLASSIFIED

(CLASSIFICATION)

DOCUMENT NO.

UNDOCUMENTED

44-77153
SERIES AND COPY NO.

GENERAL ELECTRIC

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

DATE

March 20, 1963

☒

RESTRICTED DATA

THIS DOCUMENT CONTAINS RESTRICTED DATA
AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954.
TRANSMISSION OR THE DISCLOSURE OF ITS
CONTENTS IN ANY MANNER TO AN UNAUTHORIZED
PERSON IS PROHIBITED.

TITLE

PROVISIONAL PROCESS SPECIFICATIONS
FOR FABRICATION OF KIT & KIIT TAR-
GET ELEMENTS FOR K REACTOR E-N
LOAD (PT-IP-561-C)

☐

OTHER OFFICIAL CLASSIFIED INFORMATION

THIS MATERIAL CONTAINS INFORMATION AFFECTING
THE NATIONAL DEFENSE OF THE UNITED STATES
WITHIN THE MEANING OF THE ESPIONAGE LAWS,
TITLE 18, U. S. C., SECS. 793 AND 794, THE TRANS-
MISSION OR REVELATION OF WHICH IN ANY MANNER
TO AN UNAUTHORIZED PERSON IS PROHIBITED BY
LAW.

AUTHOR

E. V. Padgett, Jr.
Process Engineering
Fuels Engineering
Operation
Production Fuels
Section - IPD

ISSUING FILE

THIS DOCUMENT IS NOT TO BE LEFT UNATTENDED OR WHERE AN UNAUTHORIZED PERSON MIGHT HAVE ACCESS
TO IT. WHEN IN USE, IT MUST BE STORED IN AN APPROVED LOCKED REPOSITORY WITH AN APPROVED
GUARDIAN. WHILE IT IS YOUR POSSESSION AND UNTIL YOU HAVE OBTAINED A SIGNED RECEIPT FROM
CLASSIFIED FILES, IT IS YOUR RESPONSIBILITY TO KEEP IT AND ITS CONTENTS WITHIN THE LIMITS OF
PROJECT AND FROM ANY UNAUTHORIZED PERSON. ITS TRANSMISSION, TO, AND STORAGE AT YOUR PLACE
OF RESIDENCE IS PROHIBITED. IT IS NOT TO BE DUPLICATED. IF ADDITIONAL COPIES ARE REQUIRED,
OBTAIN THEM FROM THE ISSUING FILE. ALL PERSONS READING THIS DOCUMENT ARE REQUESTED
TO SIGN IN THE SPACE PROVIDED BELOW.

ROUTE TO:

PAYROLL NO.

LOCATION

FILES ROUTE
DATE

SIGNATURE AND DATE

*Extra
File Copy*

Records Center 3-25-63

REFERENCE COPY

RECEIVED 300 AREA

APR 3 1963

RETURN TO

TECHNICAL INFORMATION FILES

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DECLASSIFIED

DECLASSIFIED

44-77153

This document consists of
15 pages, No. 22 of
24 copies. ~~Series A~~

PROVISIONAL PROCESS SPECIFICATIONS FOR
FABRICATION OF KIT & KIIT TARGET ELEMENTS
FOR K REACTOR E-N LOAD (PT-IP-561-C)

E. V. Padgett, Jr.
Process Engineering
Fuels Engineering Operation
Production Fuels Section - IPD

March 20, 1963

Classification Cancelled and Changed To

DECLASSIFIED

By Authority of D. S. L...

~~PR-24~~ 3-21-94

By J. E. S... 3-20-94

Verified By ISK/H... 4-4-94

DISTRIBUTION

1. H. E. Berg	13. J. D. Schaffer
2. W. A. Blanton	14. J. S. Shipp
3. A. G. Blasewitz	15. J. T. Stringer
4. C. M. Heeb	16. H. F. Tew
5. K. L. Hladek	17. F. W. Van Wormer
6. F. W. Knight	18. F. L. Van Wyck
7. H. C. Money	19. E. A. Weakley
8. D. E. Munro	20. J. J. Wick
9. V. H. Nelson	21.
10. H. G. Powers	22. ...
11. R. Roske	23. ...
12. R. W. Scanlon	24. EVP File

~~Document contains restricted information
defined in E.O. 11652 of 1954.
Its transmittal and use of its
contents in any manner to an unauthorized person
is prohibited.~~

DECLASSIFIED

DECLASSIFIED

APR - 77/53

PROVISIONAL PROCESS SPECIFICATIONS FOR
FABRICATION OF KIT & KIIT TARGET ELEMENTS
FOR K REACTOR E-N LOAD (PT-IP-561-C)

It is necessary to modify existing I&E fuel element components to produce the requested target elements by early April, 1963. Normally, a minimum of eighteen weeks is required to produce components of a new design. Therefore, the finished target elements will not be of the optimum designed dimensions. The proposed minor deviations have been approved by Reactor Engineering for the demonstration load. It is anticipated that only these test quantities will be fabricated to these dimensions. These provisional process specifications are established on this basis and are subject to change as the fabrication techniques are developed.

DESCRIPTION OF PROCESS

I. Preparation and Inspection of Core

The cores are machined without lubricant to final dimensions immediately prior to assembly, to minimize the hydrogen content of the completed assemblies. The KIT cores can be machined, as normal, from the 1.405 inch outside diameter pierced rod stock. The larger KIIT cores are to be produced from 2.090 inch diameter rod stock. The core blanks will be received in rough machined form 1.455 inch O.D. and 0.515 inch I.D.

Core Specifications

1. Lithium Content of Cores.

Same as Specification C202(a), HW-47029.

2. Dimensions and Tolerances

<u>Dimensions</u>	<u>Nominal Core Dimensions</u>	
	<u>KIT</u>	<u>KIIT</u>
a. Outside diameter $\pm$ 0.003	1.376	1.435
b. Inside diameter $\pm$ 0.003	0.504	0.532

HW-7718.3
DECLASSIFIED

		<u>KIT</u>	<u>KIIT</u>
c. Length	± 0.010	3.800	3.800
d. Radius (both ends) Max.		0.030	0.030
e. Surface finish (OD&ID) Max.		125	125
f. Base end taper		4-5°	4-5°

See figures 1 and 2.

3. Metal Soundness and Surface Condition.

Same as Specification C202(c), HW-47029.

4. Impurity Content.

Same as Specification C202(d), HW-47029.

II. Preparation and Inspection of the Jacket Components

The required KIT model target elements approach the K4E fuel element diameters. The C2N cans are modified to be sized to the K4E size and to receive the K4E cap spire. The K4E cap spires are modified for the unbonded fabrication process. See Figures 3 and 4.

The KIIT model target element jacketing components require modification of the standard K5N cans and cap-spires. See Figures 5 and 6.

The dimensions of the jacketing components are critical to control the subsequent sizing operation. Inspection for any perforations or defects is required since they were modified in the shops.

The components are annealed to promote intimate contact of the core, can, and spire after sizing. The components are thoroughly cleaned and deoxidized to remove foreign material and to promote sound welds.

Component Specifications

1. Jacketing Materials.

Jacketing components shall be fabricated from X-8001F alloy and meet Specifications F105.1 through F105.3.

[REDACTED]

44-77183

-3-

DECLASSIFIED

2. Dimensions and Tolerances

<u>Dimensions</u>	<u>Nominal Component Dimensions</u>	
	<u>KIT</u>	<u>KIIT</u>
a. Can model	C2N	K5N
b. Cap-spire model	K4E	K5N
c. Can length ± 0.040	4.510	4.510
d. Spire length (overall) ± 0.025	4.475	4.475
e. Wafer diameter	1.378 $\begin{smallmatrix} +.002 \\ -.003 \end{smallmatrix}$	1.438 $\begin{smallmatrix} +.001 \\ -.002 \end{smallmatrix}$
f. Water thickness ± 0.010	0.260	0.260
g. Can base thickness ± 0.010	0.260	0.260
h. Can base I.D.	0.504 ± 0.001	Normal

III. Assembly and Sizing of the Components

The core is inserted into the can tapered end next to the base to minimize the entrapped air. The core seating force is adjusted to assure a maximum total axial gap of 0.010 inches.

The assemblies are externally sized with the use of three stage nylon dies. A nylon tipped mandrel is used for internal sizing. The residual air gap between the core and the jacket is controlled by making a proper reduction. The same general rules of selection of nylon die sizes shall apply.

The KIT sizing is similar to the present O4T model. However, because the spire well in the K5N (KIIT element) can base is about ten mils larger than the core inside diameter, expansion of the spire tube at this point, by spinning or other techniques, may be necessary to effect a tight closure for welding. A similar procedure was used to produce the first small scale engineering demonstration loading of the O4T model elements. The spire tube for the KIIT model requires

Doc 77183

[REDACTED]

DECLASSIFIED

a nominal 0.012 inch expansion. This is too much for a single sizing operation. Therefore, the KIIT model requires a two step internal sizing operation.

Specifications

1. The maximum total axial gap (non-seating) shall be 0.010 inches.
2. The core and jacket material shall be in intimate contact and controlled by proper internal and external sizing.

IV. Finishing & Inspection

The excess can and spire length is removed by facing the sized assembly. The proper end contours are to be machined on the elements prior to welding. Closure welds are made by tungsten inert-arc welding using direct current, straight polarity.

Specifications

1. End contours are to be machined in accordance with Specification F302.2 for the KIT model and in accordance with H-3-7350 for the KIIT model (K5N contour).

2. Finished length:

a. Model KIT &	4.420	Maximum
Model KIIT	4.300	Nominal
	4.220	Minimum

3. Cap & Base thickness:

a. Model KIT &	.270	Maximum
Model KIIT	.260	Nominal
	.240	Minimum

4. Finished Diameter:

	OD		ID
a. Model KIT	1.463	Maximum	0.417
	1.452	Nominal	0.404
	1.437	Minimum	0.391
b. Model KIIT	1.522	Maximum	0.445
	1.511	Nominal	0.432
	1.496	Minimum	0.419

[REDACTED]

Ref. 7715 2

[REDACTED]

DECLASSIFIED

5. Depth of Acceptable Surface Mars:

Can base	0.035	Maximum
Other surfaces	0.004	Maximum

6. Thickness Defect-free Weld Metal 0.025 Minimum

7. Weld Overhang:

One Side	0.010	Maximum
Sum-Opposite Sides	0.015	Maximum

8. Assemblies shall pass a full length tube or parallel plate gauge and ID ball gauge or mandrel:

	<u>Plate Gauge</u>	<u>Ball Gauge</u>
Model KIT	1.472	0.385
Model KIIT	1.522	0.417

9. General Appearance:

- a. All exterior and interior surfaces shall be free of foreign contaminates.
 - b. Surfaces shall show no evidence of seams, cracks, lamination, pinholes, or perforations, inhomogeneity, corrosive attack, or abnormal surface conditions not subject to ready and conclusive evaluation as to their acceptability.
10. Hydrogen content of the finished assembly shall not exceed six volume percent.
11. Canning rejects may be re-canned if the finished element will conform to the above specifications.
12. All welds shall be visual inspected and bubble tested. The outer welds are to be radiograph inspected for water paths.

V. Element Identification

All elements shall have a lot and/or heat number stamped on the base from which the fabrication history of both core and canned assembly can be determined by reference to production records.

[REDACTED]

44-7715-3

-6-

DECLASSIFIED

VI. Support Attachment KIIT Model

1. The KIIT model target element is to be supported by attachment of four rows of two rails each of the K5E model support rail (HW-69886 Rev.2). The rail rows shall be spaced at 90 ± 1.5 degree intervals.
2. The maximum projected rail row width shall be 0.280 inches.
3. The distance from the tip of the cap weld to the near end of the rails in each row, the maximum projected fuel diameter, and minimum projected rail height shall be as follows:

	<u>Distance from Cap End</u>		<u>Max. Projected</u>	<u>Min. Projected</u>
<u>Fuel Model</u>	<u>1st Rail</u>	<u>2nd Rail</u>	<u>Fuel Diameter</u>	<u>Rail Height</u>
KIIT	0.200 $\pm$ 1/16	2.175 $\pm$ 1/16	1.710	0.097

4. Post-sizing of the rails is permissible to conform to the above Specifications.
5. The self-supported KIIT elements are to conform to all other rail weld inspections as specified in HW-69886 Rev.2.
6. Rails which fail the shear test may be welded if the rails are not damaged. Rewelds shall be shear tested.
7. The soap coating from the welding operation should be removed by hot water prior to final inspection.

E. V. Padgett, Jr.

E. V. Padgett, Jr., Supervisor
Process Engineering
Fuels Engineering Operation
Production Fuels Section - IPD

UNCLASSIFIED

Attn 7718.3

- 7 -

Fig. 1 Core for KIT Assembly

UNCLASSIFIED

- 8 -

Fig. 2 Core for KIIT Assembly

UNCLASSIFIED

-9-

Fig. 3 Alterations to K4E Cap-Spire for KIT Assembly

UNCLASSIFIED

UNCLASSIFIED

-10-

Fig. 4 Alterations to C2N Can for KIT Assembly

UNCLASSIFIED

Her-77183

UNCLASSIFIED

-11-

Fig. 5 Alterations to K5N Cap-Spire for KIIT Assembly

UNCLASSIFIED

UNCLASSIFIED

-12-

Fig. 6 Alterations to K5N Cans for KIIT Assembly

UNCLASSIFIED

DATE

FILMED

8/2/94

END