DECLASSIFIED

[redacted]

☐

"THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TLE 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."

DOCUMENT NO. HW-23402

DATE	COPY NO.	SERIES
10/8/52	17	[redacted]

FILE DESIGNATION 300 N Obsolet

SUBJECT OR TITLE "A" CANNING PROCESS

RESTRICTED DATA

THIS DOCUMENT CONTAINS RESTRICTED DATA AS DEFINED IN THE ATOMIC ENERGY ACT OF 1946. TRANSMITTAL OF THE INFORMATION CONTAINED IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED.

REPORT ONLY.

MASTER

TO Files

FROM G. E. McCullough

THIS DOCUMENT MUST NOT BE LEFT UNATTENDED WHERE AN UNAUTHORIZED PERSON MAY HAVE ACCESS TO IT. WHEN NOT IN USE IT MUST BE STORED IN AN APPROVED LOCKED REPOSITORY WITHIN AN APPROVED GUARDED AREA. WHILE IT IS IN 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 THE PROJECT AND FROM ANY UNAUTHORIZED PERSON. ITS TRANSMITTAL, AND STORAGE AT YOUR PLACE OF RESIDENCE IS PROHIBITED. IT IS NOT TO BE DUPLICATED. IF ADDITIONAL COPIES ARE REQUIRED, OBTAIN THEM FROM THE RELEASED ISSUING FILE. ALL PERSONS READING THIS DOCUMENT ARE REQUESTED TO SIGN IN THE SPACE PROVIDED BELOW.

ROUTE TO:	READ BY	DATE
300 File		
J W Hall		8/30/54
Martha 12454		
[redacted]	[redacted] 3746	
See inside		
	R. Port	8/4/55
J. M. Navarro	5629	1-9-57
~~Records Service~~	3013	700
Franch		
Jack Manary		
L B Badgett	132 712	SEP
~~A. H. McCown~~	1186 3703	

ROUTE TO:	READ BY	DATE

RECORD CENTER FILE

DECLASSIFIED

[redacted]

THIS DOCUMENT IS PUBLICLY AVAILABLE

[redacted]

C-206-DS (2-52)

Master

[redacted]

DECLASSIFIED

HW-23402

NOT FOR CIRCULATION!
RETAINED FOR RECORD PURPOSES ONLY
REPLACED BY HW-47029

This document consists of 133 ~~39~~ pages.

[redacted]

RECORD CENTER FILE

PROCESS SPECIFICATIONS
"A" CANNING PROCESS
(TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM)

October 8, 1952

Classification Cancelled and Changed To
DECLASSIFIED
By Authority of PR-24,
C A Bauman, 10-7-93
By Jessie Maley, 11-23-94
Verified By P.D. Armani 11-10-97
NOT UCNI

TECHNICAL SECTION
ENGINEERING DEPARTMENT
NUCLEONICS DIVISION
GENERAL ELECTRIC COMPANY
RICHLAND, WASHINGTON

Classification Cancelled (Changed to CONFIDENTIAL)
By Authority of [illegible]-1147
Approved 11-15-57
By [illegible] 12-57

Operated for the Atomic Energy Commission by the
General Electric Company under Contract #W-31-109-Eng-52

[redacted]

Route To	Read By	Date	Route To	Read By	Date
J M Marousek	50129				

Revised December 28, 1953

DECLASSIFIED

[redacted]

Obsolete as of 12-28-53
Date

DECLASSIFIED

[redacted]

"Master"

HW-23402

This document consists of 47 pages.

of [redacted]

PRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 3-22-54

This document consists of [redacted] pages.

PROCESS SPECIFICATIONS
"A" CANNING PROCESS
(TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM)

October 8, 1952

TECHNICAL SECTION
ENGINEERING DEPARTMENT
NUCLEONICS DIVISION
GENERAL ELECTRIC COMPANY
RICHLAND, WASHINGTON

Operated for the Atomic Energy Commission by the
General Electric Company under Contract #W-31-109-Eng-52

[redacted]

[redacted] to an unauthorized person is prohibited.

Route To	Read By	Date	Route To	Read By	Date

[redacted]

DECLASSIFIED

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24 and 25.
C. 18 dest. 4-6-56

UNCLASSIFIED

HW-23402

[redacted]

PAGE 1-1

REVISED PAGINATION FOR HW-23402

AS OF 7-9-53	(DATE) THIS MANUAL CONSISTS OF	76	PAGES.	C.C 49
AS OF 11-23-53	(DATE) THIS MANUAL CONSISTS OF	79	PAGES.	49
AS OF 11-25-53	(DATE) THIS MANUAL CONSISTS OF	83	PAGES.	49
AS OF 3-18-54	(DATE) THIS MANUAL CONSISTS OF	110	PAGES.	39
AS OF 9-8-54	(DATE) THIS MANUAL CONSISTS OF	116	PAGES.	41
AS OF 2-15-56	(DATE) THIS MANUAL CONSISTS OF	117	PAGES.	42
AS OF 4-10-96	(DATE) THIS MANUAL CONSISTS OF	134	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	
AS OF _____	(DATE) THIS MANUAL CONSISTS OF	_____	PAGES.	

DOCUMENT INVENTORY STAMPS

INTERNAL DISTRIBUTION

Copy Number	
1	J. E. Maider - C. A. Priode
2	W. K. MacCready
3	A. B. Greninger - O. H. Greager
4	T. W. Hauff
5	G. E. McCullough
6	R. W. Benoliel
7	W. M. Mathis
8	W. W. Windsheimer
9	E. W. O'Rorke
10	O. C. Schroeder
11	P. H. Reinker
12	A. C. Callen
13 - 15	Hanford Operations Office
16	700 File
17	300 File
18	Yellow Copy
19 - 25	Extra Copies

Obsolete as of 12-24-53
Date

COPY NUMBER	INTERNAL DISTRIBUTION
1	C. N. Gross
2	W. K. MacCready
3	A. B. Greninger - O. H. Greager
4	T. W. Hauff
5	G. E. McCullough
6	W. L. Schalliol
7	W. M. Mathis
8	W. W. Windsheimer
9	E. W. O'Rorke
10	R. O. Mehann
11	P. H. Reinker
12	H. L. Mars - A. C. Callen
13 - 15	Hanford Operations Office
16	700 File
17	300 File
18	Yellow Copy
19 - 25	Extra Copies

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 3-22-54

The following copies of this page were destroyed. 5-15-54

2 thru 12, 16, 19 thru 22
24, 25

C. 18 dest. 4-6-56

ENGINEERING DEPARTMENT

PROCESS SPECIFICATIONS

TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM

The attached specifications have been provided in accordance with the responsibilities established for the Engineering Department by Organization and Policy Guide Number 03.1.2.

Specification No.	Title	Pages	Date Issued
1.0	Bare Uranium Slug Specifications	2	Dec. 28, 1953
2.0	Slug Degrease	1	Oct. 8, 1953
3.0	Slug Pickle	1	Dec. 28, 1953
4.0	Aluminum Cap and Can	2	Dec. 28, 1953
5.0	Aluminum Cap and Can Preparation	2	Dec. 28, 1953
8.0	Canning Sleeve	2	Dec. 28, 1953
9.0	Triple Dip Canning Time Cycle	1	Dec. 28, 1953
10.0	Bronze Bath	2	June 15, 1953
11.0	Tin Bath	2	Oct. 8, 1953
12.0	Centrifuge	1	Oct. 8, 1953
13.0	Aluminum-Silicon Dip Bath	2	Dec. 28, 1953
14.0	Aluminum-Silicon Canning Bath	3	Dec. 28, 1953
15.0	Canning Bath Procedure	2	June 15, 1953
16.0	Quench	1	Dec. 28, 1953
17.0	Facing	1	Oct. 8, 1953
18.0	Canned Assembly Specifications	2	Dec. 28, 1953
19.0	Welding	2	Dec. 28, 1953
20.0	Bond Test	3	July 1, 1954
21.0	Penetration Etch	1	Dec. 28, 1953
22.0	Autoclave	1	Dec. 28, 1953
23.0	Causes for Rejection (Canned Assemblies)	3	July 1, 1954
24.0	Storage	1	Dec. 28, 1953

Date

Issued by: [signature] Manager, Fuel Technology 7/16/54

Approved by: [signature] Manager, Technical 8-23-54

Approved by: [signature] Manager, Engineering 8-25-54

Accepted by: [signature] Manager, Manufacturing 8-31-54

[redacted]

Obsolete as of 7-1-54
Date

DECLASSIFIED

ENGINEERING DEPARTMENT

PROCESS SPECIFICATIONS

TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM

The attached specifications have been provided in accordance with the responsibilities established for the Engineering Department by Organization and Policy Guide Number 03.1.2.

Specification No.	Title	Pages	Date Issued
1.0	Bare Uranium Slug Specifications	2	Dec. 28, 1953
2.0	Slug Degrease	1	Oct. 8, 1953
3.0	Slug Pickle	1	Dec. 28, 1953
4.0	Aluminum Cap and Can	2	Dec. 28, 1953
5.0	Aluminum Cap and Can Preparation	2	Dec. 28, 1953
8.0	Canning Sleeve	2	Dec. 28, 1953
9.0	Triple Dip Canning Time Cycle	1	Dec. 28, 1953
10.0	Bronze Bath	2	June 15, 1953
11.0	Tin Bath	2	Oct. 8, 1953
12.0	Centrifuge	1	Oct. 8, 1953
13.0	Aluminum-Silicon Dip Bath	2	Dec. 28, 1953
14.0	Aluminum-Silicon Canning Bath	3	Dec. 28, 1953
15.0	Canning Bath Procedure	2	June 15, 1953
16.0	Quench	1	Dec. 28, 1953
17.0	Facing	1	Oct. 8, 1953
18.0	Canned Assembly Specifications	2	Dec. 28, 1953
19.0	Welding	2	Dec. 28, 1953
20.0	Frost Test	2	Oct. 8, 1953
21.0	Penetration Etch	1	Dec. 28, 1953
22.0	Autoclave	1	Dec. 28, 1953
23.0	Causes for Rejection (Canned Assemblies)	3	Dec. 28, 1953
24.0	Storage	1	Dec. 28, 1953

Issued by: Verne Cullough Manager, Fuel Technology Date 2-15-54

Approved by: O. H. Greager Manager, Technical 2-18-54

Approved by: C. B. Graudgen Manager, Engineering 2-18-54

Accepted by: J. W. Aiken Manager, Manufacturing 3-29-54

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 9-8-54

The following copies of this page were destroyed.

2 thru 12; 16, 19 thru 23; 25-A

C. 18 dest. 4-6-56

DECLASSIFIED

Obsolete as of 2-15-54
Date

HW-23402

[redacted]

ENGINEERING DEPARTMENT

PROCESS SPECIFICATIONS

DECLASSIFIED

TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM

The attached specifications have been provided in accordance with the responsibilities established for the Engineering Department by Organization and Policy Guide Number 03.1.2.

Specification No.	Title	Pages	Date Issued
1.0	Uranium Slug Machining Specifications	4, 5, 6	Feb. 4, 1953
2.0	Slug Degrease	7	Oct. 8, 1952
3.0	Slug Pickle	8, 9	Oct. 8, 1952
4.0	Aluminum Can Specifications	10, 11, 11A	Feb. 4, 1953
5.0	Aluminum Can Preparation	12, 13, 14	June 15, 1953
6.0	Aluminum Cap Specifications	15, 16, 16A	Feb. 4, 1953
7.0	Aluminum Cap Preparation	17, 18, 19	June 15, 1953
8.0	Steel Sleeve	20, 21	Oct. 8, 1952
9.0	Triple Dip Canning Time Cycle	22, 23	Oct. 23, 1953
10.0	Bronze Bath	24, 25	June 15, 1953
11.0	Tin Bath	26, 27	Mar. 30, 1953
12.0	Centrifuge	28	Oct. 8, 1952
13.0	Aluminum-Silicon Dip Bath	29, 30	Mar. 30, 1953
14.0	Aluminum-Silicon Canning Bath	31, 32	Oct. 23, 1953
15.0	Canning Bath Procedure	33, 34	June 15, 1953
16.0	Quench	35	Oct. 8, 1952
17.0	Facing	36	Oct. 8, 1952
18.0	Canned Assembly Specifications	37, 38	Dec. 9, 1952
19.0	Welding	39, 40	Nov. 11, 1953
20.0	Frost Test	41, 42	Oct. 8, 1952
21.0	Penetration Etch	43	Oct. 8, 1952
22.0	Autoclave	44	Oct. 8, 1952
23.0	Causes for Rejection (Canned Assemblies)	45, 46	Mar. 30, 1953
24.0	Storage	47	Oct. 8, 1952

			Date
Issued by:	H. McCullough	Manager, Fuel Technology	11-16-53
Approved by:	O. H. Greager	Manager, Technical	11-16-53
Approved by:	J. B. Fenderson	Manager, Engineering	11-16-53
Accepted by:	J. M. Aiden	Manager, Manufacturing	11-16-53

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 4-5-54

[redacted]

DECLASSIFIED

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25: c. 18 dest. 4-6-54

Obsolete as of 11-16-53
Date
Multilith destroyed 11-23-53

HW-23402

ENGINEERING DEPARTMENT

PROCESS SPECIFICATIONS

TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM

The attached specifications have been provided in accordance with the responsibilities established for the Engineering Department by Organization and Policy Guide Number 03.1.2.

Specification No.	Title	Pages	Date Issued
1.0	Uranium Slug Machining Specifications	4, 5, 6	Feb. 4, 1953
2.0	Slug Degrease	7	Oct. 8, 1952
3.0	Slug Pickle	8, 9	Oct. 8, 1952
4.0	Aluminum Can Specifications	10,11,11A	Feb. 4, 1953
5.0	Aluminum Can Preparation	12,13,14	June 15, 1953
6.0	Aluminum Cap Specifications	15,16,16A	Feb. 4, 1953
7.0	Aluminum Cap Preparation	17,18,19	June 15, 1953
8.0	Steel Sleeve	20, 21	Oct. 8, 1952
9.0	Triple Dip Canning Time Cycle	22, 23	June 15, 1953
10.0	Bronze Bath	24, 25	June 15, 1953
11.0	Tin Bath	26, 27	Mar. 30, 1953
12.0	Centrifuge	28	Oct. 8, 1952
13.0	Aluminum-Silicon Dip Bath	29, 30	Mar. 30, 1953
14.0	Aluminum-Silicon Canning Bath	31, 32	Oct. 8, 1952
15.0	Canning Bath Procedure	33, 34	June 15, 1953
16.0	Quench	35	Oct. 8, 1952
17.0	Facing	36	Oct. 8, 1952
18.0	Canned Assembly Specifications	37, 38	Dec. 9, 1952
19.0	Welding	39, 40	Dec. 9, 1952
20.0	Frost Test	41, 42	Oct. 8, 1952
21.0	Penetration Etch	43	Oct. 8, 1952
22.0	Autoclave	44	Oct. 8, 1952
23.0	Causes for Rejection (Canned Assemblies)	45, 46	Mar. 30, 1953
24.0	Storage	47	Oct. 8, 1952

			Date
Issued by:	[redacted]	Manager, Fuel Technology	6-21-53
Approved by:	O. H. Greager	Manager, Technical	6-26-53
Approved by:	A B Greager	Manager, Engineering	7-1-53
Accepted by:	[redacted]	Manager, Manufacturing	7-1-53

The following copies of this page were destroyed. 12-1-53
3, 4, 6 thru 11, 16, 19, 21, 22, 24 and 25.
C. 18 dest. 4-6-56

[redacted]

Obsolete as of 6-21-53 DECLASSIFIED
Date

ENGINEERING DEPARTMENT

PROCESS SPECIFICATIONS

TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM

The attached specifications have been provided in accordance with the responsibilities established for the Engineering Department by Organization and Policy Guide Number 03.1.2.

Specification No.	Title	Pages	Date Issued
1.0	Uranium Slug Machining Specifications	4,5,6	Feb. 4, 1953
2.0	Slug Degrease	7	Oct. 8, 1952
3.0	Slug Pickle	8,9	Oct. 8, 1952
4.0	Aluminum Can Specifications	10,11,11A	Feb. 4, 1953
5.0	Aluminum Can Preparation	12,13,14	Oct. 8, 1952
6.0	Aluminum Cap Specifications	15,16,16A	Feb. 4, 1953
7.0	Aluminum Cap Preparation	17,18,19	Oct. 8, 1952
8.0	Steel Sleeve	20,21	Oct. 8, 1952
9.0	Triple Dip Canning Time Cycle	22,23	Dec. 9, 1952
10.0	Bronze Bath	24,25	Dec. 9, 1952
11.0	Tin Bath	26,27	Mar. 30, 1953
12.0	Centrifuge	28	Oct. 8, 1952
13.0	Aluminum-Silicon Dip Bath	29,30	Mar. 30, 1953
14.0	Aluminum-Silicon Canning Bath	31,32	Oct. 8, 1952
15.0	Canning Bath Procedure	33,34	Oct. 8, 1952
16.0	Quench	35	Oct. 8, 1952
17.0	Facing	36	Oct. 8, 1952
18.0	Canned Assembly Specifications	37,38	Dec. 9, 1952
19.0	Welding	39,40	Dec. 9, 1952
20.0	Frost Test	41,42	Oct. 8, 1952
21.0	Penetration Etch	43	Oct. 8, 1952
22.0	Autoclave	44	Oct. 8, 1952
23.0	Causes for Rejection (Canned Assemblies)	45,46	Mar. 30, 1953
24.0	Storage	47	Oct. 8, 1952

			Date
Issued by:	[signature]	Manager, Fuel Technology	4-16-53
Approved by:	[signature]	Manager, Technical	4-21-53
Approved by:	[signature]	Manager, Engineering	4-21-53
Accepted by:	[signature]	Manager, Manufacturing	4-22-53

DECLASSIFIED

[redacted]

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 9-8-53. Multilith destroyed 1-9-53 C. 18 dest. 4-6-

[redacted]

[redacted]

ENGINEERING DEPARTMENT

PROCESS SPECIFICATIONS

TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM

The attached specifications have been provided in accordance with the responsibilities established for the Engineering Department by Organization and Policy Guide Number 03.1.2.

Specification No.	Title	Pages	Date Issued
1.0	Uranium Slug Machining Specifications	4, 5, 6	Dec. 9, 1952
2.0	Slug Degrease	7	Oct. 8, 1952
3.0	Slug Pickle	8, 9	Oct. 8, 1952
4.0	Aluminum Can Specifications	10, 11, 11A	Dec. 9, 1952
5.0	Aluminum Can Preparation	12, 13, 14	Oct. 8, 1952
6.0	Aluminum Cap Specifications	15, 16, 16A	Dec. 9, 1952
7.0	Aluminum Cap Preparation	17, 18, 19	Oct. 8, 1952
8.0	Steel Sleeve	20, 21	Oct. 8, 1952
9.0	Triple Dip Canning Time Cycle	22, 23	Dec. 9, 1952
10.0	Bronze Bath	24, 25	Dec. 9, 1952
11.0	Tin Bath	26, 27	Oct. 8, 1952
12.0	Centrifuge	28	Oct. 8, 1952
13.0	Aluminum-Silicon Dip Bath	29, 30	Oct. 8, 1952
14.0	Aluminum-Silicon Canning Bath	31, 32	Oct. 8, 1952
15.0	Canning Bath Procedure	33, 34	Oct. 8, 1952
16.0	Quench	35	Oct. 8, 1952
17.0	Facing	36	Oct. 8, 1952
18.0	Canned Assembly Specifications	37, 38	Dec. 9, 1952
19.0	Welding	39, 40	Dec. 9, 1952
20.0	Frost Test	41, 42	Oct. 8, 1952
21.0	Penetration Etch	43	Oct. 8, 1952
22.0	Autoclave	44	Oct. 8, 1952
23.0	Causes for Rejection (Canned Assemblies)	45, 46	Dec. 9, 1952
24.0	Storage	47	Oct. 8, 1952

			Date
Issued by:	[signature]	Manager, Pile Technology	12-19-52
Approved by:	[signature]	Manager, Technical	12-24-52
Approved by:	[signature]	Manager, Engineering	12-24-52
Accepted by:	[signature]	Manager, Manufacturing	12-30-52

all onsite copies of this ~~doc~~ page destroyed on C.D. #2146 C. 18 dest. 4-6-56

Rec'd 1-14-53

Obsolete as of 12-19-52 Date

DECLASSIFIED

ENGINEERING DEPARTMENT

PROCESS SPECIFICATIONS

[redacted] Obsolete

TRIPLE DIP CANNING PROCESS FOR ALPHA FABRICATED URANIUM

The attached specifications have been provided in accordance with the responsibilities established for the Engineering Department by Organization and Policy Guide Number 03.1.2.

Specification No.	Title	Pages	Date Issued
1.0	Uranium Slug Machining Specifications	4,5,6	Oct. 8, 1952
2.0	Slug Degrease	7	Oct. 8, 1952
3.0	Slug Pickle	8,9	Oct. 8, 1952
4.0	Aluminum Can Specifications	10,11	Oct. 8, 1952
5.0	Aluminum Can Preparation	12,13,14	Oct. 8, 1952
6.0	Aluminum Cap Specifications	15,16	Oct. 8, 1952
7.0	Aluminum Cap Preparation	17,18,19	Oct. 8, 1952
8.0	Steel Sleeve	20,21	Oct. 8, 1952
9.0	Triple Dip Canning Time Cycle	22,23	Oct. 8, 1952
10.0	Bronze Bath	24,25	Oct. 8, 1952
11.0	Tin Bath	26,27	Oct. 8, 1952
12.0	Centrifuge	28	Oct. 8, 1952
13.0	Aluminum-Silicon Dip Bath	29,30	Oct. 8, 1952
14.0	Aluminum-Silicon Canning Bath	31,32	Oct. 8, 1952
15.0	Canning Bath Procedure	33,34	Oct. 8, 1952
16.0	Quench	35	Oct. 8, 1952
17.0	Facing	36	Oct. 8, 1952
18.0	Canned Assembly Specifications	37,38	Oct. 8, 1952
19.0	Welding	39,40	Oct. 8, 1952
20.0	Frost Test	41,42	Oct. 8, 1952
21.0	Penetration Etch	43	Oct. 8, 1952
22.0	Autoclave	44	Oct. 8, 1952
23.0	Causes for Rejection (Canned Assemblies)	45,46	Oct. 8, 1952
24.0	Storage	47	Oct. 8, 1952

Date

Issued by: [redacted] Manager, Pile Technology 11-17-52

Approved by: [redacted] Manager, Technical 11-24-52

Approved by: [redacted] Manager, Engineering 11-28-52

Accepted by: [redacted] Manager, Manufacturing 12-10-52

All onsite copies of this page destroyed [redacted]
On C.D. # 2149

DECLASSIFIED

NOTICE OF DISCONTINUANCE OF REVISIONS

The Triple Dip Process for Alpha Fabricated Uranium was replaced as the standard production canning process for uranium cores on March 15, 1954, by the Lead Dip Canning Process for Beta Treated Uranium ("F" Process Specifications, HW-29341). At the present time there are no indications that the triple dip process will be used again for production canning. It is needless, therefore, to expend time and money to continually keep these specifications up-to-date with changes in the canning technology. These specifications will be revised and brought up-to-date at any time the use of the triple dip process is contemplated, using the indicated revisions in HW-29341 as a guide.

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
BARE URANIUM SLUG SPECIFICATION	1.0 (page 1 of 1 pages)
Ref. Documents	Date December 28, 1953

HW-30263 Acceptance Specifications for Hanford Atomic Products Operation Slug Cores (Specification 1, Uranium Slug Cores to Be Triple-Dip Canned)

BASIS:

1.0

A. The slug size and weight are controlled to maintain pile reactivity and to facilitate canning. Oversize slugs may cause canning rejects and undersize slugs lower the reactivity of the canned assembly.

B. Defects such as cracks, folds, and seams indicate an unsound condition in the uranium which may contribute to the severity of slug failures and may cause pile failure.

C. The warp of the slug is controlled to minimize non-seating of the slugs and penetration of the aluminum can wall during canning.

SPECIFICATIONS:

1.01

The new, "as-received," uranium slugs to be canned by the triple dip process shall conform with Specification 1 - Uranium Slug Cores to Be Triple Dip Canned, Document HW-30263.

1.02

All recovered triple dip canned uranium slugs shall be re-canned by use of the lead dip process only (HW-29341, "F" Canning Process).

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

URANIUM SLUG MACHINING SPECIFICATIONS

Specification No.

1.0

(page 1 of 3 pages)

Date

February 4, 1953

Ref. Documents

1. HW-9815 Operating Process For Machining Uranium Slugs
2. HW-22478 Authorization for Process Change - 300 Area
3. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials (HW Material No. 338)

BASIS:

1.01 Size, Weight, and Finish:

The slug weight is important to the process since it affects the canned slug reactivity and, subsequently, the pile reactivity. The minimum weight of the "Z" slug is based on the minimum reactivity desired in a canned slug.

The slug size is specified so that proper assembly of the components may be accomplished during the canning operation.

The surface finish of the bare slug is based on production records and has no technical basis other than the fact that it has been used and has not caused any known difficulties.

Slug Radius

The slug radius is a compromise between reactivity loss and canning difficulties. Any removal of uranium from the bare slug lowers the reactivity of the canned slugs. An unbroken wire edge is believed to be detrimental from a canning standpoint and will cause non-seating up to 0.050" with the present can design Pages 11 and 11 A.

A bevel is acceptable provided that the mode of fabrication produces no wire edge.

Obsolete as of 2-4-53
Date

[redacted]

-4- DECLASSIFIED

HW-23402

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications c.18 dest. 4-6-56

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
URANIUM SLUG MACHINING SPECIFICATIONS	1.0 (page 1 of 3 pages)
Ref. Documents	Date December 9, 1952

1. HW-9815 Operating Process For Machining Uranium Slugs
2. HW-22478 Authorization for Process Change - 300 Area
3. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials (HW Material No. 338)

BASIS:

1.01 Size, Weight, and Finish:

The slug weight is important to the process since it affects the canned slug reactivity and, subsequently, the pile reactivity. The minimum weight of the "Z" slug is based on the minimum reactivity desired in a canned slug.

The slug size is specified so that proper assembly of the components may be accomplished during the canning operation.

The surface finish of the bare slug is based on production records and has no technical basis other than the fact that it has been used and has not caused any known difficulties.

Slug Radius

The slug radius is a compromise between reactivity loss and canning difficulties. Any removal of uranium from the bare slug lowers the reactivity of the canned slugs. An unbroken wire edge is believed to be detrimental from a canning standpoint and will cause non-seating up to 0.050" with the present can design (Drawing H-3-4943 and H-3-6081)

A bevel is acceptable provided that the mode of fabrication produces no wire edge.

[redacted]

Obsolete

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:

URANIUM SLUG MACHINING SPECIFICATIONS

Specification No.

1.0

(page 1 of 3 pages)

Date

October 8, 1952

Ref. Documents

1. HW-9815 Operating Process For Machining Uranium Slugs
2. HW-22478 Authorization for Process Change - 300 Area
3. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials (HW Material No. 338)

BASIS:

1.01 Size, Weight, and Finish:

The slug weight is important to the process since it affects the canned slug reactivity and, subsequently, the pile reactivity. The minimum weight of the "Z" slug is based on the minimum reactivity desired in a canned slug.

The slug size is specified so that proper assembly of the components may be accomplished during the canning operation.

The surface finish of the bare slug is based on production records and has no technical basis other than the fact that it has been used and has not caused any known difficulties.

Slug Radius

The slug radius is a compromise between reactivity loss and canning difficulties. Any removal of uranium from the bare slug lowers the reactivity of the canned slug. An unbroken wire edge is believed to be detrimental from a canning standpoint and will cause non-seating up to 0.050" with the present can design (Drawing H-3-4943).

[redacted] Obsolete as of 12-28-53 just replaced Date 5-

Slug Defects

Any gross defect or any indication of cracking in the bare slug denotes an unsound condition which may cause failure during irradiation.

The tube gage dimension for the four-inch slug and the warp specification for the eight-inch slug are specified to prevent the canning of extreme "dog-leg" or warped slugs which may cause penetration of the aluminum jacket during canning.

1.02

The coolant used affects the quality and reactivity of the uranium slug, the recovery value of the machined turnings; and the relative safety of the machining operation. For these reasons the coolant should have a low nuclear cross-section, prevent the oxidation of the turnings, and extend tool life. The present coolant has been selected as the best available after extensive investigation.

Tungsten-carbide tool tips are being used for the machining operation because of the following reasons:

a) They produce a satisfactory product.
b) They have a reasonably long life.
c) The tool tips have a high nuclear cross-section, but this fact has not caused any known reactivity loss.
d) The tool tips are magnetic and can be separated from the turnings by magnetic means.

SPECIFICATIONS:

1.01 The dimensional and surface specifications for the bare uranium slug shall conform to Page 6.

1.02 The coolant used must have a minimum dih value of minus 0.012 per gram, as used.

[redacted]

[redacted]

[redacted]

U. 18 Dec. 4-6-56

Specification No.

1.0
(page 2 of 3 pages)

Slug Defects

Any gross defect or any indication of cracking in the bare slug denotes an unsound condition which may cause failure during irradiation.

The tube gage dimension for the four-inch slug and the warp specification for the eight-inch slug are specified to prevent the canning of extreme "dog-leg" or warped slugs which may cause penetration of the aluminum jacket during canning.

1.02

The coolant used affects the quality and reactivity of the uranium slug, the recovery value of the machined turnings; and the relative safety of the machining operation. For these reasons the coolant should have a low nuclear cross-section, prevent the oxidation of the turnings, and extend tool life. The present coolant has been selected as the best available after extensive investigation.

Tungsten-carbide tool tips are being used for the machining operation because of the following reasons:

a) They produce a satisfactory product.
b) They have a reasonably long life.
c) The tool tips have a high nuclear cross-section, but this fact has not caused any known reactivity loss.
d) The tool tips are magnetic and can be separated from the turnings by magnetic means.

SPECIFICATIONS:

1.01 The dimensional and surface specifications for the bare uranium slug shall conform to Drawing No. H-3-4965, Revision 1 (attached). Slug type nomenclature for Drawing H-3-4965 is as follows:

1. "FM" and "M" slugs are standard full dimensioned, as machined slugs (four and eight inch respectively).
2. "FZM" and "ZM" slugs are slugs that have been machined undersize in length and/or diameter (four and eight inch respectively).
3. "FZR" and "ZR" slugs are slugs that have been through the Slug Recovery Process (four and eight inch respectively).

1.02 The coolant used must have a minimum dih value of minus 0.012 per gram, as used.

A bevel is acceptable provided that the mode of fabrication produces no wire edge.

Slug Defects

Any gross defect or any indication of cracking in the bare slug denotes an unsound condition which may cause failure during irradiation.

The tube gage dimension is specified to prevent the canning of extreme "dog-leg" or warped slugs which may cause penetration of the aluminum jacket during canning.

1.02

The coolant used affects the quality and reactivity of the uranium slug, the recovery value of the machined turnings; and the relative safety of the machining operation. For these reasons the coolant should have a low nuclear cross-section, prevent the oxidation of the turnings, and extend tool life. The present coolant has been selected as the best available after extensive investigation.

Tungsten-carbide tool tips are being used for the machining operation because of the following reasons:

a.) They produce a satisfactory product.
b) They have a reasonably long life.
c) The tool tips have a high nuclear cross-section, but this fact has not caused any known reactivity loss.
d) The tool tips are magnetic and can be separated from the turnings by magnetic means.

SPECIFICATIONS:

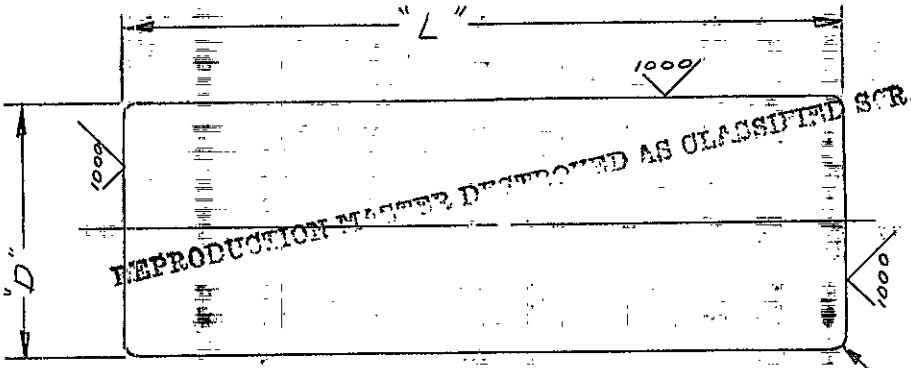
1.01 The dimensional and surface specifications for the bare uranium slug shall conform to Drawing No. H-3-4965 (attached).

1.02 The coolant used must have a minimum dih value of minus 0.012 per gram, as used.

[redacted]

Obsolete as of 12-28-53 not replaced
Date

HW 23402
PAGE 6 (Page 3 of 3 pages)
COPY



TYPE	LENGTH "L"	DIAMETER "D"	WEIGHT
FM	4.045" ±.010"	1.350" +.001" −.002"	x x x
FZ	4.055" MAX.	1.351". MAX.	3.82 LBS. MIN.
M	8.400" ±.010"	1.330" +.001 −.002	x x x
Z	8.410" MAX.	1.331" MAX.	7.72 LBS. MIN.

NOTES:

1. STANDARD GENERAL ELECTRIC 1000 FINISH ON ALL SURFACES.
2. SLUGS SHOWING ANY EVIDENCE OF CRACKING OR HAVING SURFACE IMPERFECTIONS GREATER THAN 1/16" IN DEPTH SHALL BE REJECTED.
3. THE 4" SLUG MUST PASS THRU A TUBE GAGE WITH AN INSIDE DIAMETER OF 1.360 ±.0005", 4 1/2" LONG.
4. MAX. WARP FOR 8" SLUG SHALL BE 0.020" (SINGLE THROW)
5. SLUG TYPE NOMENCLATURE
   a) "FM" & "M" SLUGS ARE STANDARD FULL DIMENSIONED, AS MACHINED SLUGS, (4" & 8" SLUGS RESPECTIVELY)
   b) "FZ" & "Z" SLUGS ARE SLUGS THAT HAVE EITHER GONE THRU THE RECOVERY PROCESS OR WERE MACHINED UNDERSIZE IN EITHER LENGTH &/OR DIAMETER (4" & 8" SLUGS RESPECTIVELY)

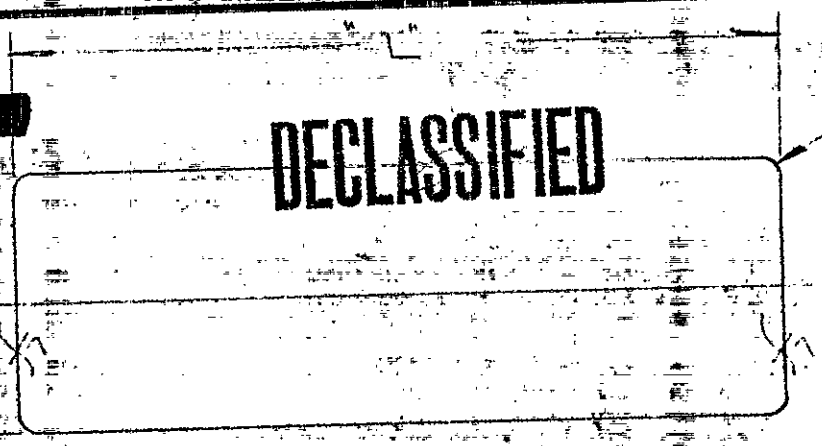
MATERIAL:
URANIUM; PER HANFORD DOCUMENT HW 25747

DIMENSIONAL & SURFACE SPECIFICATIONS FOR BARE URANIUM SLUG

REVISED 26 JANUARY 1953

[redacted]

HW-23402



HW-23402
PAGE 6

[redacted]

Obsolete as of 1-26-53
Date

DESTROYED. SEE CERTIFICATE OF DESTRUCTION # 2146
C, 18 dest. 4-6-56

NOTES:-

1- STANDARD GENERAL ELECTIC ± FINISH ON ALL SURFACES.

2- SLUGS SHOWING ANY EVIDENCE OF CRACKING OR HAVING SURFACE IMPERFECTIONS GREATER THAN 1/16" IN DEPTH SHALL BE REJECTED.

3- THE 4" SLUG MUST PASS THROUGH A TUBE GAGE WITH AN INSIDE DIAMETER OF 1.360" ± 0.0005", 4½" LONG.

4- MAX. WARP FOR 8" SLUG SHALL BE .020" (SINGLE THROW)

DIMENSIONS:-

TYPE	LENGTH "L"	DIAMETER "D"	WEIGHT
FM	4.045" ± .010"	1.350" +.001" -.002"	X X X
FZR FZM	4.055" MAX.	1.351" MAX.	3.82 LBS. MIN.
M	8.400" ± .010"	1.330" +.001" -.002"	X X X
ZR ZM	8.410" MAX	1.331" MAX	7.72 LBS. MIN.

MATERIAL:-

URANIUM; PER HANFORD DOCUMENT NO. HW-23297

[redacted]

APPROVED

CHANGE	M.T. BY	APP.	DIV.
1 ADDED FZR, FZM, M, ZR ZM AND DATE 4-			

GENERAL ELECTRIC CO.
HANFORD WORKS

DIMENSIONAL AND SURFACE SPECIFICATION FOR BARE URANIUM-SLUG

SCALE —
APPROVED
H. A. Johnson

SUPERSEDES H-4-1851

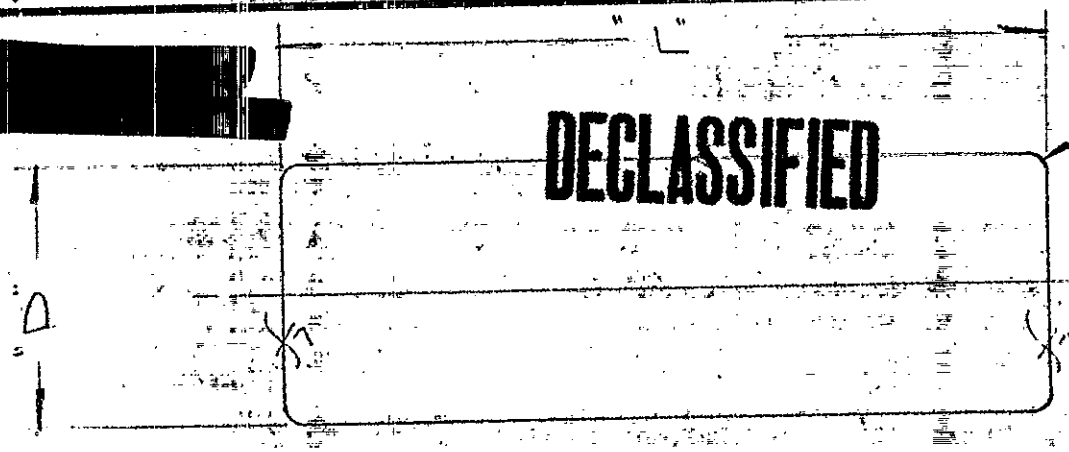
DATE 3-5-52 DRAWN BY D.R.S.
CHECKED CH PROJ. NO.
E.R. NO. BLDG. NO.
DWG. NO. H-3-4965
NO.

DECLASSIFIED

SHANNON & CO. Recd 1-14-53

HW-23402

[redacted]



Obsolete

NOTES:-

1- STANDARD GENERAL ELECTIC FINISH ON ALL SURFACES.

2- SLUGS SHOWING ANY EVIDENCE OF CRACKING OR HAVING SURFACE IMPERFECTIONS GREATER THAN 1/16" IN DEPTH SHALL BE REJECTED.

3- THE 4" SLUG MUST PASS THROUGH A TUBE GAGE WITH AN INSIDE DIAMETER OF 1.360" ± 0.0005", 4½" LONG.

DIMENSIONS:-

TYPE	LENGTH "L"	DIAMETER "D"	WEIGHT
FM	4.045" ± .010"	1.350" +.001" −.002"	X X X
FZ	4.055" MAX.	1.351" MAX.	3.82 LBS. MIN.

MATERIAL:-

URANIUM; PER HANFORD DOCUMENT NO HW ~~23207~~ 25747

[redacted]

GENERAL ELECTRIC CO.
HANFORD WORKS

DIMENSIONAL AND SURFACE SPECIFICATION FOR BARE URANIUM-SLUG

SCALE —

APPROVED

H. A. Johnson

SUPERSEDES H-4-1851

DATE 3-5-52 DRAWN BY D.R.S.

CHECKED [illegible] PROJ. NO.

E. R. NO. BLDG. NO.

DWG. NO. H-3-49765

NO.

Issued - 3-27-52

SHANNON & CO.

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
SLUG PICKLE	3.0 (page 1 of 1 page)
Ref. Documents	Date December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedure for Essential Materials (HW Material Numbers 10 - Nitric Acid)

BASIS:

3.01

The slug is etched to remove the oxide film so that complete wetting may be obtained in the first molten bath. The acid concentration and temperature should be such that the oxide film is removed. Impurities in the nitric acid, such as phosphoric acid, iron, uranium, and metals precipitable as hydroxides, have caused incomplete wetting and should be limited. To minimize the loss of uranium the slugs should be pickled for the minimum time necessary to remove the oxide. The slugs should be rinsed free of acid and dried as quickly as possible to retard the reappearance of the oxide film. The slugs should be canned before an excess oxide film reappears so that proper wetting will be obtained.

The second major use of the etching procedure is to reveal certain types of defects found in bare uranium slugs. Slugs with cracks, seams, or laminations should be detected and rejected after the pickle operation.

SPECIFICATIONS:

3.01

The uranium slug to be canned shall be pickled in nitric acid, (HW Material No. 10, Document HW-19156) rinsed in water and hot-air dried. The composition, temperature, and concentration of the nitric acid and the etching time shall be such that the pickled slug will wet completely as determined by visual observation in the first molten bath.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: SLUG PICKLE

Specification No. 3.0 (page 1 of 2 pages)

Ref. Documents

Date October 8, 1952

1. HW-9401 Process for Canning Uranium Four-inch Slugs.
2. HW-19156 Specifications, Acceptance and Sampling Procedure for Essential Materials.

BASIS:

3.01

The etching bath is used to remove the oxide film from the uranium slugs so that complete wetting and transformation of the slugs may be obtained in the first molten bath. The acid concentration and temperature have been selected to result in satisfactory removal of the oxide film. Impurities such as phosphoric acid, iron, uranium, and other metals precipitable as hydroxides have caused incomplete wetting and maximum amounts have been specified.

The second major use of the etching bath is to reveal certain types of defects found in bare uranium slugs. Slugs with cracks, laps, or folds should be detected and rejected after the pickle operation.

3.02

The slugs should be rinsed free of acid and dried as quickly as possible to retard the reappearance of the oxide film.

3.03

The slugs should be canned before an excess oxide film reappears so that proper wetting will be obtained.

3.04

The maximum weight loss during pickle is specified to prevent excessive etching which lowers the canned slug reactivity.

SPECIFICATIONS:

3.01 Etchant: Nitric Acid (HW Material No. 10, Document HW-19156)

a) Concentration: 50% ± 5% by weight
b) Temperature: 65°C ± 5°C
c) Contaminants:
   1) Fe 0.25% by weight maximum
   2) U 6% by weight maximum
   3) Total other metals precipitable as hydroxides 0.25% by weight maximum
   4) Phosphate ion 0.1% by weight maximum
d) Immersion time: Such that the oxide film is removed (1 minute minimum).

3.02 The slugs shall be rinsed free of acid and air dried within 20 minutes after rinsing.

3.03 Slugs with a tarnish, such that wetting and subsequent transformation in the first molten bath may be impaired, shall be re-etched.

3.04 The maximum weight loss of any slug during pickle shall be 0.25%.

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25.
C.18 Dest. 4-6-56

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

0.18 dest. 4-6-56

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:	Specification No.
SLUG DEGREASE	2.0
Ref. Documents	Date October 8, 1952

1. HW-9401 Process For Canning Uranium Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures For Essential Materials.

BASIS:

2.01

The degreasing operation is necessary to promote proper etching of the uranium slugs. The degreaser removes foreign material and machining oil that would contaminate the etching bath and may inhibit slug wetting in the first molten bath. Requirements of the degreasing agent are that it should not lower the reactivity or the quality of the canned slug. For this reason, highly stabilized degreasing agents are preferred since they lessen the possibility of the chemical break-down and permit safer operation. Highly stabilized trichloroethylene has been selected for this operasince it meets the above requirements.

SPECIFICATION:

2.01 The solvent used in the solvent vapor degreaser shall be trichloroethylene (HW Material No. 323, Document HW-19156). The solvent vapor degreaser shall be operated according to the manufacturer's recommendations for the removal of oil and dirt.

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

ALUMINUM CAP AND CAN

Specification No.

4.0

(page 1 of 2 pages)

Ref. Documents

Date

December 28, 1953

1. HW-19156 Specifications, Acceptance and Sampling Procedure for Essential Materials (HW Material Nos. 302 and 303 - Aluminum Can and Cap, respectively)
2. HW-29441 Corrosion Evaluation of Impact Extruded Slug Caps

BASIS:

4.01

The dimensions and composition of the aluminum components must be controlled for the following reasons:

a) The component parts must be properly assembled during the canning operation.

b) High reactivity of the canned assembly is required.

c) The aluminum jacket must be of sufficient strength and thickness to withstand the corrosion and the physical forces encountered before and during pile irradiation.

d) The aluminum caps should not be crack-sensitive. It has been found that the ratio of iron to silicon should be greater than 2 to 1 to prevent cracking during the welding operation.

Any perforations or defects in the aluminum components may allow water to attack the uranium slug causing autoclave and pile failures.

Corrosion tests (Document HW-29441) have shown that aluminum caps containing second phase material in a continuous pattern are highly susceptible to localized penetration due to corrosion.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:
ALUMINUM CAN SPECIFICATIONS

Specification No.
4.0
(page 1 of 3 pages)

Ref. Documents

Date
February 4, 1953

1. HW-9401 Process For Canning Uranium Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedure for Essential Materials

BASIS:

4.01

The dimensions and composition of the aluminum can must be controlled for the following reasons:

a) The component parts must be properly assembled during the canning operation.
b) High reactivity of the canned assembly is required.
c) The aluminum jacket must be of sufficient strength and thickness to withstand the corrosion and the physical forces encountered before and during pile irradiation.

4.02

Any perforation or defect in the can wall may allow water to attack the uranium slug, causing autoclave and pile failures.

SPECIFICATIONS:

4.01 The aluminum can used to encase the four-inch uranium slug shall conform with Page 11 and the can used to encase the eight-inch uranium slug shall conform with Page 11A. (HW Material No. 302 Document HW-19156).

4.02 The aluminum can used shall be free of visible cracks, seams, holes, porosity, folds, laminations, and imbedded foreign materials.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:
ALUMINUM CAN SPECIFICATIONS

Specification No.
4.0
(page 1 of 3 pages)

Ref. Documents

Date
December 9, 1952

1. HW-9401 Process For Canning Uranium Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedure for Essential Materials

BASIS:

4.01

The dimensions and composition of the aluminum can must be controlled for the following reasons:

a) The component parts must be properly assembled during the canning operation.
b) High reactivity of the canned assembly is required.
c) The aluminum jacket must be of sufficient strength and thickness to withstand the corrosion and the physical forces encountered before and during pile irradiation.

4.02

Any perforation or defect in the can wall may allow water to attack the uranium slug, causing autoclave and pile failures.

SPECIFICATIONS:

4.01 The aluminum can used to encase the four-inch uranium slug shall conform with Drawing H-3-4943 (attached) and the can used to encase the eight-inch uranium slug shall conform with Drawing H-3-6081 (attached). (HW Material No. 302 Document HW-19156).

4.02 The aluminum can used shall be free of visible cracks, seams, holes, porosity, folds, laminations, and imbedded foreign materials.

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Obsolete

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:

ALUMINUM CAN SPECIFICATIONS

Specification No.

4.0
(page 1 of 2 pages)

Ref. Documents

Date
October 8, 1952

1. HW-9401 Process For Canning Uranium Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedure for Essential Materials

BASIS:

4.01

The dimensions and composition of the aluminum can must be controlled for the following reasons:

a) The component parts must be properly assembled during the canning operation.
b) High reactivity of the canned assembly is required.
c) The aluminum jacket must be of sufficient strength and thickness to withstand the corrosion and the physical forces encountered before and during pile irradiation.

4.02

Any perforation or defect in the can wall may allow water to attack the uranium slug, causing autoclave and pile failures.

SPECIFICATIONS:

4.01 The aluminum can used to encase the four-inch uranium slug shall conform with Drawing H-3-4943 attached. (HW Material No. 302 Document HW-19156)

4.02 The aluminum can used shall be free of visible cracks, seams, holes, porosity, folds, laminations, and imbedded foreign materials.

DESTROYED. SEE CERTIFICATE OF DESTRUCTION #2149

[redacted]

[redacted]

10A

DECLASSIFIED

Specification No.

4.0

(page 2 of 2 pages)

Date

December 28, 1953

SPECIFICATIONS:

4.01

The aluminum components used to encase the uranium slug shall conform to the specifications for Essential Materials 302 and 303, Document HW-19156.

[redacted]

[redacted]

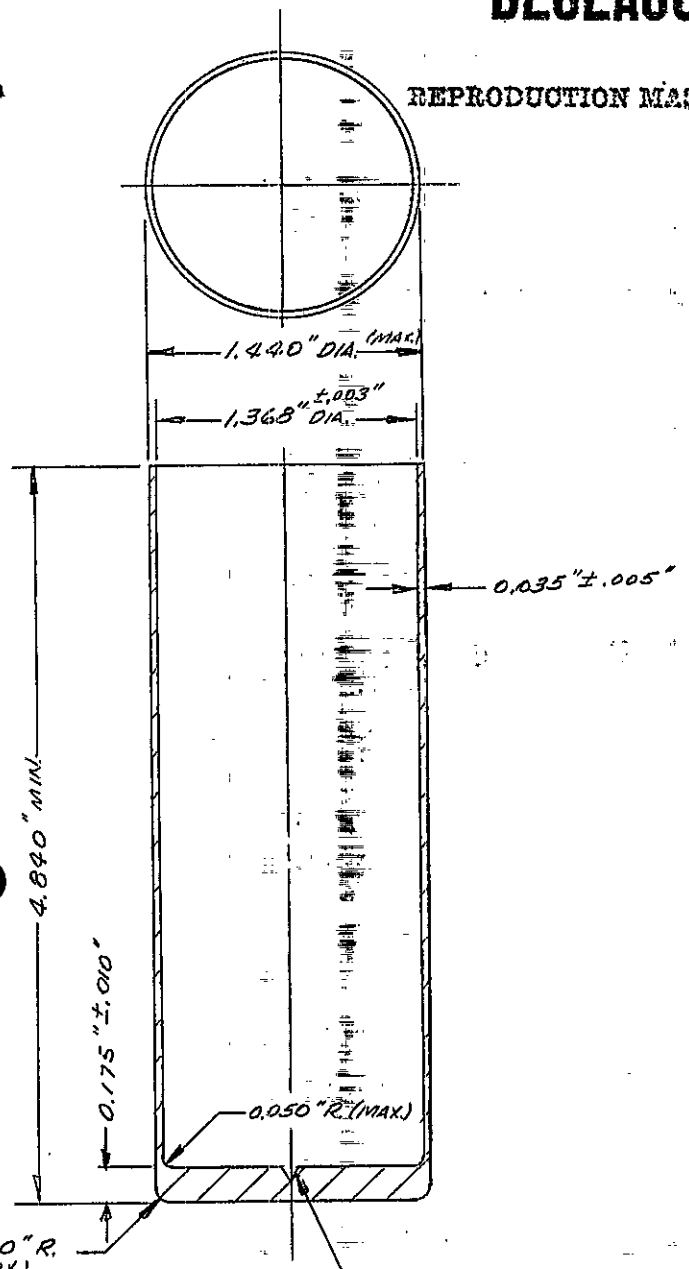
Obsolete as of 12-28-58

Date HW 23402

PAGE 11 (Page 2 of 3 pages)

[redacted]

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 3-22-54



NOTES:

1. MATERIAL AS SPECIFIED IN DOCUMENT HW 19156
2. SURFACE FINISH: INSIDE: SURFACE TO BE "AS FABRICATED" & SHALL BE FREE OF STAINS & DEFECTS EXCEPT THAT SCRATCHES & DIE MARKS NOT EXCEEDING 0.003" IN DEPTH SHALL BE PERMITTED. OUTSIDE: MUST PASS SPECIFICATION # 2301 (b)
3. THIS DRAWING PERTAINS TO TECHNICAL SPECIFICATIONS ONLY & MUST NOT BE USED FOR PURCHASING.

CENTERING DEPRESSION SUCH AS DIMPLE OR RINGS SHALL BE OPTIONAL WITH THE MANUFACTURER PROVIDED THAT IT DOES NOT EXCEED 0.087" IN DEPTH & IS APPROVED BY THE GENERAL ELECTRIC CO.

The following copies of this page were destroyed. 5-15-59
2 thru 12, 16, 19 thru 24, 25.
U. 18 A dest. 4-6-59

ALUMINUM CAN FOR 4" SLUG

REVISED 26 JANUARY 1953

[redacted]

DECLASSIFIED

Obsolete as of 1-26-53
Date

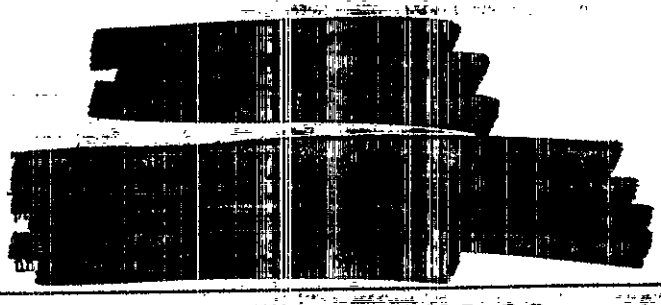
HW-23402
PAGE 11
17

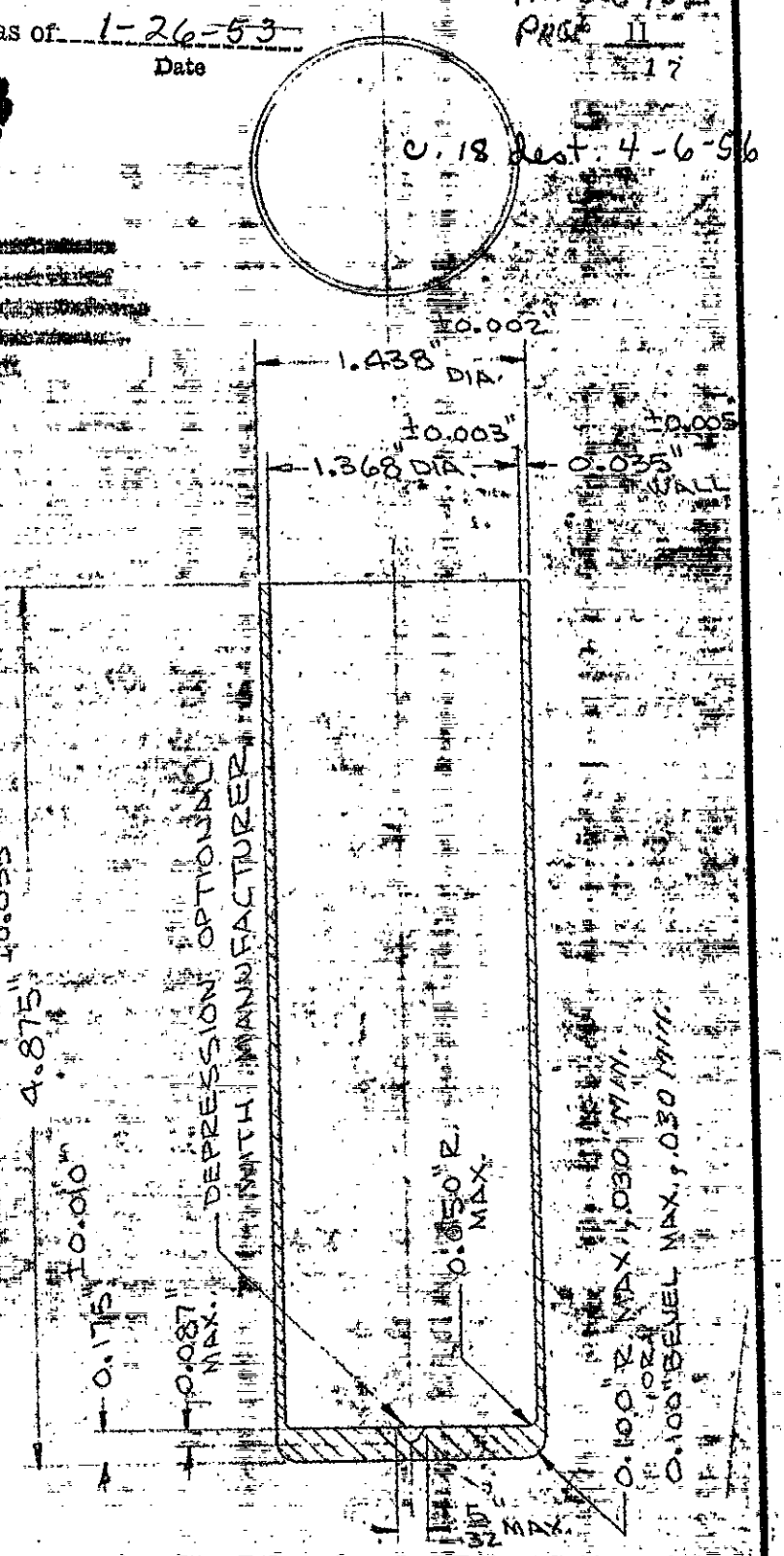
[redacted]

C. 18 dest 4-6-56

NOTES:-

1. MATERIAL TO BE AS SPECIFIED ON ORDER.
2. ALL CANS SHALL PASS A 1.364" FULL LENGTH MANDREL & SHALL ALSO PASS A 1.447" FULL LENGTH TUBE GAGE.
3. OUTSIDE SURFACE - SCRATCHES SHALL NOT EXCEED 0.001" DEPTH & THE SURFACE SHALL BE FREE OF GALLED & CHECKED AREAS.
4. INSIDE SURFACE - SURFACE TO BE "AS FABRICATED" & SHALL BE FREE OF STAINS & DEFECTS, EXCEPT THAT SCRATCHES & DIE MARKS NOT EXCEEDING 0.003" IN DEPTH SHALL BE PERMITTED.





GENERAL ELECTRIC CO.
HANFORD WORKS

ALUMINUM CAN

DECLASSIFIED

SCALE FULL

APPROVED
E. W. O'Rourke
H. L. Marks

DATE 2-5-52 DRAWN BY D. R. S.
CHECKED [redacted] PROJ. NO.
E. R. NO. BLDG. NO.

DWG. NO. H-3-4943
NO.

SHANNON & CO.

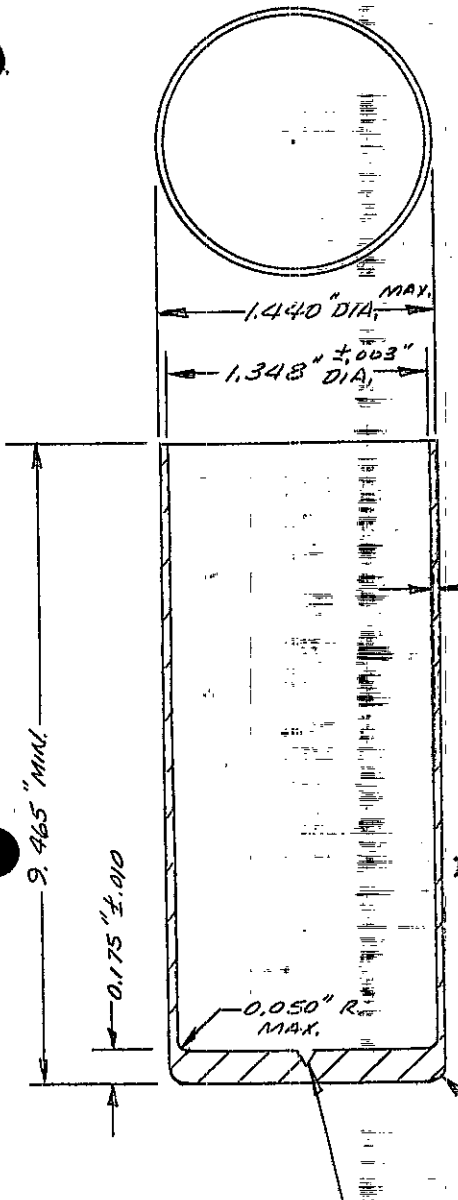
[redacted]

DECLASSIFIED

HW 23402
PAGE IIA (Page 3 of 3 pages)

[redacted]

Obsolete as of 12-28-53
Date
Not Replaced



NOTES:

1. MATERIAL: AS SPECIFIED IN DOCUMENT HW 19156
2. SURFACE FINISH:
   INSIDE: SURFACE TO BE "AS FABRICATED" & SHALL BE FREE OF STAINS & DEFECTS EXCEPT THAT SCRATCHES & DIE MARKS NOT EXCEEDING 0.003" IN DEPTH SHALL BE PERMITTED.
   OUTSIDE: MUST PASS SPECIFICATION #23.01(b)
3. THIS DRAWING PERTAINS TO TECHNICAL SPECIFICATIONS ONLY & MUST NOT BE USED FOR PURCHASING.

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 5-12-54

CENTERING DEPRESSION SUCH AS RINGS OR DIMPLE SHALL BE OPTIONAL WITH THE MANUFACTURER PROVIDED THAT IT DOES NOT EXCEED 0.087" IN DEPTH & IS APPROVED BY THE GENERAL ELECTRIC CO.

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25.
c. 18A - 4-6-56

ALUMINUM CAN FOR 8" SLUG

REVISED 26 JANUARY 1953

DECLASSIFIED

[redacted]

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process for Alpha Fabricated Uranium

Subject

ALUMINUM CAP AND CAN PREPARATION

Specification No.

5.0

(page 1 of 2 pages)

Ref. Documents

Date

December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials
3. HW-27734 Evaluation of Etchants for Deoxidizing Aluminum Components
4. HW-28371 Interim Report on PT 313-105 -16M, Evaluation of Diversey 514 as an Etchant in the Aluminum Component Cleaning Process
5. HW-27428 Hydrofluosilic Acid as a Can and Cap Etchant

BASIS:

5.01

The aluminum components should be prepared by cleaning and etching so that they will wet properly in the molten aluminum-silicon (References 1 - 5). Proper wetting of the components by the aluminum-silicon is essential because of heat transfer considerations, bond strength, and corrosion resistance.

5.02

The component preparation should not alter the dimensional characteristics of the caps and cans because of the basis found in Specification 4.0.

5.03

A high reactivity of the canned assembly is desired because of economic and technical considerations. The corrosion resistance of the components must be maintained so that the fuel slug jacket will not fail due to corrosion under pile irradiation.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

ALUMINUM CAN PREPARATION

Specification No.

5.0
(page 1 of 3 pages)

Date
June 15, 1953

Ref. Documents

1. HW-9401 Process For Canning Uranium Four-inch Slugs.
2. HW-19156 Specifications Acceptance and Sampling Procedures for Essential Materials.
3. HW-10605 Aluminum Component Preparation and Use.
4. HW-27734 Evaluation of Etchants for Deoxidizing Aluminum Components.
5. HW-28371 Interim Report on PT 313-105-16 M, Evaluation of Diversey 514 as an Etchant in the Aluminum Component Cleaning Process.
6. HW-27428 Hydrofluosilicic Acid as a Cap and Can Etchant.

BASIS:

5.01

a) The degreasing operation removes oil and dirt which would otherwise reduce the effectiveness of the alkaline wash. Highly stabilized degreasing agents are preferred to lessen the possibility of chemical breakdown and permit safer operation.
b) The wash solution removes the remainder of the oil and dirt so that proper etching and aluminum-silicon wetting may be obtained. The temperature of the can and wash solutions, and the time of immersion are critical. If either the solution or can temperature is too high, or the time of immersion too long, a film will be formed which will inhibit can wetting in the canning bath. If the solution temperature is too low or the time of immersion too short, the oil and dirt will not be properly removed and poor wetting of the can may result.
c) The hot rinse removes the majority of the wash solution. The cold rinse removes the remaining wash solution and cools the cans to the etching temperature.

[redacted]

GENERAL NOTES

MATERIAL: ALUMINUM X7-S
ALUMINUM CONTENT 99.3% MIN.

INSPECTION:
ALL CANS SHALL PASS A 1.341" FULL LENGTH MANDREL & SHALL ALSO PASS AT 1.347" FULL LENGTH "GO" GAGE.

FINISH:
OUTSIDE SURFACE - SCRATCHES SHALL NOT EXCEED .001" IN DEPTH AND THE SURFACE SHALL BE FREE OF GALLED & CHECKED AREAS.

INSIDE SURFACE - THE SURFACE SHALL BE AS FABRICATED AND SHALL BE FREE OF STAINS AND DEFECTS EXCEPT THAT SCRATCHES AND DIE MARKS NOT EXCEEDING .001" IN DEPTH SHALL BE PERMITTED.

ALL PRINTS ARE THE PROPERTY OF THE UNITED STATES GOVERNMENT AND IT IS IMPERATIVE THAT THEY BE RETURNED

[redacted]

NO.	DESCRIPTION	BY	DATE	APP'D	DATE
	REVISIONS				

SCALE: FULL

	APPROVALS BY	DEPT
DRAWN BY		
CHECKED BY		
FUNCTIONAL SUPERVISOR		
ENG. REP. NO.		
PROJECT NO.		

GENERAL ELECTRIC CO.
HANFORD WORKS

DWG. NO.	TITLE
REFERENCE DRAWINGS	

BLDG. NO'S	DWG. NO.

Specification No.
5.0
(page 2 of 2 pages)
Date
December 28, 1953

SPECIFICATIONS:

5.01

The aluminum caps and cans shall be cleaned and etched in such a manner that they will wet in the molten aluminum-silicon.

5.02

The component preparation shall not alter the dimensional characteristics of the components to the extent that they fail to meet specifications for Essential Materials 302 and 303, Document HW-19156.

5.03

The component preparation shall not adversely affect the reactivity or corrosion characteristics of the aluminum components.

d) Three etchants are specified since it is operationally desirable to maintain alternate processes. The etch removes the irregular oxide film to promote even wetting of the cans. Time of etch, the temperature of the acid, and the period of use are specified to promote satisfactory etching and subsequent aluminum-silicon wetting.
e) The rinse after etching removes adhering acid and minimizes the acid carry-over to the dehydrant.
f) The cans are dehydrated after rinsing to prevent the reaction between water and the aluminum that would cause uneven oxidation of the surface before canning, and to minimize the deposition of dissolved minerals on the surface of the can.
g) The can should be dried as soon as possible to inhibit reoxidation.

5.02

The purpose of the can preparation is to provide a satisfactory can surface for wetting by the aluminum-silicon. Proper wetting of the can by the molten aluminum-silicon is essential to ensure adequate bonding between the can, cap, and slug.

SPECIFICATIONS:

5.01 The can preparation shall be as follows:

a) Degrease - The solvent used in the solvent vapor degreaser shall be trichloroethylene (HW Material No. 323, Document HW-19156). The solvent vapor degreaser shall be operated according to the manufacturer's recommendations for the removal of oil and dirt.
b) Wash - Solution Composition: 0.1% ± 0.01% Duponol ME by weight (HW Material No. 335, Document HW-19156)
0.1% ± 0.01% Sodium pyrophosphate by weight (HW Material No. 320, Document HW-19156)
Can Temperature: 35°C Maximum before wash.
Solution Temperature: 60°C ± 5°C.
Immersion time: 6 1/2 minutes ± 1/2 minute.
Period of Use: Change daily.
c) Rinse - Hot water rinse (60°C ± 5°C) followed by a cold water rinse at tap water temperature.

multilith destroyed classif scrap 7-1-53

Obsolete as of 6-15-53
Date

[redacted]

DECLASSIFIED

[redacted]

Specification No.

5.0

e) The rinse after etching removes adhering acid and minimizes the acid carry-over to the dehydrant.

f) The cans are dehydrated after rinsing to prevent the reaction between water and the aluminum that would cause uneven oxidation of the surface before canning, and to minimize the deposition of dissolved minerals on the surface of the can.

g) The can should be dried as soon as possible to inhibit reoxidation.

5.02

The purpose of the can preparation is to provide a satisfactory can surface for wetting by the aluminum-silicon. Proper wetting of the can by the molten aluminum-silicon is essential to ensure adequate bonding between the can, cap, and slug.

SPECIFICATIONS:

5.01 The can preparation shall be as follows:

a) Degrease - The solvent used in the solvent vapor degreaser shall be trichloroethylene (HW Material No. 323, Document HW-19156). The solvent vapor degreaser shall be operated according to the manufacturer's recommendations for the removal of oil and dirt.

b) Wash - Solution Composition: 0.1% ± 0.01% Duponol ME by weight (HW Material No. 335, Document HW-19156)
0.1% ± 0.01% Sodium pyrophosphate by weight (HW Material No. 320, Document HW-19156)
Can Temperature: 35°C Maximum before wash.
Solution Temperature: 60°C ± 5°C.
Immersion time: 6 1/2 minutes ± 1/2 minute.
Period of Use: Change daily.

c) Rinse - Hot water rinse (60°C ± 5°C) followed by a cold water rinse at tap water temperature.

d) Etch - Etchant: Phosphoric Acid (HW Material No. 317, Document HW-19156)
Composition: 20% ± 2% by weight
Temperature: 25°C ± 5°C
Immersion Time: 4 minutes ± 1/4 minute
Period of Use: 6 days

e) Rinse - Cold water rinse at tap water temperature.

DECLASSIFIED

[redacted]

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 9-8-53. cn 18 dec 7. 4-6-56

multilith destroyed 7-9-53

Obsolete as of 6-15-53
-12- Date

[redacted]

HW-23402

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
ALUMINUM CAN PREPARATION	5.0 (page 1 of 3 pages)
Ref. Documents	Date October 8, 1952

1. HW-9401 Process For Canning Uranium Four-inch Slugs.
2. HW-19156 Specifications Acceptance and Sampling Procedures for Essential Materials.
3. HW-10605 Aluminum Component Preparation and Use.

BASIS:

5.01

a) The degreasing operation removes oil and dirt which would otherwise reduce the effectiveness of the alkaline wash. Highly stabilized degreasing agents are preferred to lessen the possibility of chemical breakdown and permit safer operation.

b) The wash solution removes the remainder of the oil and dirt so that proper etching and aluminum-silicon wetting may be obtained. The temperature of the can and wash solution, and the time of immersion are critical. If either the solution or can temperature is too high, or the time of immersion too long, a film will be formed which will inhibit can wetting in the canning bath. If the solution temperature is too low or the time of immersion too short, the oil and dirt will not be properly removed and poor wetting of the can may result.

c) The hot rinse removes the majority of the wash solution. The cold rinse removes the remaining wash solution and cools the cans to the etching temperature.

d) The etch removes the irregular oxide film to promote even wetting of the cans. Time of etch, the temperature of the acid, and the period of use are specified to promote satisfactory etching and subsequent aluminum-silicon wetting.

[redacted]

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 9-8-53 c, 18 dest. 4-6-56

Specification No.

d) Three etchants are specified since it is operationally desirable to maintain alternate processes. The etch removes the irregular oxide film to promote even wetting of the caps in the canning bath. Time of etch, the temperature of the acid, and the period of use are specified to promote satisfactory etching and subsequent wetting in the aluminum-silicon baths.
e) The rinse after etching removes adhering acid and minimizes the acid carry-over to the dehydrant.
f) The caps are dehydrated after rinsing to prevent the reaction between water and the aluminum that would cause uneven oxidation of the surface before canning, and to minimize the deposition of dissolved minerals on the surface of the cap.
g) The caps should be dried as soon as possible to inhibit reoxidation.

7.02

The purpose of the cap preparation is to provide a satisfactory cap surface for wetting by the aluminum-silicon. Proper wetting of the cap by the molten aluminum-silicon is essential to ensure adequate bonding between the cap, can, and slug.

SPECIFICATIONS:

7.01 The cap preparation shall be as follows:

a) The solvent used in the solvent vapor degreaser shall be trichloroethylene (HW Material No. 323, Document HW 19156). The solvent vapor degreaser shall be operated according to the manufacturer's recommendations for the removal of oil and dirt.
b) Wash - Solution Composition: 0.1% ± 0.01% Duponol ME by weight (HW Material No. 335, Document HW-19156)
0.1% ± 0.01% Sodium pyrophosphate by weight (HW Material No. 320, Document HW-19156)
Cap Temperature: 35°C Max. before wash.
Solution Temperature: 60°C ± 5°C.
Immersion Time: 6 1/2 minutes ± 1/2 minute.
Period of Use: change daily
c) Rinse - Hot water rinse (60°C ± 5°C) followed by a cold water rinse at tap water temperature.

[redacted]

Specification No.
5.0
(page 3 of 3 pages)
June 15, 1953

d) Etch - Alternate etchants:

Phosphoric Acid (HW Material No. 317, Document HW-19156)

Composition: 20% ± 2% by weight
Temperature: 25°C ± 5°C
Immersion Time: 8 minutes ± 1/4 minute
Period of Use: 6 days maximum

Diversey 514 (HW Material No. 324, Document HW-19156)

Composition: 14 ounces per gallon minimum
Temperature: 25C ± 5C
Immersion Time: 5 minutes ± 1/4 minute
Period of Use: 6 days maximum

Fluosilicic Acid (H_2SiF_6) (HW Material No. 312, Document HW-19156)

Composition: 1.4% ± 0.2% by weight
Temperature: 25C ± 5C
Immersion Time: 8 minutes ± 1/2 minute
Period of Use: 16 hours maximum

e) Rinse - Cold water rinse at tap water temperature.
f) Dehydrate - Dehydrant: Methanol (HW Material No. 314, Document HW-19156) Maximum water content 18% by weight
Minimum pH 5.0
g) Dry - Cans are to be air dried within 30 minutes after methanol rinse.

5.02 The cans shall be used within four hours after preparation.

[redacted]

Specification No.
5.0
(page 3 of 3 pages)

5.01
f) Dehydrate - Dehydrant: Methanol (HW Material No. 314, Document HW-19156) Maximum water content 18% by weight
Minimum pH 5.0

g) Dry - Cans are to be air dried within 30 minutes after methanol rinse.

5.02 The cans shall be used within four hours after preparation.

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 9-8-53. C.18 dest. 4-6-5

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

ALUMINUM CAP SPECIFICATIONS

Specification No.

6.0

(page 1 of 3 pages)

Date

February 4, 1953

Ref. Documents

1. HW-9401 Process For Canning Uranium Four-inch Slugs.
2. HW-19156 Specifications, Acceptance and Sampling Procedures For Essential Materials.

BASIS:

6.01

The dimensions and composition of the aluminum cap must be controlled for the following reasons:

a) The component parts must be properly assembled during the canning operation.
b) High reactivity of the canned assembly is required.
c) The aluminum cap must be of sufficient strength and thickness to withstand the corrosion and the physical forces encountered before and during pile irradiation.
d) The diameter of the aluminum cap has been selected to minimize the width of the bonding layer between the cap and can.

6.02

Any perforation in the cap may allow water to attack the uranium slug resulting in autoclave and pile failures.

SPECIFICATIONS:

6.01 The aluminum cap used in the canning operation of the four-inch uranium slug shall conform with Page 16 and the cap used in the canning operation of the eight-inch slug shall conform with Page 16 A. HW Material No. 303, Document HW-19156.

6.02 The aluminum cap used shall be free of visible cracks, seams, holes, porosity, or folds.

HANFORD WORKS

C.18 dest. 4-6-56

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
ALUMINUM CAP SPECIFICATIONS	6.0 (page 1 of 3 pages)
Ref. Documents	Date December 9, 1952

1. HW-9401 Process For Canning Uranium Four-inch Slugs.
2. HW-19156 Specifications, Acceptance and Sampling Procedures For Essential Materials.

BASIS:

6.01

The dimensions and composition of the aluminum cap must be controlled for the following reasons:

a) The component parts must be properly assembled during the canning operation.
b) High reactivity of the canned assembly is required.
c) The aluminum cap must be of sufficient strength and thickness to withstand the corrosion and the physical forces encountered before and during pile irradiation.
d) The diameter of the aluminum cap has been selected to minimize the width of the bonding layer between the cap and can.

6.02

Any perforation in the cap may allow water to attack the uranium slug resulting in autoclave and pile failures.

SPECIFICATIONS:

6.01 The aluminum cap used in the canning operation of the four-inch uranium slug shall conform with Drawing H-3-4920, Revision 1 (attached) and the cap used in the canning operation of the eight-inch slug shall conform with Drawing H-3-4921 (attached). HW Material No. 303, Document HW-19156.

6.02 The aluminum cap used shall be free of visible cracks, seams, holes, porosity, or folds.

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Obsolete

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

ALUMINUM CAP SPECIFICATIONS

Specification No.

6.0
(page 1 of 2 pages)

Date
October 8, 1952

Ref. Documents

1. HW-9401 Process For Canning Uranium Four-inch Slugs.
2. HW-19156 Specifications, Acceptance and Sampling Procedures For Essential Materials.

BASIS:

6.01

The dimensions and composition of the aluminum cap must be controlled for the following reasons:

a) The component parts must be properly assembled during the canning operation.
b) High reactivity of the canned assembly is required.
c) The aluminum cap must be of sufficient strength and thickness to withstand the corrosion and the physical forces encountered before and during pile irradiation.
d) The diameter of the aluminum cap has been selected to minimize the width of the bonding layer between the cap and can.

6.02

Any perforation in the cap may allow water to attack the uranium slug resulting in autoclave and pile failures.

SPECIFICATIONS:

6.01 The aluminum cap used in the canning operation of the four-inch uranium slug shall conform with Drawing H-3-4920, (Revision 1) attached. (HW Material No. 303, Document HW-19156).

6.02 The aluminum cap used shall be free of visible cracks, seams, holes, porosity, or folds.

[redacted]

[redacted]

Obsolete as of 12-28-53 not Replaced
Date

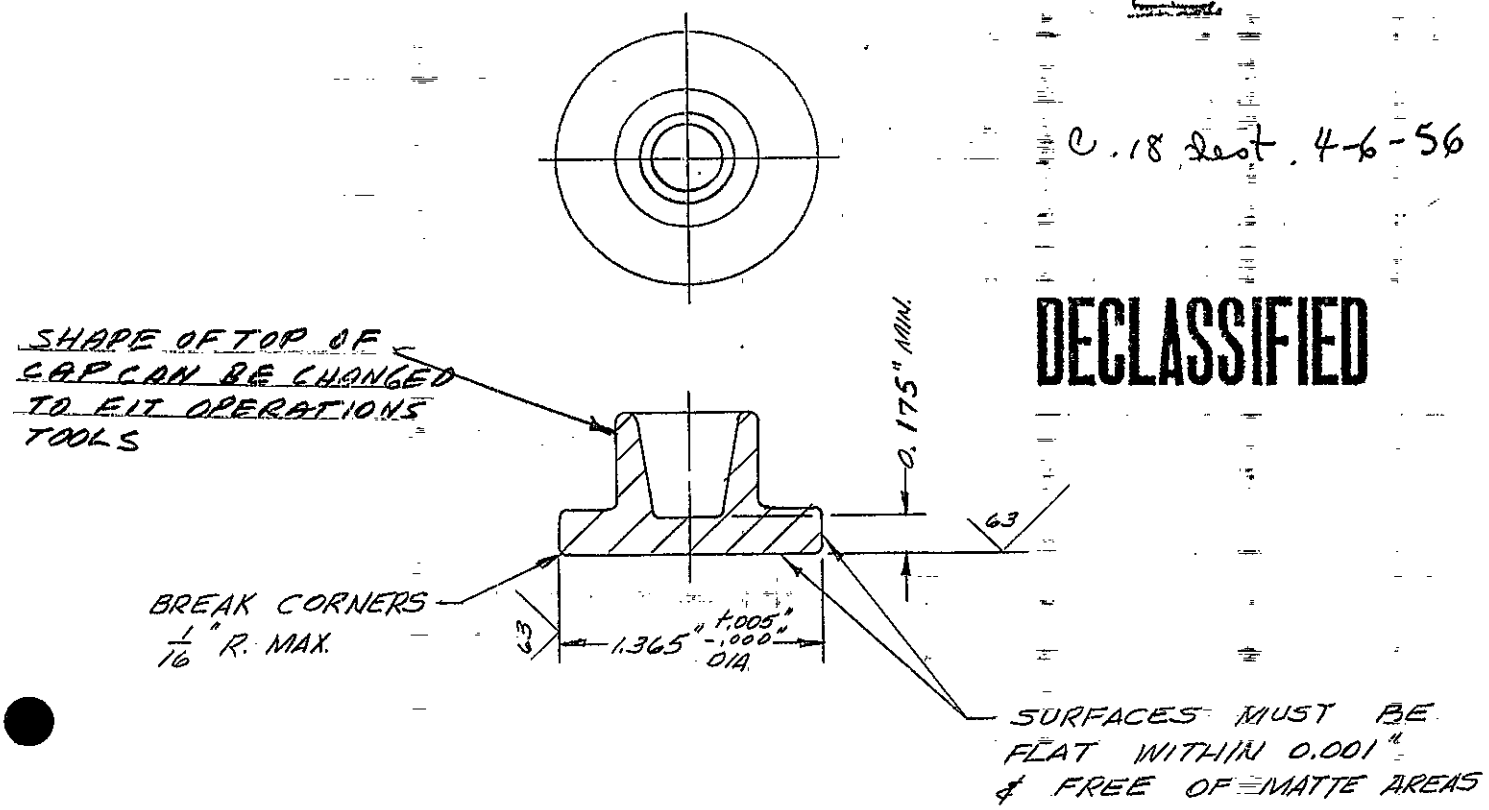
HW 23402
PAGE 16 (Page 2 of 3 pages)

[redacted]

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 3-22-54

C.18 Dept. 4-6-56

DECLASSIFIED



NOTES:

1. MATERIAL - AS SPECIFIED IN DOCUMENT HW 19156
2. CARS TO BE FABRICATED BY IMPACT EXTRUSION OF BLANKS FROM ROLLED PLATE.
3. THIS DRAWING PERTAINS TO TECHNICAL SPECIFICATIONS ONLY & MUST NOT BE USED FOR PURCHASING.

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25.

ALUMINUM CAP FOR 4" SLUG

REVISED 26 JANUARY 1953

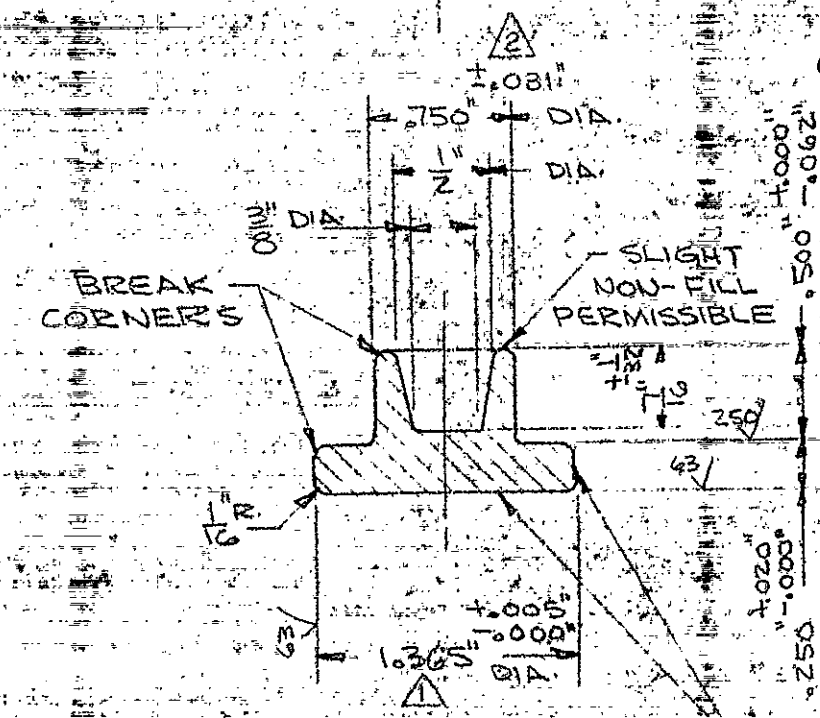
DECLASSIFIED

[redacted]

[redacted]

Obsolete as of 1-26-53
Date

c. 18 Dec. 4-6-56



SURFACE MUST BE FLAT WITHIN 0.001" & FREE OF MATTE AREAS

MATERIAL:-

ALUMINUM AS SPECIFIED ON ORDER — (CAPS FABRICATED BY IMPACT EXTRUSION OF BLANKS FROM ROLLED PLATE.)

[redacted]

[redacted]

2 - WAS .750 ±.005" 2-19-52 J.B.D.

1 WAS 1.345 ±.005" 12-18-51 [redacted]

[redacted]

GENERAL ELECTRIC CO.
HANFORD WORKS

ALUMINUM CAP

SCALE FULL

APPROVED

E.W. O'Rorke

H.L. Mars

W. Whitehouse

DATE 11-9-51 DRAWN BY [redacted]

CHECKED [redacted] PROJ. NO.

E. R. NO. BLDG. NO.

DWG. NO. H-3-4920
NO.

SHANNON & CO.

[redacted]

Obsolete as of 1-28-53 Date Replaced

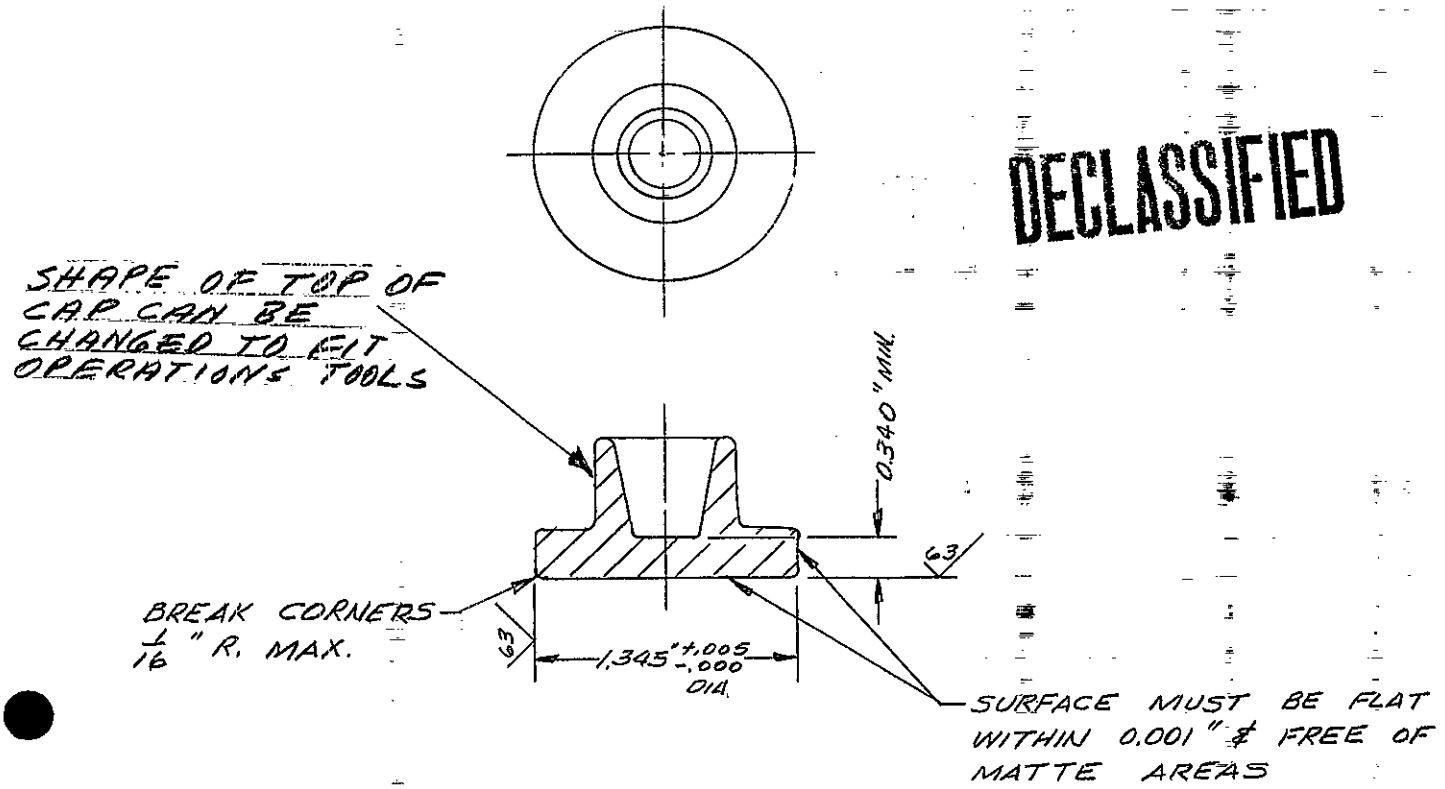
16A

HW 23402
PAGE [redacted] (Page 3 of 3 Pages)

[redacted] 3-22-54

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP...2.....

DECLASSIFIED



NOTES:

1. MATERIAL - AS SPECIFIED IN DOCUMENT HW 19156
2. CAPS TO BE FABRICATED BY IMPACT EXTRUSION OF BLANKS FROM ROLLED PLATE.
3. THIS DRAWING PERTAINS TO TECHNICAL SPECIFICATIONS ONLY & MUST NOT BE USED FOR PURCHASING

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22
24, 25
C. 18 dest. 4-6-56

ALUMINUM CAP FOR 8" SLUG

DECLASSIFIED

REVISED 26 JANUARY 1953 ...

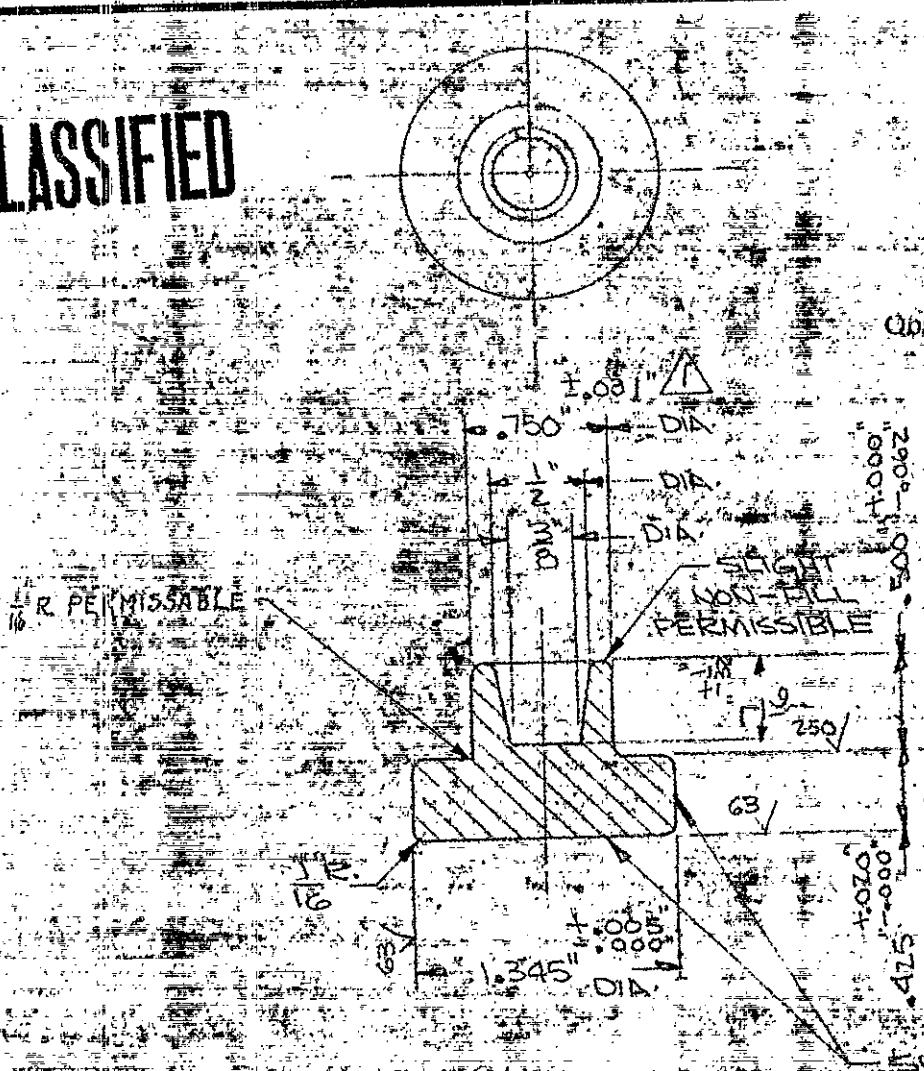
[redacted]

DECLASSIFIED

HW-23402
Page 16A
[redacted]

Obsolete as of 1-26-53
Date

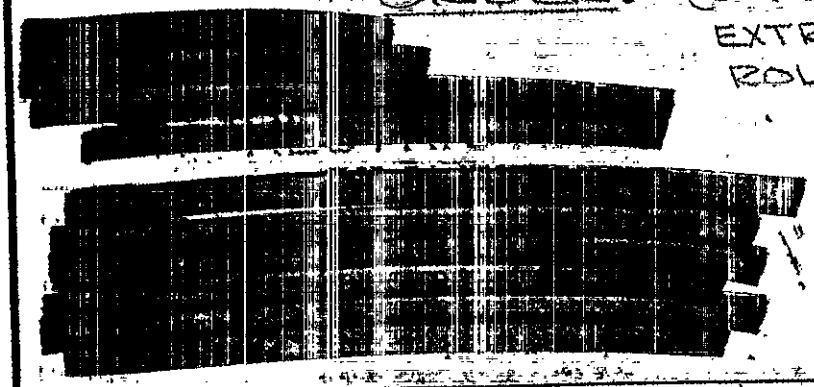
CTR Dept. 4-6-56



SURFACE MUST BE FLAT WITHIN 0.001" & FREE OF MATTE AREAE

MATERIAL 8-

ALUMINUM AS SPECIFIED ON ORDER. - (CAPS FABRICATED BY IMPACT EXTRUSION OF BLANKS FROM ROLLED PLATE.)



1" 1"

⚠1 - ADDED NOTE & REMOVED NOTE - BREAK CORNERS. TOL. WAS ±.005

GENERAL ELECTRIC CO.
HANFORD WORKS

ALUMINUM CAP

SCALE FULL

APPROVED
E W O'Rork
H L Mars
W Wiedemann

DATE 11-9-51 DRAWN BY D.R.S.
CHECKED [redacted] PROJ. NO.
E. R. NO. BLDG. NO.

DWG. NO. H-3-4971
NO.

DECLASSIFIED

SHANNON & CO. Recd 1-14-53

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: ALUMINUM CAP PREPARATION

Specification No. 7.0 (page 1 of 3 pages)

Ref. Documents

Date June 15, 1953

1. HW-9401 Process for Canning Uranium Four-Inch Slugs.
2. HW-19156 Specifications, Acceptance and Sampling Procedures For Essential Materials.
3. HW-10605 Aluminum Component Preparation and Use
4. HW-27734 Evaluation of Etchants for Deoxidizing Aluminum Components
5. HW 28371 Interim Report on PT 313-105-16M, Evaluation of Diversey 514 as an Etchant in the Aluminum Component Cleaning Process.
6. HW-27428 Hydrofluosilicic Acid as a Cap and Can Etchant

BASIS

7.01

a) The degreasing operation removes oil and dirt which would otherwise reduce the effectiveness of the alkaline wash. Highly stabilized degreasing agents are preferred to lessen the possibility of chemical breakdown and permit safer operation.
b) The wash solution removes the remainder of the oil and dirt so that proper etching and aluminum-silicon wetting may be obtained. The temperature of the cap and wash solution, and the time of immersion are critical. If either the cap or solution temperature is too high or the time of immersion too long, a film will be formed which will inhibit cap wetting in the canning bath. If the solution temperature is too low or the time of immersion too short, the oil and dirt will not be properly removed and poor wetting of the cap may result.
c) The hot rinse removes the majority of the wash solution. The cold rinse removes the remaining wash solution and cools the caps to the etching temperature.

HANFORD WORKS

ENGINEERING DEPARTMENT

v. 18 dest. 4-6-56

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:

ALUMINUM CAP PREPARATION

Specification No.
7.0
(page 1 of 3 pages)

Date
October 8, 1952

Ref. Documents

1. HW-9401 Process for Canning Uranium Four-Inch Slugs.
2. HW-19156 Specifications, Acceptance and Sampling Procedures For Essential Materials.
3. HW-10605 Aluminum Component Preparation and Use.

BASIS:

7.01

a) The degreasing operation removes oil and dirt which would otherwise reduce the effectiveness of the alkaline wash. Highly stabilized degreasing agents are preferred to lessen the possibility of chemical breakdown and permit safer operation.

b) The wash solution removes the remainder of the oil and dirt so that proper etching and aluminum-silicon wetting may be obtained. The temperature of the cap and wash solution, and the time of immersion are critical. If either the cap or solution temperature is too high or the time of immersion too long, a film will be formed which will inhibit cap wetting in the canning bath. If the solution temperature is too low or the time of immersion too short, the oil and dirt will not be properly removed and poor wetting of the cap may result.

c) The hot rinse removes the majority of the wash solution. The cold rinse removes the remaining wash solution and cools the caps to the etching temperature.

d) Two etchants are specified since it is operationally desirable to maintain alternate processes. The etch removes the irregular oxide film to promote even wetting of the caps in the canning bath. Time of etch, the temperature of the acid, and the period of use are specified to promote satisfactory etching and subsequent wetting in the aluminum-silicon baths.

Multilith DESTROYED AS CLASSIFIED SCRAP 9-10-53 [redacted]

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 9-8-53.

[redacted]

[redacted]

e) The rinse after etching removes adhering acid and minimizes the acid carry-over to the dehydrant.
f) The caps are dehydrated after rinsing to prevent the reaction between water and the aluminum that would cause uneven oxidation of the surface before canning, and to minimize the deposition of dissolved minerals on the surface of the cap.
g) The caps should be dried as soon as possible to inhibit reoxidation.

7.02

The purpose of the cap preparation is to provide a satisfactory cap surface for wetting by the aluminum-silicon. Proper wetting of the cap by the molten aluminum-silicon is essential to ensure adequate bonding between the cap, can, and slug.

SPECIFICATIONS:

7.01 The cap preparation shall be as follows:

a) The solvent used in the solvent vapor degreaser shall be trichloroethylene (HW Material No. 323, Document HW-19156). The solvent vapor degreaser shall be operated according to the manufacturer's recommendations for the removal of oil and dirt.
b) Wash - Solution Composition: 0.1% ± 0.01% Duponol ME by weight (HW Material No. 335, Document HW-19156)
0.1% ± 0.01% Sodium pyrophosphate by weight (HW Material No. 320, Document HW-19156)
Cap Temperature: 35°C Max. before wash.
Solution Temperature: 60°C ± 5°C.
Immersion time: 6 1/2 minutes ± 1/2 minute.
Period of Use: change daily
c) Rinse - Hot water rinse (60°C ± 5°C) followed by a cold water rinse at tap water temperature.
d) Etch - Alternate Cap Etchants: Phosphoric Acid (HW Material No. 317, Document HW-19156)
Composition: 20% ± 2% by weight
Temperature: 25% ± 5°C
Immersion time: 8 minutes ± 1/4 minute
Period of use: 6 days
Etchant: Hydrofluosilicic acid (H_2SiF_6) (HW Material No. 312 Document HW-19156)

Multilith

[redacted]

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 9-8-53, ¶.18 dest. 4-6-

d) Etch - Alternate cap etchants:

Phosphoric Acid (HW Material No. 317, Document HW-19156)

Composition: 20% ± 2% by weight
Temperature: 25°C ± 5°C
Immersion time: 8 minutes ± 1/4 minute
Period of use: 6 days

Fluosilicic Acid (H_2SiF_6) (HW Material No. 312, Document HW-19156)

Composition: 1.4% ± 0.2%
Temperature: 25°C ± 5°C
Immersion Time: 8 minutes ± 1/2 minute
Period of Use: 16 hours maximum

Diversey 514 (HW Material No. 324, Document HW-19156)

Composition: 14 ounces per gallon minimum
Temperature: 25C ± 5C
Immersion Time: 5 minutes ± 1/4 minute
Period of Use: 6 days maximum

e) Rinse - Cold water rinse at tap water temperature.
f) Dehydrate - Dehydrant: Methanol (HW Material No. 314, Document HW-19156)
Maximum water content 18% by weight
Minimum pH 5.0
g) Dry - Caps to be air dried within 30 minutes after methanol rinse.

7.02 The caps shall be used within four hours after preparation.

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25.
[redacted]
C. 18-A Dest. 4-6-56

[redacted]

Specification No.
7.0
(page 3 of 3 pages)

Composition: 1% ± 0.1% by weight
Temperature: 25°C ± 5°C
Immersion Time: 8 minutes ± 1/4 minute
Period of Use: 1000 caps per 10 liter batch.

e) Rinse - Cold water rinse at tap water temperature.

f) Dehydrate - Dehydrant: Methanol (HW Material No. 314, Document HW-19156)
Maximum water content 18% by weight
Minimum pH 5.0

g) Dry - Caps to be air dried within 30 minutes after methanol rinse.

7.02 The caps shall be used within four hours after preparation.

Multilith

DESTROYED AS CLASSIFIED SCRAP 7-10-53

[redacted]

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 7-8-53.

c. 18 dest. 4-6-5

20

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
CANNING SLEEVE	8.0 (page 1 of 2 pages)
Ref. Documents	Date December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials (HW Material No. 321 - Canning Sleeve)
3. HW-18240 Elimination of Al-Si Rejects-Victor Cans

BASIS:

8.01

A sleeve is required during the canning operation to protect the exterior of the aluminum can from the attack of the molten aluminum-silicon. The wall thickness of the sleeve is controlled because it affects the residual wall thickness of the can after canning.

The optimum difference between the inside diameter of the sleeve and the outside diameter of the aluminum can has been determined to be 0.012" to 0.014" (Document HW-18240). If the difference is greater than 0.014" aluminum-silicon "slopovers," may result, and if the difference is smaller than 0.012" wrinkled cans may be caused. A ferrous material is specified for sleeves because its resistance to molten aluminum-silicon is adequate and its thermal conductivity is satisfactory for the preheating of the aluminum can.

8.02

The canned assembly must resist corrosive attack before and during pile irradiation. Foreign materials that are not removed from the assembly surface during the penetration etch may accelerate the corrosion of the aluminum components to the extent that the pile water may attack the uranium and cause the slug to fail.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
STEEL SLEEVE	8.0 (page 1 of 2 pages)
Ref. Documents	Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures For Essential Materials (HW Material No. 321)
3. HW-18240 Elimination of Al-Si Rejects-Victor Cans

BASIS:

8.01

A sleeve is required during the canning operation to protect the exterior of the aluminum can from the attack of the molten aluminum-silicon. The wall thickness of the steel sleeve affects the aluminum can temperature and therefore must be controlled, since the aluminum can temperature at the time of canning is critical.

The optimum difference between the inside diameter of the sleeve and the outside diameter of the aluminum can has been determined to be 0.012" to 0.014" (Document HW-18240). If the difference is greater than 0.014" aluminum-silicon "slopovers" may result, and if the difference is smaller than 0.012" wrinkled cans may be caused.

8.02

The canned assembly must resist corrosive attack before and during pile irradiation. Foreign materials that are not removed during the penetration etch may accelerate corrosion in such a manner so as to reduce the residual aluminum can thickness to a dangerously low value.

Obsolete as of 12-28-53
Date

[redacted]

Specification No.
8.0
(page 2 of 2 pages)

SPECIFICATIONS:

8.01 A steel sleeve with a wall thickness of 0.150" ± 0.015" shall be used to protect the aluminum can during the canning operation.

8.02 The sleeve or any material used to prepare the sleeve shall not deposit any foreign material on the exterior of the aluminum can which cannot be removed during the penetration etch (Process Specification 21.0).

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 3-22-54

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25.

[redacted]

e.18-A dest. 4-6-56

Specification No.
8.0
(page 2 of 2 pages)
Date
December 28, 1953

SPECIFICATIONS:

8.01

A steel or cast iron sleeve shall be used to protect the aluminum can during the canning operation.

8.02

The sleeve or any material used to prepare the sleeve shall not deposit any foreign material on the exterior of the aluminum can which cannot be removed during the penetration etch (Process Specification 21.0).

22

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
TRIPLE DIP CANNING TIME CYCLE	9.0 (page 1 of 1 page)
Ref. Documents	Date December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs

BASIS:

9.01

The triple dip canning process and time cycle are based on operating experience and production tests. Detailed bases for each bath are found on the following pages.

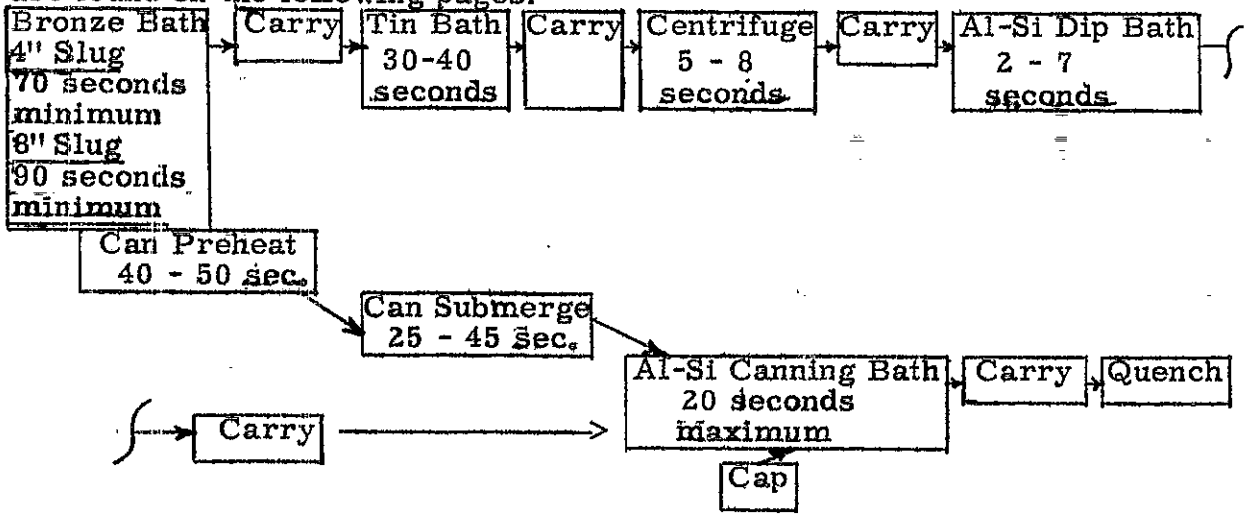
9.02

The carry times during the canning process should be maintained at a minimum to ensure a uniform product.

SPECIFICATIONS:

9.01

The triple dip process for canning uranium slugs shall follow the flow sheet below: The slugs shall be dipped in each bath for the time indicated and the components assembled in the canning bath. Detailed bath specifications are found on the following pages.



9.02 Maximum carry time 10 seconds.

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
TRIPLE DIP CANNING TIME CYCLE	9.0 (page 1 of 2 pages)
Ref. Documents	Date October 23, 1953

1. HW-9401 Operating Process for Canning Four-inch Slugs

BASIS:

9.01

The triple-dip canning process and time cycle are based on operating experience and production tests. Records and test data were obtained using the present type furnaces, Type HD 2430 Hevi-Duty electrical resistance furnaces (or equivalent) and by measuring bath temperatures in the following manner: The bath temperature for the bronze, tin, and aluminum-silicon dip baths is obtained by locating the thermocouple 1" to 3" inward from the crucible wall at a depth of 10" to 14" from the top of the pot. The temperature of the canning bath is obtained by locating the thermocouple approximately midway between two adjacent canning jacks, 1" to 2" inward from the crucible wall at a depth of 3" to 6" from the top of the pot. Since the following Specifications are based on past records and test data, they are only applicable to the present equipment and procedures; and any change of equipment or in procedure will have to be evaluated and new specifications determined.

The specifications are also applicable for a Model CG-1 Ajax induction furnace when used for a canning bath. The bath temperature shall be measured by a thermocouple located at the center of the channel side of the furnace, six to eight inches inward from the crucible wall at a depth of six to eight inches in the melt.

Detailed bases for each bath are found on the following pages.

9.02

The carry times during the canning process should be maintained at a minimum to ensure a uniform product.

[redacted]

HW-23402

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
TRIPLE DIP CANNING TIME CYCLE	9.0 (page 1 of 2 pages)
Ref. Documents	Date June 15, 1953

1. HW-9401 Operating Process for Canning Four-inch Slugs

BASIS:

9.01

The triple-dip canning process and time cycle are based on operating experience and production tests. Records and test data were obtained using the present type furnaces, Type HD 2430 Hevi-Duty electrical resistance furnaces (or equivalent) and by measuring bath temperatures in the following manner: The bath temperature for the bronze, tin, and aluminum-silicon dip baths is obtained by locating the thermocouple 1" to 3" inward from the crucible wall at a depth of 10" to 14" from the top of the pot. The temperature of the canning bath is obtained by locating the thermocouple approximately midway between two adjacent canning jacks, 1" to 2" inward from the crucible wall at a depth of 3" to 6" from the top of the pot. Since the following Specifications are based on past records and test data, they are only applicable to the present equipment and procedures; and any change of equipment or in procedure will have to be evaluated and new specifications determined.

Detailed bases for each bath are found on the following pages.

9.02

The carry times during the canning process should be maintained at a minimum to ensure a uniform product.

[redacted]

[redacted] Obsolete as of 6-15-53
-22- Date

HW-23402

[redacted] DECLASSIFIED

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
TRIPLE DIP CANNING TIME CYCLE	9.0 (page 1 of 2 pages)
Ref. Documents	Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs

BASIS:

9.01

The triple-dip canning process and time cycle are based on operating experience and production tests. Records and test data were obtained using the present type furnaces, Type HD 2430 Hevi-Duty electrical resistance furnaces (or equivalent) and by measuring bath temperatures in the following manner: The bath temperature for the bronze, tin, and aluminum-silicon dip baths is obtained by locating the thermocouple 1" to 3" inward from the crucible wall at a depth of 10" to 14" from the top of the pot. The temperature of the canning bath is obtained by locating the thermocouple approximately midway between two adjacent canning jacks, 1" to 2" inward from the crucible wall at a depth of 3" to 6" from the top of the pot. Since the following Specifications are based on past records and test data, they are only applicable to the present equipment and procedures; and any change of equipment or in procedure will have to be evaluated and new specifications determined.

Detailed bases for each bath are found on the following pages.

9.02

The carry times during the canning process should be maintained at a minimum to ensure a uniform product.

Multilith DESTROYED AS CLASSIFIED SCRAP 7-10-53

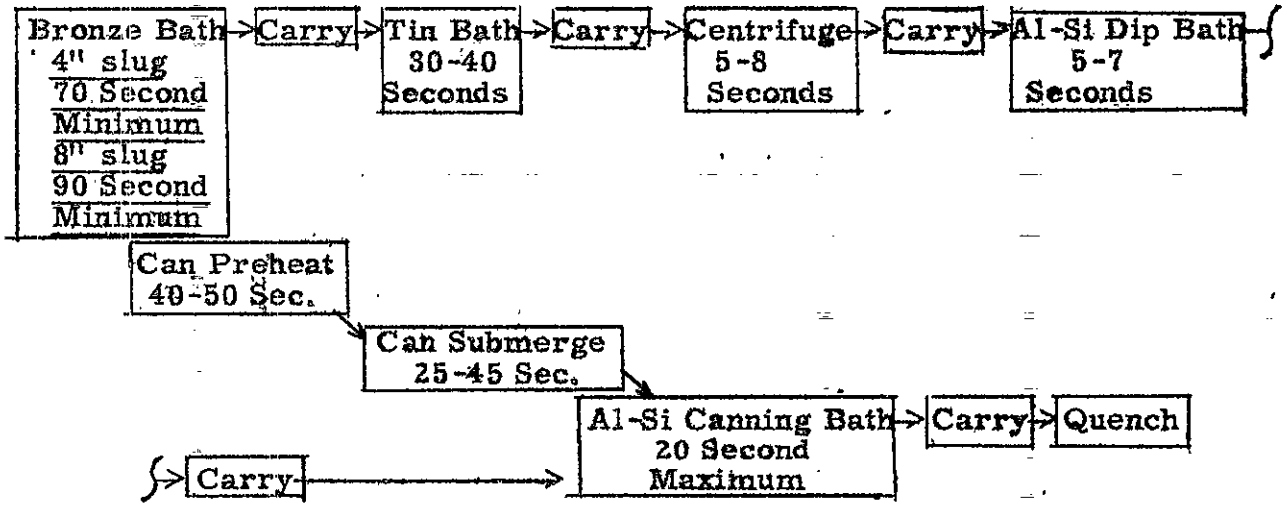
DECLASSIFIED [redacted]

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 9-8-53.
C.18-A Dest. 4-6-5

Specification No.
9.0
(page 2 of 2 pages)
Date
October 23, 1953

SPECIFICATIONS:

9.01 The triple-dip process for canning uranium slugs shall follow the flow sheet below: The slugs shall be dipped in each bath for the time indicated and the components assembled in the canning bath. Detailed bath specifications are found on the following pages.



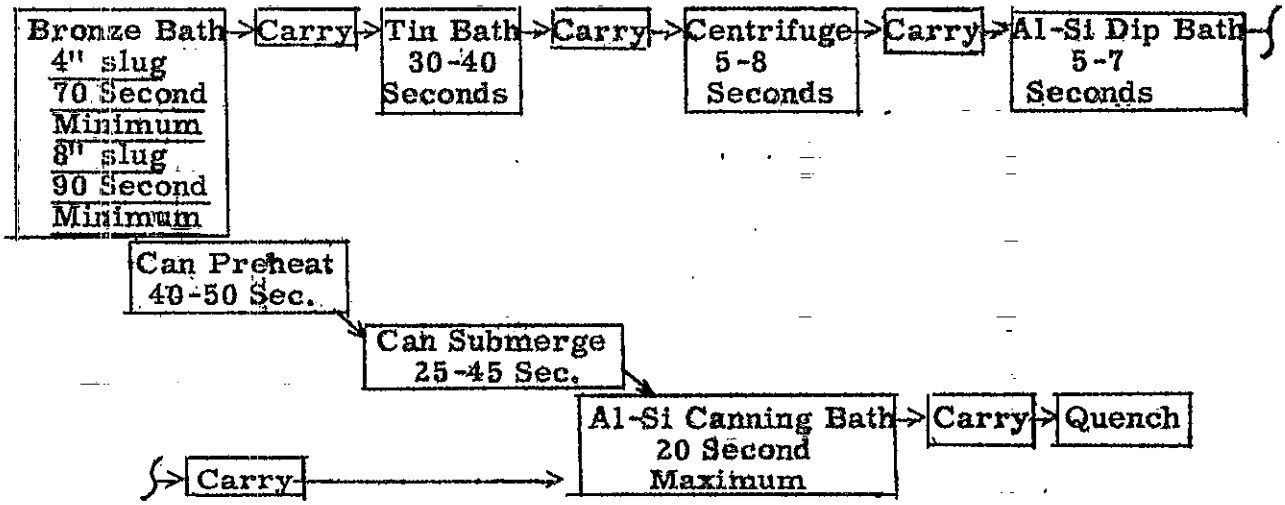
9.02 Maximum carry time 10 Seconds.

Obsolete as of 10-23-53
Date
Multilith revised and redated 10-23-53.

Specification No.
9.0
(page 2 of 2 pages)
June 15, 1953

SPECIFICATIONS:

9.01 The triple-dip process for canning uranium slugs shall follow the flow sheet below: The slugs shall be dipped in each bath for the time indicated and the components assembled in the canning bath. Detailed bath specifications are found on the following pages.



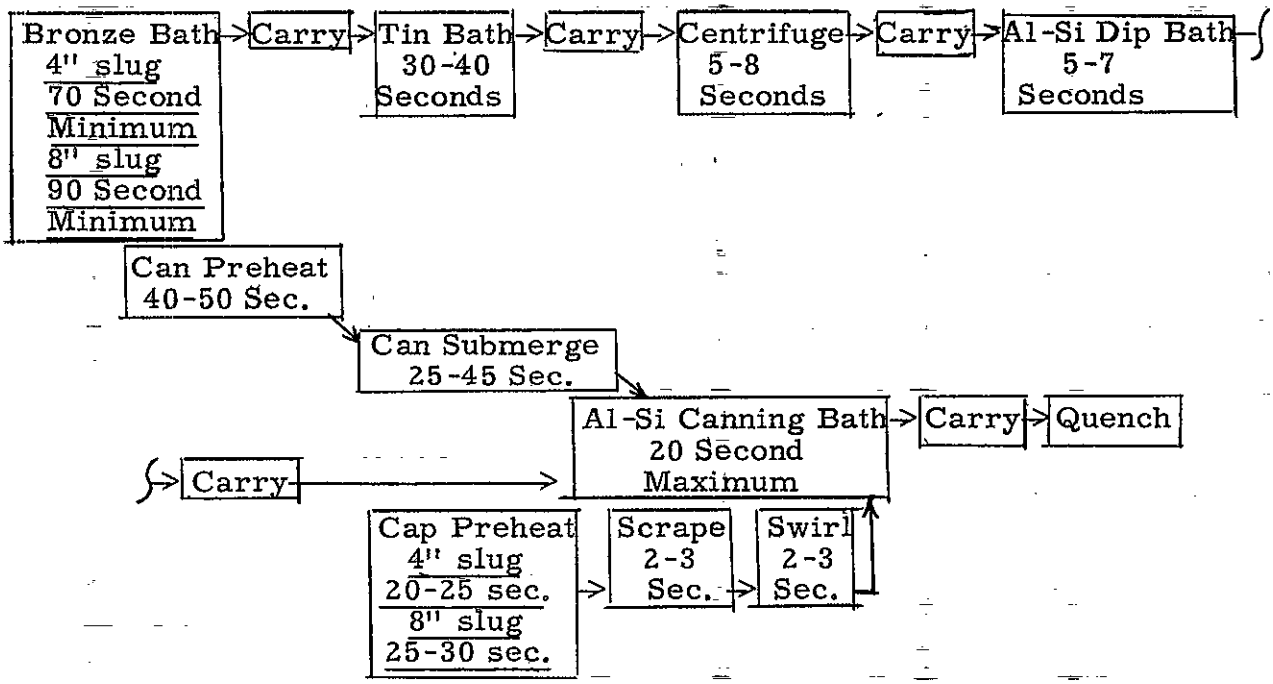
9.02 Maximum carry time 10 Seconds.

The following copies of this page were destroyed. 12-15-53
1 thru 12, 16, 19 thru 22, 24 and 25.
c. 18-A dest. 4-6-5

Specification No.
9.0
(page 2 of 2 pages)

SPECIFICATIONS:

9.01 The triple-dip process for canning uranium slugs shall follow the flow sheet below: The slugs shall be dipped in each bath for the time indicated and the components assembled in the canning bath. Detailed bath specifications are found on the following pages.



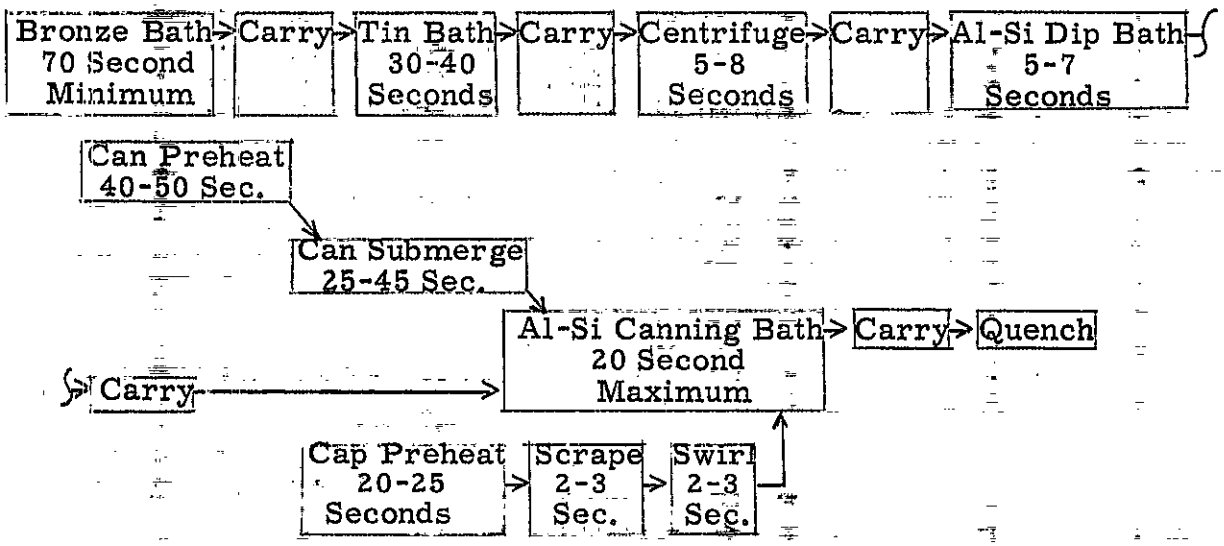
9.02 Maximum carry time 10 Seconds.

Specification No.

9.0
(page 2 of 2 pages)

SPECIFICATIONS:

9.01 The triple-dip process for canning uranium slugs shall follow the flow sheet below: The slugs shall be dipped in each bath for the time indicated and the components assembled in the canning bath. Detailed bath specifications are found on the following pages.



9.02 Maximum carry time 10 Seconds.

[redacted]

DECLASSIFIED

24

HW-23402

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
BRONZE BATH	10.0 (page 1 of 2 pages)
Ref. Documents	Date June 15, 1953

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials

BASIS:

10.01

The bronze bath is the initial part of the uranium beta heat treatment and prepares the uranium slug surface for wetting by the succeeding metal baths. The bath composition is limited only by the copper content and the essential material specifications. The copper content is critical since a higher percentage of copper may result in solid alpha copper particles being formed; while a lower percentage of copper may cause excessive tin carry-over and canning defects. Past experience has shown that tin carry-over can also be reduced by using a high percentage of recovered bronze to make up the bronze charge. The essential material specifications are necessary to prevent the inclusion of high nuclear cross-section elements in the canned slug assembly, and to prevent the inclusion of elements that would form high melting point alloys.

10.02

10.03

The temperature of the bronze bath is critical because it is the initial stage of the uranium heat treatment. The uranium is heated to the beta range in the bronze bath and quenched to the alpha range in the tin bath. The lower limit of the temperature and the time of slug immersion are specified to ensure complete transformation of the uranium slug. The upper limit of the temperature is specified to prevent the overheating of the uranium into the gamma range, causing excessive grain growth.

[redacted]

DECLASSIFIED

G-18 A Dec. 4-6-56

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
BRONZE BATH	10.0 (page 1 of 2 pages)
Ref. Documents	Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials

BASIS:

10.01

The bronze bath is the initial part of the uranium beta heat treatment and prepares the uranium slug surface for wetting by the succeeding metal baths. The bath composition is limited only by the copper content and the essential material specifications. The copper content is critical since a higher percentage of copper may result in solid alpha copper particles being formed; while a lower percentage of copper may cause excessive tin carry-over and canning defects. Past experience has shown that tin carry-over can also be reduced by using a high percentage of recovered bronze to make up the bronze charge. The essential material specifications are necessary to prevent the inclusion of high nuclear cross-section elements in the canned slug assembly, and to prevent the inclusion of elements that would form high melting point alloys.

10.02

10.03

The temperature of the bronze bath is critical because it is the initial stage of the uranium heat treatment. The uranium is heated to the beta range in the bronze bath and quenched to the alpha range in the tin bath. The lower limit of the temperature and the time of slug immersion are specified to ensure complete transformation of the uranium slug. The upper limit of the temperature is specified to prevent the overheating of the uranium into the gamma range, causing excessive grain growth.

10.04

The slug agitation in the bronze bath is specified to promote uniform heating, complete transformation, and complete wetting of the slug.

10.05

The uranium slug is agitated through the flux layer to promote complete and uniform wetting of the slug.

10.06

The flux composition is specified to maintain a fluid mixture at operating temperatures that will prevent surface oxidation of the bronze bath and prevent oxidation of the slug during the transfer to the tin bath. The flux should be changed at any time the slugs fail to wet properly in the bronze bath.

SPECIFICATIONS:

10.01 Bath Composition: The bronze bath shall be composed of copper (HW Material No. 311, Document HW-19156), tin (HW Material No. 322, Document HW-19156), and normal contaminating elements of uranium, iron, nickel, and chromium.

Composition Limits: Copper 45% to 49% by weight.

10.02 Bronze Temperature: 730°C to 750°C

10.03 Slug immersion time in bronze: 4" slug - 55 seconds minimum
8" slug - 75 seconds minimum

10.04 Slug agitation in bronze:
Rate: 45 complete cycles per minute.
Length of Stroke: 4 inch minimum (stroke defined as total displacement in either direction).

10.05 The slug shall be agitated through the flux layer in such a manner that the complete slug is alternately in the bronze and then in the flux, or flux and air.
Time: 15 second minimum
Rate: 60 ± 12 cycles per minute

10.06 The bath shall be covered with a flux layer, a minimum of 1/2" thick, composed of a eutectic mixture of $BaCl_2$, KCl, and NaCl (HW Material Number 319).

[redacted]

6-15-54 [illegible]

Obsolete as of 6-15-53
Date

[redacted]

[redacted]

DECLASSIFIED

Specification No.
10.0
(page 2 of 2 pages)

10.04

The slug agitation in the bronze bath is specified to promote uniform heating, complete transformation, and complete wetting of the slug.

10.05

The uranium slug is agitated through the flux layer to promote complete and uniform wetting of the slug.

10.06

The flux composition is specified to maintain a fluid mixture at operating temperatures that will prevent surface oxidation of the bronze bath and prevent oxidation of the slug during the transfer to the tin bath. The flux should be changed at any time the slugs fail to wet properly in the bronze bath.

SPECIFICATIONS:

10.01 Bath Composition: The bronze bath shall be composed of copper (HW Material No. 311, Document HW-19156), tin (HW Material No. 322, Document HW-19156), and normal contaminating elements of uranium, iron, nickel, and chromium.

Composition Limits: Copper 45% to 49% by weight.

10.02 Bronze Temperature: 730°C to 750°C

10.03 Slug immersion time in bronze: 4" slug - 55 seconds minimum
8" slug - 75 seconds minimum

10.04 Slug agitation in bronze:
Rate: 45 complete cycles per minute.
Length of Stroke: 4 inch minimum (stroke defined as total displacement in either direction).

10.05 The slug shall be agitated through the flux layer in such a manner that the complete slug is alternately in the bronze and then in the flux, or flux and air.
Time: 15 second minimum
Rate: 60 ± 12 cycles per minute.

DECLASSIFIED

10.06 The bath shall be covered with a flux layer, a minimum of 1/2" thick, composed of $BaCl_2$, KCl, and NaCl (HW Material Nos. 308, 316, and 318 respectively, Document HW-19156)

Acceptable Compositions: (As prepared)

$BaCl_2$ (anhydrous)	48.1 ± 0.5%	$BaCl_2$ (dihydrate)	52.0% ± 0.5%
KCl	30.7% ± 0.5%	KCl	28.6% ± 0.5%
NaCl	21.2% ± 0.5%	NaCl	19.4% ± 0.5%

multilith DESTROYED AS CLASSIFIED SCRAP 1-10-53

[redacted]

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 9-8-53 C-18 Dest. 4-6
Rec'd 1-14-53

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
TIN BATH	11.0 (page 1 of 2 pages)
Ref. Documents	Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials

BASIS:

11.01

11.02

11.03

The tin bath quenches the slug to complete the heat treatment of the uranium and cools the slug to the canning temperature. The tin bath also reduces the amount of copper, and bronze flux which are carried over to the aluminum-silicon baths.

The amount of copper is specified since it forms high melting point inter-metallic alloys with aluminum, it interferes with the separation process, and it lowers the reactivity of the canned assembly.

The amount of aluminum required is variable, and only enough should be added to protect the tin bath from oxidation.

11.04

Any dirt, flux, and oxide on the surface of the tin bath may interfere with slug wetting and adhere to the slug, causing canning difficulties.

11.05

The slug is agitated in the tin bath to flush off adhering bronze flux and copper.

10.04

The slug agitation in the bronze bath is specified to promote uniform heating, complete transformation, and complete wetting of the slug.

10.05

The uranium slug is agitated through the flux layer to promote complete and uniform wetting of the slug.

10.06

The flux composition is specified to maintain a fluid mixture at operating temperatures that will prevent surface oxidation of the bronze bath and prevent oxidation of the slug during the transfer to the tin bath. The flux should be changed at any time the slugs fail to wet properly in the bronze bath.

SPECIFICATIONS:

10.01 Bath Composition: The bronze bath shall be composed of copper (HW Material No. 311, Document HW-19156), tin (HW Material No. 322, Document HW-19156), and normal contaminating elements of uranium, iron, nickel, and chromium.

Composition Limits: Copper 45% to 49% by weight.

10.02 Bronze Temperature: 730°C to 755°C

10.03 Slug immersion time in bronze: 55 second minimum

10.04 Slug agitation in bronze:

Rate: 45 complete cycles per minute.

Length of Stroke: 4 inch minimum (stroke defined as total displacement in either direction)

10.05 The slug shall be agitated through the flux layer in such a manner that the complete slug is alternately in the bronze and then in the flux, or flux and air.

Time: 15 second minimum

Rate: 60 ± 12 cycles per minute.

10.06 The bath shall be covered with a flux layer, a minimum of 1/2" thick, composed of $BaCl_2$, KCl, and NaCl (HW Material Nos. 308, 316, and 318 respectively, Document HW-19156)

Acceptable Compositions: (As prepared)

$BaCl_2$ (anhydrous)	48.1 ± 0.5%	$BaCl_2$ (dihydrate)	52.0% ± 0.5%
KCl	30.7% ± 0.5%	KCl	28.6% ± 0.5%
NaCl	21.2% ± 0.5%	NaCl	19.4% ± 0.5%

DESTROYED. SEE CERTIFICATE OF DESTRUCTION # 2149

Specification No.
11.0
(page 2 of 2 pages)
March 30, 1953

SPECIFICATIONS:

11.01 The tin bath shall be composed of tin (HW Material No. 322, Document HW-19156), aluminum (HW Material No. 304, Document HW-19156), and normal contaminating elements of uranium, copper, iron, chromium, and nickel.

Composition Limits:
a) Copper 5% maximum by weight
b) Aluminum shall be added to the tin bath as necessary to inhibit surface oxidation of the bath.

11.02 Bath temperature: 585° - 600°C.

11.03 Immersion time: 30 to 40 seconds

11.04 Dirt, flux, and oxide shall be kept skimmed from the surface of the tin bath during canning.

11.05 Slug agitation:
a) Rate: 84 ± 12 cycles per minute
b) Length of stroke: 2 1/2 inch minumum
c) Time of agitation: 5 second minumum

e.18 dest. 4-6-56

Specification No.
11.0
(page 2 of 2 pages)

SPECIFICATIONS:

11.01 The tin bath shall be composed of tin (HW Material No. 322, Document HW-19156), aluminum (HW Material No. 304, Document HW-19156), and normal contaminating elements of uranium, copper, iron, chromium, and nickel.

Composition Limits:
a) Copper 5% maximum by weight
b) Aluminum shall be added to the tin bath as necessary to inhibit surface oxidation of the bath.

11.02 Bath temperature: 595°C ± 5°C

11.03 Immersion time: 30 to 40 seconds

11.04 Dirt, flux, and oxide shall be kept skimmed from the surface of the tin bath during canning.

11.05 Slug agitation:
a) Rate: 84 ± 12 cycles per minute
b) Length of stroke: 2 1/2 inch minumum
c) Time of agitation: 5 second minumum

[redacted]

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: CENTRIFUGE

Specification No. 12.0

Ref. Documents

1. HW-9401 Operating Process for Canning Four-inch Slugs.

Date October 8, 1952

BASIS:

12.01
12.02
12.03

The centrifuge has been part of the process since it was originated and is considered necessary for the following reasons:

a) It reduces material carry-over from the bronze and tin baths to the aluminum-silicon baths.
b) It may have unknown effects on slug quality and should not be removed without conclusive test data.

SPECIFICATIONS:

12.01 Speed: 500 rpm minimum.

12.02 Length of moment arm: 4 inches minimum

12.03 Time: 5 to 8 seconds.

c. 18 Dept. 4-6-56

[redacted]

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

ALUMINUM-SILICON DIP BATH

Specification No.

13.0

(page 1 of 2 pages)

Ref. Documents

Date

December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials

BASIS:

13.01

The purpose of the aluminum-silicon dip bath is to reduce the tin carry-over to the aluminum-silicon canning bath and to form compound layers between the aluminum-silicon and the uranium.

Excess tin is believed to prevent the formation of the uranium compound layers and to interfere with the wetting of the slug by the molten aluminum-silicon.

The compound layers between the aluminum-silicon and the uranium are a normal consequence of the triple dip process; and are considered desirable since they form a metallurgical bond between the aluminum-silicon and the uranium, and because it is believed they provide a secondary barrier to protect the uranium from attack by water.

13.02

The temperature of the dip bath maintains the slug at the canning temperature.

13.03

Any dirt and oxide on the surface of the dip bath may be included in the canned assembly and interfere with the bonding between the cap, can, and slug.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: ALUMINUM-SILICON DIP BATH

Specification No. 13.0 (page 1 of 2 pages)

Ref. Documents

Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials

BASIS:

13.01

The purpose of the aluminum-silicon dip bath is to reduce the tin carry-over to the aluminum-silicon canning bath and to form compound layers between the aluminum-silicon and the uranium.

Excess tin is believed to prevent the formation of the uranium compound layers and to interfere with the wetting of the slug by the molten aluminum-silicon.

The compound layers between the aluminum-silicon and the uranium are a normal consequence of the triple-dip process; and are considered desirable since they form a metallurgical bond between the aluminum-silicon and the uranium, and because it is believed they provide a secondary barrier to protect the uranium from attack by water.

13.02

The temperature of the dip bath maintains the slug at the canning temperature.

13.03

Any dirt and oxide on the surface of the dip bath may be included in the canned assembly and interfere with the bonding between the cap, can, and slug.

13.04

The slug is agitated in the dip bath to remove as much tin as possible from the surface of the slug and to form uniform compound layers. The time is critical since a shorter time may not permit adequate tin removal and a longer time may form excessively thick, brittle compound layers.

SPECIFICATIONS:

13.01

The dip bath shall be composed of aluminum and silicon and the normal contaminating elements of uranium, tin, copper, iron, chromium, and nickel that are picked up during use.

The dip bath shall be made up from aluminum silicon alloy (HW Material No. 306, Document HW-19156) with the silicon content adjusted by the addition of aluminum, silicon, or master alloy of aluminum and silicon of sufficient purity that the composition of the virgin bath will conform to the specification for HW Material No. 306 except for the silicon content or aluminum-silicon alloy bailed from the canning bath may be used.

13.02

Bath temperature: 585° - 600°C.

13.03

Dirt and oxide shall be kept skimmed from the surface of the dip bath during canning.

13.04

Slug agitation in the dip bath:

a) Rate: 50 to 90 cycles per minute
b) Length of stroke: 4" minimum

13.05

Dip Time 2 to 7 seconds.

Specification No.
13.0
(page 2 of 2 pages)
March 30, 1953

13:04

The slug is agitated in the dip bath to remove as much tin as possible from the surface of the slug and to form uniform compound layers. The time is critical since a shorter time may not permit adequate tin removal and a longer time may form excessively thick, brittle compound layers.

SPECIFICATIONS:

13.01 The dip bath shall be composed of virgin aluminum-silicon (HW Material No. 306, Document HW-19156) or aluminum-silicon bailed from the canning bath plus normal contaminating elements of uranium, tin, copper, iron, chromium, and nickel.

13.02 Bath temperature: 585° - 600°C.

13.03 Dirt and oxide shall be kept skimmed from the surface of the dip bath during canning.

13.04 Slug agitation in the dip bath:
a) Rate: 50 to 90 cycles per minute
b) Length of stroke: 4" minimum

13.05 Dip Time 5 to 7 seconds.

Obsolete as of 3-30-63
Date

[redacted]

Specification No.
13.0

13:04

The slug is agitated in the dip bath to remove as much tin as possible from the surface of the slug and to form uniform compound layers. The time is critical since a shorter time may not permit adequate tin removal and a longer time may form excessively thick, brittle compound layers.

SPECIFICATIONS:

13.01 The dip bath shall be composed of virgin aluminum-silicon (HW Material No. 306, Document HW-19156) or aluminum-silicon bailed from the canning bath plus normal contaminating elements of uranium, tin, copper, iron, chromium, and nickel.

13.02 Bath temperature: 595°C ± 5°C

13.03 Dirt and oxide shall be kept skimmed from the surface of the dip bath during canning.

13.04 Slug agitation in the dip bath:
a) Rate: 50 to 90 cycles per minute
b) Length of stroke: 4" minimum

13.05 Dip Time 5 to 7 seconds.

[redacted]

31

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

ALUMINUM-SILICON CANNING BATH

Specification No.

14.0
(page 1 of 3 pages)

Ref. Documents

Date
December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials

BASIS:

14.01
14.02
14.03

The composition and temperature of the aluminum-silicon canning bath have been selected to obtain the maximum bonding between the cap, can, and slug with the minimum penetration of the aluminum components.

The lower temperature range specified for the Ajax induction furnace was indicated by statistical analysis of can wall penetration data.

The tin specification is included for the following reasons:

a) See Basis 13.01
b) The tin limit effectively controls the other contaminating elements in the canning bath and has proven to be satisfactory on a production basis. Before the tin limit can be removed, an investigation of the effects of the other contaminants will have to be made and limits determined.

The silicon content is specified as a temperature spread obtained by a thermal analysis technique. The thermal analysis technique,* as now used, consists of ladling approximately three pounds of aluminum-silicon into a graphite crucible (4 5/8" outside diameter, 3 7/8" inside diameter, calibrated chromel-alumel thermocouple. The thermocouple is enclosed within the sample and rotated in a circular path 1 1/2" in diameter, at approximately 160 rpm. Care must be taken to maintain contact between the thermocouple bead and the bottom of the protecting tube.

*This analytical method will be removed from the Process Specifications when the appropriate analytical methods manual is issued.

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
ALUMINUM-SILICON CANNING BATH	14.0 (page 1 of 2 pages)
Ref. Documents	Date October 23, 1953

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials

BASIS:

14.01
14.02
14.03

The composition and temperature of the aluminum-silicon canning bath have been selected to obtain the maximum bonding between the cap, can, and slug with the minimum penetration of the aluminum components.

The lower temperature range specified for the Ajax induction furnace was indicated by statistical analysis of can wall penetration data.

The tin specification is included for the following reasons:

a) See Basis 13.01
b) The tin limit effectively controls the other contaminating elements in the canning bath and has proven to be satisfactory on a production basis. Before the tin limit can be removed, an investigation of the effects of the other contaminants will have to be made and limits determined.

The silicon content is specified as a temperature spread obtained by a thermal analysis technique. The thermal analysis technique, as now used, consists of ladling approximately three pounds of aluminum-silicon into a graphite crucible (4 5/8" outside diameter, 3 7/8" inside diameter, and 5 3/4" high) and measuring the temperature of the sample with a calibrated chromel-alumel thermocouple. The thermocouple is enclosed in a ceramic protecting tube that is immersed to a depth of approx. 2" within the sample and rotated in a circular path 1 1/2" in diameter, at approximately 160 rpm. Care must be taken to maintain contact between the thermocouple bead and the bottom of the protecting tube.

HW-23402

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:

ALUMINUM-SILICON CANNING BATH

Specification No.

14.0

(page 1 of 2 pages)

Date

October 8, 1952

Ref. Documents

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials

BASIS:

14.01
14.02
14.03

The composition and temperature of the aluminum-silicon canning bath were developed to obtain the maximum bonding between the cap, can, and slug with the minimum penetration of the aluminum components.

The tin specification is included for the following reasons:

a) See Basis 13.01
b) The tin limit effectively controls the other contaminating elements in the canning bath and has proven to be satisfactory on a production basis. Before the tin limit can be removed, an investigation of the effects of the other contaminants will have to be made and limits determined.

The silicon content is specified as a temperature spread obtained by a thermal analysis technique. The thermal analysis technique, as now used, consists of ladling approximately three pounds of aluminum-silicon into a graphite crucible (4 5/8" outside diameter, 3 7/8" inside diameter, and 5 3/4" high) and measuring the temperature of the sample with a calibrated chromel-alumel thermocouple. The thermocouple is enclosed in a ceramic protecting tube that is immersed to a depth of approx. 2" within the sample and rotated in a circular path 1 1/2" in diameter, at approximately 160 rpm. Care must be taken to maintain contact between the thermocouple bead and the bottom of the protecting tube.

The temperature spread is obtained by subtracting the solidus temperature, shown by the thermal arrest; from the liquidus temperature, shown by the initial change of slope of the cooling curve. This method of determining the approximate silicon content of the canning bath is specified for the following reasons:

a) The method has proven to be satisfactory for production testing.
b) Consistent results are obtainable using this method.
c) No better test on a production basis is available.

It is possible to obtain a similar temperature spread in a hypereutectic alloy and if there is any reason to suspect that the composition is in the hypereutectic range it should be checked. This can be done by adding a small amount of aluminum and if the temperature spread is reduced the composition is hypereutectic and must be further adjusted.

SPECIFICATIONS:

14.01

The canning bath shall be composed of aluminum and silicon and the normal contaminating elements of uranium, tin, copper, iron, chromium, and nickel that are picked up during use.

The canning bath shall be made up from aluminum silicon alloy (HW Material No. 306, Document HW-19156) with the silicon content adjusted by the addition of aluminum, silicon, or master alloy of aluminum and silicon of sufficient purity that the composition of the virgin bath will conform to the specification for HW Material No. 306 except for the silicon content.

Composition Limits:

a) Silicon content: The silicon content shall be determined by a thermal analysis technique.
Acceptable temperature spread range between liquidus and solidus temperatures: 6.3°C to 10.2°C (These temperature spreads correspond to an approximate silicon range of 11.5% to 10.9%.
b) Tin content: 0.3% max. by weight

The furnace used for the canning bath shall be either a Type HD2430 Hevi-Duty electrical resistance furnace, a model CG-1 Ajax induction furnace, or an equivalent furnace. The temperature of the resistance canning furnace is obtained by locating the thermocouple approximately midway between the two canning jacks one to two inches inward from the crucible wall at a depth of three to six inches. For the induction canning furnace, the thermocouple is located at the center of the channel side, six to eight inches outward from the crucible wall at a depth of six to eight inches.

Specification No.
14.0
(page 2 of 2 pages)
Date
October 23, 1953

The temperature spread is obtained by subtracting the solidus temperature, shown by the thermal arrest; from the liquidus temperature, shown by the initial change of slope of the cooling curve. This method of determining the approximate silicon content of the canning bath is specified for the following reasons:

a) The method has proven to be satisfactory for production testing.
b) Consistent results are obtainable using this method.
c) No better test on a production basis is available.

It is possible to obtain a similar temperature spread in a hypereutectic alloy and if there is any reason to suspect that the composition is in the hypereutectic range it should be checked. This can be done by adding a small amount of aluminum and if the temperature spread is reduced the composition is hypereutectic and must be further adjusted.

SPECIFICATIONS:

14.01 The canning bath shall be composed of aluminum-silicon (HW Material No. 306, Document HW-19156), aluminum (purity equal to the analysis of HW Material Nos. 302 or 303, Document HW-19156), and normal contaminating elements of uranium, tin, copper, iron, chromium, and nickel.

Composition Limits:

a) Silicon content: The silicon content shall be determined by a thermal analysis technique.
Acceptable temperature spread range between liquidus and solidus temperatures: 6.3°C to 10.2°C (These temperature spreads correspond to an approximate silicon range of 11.5% to 10.9%.
b) Tin content: 0.3% max. by weight

14.02 Bath temperature: 596C Max. (Resistance furnace)
594C Max. (Induction furnace)

14.03 Canning time: 20 second maximum
(From slug immersion into canning bath to quench).

Specification No.
14.0
(page 2 of 2 pages)

The temperature spread is obtained by subtracting the solidus temperature, shown by the thermal arrest; from the liquidus temperature, shown by the initial change of slope of the cooling curve. This method of determining the approximate silicon content of the canning bath is specified for the following reasons:

a) The method has proven to be satisfactory for production testing.
b) Consistent results are obtainable using this method.
c) No better test on a production basis is available.

It is possible to obtain a similar temperature spread in a hypereutectic alloy and if there is any reason to suspect that the composition is in the hypereutectic range it should be checked. This can be done by adding a small amount of aluminum and if the temperature spread is reduced the composition is hypereutectic and must be further adjusted.

SPECIFICATIONS:

14.01 The canning bath shall be composed of aluminum-silicon (HW Material No. 306, Document HW-19156), aluminum (purity equal to the analysis of HW Material Nos. 302 or 303, Document HW-19156), and normal contaminating elements of uranium, tin, copper, iron, chromium, and nickel.

Composition Limits:

a) Silicon content: The silicon content shall be determined by a thermal analysis technique. Acceptable temperature spread range between liquidus and solidus temperatures: 6.3°C to 10.2°C (These temperature spreads correspond to an approximate silicon range of 11.5% to 10.9%.
b) Tin content: Broad Limit - 0.3% max. by weight
Narrow Limit - o.2% max. by weight.

14.02 Bath temperature: 585°C to 596°C

14.03 Canning time: 20 second maximum
(From slug immersion into canning bath to quench).

[redacted]

32A

Specification No.
14.0
(page 3 of 3 pages)
Date
December 28, 1953

14.02

Bath temperature: 596C Max. (Resistance furnace)
594C Max. (Induction furnace)

14.03

Canning time: 20 second maximum
(From slug immersion into canning bath to quench).

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: CANNING BATH PROCEDURE

Specification No. 15.0 (page 1 of 2 pages)

Ref. Documents

Date June 15, 1953

1. HW-9401 Operating Process for Canning Four-inch Slugs
   HW-22677 Preliminary Evaluation of Cap Preheating Methods
   HW-28123 Use of Low Frequency Vibration to Promote Wetting of Caps

BASIS:

15.01

The canning time cycle controls the penetration of the aluminum can; the width of the aluminum-silicon bond between the cap and can; and the quality of the bond between the cap, can, and slug.

15.02

The conditions of preheating and submerging the can-sleeve assembly affect the penetration of the can and the seating of the uranium slug. Quick submersion avoids excessive can wall erosion and results in better aluminum-silicon wetting of the can bottom.

15.03

Any dirt and oxide on the surface of the canning bath may be included in the canned assembly and interfere with the bonding between the slug, can, and cap, or cause penetration of the can wall, corrosion and poor welds.

15.04

The slug is dipped in the canning bath to maintain the slug at canning temperature and to flush off the lower purity aluminum-silicon carried over from the dip bath.

15.05

The method of cap preheat and insertion affects the width of the aluminum-silicon bond between the cap, can, and slug. Methods that have proven to be satisfactory are described in Documents HW-9401, HW-28123, and

Obsolete as of 6-15-50
Date

[redacted]

DECLASSIFIED

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: CANNING BATH PROCEDURE

Specification No. 15.0 (page 1 of 2 pages)

Ref. Documents

Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs
   HW-22677 Preliminary Evaluation of Cap Preheating Methods

BASIS:

15.01

The canning time cycle controls the penetration of the aluminum can; the width of the aluminum-silicon bond between the cap and can; and the quality of the bond between the cap, can and slug.

15.02

The conditions of preheating and submerging the can-sleeve assembly affect the penetration of the can and the seating of the uranium slug. Quick submersion avoids excessive can wall erosion and results in better aluminum-silicon wetting of the can bottom.

15.03

Any dirt and oxide on the surface of the canning bath may be included in the canned assembly and interfere with the bonding between the slug, can, and cap, or cause penetration of the can wall, corrosion and poor welds.

15.04

The slug is dipped in the canning bath to maintain the slug at canning temperature and to flush off the lower purity aluminum-silicon carried over from the dip bath.

15.05

The method of cap preheat and insertion affects the width of the aluminum-silicon bond between the cap, can and slug. The present method, if carefully followed, gives satisfactory results under production conditions and test conditions. (Document HW-22677)

DECLASSIFIED

[redacted]

Multilith DESTROYED AS CLASSIFIED SCRAP 7-10-53

Copies 1 thru 12, 16, 19 thru 22, 24, 25 of this page destroyed as classified scrap 7-8-53, c.18 dct. 4-6-5

HW-22677. Basically, these methods consist of preheating the aluminum cap, and wetting the cap surface with molten aluminum-silicon by mechanical abrasion or low frequency vibration.

A general cap wetting specification is given since Specification 18.01 controls the amount of cap erosion; and welding serves as a controlling test for cap wetting. If the cap is not wet on the sides, the weld will be uneven, contain oxide inclusions and pinholes, or will have other defects that can be detected by visual inspection.

SPECIFICATIONS:

15.01 The assembly of the component parts shall follow the canning time cycle, Specification No. 11.0.

15.02 The can-sleeve assembly shall be immersed in the molten bath in a vertical position to within 1/2 inch of the mouth and shall be preheated for the specified time. After preheating, the can-sleeve assembly shall be quickly submerged and held for the specified time.

15.03 The surface of the canning bath shall be skimmed of dirt and oxide immediately prior to the slug immersion into the bath.

15.04 The slug shall be submerged in the canning bath, then oriented coaxial with the can, and inserted carefully in the submerged can.

15.05 The cap shall be preheated and wet on the sides and bottom by molten aluminum-silicon prior to insertion into the aluminum can.

[redacted]

Specification No.
15.0
(page 2 of 2 pages)

SPECIFICATIONS:

15.01 The assembly of the component parts shall follow the canning time cycle, Specification No. 11.0.

15.02 The can-sleeve assembly shall be immersed in the molten bath in a vertical position to within 1/2 inch of the mouth and shall be preheated for the specified time. After preheating, the can-sleeve assembly shall be quickly submerged and held for the specified time.

15.03 The surface of the canning bath shall be skimmed of dirt and oxide immediately prior to the slug immersion into the bath.

15.04 The slug shall be submerged in the canning bath, then oriented coaxial with the can, and inserted carefully in the submerged can.

15.05 The cap shall be preheated by being held motionless in the canning bath. After preheat, the cap shall be removed from the bath and the bottom scraped on a transite board. The cap shall then be resubmerged in the bath for approximately three seconds, during which it is given three vigorous swirls approximately 3 inches in diameter. Without removing the cap from the bath, it shall be carefully inserted in the submerged can with enough force to ensure proper seating.

35

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
QUENCH	16.0 (page 1 of 1 page)
Ref. Documents	Date December 28, 1953

1. HW-9401 Operating Process for Canning Four-inch Slugs

BASIS:

16.01

The canned assemblies are quenched to permit handling.

16.02

The aluminum-silicon is kept dry until it has solidified to prevent the formation of steam which may cause cocked caps and the formation of gas pockets in the bonding layer between the cap and can.

SPECIFICATIONS:

16.01

Quench: The canned assemblies shall be water quenched.

16.02

Depth of Immersion: The canned assembly shall be bottom-quenched so that the molten aluminum-silicon does not contact the water until after it has solidified.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:	Specification No.
QUENCH	16.0
Ref. Documents	Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs

BASIS:

16.01

The canned assemblies are quenched to permit handling.

16.02

The aluminum-silicon is kept dry until it has solidified to prevent the formation of steam which may cause cocked caps and the formation of gas pockets in the bonding layer between the cap and can.

SPECIFICATIONS:

16.01 Quench: Water

16.02 Depth of Immersion: The canned assembly shall be bottom-quenched so that the molten aluminum-silicon does not contact the water until after it has solidified.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:	Specification No.
FACING	17.0
Ref. Documents	Date: October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs

BASIS:

17.01

The facing of the canned slug removes the excess aluminum cap and aluminum-silicon remaining from the canning of the assembly. The facing should be done in such a manner that the bond between the cap and the uranium is not fractured and that the aluminum-silicon bonding layer between the cap and can is clearly visible.

It is necessary to have a sound bond between the cap and the uranium slug because of heat transfer considerations and to add protection for the uranium from attack by water.

The bonding layer should be clearly visible for the following reasons:

a) The accuracy of the bonding layer inspection depends on the clarity of the bonding layer.
b) Certain types of cocked caps are more easily detected.

A standard General Electric f-5 finish or smoother should be adequate for bonding layer clarity and also will facilitate the welding operation.

SPECIFICATIONS:

17.01 The caps shall be faced to such a finish that the aluminum-silicon bonding layer between the cap and can is clearly visible and can be measured for width.

37

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

CANNED ASSEMBLY SPECIFICATIONS

Specification No.

18.0

(page 1 of 2 pages)

Ref. Documents

Date

December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs

BASIS:

18.01

The cap thickness (aluminum cap thickness plus Al-Si thickness) is specified to provide adequate protection of the uranium slug while not causing excess reactivity loss. At the present time there is no non-destructive test for aluminum cap thickness or cocked caps.

The degree of non-seating is limited to prevent excessive reactivity losses in the piles.

The width of the bond between the cap and can affects the amount of non-aluminum elements present in the weld bead. Such elements are undesirable since they may lower the corrosion resistance of the weld bead. If the bond is too wide, the weld may not weld the can to the cap. The 0.040" maximum bonding layer width has been specified as a practical limit and will be lowered at such time as the cap wetting technique is perfected.

SPECIFICATIONS:

18.01

The canned assembly after facing shall conform to page 2 of this specification.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
CANNED ASSEMBLY SPECIFICATIONS	18.0 (page 1 of 2 pages)
Ref. Documents	Date December 9, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs

BASIS:

18.01

The cap thickness is specified to provide adequate protection of the uranium slug while not causing excess reactivity loss. At the present time there is no non-destructive test for aluminum cap thickness or cocked caps.

The degree of non-seating is limited to prevent excessive reactivity losses in the piles.

The width of the bond between the cap and can affects the amount of non-aluminum elements present in the weld bead. Such elements are undesirable since they may lower the corrosion resistance of the weld bead. If the bond is too wide, the weld may not weld the can to the cap. The 0.040" maximum bonding layer width has been specified as a practical limit and will be lowered at such time as the cap wetting technique is perfected.

SPECIFICATIONS:

18.01 The canned assembly after facing shall conform to Drawing H-3-4957 (Revision 2) attached.

[redacted]

DECLASSIFIED

Obsolete

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: CANNED ASSEMBLY SPECIFICATIONS

Specification No. 18.0 (page 1 of 2 pages)

Ref. Documents

Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs

BASIS:

18.01

The cap thickness is specified to provide adequate protection of the uranium slug while not causing excess reactivity loss. At the present time there is no non-destructive test for aluminum cap thickness or cocked caps.

The degree of non-seating is limited to prevent excessive reactivity losses in the piles.

The width of the bond between the cap and can affects the amount of non-aluminum elements present in the weld bead. Such elements are undesirable since they may lower the corrosion resistance of the weld bead. If the bond is too wide, the weld may not weld the can to the cap. The 0.040" maximum bonding layer width has been specified as a practical limit and will be lowered at such time as the cap wetting technique is perfected.

SPECIFICATIONS:

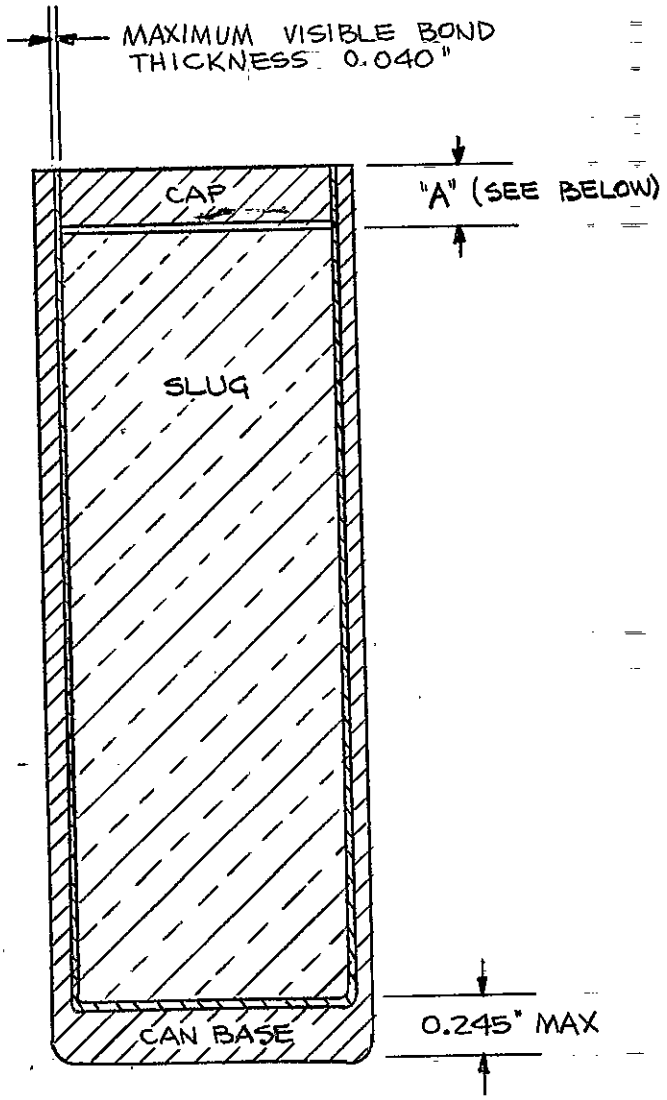
18.01 The canned assembly after facing shall conform to Drawing H-3-4957 (Rev. 1) attached.

[redacted]

[redacted]

DECLASSIFIED 38

[redacted]



LEGEND	
SLUG LENGTH	"A" DIMENSION
4"	0.195" ±0.020"
8"	0.340" ±0.020"

CANNED SLUG SPECIFICATIONS

DRAWN: 28 DECEMBER 1953

DECLASSIFIED

[redacted]

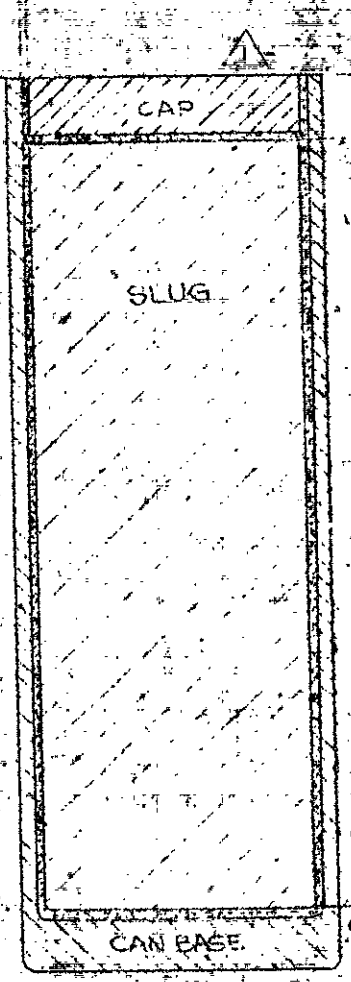
[redacted]

Obsolete as of 12-28-53
Date

HW-23402
PAGE 38

[redacted]

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25. c.18 dest. 4-6-56



REVISIONS			
DESCRIPTION	BY	APP'D	DIV
2 ADDED 8" SLUG / 1 WAS 4"	MT. HUBEL 1-30-53		

LEGEND	
SLUG LENGTH	"A" DIMENSION
4"	0.185" ± 0.010"
8"	0.350" ± 0.010"

[redacted]

GENERAL ELECTRIC CO.
HANFORD WORKS

CANNED URANIUM SLUG SPECIFICATIONS

SCALE NONE
APPROVED
H. A. Anderson

DATE 1-28-53 DRAWN BY TSD
CHECKED [illegible] PROJ. NO.
E. R. NO. BLDG. NO.
DWG. NO. H-3-4957
NO.

SHANNON & CO. Rec'd 1-14-53

[redacted]

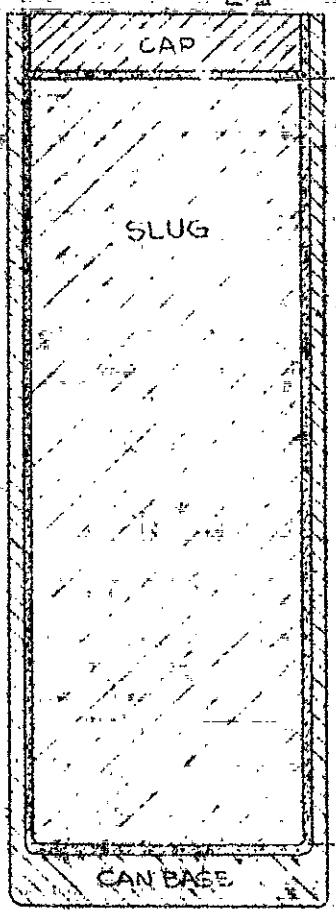
DECLASSIFIED

HW-23402
PAGE 38

[redacted]

Obsolete

MAXIMUM VISIBLE BOND THICKNESS 0.040"



"A" (SEE BELOW)

0.215" MAX.

DESTROYED. SEE CERTIFICATE OF DESTRUCTION # 2149

DESCRIPTION	REVISIONS	BY	APP'D	DIV
1 WAS #5	3-30-60 4-12-60			

LEGEND	
SLUG LENGTH	"A" DIMENSION
4"	0.185" ± 0.010"

[redacted]

GENERAL ELECTRIC CO.
HANFORD WORKS

CANNED URANIUM SLUG SPECIFICATIONS

SCALE NONE

APPROVED

H. A. Simpson

DECLASSIFIED

DATE [redacted] DRAWN BY TBD

CHECKED [redacted] PROJ. NO.

E. R. NO. [redacted] BLDG. NO.

DWG. NO. H-3-4957

NO.

SHANNON & CO.

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
WELDING	19.0 (page 1 of 2 pages)
Ref. Documents	Date December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials (HW Material No. 307 - Argon)
3. HW-21744 Final Report, Production Test 313-116-M
4. HW-27297 Final Report, Production Test 313-120-M

BASIS:

19.01

An inert-arc type welding method was selected after extensive and continued experimentation.

19.02

Present inspection methods can determine, without regard to the welding procedure, whether or not a weld is acceptable. Destructive testing has shown that a weld with the specified weld dimensions will have the cap joined to the can, the percentage of bonding layer constituents on the outer weld surface reduced to a minimum, and the bonding layer penetrated to the specified weld depth as a test for voids and impurities.

19.03

Defects such as pinholes, porosity, cracking, and other discontinuities in the weld and in the underlying bond can be the cause of pile failures and autoclave failures. Excess weld overhang is undesirable since it restricts the cooling water flow and is a possible cause of slug cavitation.

19.04

The welding operation acts as a test to reject slugs with poor bonds between the cap and can. A poor bond between the cap and can may provide an entrance for water to attack the uranium slug. Patching of the weld may cause a porous area in the weld bead.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
WELDING	19.0 (page 1 of 2 pages)
Ref. Documents	Date November 11, 1953

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials
3. HW-21744 Final Report, Production Test 313-116-M
4. HW-27297 Final Report, Production Test 313-120-M

BASIS:

19.01

An alternating current, inert arc, type welding method was selected after extensive and continued experimentation.

19.02

Continued operating experience has revealed that a general welding method, rather than a detailed welding procedure, can be specified for the welding operation. Present inspection methods can determine, without regard to the welding procedure, whether a weld is acceptable. Destructive testing has shown that a weld with the specified weld dimensions will have the cap joined to the can, the percentage of bonding layer constituents on the outer weld surface reduced to a minimum, and the bonding layer penetrated to the specified weld depth as a test for voids and impurities.

19.03

Defects such as pinholes, porosity, cracking, and other discontinuities in the weld and in the underlying bond can be the cause of pile failures and autoclave failures. Excess weld overhang is undesirable since it restricts the cooling water flow and is a possible cause of slug cavitation.

19.04

The welding operation acts as a test to reject slugs with poor bonds between the cap and can. A poor bond between the cap and can may provide an entrance for water to attack the uranium slug. Patching of the weld may cause a porous area in the weld bead.

[redacted]

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
WELDING	19.0 (page 1 of 2 pages)
Ref. Documents	Date October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs
2. HW-19156 Specifications, Acceptance and Sampling Procedures for Essential Materials
3. HW-21744 Final Report, Production Test 313-116-M
4. HW-24486 Interim Report #1 on Production Test 313-120-M

BASIS:

19.01

An alternating current, inert arc, type welding machine was selected after extensive and continued experimentation.

19.02

An acceptable combination of welding variables is necessary to obtain a satisfactory weld bead with regard to penetration, width, and continuity.

19.03

Defects such as pinholes, porosity, cracking, and other discontinuities in the weld and in the underlying bond can be the cause of pile failures and autoclave failures. Excess weld overhang is undesirable since it restricts the cooling water flow and is a possible cause of slug cavitation.

19.04

The welding operation acts as a test to reject slugs with poor bonds between the cap and can. A poor bond between the cap and can may provide an entrance for water to attack the uranium slug. Patching of the weld may cause a porous area in the weld bead.

SPECIFICATIONS:

19.01

An inert-arc type welding method using argon (HW Material No. 307, Document-19156) shall be used in the welding operation.

19.02

The weld bead produced shall have the following dimensions:

Width - 0.125" to 0.187" (Distance measured on a radius at the cap surface).
Penetration - 0.050" minimum (Distance from the top of the can to the root of weld bead as measured on a line parallel to the longitudinal slug axis.)

19.03

The weld bead produced shall be smooth, even, and free from pinholes, porosity, cracks, and other discontinuities. The final weld bead shall pass a ring gage 1.4505" maximum inside diameter.

19.04

Any evidence of a poor bond between the cap and can during welding is cause for rejection of the slug. Defective welds shall not be repaired by patching or any other method.

Obsolete as of 12-28-53
Date

[redacted]

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRA[redacted] 3-22-54

Specification No.
19.0
(page 2 of 2 pages)
Date
November 11, 1953

DECLASSIFIED

SPECIFICATIONS:

19.01

An alternating current, inert arc, type welding method using argon (HW Material No. 307, Document HW-19156) shall be used in the welding operation.

19.02

The weld bead produced shall have the following dimensions:

Width - 0.125" to 0.187" (Distance measured on a line perpendicular to the longitudinal slug axis.)

Penetration - 0.050" minimum (Distance from the top of the cap to the root of weld bead as measured on a line parallel to the longitudinal slug axis.)

19.03

The weld bead produced shall be smooth, even, and free from pinholes, porosity cracks, and other discontinuities. The final weld bead shall pass a ring gage that has an inside diameter of 1.450" ± 0.005".

19.04

Any evidence of a poor bond between the cap and can during welding shall cause rejection of the slug. Defective welds shall not be repaired by patching or any other method.

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25.
[redacted]
c. 18 dest. 4-6-56

DECLASSIFIED

Specification No.
19.0
(page 2 of 2 pages)

SPECIFICATIONS:

19.01 An alternating current, inert arc, type welding method using argon (HW Material No. 307, Document HW-19156) shall be used in the welding operation.

19.02 Welding Variables: Acceptable combinations of amperage, arc path, rpm, and argon flow are found in Table I.

Revolutions	Time for number of revolutions ± 2 seconds	Type of weld pass	Amperage ± 3 amps		Argon flow Liters per minute
			4" slug	8" slug	
4	60	1-2*	85	100	3.5 Minimum
6	60	1-2	105	120	3.5 Minimum
6	60	1-1**	115	130	3.5 Minimum
7	60	1-2	110	125	3.5 Minimum
7	60	1-1	120	135	3.5 Minimum
8	60	1-2	115	130	3.5 Minimum
8	60	1-1	125	140	3.5 Minimum

*One preheat pass, approx. 3/8" from slug edge, followed by two welding passes.

**One preheat pass, approx. 3/8" from slug edge, followed by one welding pass.

19.03 The weld bead produced shall be smooth, even, and free from pinholes, porosity, cracks, and other discontinuities. The final weld bead shall pass a ring gage that has an inside diameter of 1.450" ± 0.0005".

19.04 Any evidence of a poor bond between the cap and can during welding shall cause rejection of the slug. Defective welds shall not be repaired by patching, or any other method.

SPECIFICATIONS:

19.01 An alternating current, inert arc, type welding method using argon (HW Material No. 307, Document HW-19156) shall be used in the welding operation.

19.02 Welding Variables: Acceptable combinations of amperage, arc path, rpm, and argon flow are found in Table I.

Revolutions	Time for number of revolutions ± 2 seconds	Type of weld pass	Amperage ± 3 amps	Argon flow Liters per minute
4	60	1-2*	85	3.5 Minimum
6	60	1-2	105	3.5 Minimum
6	60	1-1**	115	3.5 Minimum
7	60	1-2	110	3.5 Minimum
7	60	1-1	120	3.5 Minimum
8	60	1-2	115	3.5 Minimum
8	60	1-1	125	3.5 Minimum

*One preheat pass, approx. 3/8" from slug edge, followed by two welding passes.
**One preheat pass, approx. 3/8" from slug edge, followed by one welding pass.

19.03 The weld bead produced shall be smooth, even, and free from pinholes, porosity, cracks, and other discontinuities. The final weld bead shall pass a ring gage that has an inside diameter of 1.450" ± 0.0005".

19.04 Any evidence of a poor bond between the cap and can during welding shall cause rejection of the slug. Defective welds shall not be repaired by patching, or any other method.

41

[redacted]

HW-23402

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process for Alpha Fabricated Uranium

Subject	Specification No.
BOND TEST	20.0 (page 1 of 3 pages)
Ref. Documents	Date July 1, 1954

1. HW-9401, Operating Process for Canning Four-Inch Slugs
2. HW-19156, Specifications, Acceptance, and Sampling Procedures for Essential Materials, (HW Materials Nos. 301 and 310 - Acenaphthene and Carbon Tetrachloride, respectively)
3. HW-23402, "A" Canning Process
4. HW-32186, Development of Ultrasonic Unbond Test

BASIS:

The slugs are tested for completeness of bonding between the slug core and the side wall of the slug can. Slugs having an unbonded area larger than one square centimeter have been rejected in the past by means of the frost test to ensure that localized corrosion does not result from thermo-galvanic action near the defective area in which the heat transfer is limited.

The frost test equipment for testing bonding is calibrated using slugs with voids in the braze layers that are approximately one square centimeter in area, the exact size of which can be readily established by means of autoradiography. The frost test, then, essentially rejects all slugs having void areas one square centimeter or larger and all slugs having other unbonded areas of this approximate size depending on their relative insulating effect.

The ultrasonic bond test equipment is designed to measure the total unbonded area in the side wall of the slug rather than the areas of discrete defects. The rejection limit when using the ultrasonic test is essentially the response to a one square centimeter unbonded area in conjunction with a small allowance for the sum of minute unbonded areas found in pieces of acceptable quality.

[redacted]

HW-23402

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: FROST TEST

Specification No. 20.0
(page 1 of 2 pages)

Ref. Documents

Date October 8, 1952

1. HW-9401, Operating Process for Canning Four-inch Slugs.
2. HW-19156, Specifications, Acceptance and Sampling Procedures for Essential Materials.

BASIS:

20.01

The slugs are coated with a substance that will melt under test conditions to indicate a poorly bonded area between the can, slug, and, or cap. If the frost material is removed, an accurate test cannot be obtained.

20.02

The slug temperature at the time of testing is critical since the machine is calibrated at a specific temperature. If the slugs are at a low temperature, unbonded slugs may not be found; and if the slug temperature is too high, acceptable slugs may be rejected.

20.03

(a), (b) The operating conditions of the Frost Test Machine are established to obtain maximum sensitivity.
(c) Pilot slugs are used to check the accuracy of the machine.
(d) Slugs that show an indication of an unbonded area are rejected because of heat transfer considerations.

20.04

The slugs should be defrosted to promote proper etching.

Pilot slugs (secondary standards) are used during normal operation to check the accuracy of the frost test equipment. Duplication of response may be checked using slugs with areas exceeding the maximum areas specified for standard slugs.

Pilot slugs may be used instead of standard slugs for routine checking of the ultrasonic test unit insofar as ensuring that slugs having unbonded areas as large or larger than in standard slugs are rejected. Several auxiliary methods may be used to ensure that slugs with less total unbonded area than the standard slugs are not rejected.

SPECIFICATIONS:

20.01

Slugs shall be tested for the presence of deleterious unbonded areas by either the frost test procedure or the use of the ultrasonic test device.

20.02

Frost Test Procedure

a) The slugs shall be sprayed with a mixture of acenaphthene (HW Material No. 301, Document HW-19156) dissolved in carbon tetrachloride (HW Material No. 310, Document HW-19156) or equivalent solvent. The slugs shall be handled so that the sprayed coating is not removed prior to the frost test.

b) After the spraying operation, the slugs shall be brought to a minimum temperature of 25 C and tested at that temperature.

c) Frost test:

(1) Power input: As required by the coil calibration to reproduce established melted areas on standard slugs at 26 C ± 1 C.

(2) Travel Rate: 5.20 ± 0.05 inches per second.

(3) Pilot Slug Check: Pilot slugs shall be used to check the accuracy of the machine. The outlined areas on consecutive pilot slugs tested are to be rotated 90 degrees from the previous pilot slug to check the centering of the slugs in the coil. If the melted areas on pilot slugs do not correspond to areas outlined thereon, showing the machine to be in error, frost testing shall be discontinued until the cause of the trouble can be located and corrected. In

Specification No.
20.0
(page 2 of 2 pages)

SPECIFICATIONS:

20.01 The slugs shall be sprayed with a mixture of acenaphthene (HW Material No. 301, Document HW-19156) dissolved in carbon tetrachloride (HW Material No. 310, Document HW-19156) or equivalent solvent. The slugs shall be handled so that the sprayed coating is not removed prior to the frost test.

20.02 After the spraying operation, the slugs shall be brought to a minimum temperature of 25°C and tested at that temperature.

20.03 Frost Test:

a) Power input: As required by the coil calibration to reproduce established melted areas on standard slugs at 26°C ± 1°C.
b) Travel Rate: 5.20 ± 0.05 inches per second.
c) Pilot Slug Check: Pilot slugs shall be used to check the accuracy of the machine. The outlined areas on consecutive pilot slugs tested are to be rotated 90° from the previous pilot slug to check the centering of the slugs in the coil. If the melted areas on Pilot slugs do not correspond to areas outlined thereon, showing the machine to be in error, frost testing shall be discontinued until the cause of the trouble can be located and corrected. In such case, all slugs tested subsequent to the most recent satisfactory standard shall be retested.
d) Slug acceptability: Any slug showing a melted area of any size shall be rejected.

20.04 After frost test, the slugs shall be defrosted.

this case, all slugs tested subsequent to the most recent satisfactory pilot slug check shall be retested.

(4) Slug acceptability: Any slug showing a melted area of any size shall be rejected.

d) After frost test, the slugs shall be defrosted.

20.03

Ultrasonic Test Procedure

a) The ultrasonic bond test equipment shall be adjusted so that the indicator will indicate rejection when standard slugs are tested.

b) Standard slugs or pilot slugs shall be used to check the accuracy of the equipment. If the machine is found to be in error, all slugs tested subsequent to the most recent satisfactory slug check shall be retested.

20.04

Standard Slugs

a) Standard slugs for the calibration of the frost test equipment shall be slugs with void areas in the braze layer or unbonded areas of equivalent heat transfer effect of 1.0 ± .05 square centimeters in area.

b) Standard slugs for the calibration of the ultrasonic bond tester shall be slugs with one braze layer void of 1.0 + .05 square centimeters in area. The equipment response (count) from scanning the whole slug shall not exceed the response from scanning this specified defect by more than 20 per cent.

20.05

Pilot Slugs

a) The size of any individual unbonded test area on frost test pilot slugs shall be at least one square centimeter in area. Frost test pilot slugs shall be calibrated using standard slugs.

b) Pilot slugs used for the ultrasonic bond test shall meet the standard slug specification except the unbonded area need not be present as a void in the braze layer. The size of the unbonded area shall be verified by the counting method using standard slugs for comparison.

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
PENETRATION ETCH	21.0 (page 1 of 1 page)
Ref. Documents	Date December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-19156 Specification, Acceptance and Sampling Procedures for Essential Materials (HW Material No. 10 - Nitric Acid)

BASIS:

21.01

The etch reveals any aluminum-silicon which has penetrated or has been soldered to the outside of the can and indicates the approximate concentration of the bonding metal in the weld. Slugs having such defects are potential pile failures because of the poor corrosion resistance of these areas. The slugs are rinsed and dried to permit handling and facilitate the subsequent visual inspection.

21.02

The immersion time is limited to prevent excessive removal of the can and weld metal.

SPECIFICATIONS:

21.01

The canned slugs shall be etched in nitric acid, (HW Material No. 10, Document HW-19156) rinsed, and dried. The standard for the etchant will be to equal or heighten the contrast obtained by etching an Al-Si reject for 10 minutes in a freshly prepared 40% ± 1 % nitric acid solution, by weight, at 80 C.

21.02

Maximum etching time: 20 minutes.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:	Specification No.
PENETRATION ETCH	21.0
Ref. Documents	Date: October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs.
2. HW-19156 Specification, Acceptance and Sampling Procedures for Essential Materials.

BASIS:

21.01

The etch reveals any aluminum-silicon which has penetrated or has been soldered to the outside of the can and indicates the approximate concentration of the bonding metal in the weld. Slugs having such defects are potential pile failures because of the poor corrosion resistance of these areas. The slugs are rinsed and dried to permit handling and facilitate the subsequent visual inspection.

21.02

The immersion time is limited to prevent excessive removal of the can and weld metal.

SPECIFICATIONS:

21.01 The canned slugs shall be etched in nitric acid, (HW Material No. 10, Document HW-19156), rinsed, and dried. After etching, any aluminum-silicon on the surface of the canned assembly shall be darkened and the aluminum can shall have a bright clean finish. The standard for the etchant will be to equal or heighten the contrast obtained by etching an Al-Si reject for 10 minutes in a freshly prepared 40% nitric acid solution, by weight, at 80°C.

21.02 Maximum time of immersion: 20 minutes.

44

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specification

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
AUTOCLAVE	22.0 (page 1 of 1 pages)
Ref. Documents	Date December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-29952 Laboratory Comparison of Steam and Water Autoclaving

BASIS:

22.01

The autoclave test is designed to reject canned slugs with unsound closures, cans, and/or caps. Such slugs are potential pile failures. It has been experimentally determined that either steam or water autoclaving is an acceptable test method (Document HW-24952).

22.02

Subsequent handling of slugs after autoclaving, other than normal inspection and storage, may alter the thickness of the aluminum jacket and oxide film found on the slug.

SPECIFICATIONS:

22.01

Temperature: Steam or water temperature 165 C to 180 C.

Duration of Test: 40 hours minimum

22.02

The autoclave test shall be the final operation prior to the storage and shipment of the canned slug.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:	Specification No.
AUTOCLAVE	22.0
Ref. Documents	Date
	October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs.

BASIS:

22.01

The autoclave test is designed to reject canned slugs with unsound closures, cans, and, or caps. Such slugs are potential pile failures.

22.02

Subsequent handling of slugs after autoclave, other than normal inspection and storage, may alter the thickness of the aluminum jacket and oxide film found on the slug.

SPECIFICATIONS:

22.01 Steam pressure: 90-125 psig
Duration of Test: 40 hours minimum

22.02 The autoclave test shall be the final operation prior to the storage and shipment of the canned slugs.

[redacted]

[redacted]

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process for Alpha Fabricated Uranium

Subject	Specification No.
CAUSES FOR REJECTION (CANNED ASSEMBLIES)	23.0 (page 1 of 3 pages)
Ref. Documents	Date July 1, 1954

1. HW-9401, Operating Process for Canning Four-Inch Slugs
2. HW-23543, Final Report Production Test 105-468P, Mechanical Damage to Slug Cans During Charging
3. HW-23402, "A" Canning Process

BASIS:

23.01

The defects below are causes for rejection because:

a) Specific bases are contained in each specification.

b) (1) The thickness of aluminum jacket protecting the uranium slug may be reduced to a dangerously low value if the specification limits are exceeded.

The cap end is included in the 0.004-inch specification to reject slugs that may have damaged weld beads and because of the danger of a deep marred surface coinciding with a cocked cap.

(2) The 0.035-inch marred surface specification for the base end of the slug is predicated on the requirement of a minimum of 0.035-inch of aluminum plus a 25 per cent safety factor between the exterior of can base and the bottom of the extrusion dimple in the interior of the can.

(3) The base end bevel specification limits damage, otherwise permitted on the base of slug, that would extend into the side wall of the can or would result from dropping the slug.

(4) Any foreign material imbedded in the surface may cause accelerated local corrosion.

[redacted]

Obsolete as of 2-1-54
Date

DECLASSIFIED

45

[redacted]

HW-23402

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject	Specification No.
CAUSES FOR REJECTION (CANNED ASSEMBLIES)	23.0 (page 1 of 3 pages)
Ref. Documents	Date December 28, 1953

1. HW-9401 Operating Process for Canning Four-Inch Slugs
2. HW-23543 Final Report Production Test 105-468P, Mechanical Damage to Slug Cans during Charging

The following copies of this page were destroyed. 9-24-54
2 thru 12; 16, 19 thru 22; 25-A
C. 18 dest. 4-6-56

BASIS:

23.01

The defects below are causes for rejection because:

a) Specific bases are contained in each specification.

b) (1) The thickness of the aluminum jacket protecting the uranium slug may be reduced to a dangerously low value if the specification limits are exceeded.

The cap end is included in the 0.004" specification to reject slugs that may have damaged weld beads and because of the danger of a deep marred surface coinciding with a cocked cap.

The base end bevel is included in the 0.004" specification as a measure to reject slugs that have been dropped. Such slugs have damaged cans or caps that may be more susceptible to corrosion and failure in the pile.

(2) The 0.035" marred surface specification for the base end of the slug is predicated on the requirement of a minimum of 0.035" of aluminum plus a 25% safety factor between the exterior of the can base and the bottom of the extrusion dimple in the interior of the can.

(3) Any foreign material imbedded in the surface may cause accelerated local corrosion.

c) The presence of aluminum-silicon on the exterior of the canned assembly lowers the corrosion resistance of the slug.

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 9-8-54

[redacted]

DECLASSIFIED

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

CAUSES FOR REJECTION (CANNED ASSEMBLIES)

Specification No.

23.0

(page 1 of 2 pages)

Ref. Documents

Date

March 30, 1953

1. HW-9401 Operating Process for Canning Four-inch Slugs.
2. HW-23543 Final Report Production Test 105-468P, Mechanical Damage to Slug Cans During Charging.

BASIS:

23.01

The defects below are causes for rejection because:

a) Specific bases are contained in each specification.

b) (1) The aluminum jacket protecting the uranium slug may be reduced to a dangerous low value if the specification limits are exceeded.

The base end bevel is included in the 0.004" specification as a measure to reject slugs that have been dropped. Such slugs have been physically shocked and may have weakened or cracked bonding layers.

The cap end is included in the 0.004" specification to reject slugs which may have damaged weld beads and because of the danger of a deep marred surface coinciding with a cocked cap.

(2) The 0.035" specification for the base end of the slug is based on the figure of 0.035" minimum required aluminum thickness with a 23 per cent safety factor.

(3) Any foreign material imbedded in a surface mar may cause accelerated local corrosion.

c) The corrosion resistance of the canned assembly has been lowered.

d) The poor bond may provide an entrance for water to attack the uranium slug.

e) The discontinuities may provide an entrance for water to attack the uranium slug.

f) The cracked or cocked cap may provide an entrance for water to enter the assembly and also lowers the strength of the cap.

g) Any warped or oversize canned slug will restrict cooling water flow through the pile tubes and in extreme cases may block the tube.

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject

CAUSES FOR REJECTION (CANNED ASSEMBLIES)

Specification No.

23.0
(page 1 of 2 pages)

Ref. Documents

Date

December 9, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs.
2. HW-23543 Final Report Production Test 105-468P, Mechanical Damage to Slug Cans During Charging.

BASIS:

23.01

The defects below are causes for rejection because:

a. Specific bases are contained in each specification.

b. (1) The aluminum jacket protecting the uranium slug may be reduced to a dangerous low value if the specification limits are exceeded.

The base end bevel is included in the 0.004" specification as a measure to reject slugs that have been dropped. Such slugs have been physically shocked and may have weakened or cracked bonding layers.

The cap end is included in the 0.004" specification to reject slugs which may have damaged weld beads and because of the danger of a deep marred surface coinciding with a cocked cap.

(2) The 0.035" specification for the base end of the slug is based on the figure of 0.035" minimum required aluminum thickness with a 23 percent safety factor.

(3) Any foreign material imbedded in a surface mar may cause accelerated local corrosion.

c. The corrosion resistance of the canned assembly has been lowered.

d. The poor bond may provide an entrance for water to attack the uranium slug.

e. The discontinuities may provide an entrance for water to attack the uranium slug.

f. The cracked or cocked cap may provide an entrance for water to enter the assembly and also lowers the strength of the cap.

g. Any warped or oversize canned slug will restrict cooling water flow through the pile tubes and in extreme cases may block the tube.

h) There is evidence of an unsound bond between the can and slug which may cause the slug to fail under irradiation.
i) The corrosion resistance of the canned assembly has been lowered.
j) The dih of canned slugs as measured in the Hanford 305 pile is a measure of the relative reactivity of the slugs in the Hanford 105 reactors. The higher the dih value (the value may be positive since the material tested is compared to a standard) the greater the reactivity of the slugs under irradiation. The limits imposed were selected as a compromise between canning efficiency and pile operating efficiency.

SPECIFICATIONS:

23.01 Causes for rejection:
a) Failure to meet process specifications.
b) Marred surface (cause for rejection)
(1) Any scratch, dent, or hole greater than the specified limit on the cap end, cylindrical surface, or base end bevel of the canned slug.
Broad Limit: 0.004" in depth
Narrow Limit: 0.003" in depth
(2) Any scratch, dent, or hole greater than 0.035" in depth on the base end of the slugs.
(3) Any scratch, dent, or hole on the surface of the canned assembly that contains any foreign material.
c) Any evidence of aluminum-silicon penetration or slopover.
d) Any evidence of a poor bond between the cap and can during welding.
e) Any pinholes, porosity, cracking, or other discontinuities in the weld bead.
f) Any evidence of a cracked or cocked cap.
g) Failure of an autoclaved slug to pass through a 1.455"±0.0005" tube gage 1/2 inch longer than the final canned slug length.
h) Any swelling, wrinkling, or rupture of a can wall or cap of an autoclaved slug.
i) Any evidence of corrosive pitting.
j) Lots having a dih of below minus 0.460 per stringer of 22 four inch slugs and 11 eight inch slugs sampled randomly. In addition, the monthly average of the dih values for all lots canned during any consecutive 30 calendar day period shall not be less than -0.210.

HANFORD WORKS

ENGINEERING DEPARTMENT

Obsolete

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject:

CAUSES FOR REJECTION (CANNED ASSEMBLIES)

Specification No.

23.0

(page 1 of 2 pages)

Ref. Documents

Date

October 8, 1952

1. HW-9401 Operating Process for Canning Four-inch Slugs.
2. HW-23543 Final Report Production Test 105-468P, Mechanical Damage to Slug Cans During Charging.

BASIS:

23.01

The defects below are causes for rejection because:

a. Specific bases are contained in each specification.
b. The aluminum can wall thickness protecting the uranium slug has been reduced to a potentially dangerous value.
c. The corrosion resistance of the canned assembly has been lowered.
d. The poor bond may provide an entrance for water to attack the uranium slug.
e. The discontinuities may provide an entrance for water to attack the uranium slug.
f. The cracked or cocked cap may provide an entrance for water to enter the assembly and also lowers the strength of the cap.
g. Any warped or oversize canned slug will restrict cooling water flow through the pile tubes and in extreme cases may block the tube.
h. There is evidence of an unsound bond between the can and slug which may cause the slug to fail under irradiation.
i. The corrosion resistance of the canned assembly has been lowered.
j. Slugs with low reactivity may reduce the efficiency of the piles.

d) The poor bond may provide an entrance for water to attack the uranium slug.

e) The discontinuities may provide an entrance for water to attack the uranium slug.

f) A defective component may allow water to enter the assembly and cause the slug to fail.

g) Any warped or oversize canned slug will restrict cooling water flow through the pile tubes and in extreme cases may block the tube.

h) There is evidence of an unsound bond between the can and slug which may cause the slug to fail under irradiation.

i) The dih of canned slugs as measured in the Hanford 305 pile is a measure of the relative reactivity of the slugs in the Hanford production reactors. The higher the dih value (the value may be positive since the material tested is compared to a standard) the greater the reactivity of the slugs under irradiation. The limits imposed were selected as a compromise between canning efficiency and pile operating efficiency.

SPECIFICATIONS:

23.01

Causes for rejection:

a) Failure to meet process specifications.

b) Marred surface

(1) Any scratch or dent greater than 0.004-inch in depth on the cap end or side wall of the slug.

(2) Any scratch or dent greater than 0.035-inch in depth on the base end of the slug.

(3) Any scratch or dent greater than 0.035-inch in depth on the base end bevel that has not resulted from dropping the slug providing the defect does not extend into the side wall. Defects caused by dropping the slug or which extend into side wall of the slug shall not be greater than 0.004-inch in depth.

(4) Any scratch or dent on the surface of the canned assembly that contains any foreign material.

Specification No.
23.0
(page 2 of 3 pages)
Date
December 28, 1953

d) The poor bond may provide an entrance for water to attack the uranium slug.

e) The discontinuities may provide an entrance for water to attack the uranium slug.

f) A defective component may allow water to enter the assembly and cause the slug to fail.

g) Any warped or oversize canned slug will restrict cooling water flow through the pile tubes and in extreme cases may block the tube.

h) There is evidence of an unsound bond between the can and slug which may cause the slug to fail under irradiation.

i) The corrosion resistance of the canned assembly has been lowered.

j) The dih of canned slugs as measured in the Hanford 305 pile is a measure of the relative reactivity of the slugs in the Hanford production reactors. The higher the dih value (the value may be positive since the material tested is compared to a standard) the greater the reactivity of the slugs under irradiation. The limits imposed were selected as a compromise between canning efficiency and pile operating efficiency.

SPECIFICATIONS:

23.01

Causes for rejection:

a) Failure to meet process specifications.

b) Marred surface.

(1) Any scratch or dent greater than 0.004" in depth on the cap end, cylindrical surface, or base end bevel of the canned slug.

(2) Any scratch or dent greater than 0.035" in depth on the base end of the slug.

(3) Any scratch or dent on the surface of the canned assembly that contains any foreign material.

Obsolete as of 3-30-53
Date

h. There is evidence of an unsound bond between the can and slug which may cause the slug to fail under irradiation.
i. The corrosion resistance of the canned assembly has been lowered.
j. Slugs with low reactivity may reduce the efficiency of the piles.

SPECIFICATIONS:

23.01 Causes for rejection:
a. Failure to meet process specifications.
b. Marred surface (cause for rejection)
(1) Any scratch, dent, or hole greater than the specified limit on the cap end, cylindrical surface, or base end bevel of the canned slug.
Broad Limit: 0.004" in depth
Narrow Limit: 0.003" in depth

(2) Any scratch, dent, or hole greater than 0.035" in depth on the base end of the slugs.
(3) Any scratch, dent, or hole on the surface of the canned assembly that contains any foreign material.
c. Any evidence of aluminum-silicon penetration or slopover.
d. Any evidence of a poor bond between the cap and can during welding.
e. Any pinholes, porosity, cracking, or other discontinuities in the weld bead.
f. Any evidence of a cracked or cocked cap.
g. Failure of an autoclaved slug to pass through a 1.455" tube gage 1/2 inch longer than the final canned slug length.
h. Any swelling, wrinkling, or rupture of a can wall or cap of an autoclaved slug.
i. Any evidence of corrosive pitting.
j. Lots having a dih of below minus 0.290 per stringer of 22 four inch slugs or 11 eight-inch slugs sampled randomly.

DESTROYED. SEE CERTIFICATE OF DESTRUCTION # 2146

Specification No.
23.0
(page 2 of 2 pages)

Obsolete

SPECIFICATIONS:

23.01 Causes for rejection:

a. Failure to meet process specifications.
b. Marred surface - any scratch, dent, or hole greater than 0.004" in depth.
Note: Slugs having scratches, dents, or holes greater than 0.003" in depth must be stamped with an identifying mark and a production record must be maintained of the number of such slugs shipped to the pile areas.
c. Any evidence of aluminum-silicon penetration or slopover.
d. Any evidence of a poor bond between the cap and can during welding.
e. Any pinholes, porosity, cracking, or other discontinuities in the weld bead.
f. Any evidence of a cracked or cocked cap.
g. Failure of an autoclaved slug to pass through a 1.455" tube gage 4 1/2 inches long.
h. Any swelling, wrinkling, or rupture of a can wall or cap of an autoclaved slug.
i. Any evidence of corrosive pitting.
j. Lots having a dih of below minus 0.290 per stringer of 22 four inch slugs sampled randomly shall be held for inspection by the Technical Section before shipment to the 100 areas.

DESTROYED. SEE CERTIFICATE OF DESTRUCTION # 2149

c) Any evidence of aluminum-silicon penetration or slopover.

d) Evidence of a poor bond between the cap and can during welding.

e) Pinholes, porosity, cracking, or other discontinuities in the weld bead.

f) Evidence of a defective can or cap such as seams, laminations, or holes.

g) Failure of an autoclaved slug to pass through a 1.4555-inch maximum inside diameter tube gage 1/2 inch longer than the final canned slug length.

h) Any swelling, wrinkling, or rupture of a can wall or cap of an autoclaved slug.

i) Evidence of corrosive pitting.

j) Lots having a dih of below minus 0.460 per stringer of 22 four-inch slugs or 11 eight-inch slugs sampled randomly. In addition, the monthly average of the dih values for all lots shipped to any pile area during any consecutive 30 calendar day period shall not be less than -0.210.

Obsolete as of 7-1-54
Date

REPRODUCTION MASTER DESTROYED AS CLASSIFIED SCRAP 9-8-54
46A
HW-23402

DECLASSIFIED

Specification No.
23.0
(page 3 of 3 pages)
Date
December 28, 1953

c) Any evidence of aluminum-silicon penetration or slopover.

d) Evidence of a poor bond between the cap and can during welding.

e) Pinholes, porosity, cracking, or other discontinuities in the weld bead.

f) Evidence of a defective can or cap such as seams, laminations, or holes.

g) Failure of an autoclaved slug to pass through a 1.4555" max. inside diameter tube gage 1/2 inch longer than the final canned slug length.

h) Any swelling, wrinkling, or rupture of a can wall or cap of an autoclaved slug.

i) Evidence of corrosive pitting.

j) Lots having a dih of below minus 0.460 per stringer of 22 four-inch slugs and 11 eight-inch slugs sampled randomly. In addition, the monthly average of the dih values for all lots shipped to any pile area during any consecutive 30 calendar day period shall not be less than -0.210.

The following copies of this page were destroyed. 9-24-54
2 thru 12; 16, 19 thru 22; 25-A.
C. 18 Dest. 4-6-56

DECLASSIFIED

HANFORD ATOMIC PRODUCTS OPERATION

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject
STORAGE

Specification No.
24.0
(page 1 of 1 page)

Ref. Documents

Date
December 28, 1953

1. HW-21009 Corrosion of Unirradiated Process Slugs During Storage at 105DR
2. HW-21275 Corrosion of Process Slugs during Storage

BASIS:

24.01

The slugs should be stored in such a manner that the slug quality is not lowered. Improper handling (such as storing in wet or dirty containers) may lead to serious corrosion or mechanical damage.

SPECIFICATION:

24.01

The canned slugs shall be stored in such a manner that their condition at the time of shipment will meet the requirements of all previous specifications listed in this document.

[redacted] Obsolete as of 12-28-53
Date

HANFORD WORKS

ENGINEERING DEPARTMENT

Process Specifications

Triple Dip Canning Process For Alpha Fabricated Uranium

Subject: STORAGE

Specification No. 24.0

Ref. Documents

Date October 8, 1952

1. HW-21009 Corrosion of Unirradiated Process Slugs During Storage at 105DR.
2. HW-21275 Corrosion of Process Slugs During Storage.

BASIS:

24.01

If process slugs are improperly stored prior to charging, harmful corrosion of the can wall may occur, especially severe pitting.

24.02

Foreign contaminants contained in the liners and pads affect the type and severity of the corrosive attack.

24.03

Storage time should be kept to a minimum to reduce total corrosion. Slugs which show evidence of corrosive attack may fail during irradiation.

SPECIFICATIONS:

24.01 Slugs shall be shipped and stored in dry containers at all times.

24.02 Liners and pads, if used, shall be kept clean. The surface of the liner or pad that contact the canned assembly shall be free of glue.

24.03 Slugs that are stored longer than three months shall be inspected for corrosive attack before shipment and those slugs that have corrosion product build-up, or show evidence of pitting or etching attack shall be rejected.

[redacted]

The following copies of this page were destroyed. 5-15-54
2 thru 12, 16, 19 thru 22, 24, 25.
C-18 dest. 4-6-56