

DOCKET NO.

70-139

File Cy

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ATTLEBORO, MASS.

ATTLEBORO 1-0090

July 9, 1959

U. S. Atomic Energy Commission
Washington, D. C.

Attention: Mr. J. C. Delaney, Chief
Licensing Branch
Div. of Licensing and Regulation
Reference: Docket 70-139, Special Nuclear
Material license #185.
Our letter of 7/3/59

Gentlemen:

Enclosed you will find drawings of the
birdcages which we anticipate using for storage
of the PRDC 25.6% enriched uranium derbies as
mentioned in our license amendment request of
7/3/59. These drawings were inadvertently left
out when our application was mailed and should
be considered as a part of our application.

We hope that this omission did not
inconvenience you.

Very truly yours,

ENGELHARD INDUSTRIES, INC.,

Norton M. Weiss

Norton M. Weiss
Criticality Officer

NMW:jc

Enclosure - 3 cys. of 1 Dwg.



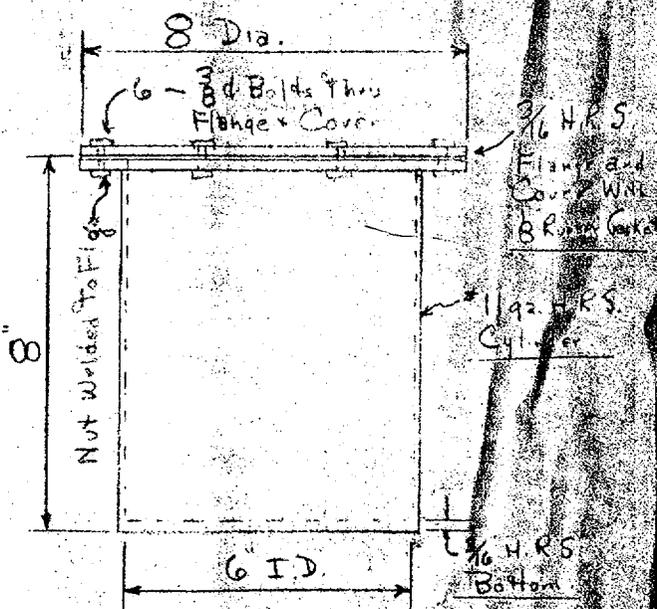
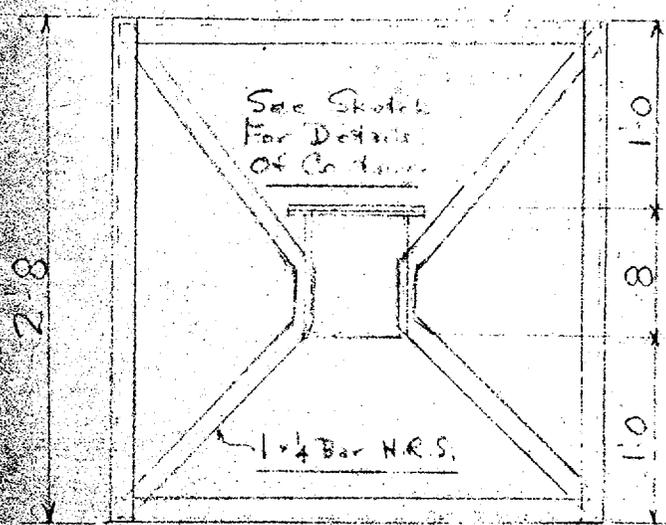
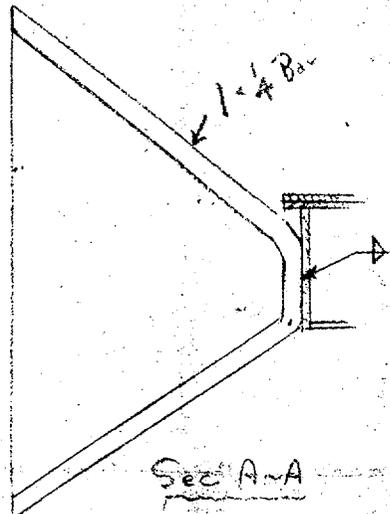
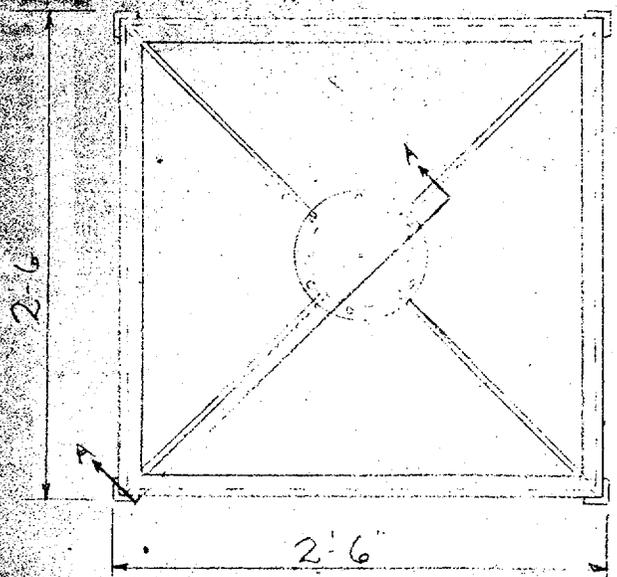
Cy. to Pu. Sec. Rom 7/14/59

(Specs. of the 27 (1/4/59))

File by

Lower Iron Works

PROVIDENCE, RHODE ISLAND



All 1 x 1/8 Angle H.R.S.

STORAGE CONTAINER

WELDED CONSTRUCTION

DETAIL OF CYLINDER

WELDED WATERTIGHT



STORAGE CONTAINERS

FOR

D.E. MAKEPEACE DIV. - ENGLEHARD IND.

J.E. 7-1-59

LRL:CPM
Docket No. 70-139

JUL 27 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

This refers to your letter of July 3, 1959 by which you request that your license, SNM-185, be amended to authorize the receipt and storage of enriched uranium derbies at your Attleboro, Massachusetts facilities.

In order that we may continue our analysis of your proposed procedures, you should provide us with the following additional information:

1. A description of the criticality safeguards you will use during the transfer of the derbies from Davidson to Makepeace birdcages at your Plainville facilities.
2. A more complete description of the emergency alarm and evacuation procedures proposed for the Attleboro site, to include,
 - a. the fail-safe features of the alarm system,
 - b. the minimum radiation level which the system will detect,
 - c. the response times of the system to various radiation levels and
 - d. the frequency with which you will conduct evacuation drills.

Engelhard Industries, Inc.

- 2 -

JUL 27 1959

3. The procedures you will use for shipping the derbies between your Plainville and Attleboro facilities to include the maximum number of birdcages per shipment and the array in which these birdcages will be placed.

This information should be submitted in quadruplicate.

Very truly yours,

Charles P. McCallum, Jr.
Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

LRL:GPM

Docket No. 70-139

JUL 27 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Durham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

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Engelhard Industries, Inc.

- 2 -

JUL 27 1959

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This information should be submitted in quadruplicate.

Very truly yours,

Charles P. McCallum, Jr.
 Nuclear Materials Section
 Licensing Branch
 Division of Licensing and Regulation

DISTRIBUTION
 Div. of INS
 Doc. Rm.
 Formal
 Suppl.
 L&R Reading
 LRL Reading
 C. P. McCallum, LRL

OFFICE ▶	LRL				
SURNAME ▶	<i>C. P. McCallum</i>				
DATE ▶	7/24/59				

INCOMING TELEGRAM

Handwritten initials

DOCKET NO. 70-134

File copy

1959 AUG 3 PM 2 52

U.S. ATOMIC ENERGY COMM.
T.M. UNH

AC

WUBO70 PD

WUX PLAINVILLE MASS AUG 3 1226PME

CHARLES P MCCALLUM, LICENSE BRANCH

USAEC GERMANTOWN MD

RE SNM 185 PLEASE AMEND FEASIBILITY REPORT DEM5 LIMITS OF URANIUM CONTENT IN PICKLING SOLUTIONS PAGE 6 PARA C LINE 7 CHANGE LIMIT FROM 350 TO 50 GRAMS U235 PAGE 9 PARA H LINE 7 350 TO 50 GRAMS U235 PAGE 15 PARA O LINE 7 FROM 350 TO 25 GRAMS OF U235 COMPUTED BY METHODS PREVIOUSLY OUTLINED IN MAY 28 AND JUNE 3 1959 SUPPLEMENTARY LETTERS WHERE CLADDING IS CONSIDERED AS ALLOY REQUEST SAME AMENDMENT APPLY ALSO TO FEASIBILITY REPORT DEM6 REFERENCES PAGE 4 PARA C PAGE 5 PARA H PAGE 8 PARA 9 CONFIRMING LETTER OF THIS DATE FOLLOWS.

ENGELHARD INDUSTRIES D E MAKEPEACE DIVN J H DURANT

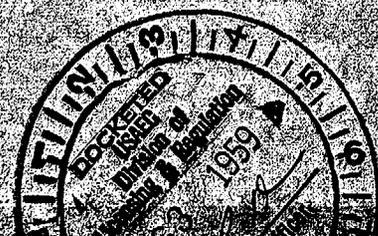
130PME

185 DEM5 6 C 7 350 50 U235 9 H 7 350 50 U235 15

ZERO 7 350 25 U235 28 3 1959 DEM6 4 C 5 H 8

ZERO.

Handwritten initials and marks



TELEGRAM

12:45 p.m.

FROM: J. H. DURANT
ENGELHARD INDUSTRIES
D. E. MAKEPEACE DIVISION
PLAINVILLE, MASSACHUSETTS

JULY 29, 1959

C. P. McCALLUM, JR.
NUCLEAR MATERIALS SECTION
LICENSING BRANCH
DIVISION OF LICENSING AND REGULATION

WAITING YOUR COMMENTS ON REQUEST TO STORE URANIUM IN ATTLEBORO
VAULT END REFERENCE DOCKET NO. 70-139

7/29
No action taken - noted that letter to
Engelhard mailed 7/27/59 /spw

Received by REH at 12:45 p.m.

9/5/59

John Dewart, Inglehart Ind., requested by
them that action be withheld on this
amendment. They are submitting charges
to cover pickling of steel-~~rod~~^{billet.}

*File by***ENGELHARD INDUSTRIES, INC.**

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ATTLEBORO, MASS.

ATTLEBORO 1-0090

August 3, 1959

Mr. Charles P. McCallum, Jr.
Division of Licensing & Regulation
Licensing Branch
U. S. Atomic Energy Commission
Germantown, Maryland

REF: Pickling Procedure for Enriched Uranium
Feasibility Report DEM 5
SNM-185, Docket 70-139



Gentlemen:

Further amending the subject application, we wish to revise the limits of uranium content in pickling solutions.

Page 6 - Paragraph C, line 7: change limit from 350 to 50 grams of U-235. (Pickling of Ingot)

Page 9 - Paragraph H, line 7: change limit from 350 to 50 grams of U-235. (Pickling of Secondary Extrusion Billet)

Page 14 - Paragraph O - delete in its entirety and substitute the following:

"O. Pickling and Shearing of Coextruded Rods

The removal of steel extrusion jacketing is accomplished by a two step pickling operation comprising a rough followed by a fine step.

Rough pickling of coextruded zirconium clad U-Mo rods will be done according to the following procedure to remove the outer steel jacketing material:

Red Dimensions: - .310" diameter x approx. 8 ft. long

1. Each red is visually inspected upon receipt prior to pickling. This is for the purpose of locating and rejecting any rods which may have cladding ruptures.

Mr. Charles McCallum, Jr.
U. S. AEC

August 3, 1959
Pickling Procedure
Feasibility Report DEM 5
SNM-185, Docket 70-139

2. Both ends of each rod are cropped on a shear so that the U-Mo alloy is exposed and most of the Cu-Ni extrusion components removed.
3. Each end of each rod is painted with 2 coats of Uni-chrome #324 (stop-off laquer which is acid resistant) to prevent acid attack of the U-Mo alloy.
4. Each rod is weighed to .1 gram on a "metrogram" balance.
5. A maximum of 3 rods (1.1 Kg U-235 total) is placed in a pickle tank which contains 1:2 ANO₃. The height of the solution in the tank will be maintained at an always safe 1" level. This will be accomplished by administrative control of acid distribution and by an overflow to limit level in the tank to 1". The overflow leads to a 5" I.D. (always safe) polyethylene container.
6. The rods will be pickled for 15 min. to remove the majority of the steel jacketing.
7. The rods will then be removed, rinsed with water, and wiped dry with clean rags.
8. Each rod will be reweighed to determine weight loss in pickling.

Experimental determinations have established that the rate of nitric acid attack upon U-Mo alloy at this particular concentration is 0.23 Mg/CM²/Min. If we assume the worst possible situation; namely, that all the uranium is exposed to the acid, we would dissolve 1.95 grams of uranium alloy per rod in 15 minutes. For 25 rods this would amount to 48.75 grams of alloy which would be equivalent to only 11.23 grams of U-235.

Since this condition of total uranium exposed will never be approached, we are confident that the amount of U-235 in solution will be negligible. At the present time we are in the process of running actual analyses of pickling solutions of depleted material in an effort to further verify this data.

Mr. Charles McCallum, Jr.
U. S. AEC

August 3, 1959
Pickling Procedure
Feasibility Report DEM 5
SNM-185, Docket 70-139

Cropped rods will undergo a second or fine pickling where necessary to remove small spots of steel which may remain after the rough pickle. The ends of the rods will be masked to prevent the U-Mo from going into solution. The pickle solution will be a mixture of nitric and hydrochloric acids at 110°F. Rods will be pickled until such time as all steel is removed (Max. of 3 rods containing a total quantity of 1.1 Kg U-235 in the tank at any time) afterwhich they will be rinsed, weighed, and placed in the shipping container.

All fine pickle solutions will be transferred to 13 gal. polyethylene containers whenever it is determined that 25 gm. U-235 has gone into solution both from before and after weighings and an actual analysis of the pickle solutions. Polyethylene containers will be stored in wire racks at an 18" distance from similar containers in the enriched scrap storage area."

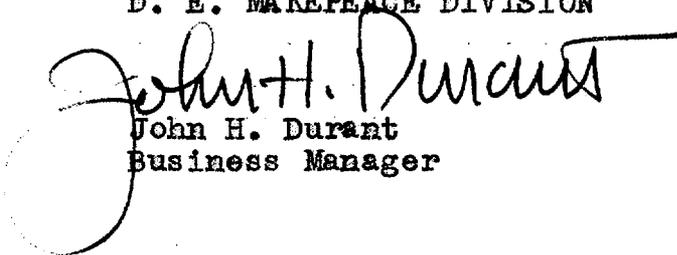
The foregoing limits have been computed by methods previously outlined in May 28th and June 3rd supplementary letters. Cladding has been considered as alloy in all cases except rough pickling of coextruded rods.

We request that these amendments also be considered to apply to feasibility report DEM 6. References may be made to Page 4, Paragraph C; page 5, Paragraph 14; Page 8, Paragraph O.

We trust that you will find these amendments satisfactory so that our application may receive your early consideration.

Very truly yours,

D. E. MAKEPEACE DIVISION


John H. Durant
Business Manager

JHD/bs

J. C. DELANEY
CHIEF, NUCLEAR MATERIALS SECTION
LICENSING BRANCH
DIVISION OF LICENSING AND REGULATION
U. S. ATOMIC ENERGY COMMISSION

ROUTINE - COLLECT

AUGUST 11, 1959

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS
ATTN: JOHN H. DURANT
BUSINESS MANAGER

YOUR LICENSE SNM-185 AMENDED THIS DATE TO AUTHORIZE FUEL ELEMENT
FABRICATION IN ACCORDANCE WITH PROCEDURES DESCRIBED IN YOUR APPLI-
CATIONS OF DECEMBER 9, 1958 AND JANUARY 13 & 30, MARCH 3, APRIL 9,
APRIL 17 (2), MAY 28 (2), JUNE 3 AND AUGUST 3, 1959 END REFERENCE
YOUR DOCKET NO. 70-139

CFMcCallum:rh
3:00 p.m.
Rm. No. B-129

70-139

J. C. DELANEY
CHIEF, NUCLEAR MATERIALS SECTION
LICENSING BRANCH
DIVISION OF LICENSING AND REGULATION
U. S. ATOMIC ENERGY COMMISSION

ROUTINE - COLLECT

AUGUST 11, 1959

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS
ATTN: JOHN H. DURANT
BUSINESS MANAGER

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APRIL 17 (2), MAY 28 (2), JUNE 3 AND AUGUST 3, 1959 END REFERENCE
YOUR DOCKET NO. 70-139

DISTRIBUTION

- D. F. Musser, NMM
- E. A. Shepherd, FIN (2)
- Div. of INS
- H. Steele, LRL
- B. R. Gustavson, LRL
- J. C. Delaney, LRL
- Doc. Rm.
- Formal
- Suppl.
- L&R Reading
- LRL Reading
- C. P. McCallum, LRL

CPMcCallum:rh
3:00 p.m.
Ra. No. B-129

OFFICE ▶	LRL	LRL				
SURNAME ▶	CPMcCallum/rh	J. C. Delaney				
DATE ▶	8/11/59	8/11/59				

ENGELHARD INDUSTRIES, INC.

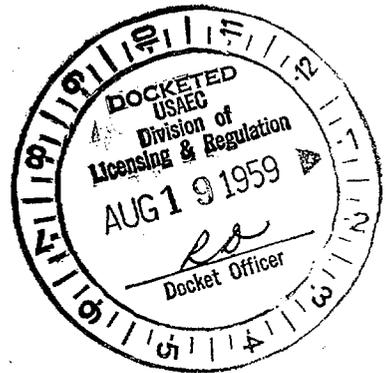
D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

August 14, 1959

U. S. Atomic Energy Commission
Washington
D. C.

ATTN: Mr. Lyall Johnson

REF: Requirement - Special Nuclear Material
Part 70 - Title 10
Docket 70-139



Gentlemen:

This is further in reply to your direction of November 1958, concerning the provision of audible alarm monitoring devices and evacuation procedures required in the event of accidental condition of criticality.

As we advised in our letter of December 9th, we have ordered and have since received four (4) Model RN-2 Gamma sensitive radiation monitors which are installed; two in our two work areas and two in our two uranium storage vaults. Location of these instruments is shown on the enclosed Drawing D-1050. We present herewith pertinent information on the monitoring instruments as is furnished by the manufacturer, Eberline Instrument Corporation:

- | | | |
|---|--|-------------------------------------|
| 1. Range of operation: | 0-20 mr/hr. | <i>SEE Design & Report File</i> |
| 2. Time Constant: | Compatible w/range selected. | |
| 3. Instrument Saturation Radiation Level: | A radiation level greater than 500 Roentgen/hr is required to cause detector saturation. | |
| 4. Visual Alarm: | Front panel mounted red light. Front panel reset button & overhead red light. | |
| 5. Audible Alarm: | Internally mounted high frequency buzzer & Klaxon horn. | |

*No done
rev req
JEP
8/20/59*

U. S. AEC
Mr. Lyall Johnson

August 14, 1959
Docket 70-139

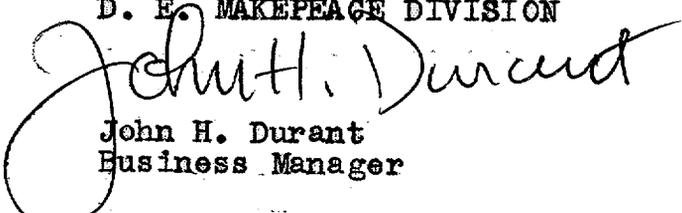
We are also enclosing three (3) copies of our emergency evacuation procedures. This procedure is posted with other plant bulletins and, in addition, will be used as the basis of evacuation drills which are conducted quarterly.

This information has been communicated to our cognizant field office which is Chicago, and it has been approved with respect to our Government material.

We hope that the information presented herewith will furnish you with sufficient information to enable you to amend our Special Nuclear Materials License to show compliance with Part 70.

Very truly yours,

D. E. MAKEPEACE DIVISION


John H. Durant
Business Manager

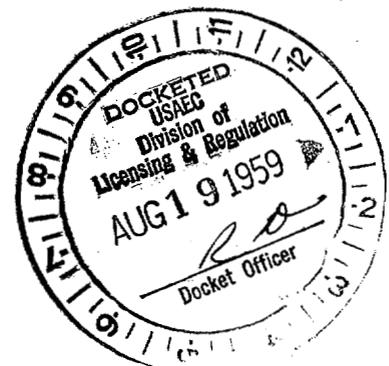
JHD/bs
encls:

ENGELHARD INDUSTRIES, INCORPORATED
D. F. MAKEPEACE DIVISION
PLAINVILLE, MASS.EMERGENCY EVACUATION PROCEDURE (PLAINVILLE PLANT)

1. When alarm sounds, all personnel will immediately evacuate the area by the nearest exit.
2. Personnel working at the rear of the nuclear department will leave by the door at the southwest corner near the vapor blast, and congregate in the rear yard to await instructions by HP personnel.
3. Personnel working toward the front and middle of the nuclear area will leave either by the door leading to the change room or the door leading to the corridor.
4. People exiting through either change room or corridor will proceed in an orderly fashion through the corridor past the guard station and out into the front of the building to await instructions.
5. People in the partitioned area and form rool department will exit through the doors at the north and west ends of the building and congregate at the parking lot to await instructions.
6. No one is to leave or enter the nuclear area through the door on the north wall nearest to the partitioned area.
7. As soon as the building has been completely evacuated, health-physicis personnel will monitor all personnel to segregate those who may have received radiation exposures. Monitoring will be done both on the person and film badge (containing in foil) with portable survey instruments.
8. When personnel monitoring has been completed, persons receiving significant exposures will be taken to Sturdy Hospital for medical attention.
9. H-P personnel will then don protective clothing and enter the area to determine the location and extent of the radiation source with survey instruments.
10. As soon as possible, the HP officer will notify the New York Operations Office of the incident and request the aid of the emergency monitoring team. (~~Major Emergency Only~~)
11. The HP officer will inform the plant manager as to the extent of damage in order that the press and radio may be informed so as to avoid misinformation which might be spread to the community.
12. When the radiation source has been located, monitoring will be done with survey instruments until the radiation level is low enough so that personnel may approach safely.
13. Depending on the source of radiation, appropriate measures will be taken to eliminate the condition (protective shielding, neutron absorption materials, removal of moderating material, replacement into always safe containers).

EMERGENCY EVACUATION PROCEDURE (CONT.)

14. As soon as the radiation has ceased, sulfur tablets located on walls will be removed and sent out to be counted as a means of determining neutron dosage evolved.
15. Chicago Operations Office will be informed as to the extent of damage and the procedures being followed.
16. No one except H-P personnel will be allowed in the area until monitoring has been completed and the area found to be safe from radiation.
17. Air samples will be taken downwind and crosswind from the source of radiation to determine whether a major dispersion of radiation has been achieved.
18. Decontamination procedures will be put into effect under the supervision of H-P personnel in order to prevent the spread of contamination to clean areas.
19. Immediate and 24 hour urine samples will be taken from those persons thought to have received exposures and anyone else desiring them.
20. A complete report of the incident and subsequent activities will be made by the H-P officer and submitted to both state and AEC authorities as soon as possible after the incident.



LRL:CPM

Docket No. 70-139

AUG 18 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

Enclosed is your Special Nuclear Material License No. SNM-185, as amended.

In reference to your proposed emergency alarm and evacuation procedures submitted December 9, 1958, you should inform us by September 1, 1959 of the degree to which these procedures have been implemented.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

Enclosure:
SNM-185, as amended

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No. SNM-185, as amended
1. Name	Engelhard Industries, Inc. D. E. Makepeace Division	4. Expiration Date September 30, 1962
2. Address	Pine & Dunham Streets Attleboro, Massachusetts	5. Docket No. 70-139
6. Special Nuclear Material	Uranium enriched in the U-235 isotope.	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license Three hundred thirty (330) kilograms of U-235 contained in uranium enriched in the U-235 isotope.
8. Authorized use For the fabrication of reactor fuel elements and related activities using the procedures described in the licensee's application of July 30, 1957, as amended February 5 and December 9, 1958 and January 13 & 30, March 3, April 9, April 17(2), May 28(2), June 3 and August 3, 1959.		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part None		

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.
Authorized place of use: The licensee's fuel element processing plant located on Route 152, Plainville, Massachusetts.

For the U. S. ATOMIC ENERGY COMMISSION

Date of issuance AUG 12 1953

LRL:CPM
Docket No. 70-139

AUG 18 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

Enclosed is your Special Nuclear Material License No.
SNM-185, as amended.

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evacuation procedures submitted December 9, 1958,
you should inform us by September 1, 1959 of the
degree to which these procedures have been implemented.

Very truly yours,

DISTRIBUTION

D. F. Musser, NMM, w/encl.
E. A. Shepherd, FIN (2), w/encl.
Div. of INS, w/encl. & Ltrs. dtd
6/3, 7/3, 9 & 27/59 & TWX dtd
8/3 & 11/59

H. Steele, LRL, w/encl.
S. R. Gustavson, LRL, w/encl.
J. C. Delaney, w/lic. only
S/Health, w/lic. only
Doc. Rm., w/encl.

Enclosure:
SNM-185, as amended

Formal, w/encl.
Suppl., w/encl.
L&R Reading, w/encl.
LRL Reading, w/encl.
C. P. McCallum, w/encl.

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

*no alteration of nature
or approval of transfer to be
made until issuance
is resumed or statements
submitted*

OFFICE ▶	LRL	LRL	FIN			
SURNAME ▶	CPM McCallum	J.C. Delaney	CPM			
DATE ▶	8/13/59	8/14/59	8/17/59			

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No.
1. Name	Engelhard Industries, Inc. D. E. Makepeace Division	SMT-185, as amended
2. Address	Fine & Dunham Streets Attleboro, Massachusetts	4. Expiration Date September 30, 1962
		5. Docket No. 70-139
6. Special Nuclear Material	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license	
Uranium enriched in the U-235 isotope.	Three hundred thirty (330) kilograms of U-235 contained in uranium enriched in the U-235 isotope.	
8. Authorized use For the fabrication of reactor fuel elements and related activities using the procedures described in the licensee's application of July 30, 1957, as amended February 5 and December 9, 1958 and January 13 & 30, March 3, April 9, April 17(2), May 28(2), June 3 and August 3, 1959. Sept. 23 and Oct. 14, 1959.		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part None		

CONDITIONS

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Authorized place of use: The licensee's fuel element processing plant located on Route 152, Plainville, Massachusetts.

For the U. S. ATOMIC ENERGY COMMISSION

Date of issuance AUG 12 1959 ?

U. S. GOVERNMENT PRINTING OFFICE: 1956-O-385852 **J. C. Delaney**
Division of Licensing and Regulation

apt
JEP
8/12/59

DOCKET NO.

70-139
File

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ATTLEBORO, MASS.

N. ATTLEBORO 1-0090

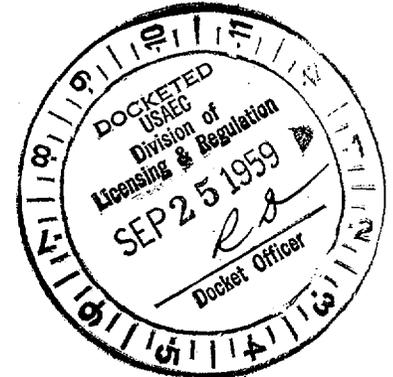
Myrtle

September 23, 1959

U. S. Atomic Energy Commission
Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation
Washington 25, D. C.

ATTN: Mr. Charles P. McCallum, Jr.

REF: Docket 70-139, Special SNM-185
Additional Storage Space



Gentlemen:

Further to our letter of July 3rd and your response of July 27th concerning our proposal to store additional 25.6% enriched uranium in our Attleboro Plant, we have investigated the matter further and find that it will not be feasible to utilize such space. Please consider the proposal of our letter of July 3rd to be abandoned and superseded by the following:

D. E. Makepeace Division of Engelhard Industries, Inc., requests an amendment to its SNM License No. 185 to permit the receipt and processing of an additional 300 Kg. U-235 to be used in the fabrication of Power Reactor Development Corporation fuel elements in accordance with feasibility report DEM-6 and subsequent revisions. This material will be received from Davison Chemical Company, Erwin, Tennessee, at a monthly rate of 60 Kg. Each monthly shipment will consist of eight (8) birdcages of 25.6% enriched derbies and one (1) birdcage of analytical samples. A drawing of such a birdcage (Exhibit A) is enclosed.

At the present time we are storing these derbies (330 Kg. U-235) in cubicles in our enriched vault. These cubicles are filled to capacity with our present supply. We propose, therefore, to store the additional material requested in a locked, caged area adjoining a vault in their original birdcages. As soon as vault cubicles become available in the course of production scheduling, the

U. S. Atomic Energy Commission
Mr. Charles P. McCallum

September 23, 1959
Additional Storage Space

derbies in the cage will be transferred to the vault. We estimate from current production planning that eight (8) birdcages will be the maximum amount of derby material outside the vault at any time. However, due to unforeseen future developments, we are requesting that we be allowed to store sixteen (16) birdcages of derby material outside the vault.

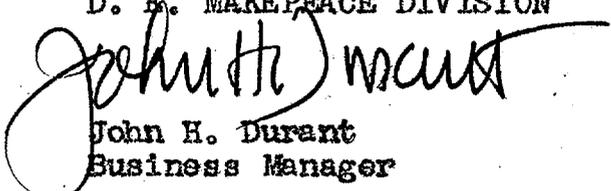
To be filled in September
Storage will be in a roped off area of the locked wire cage (see drawing E1104, Exhibit B). The rest of the cage will be used for the in-process storage of PRDC enriched material in birdcages plus a receiving inspection area. Admission to the cage will be restricted to personnel accompanied by the criticality officer or his representative.

The material in this cage would be under the surveillance of plant security guards for 24-hour daily rounds, weekends included. On nights and weekends hourly rounds are made and clocks punched. Presently installed criticality and detector warning systems will, of course, cover this area.

We trust that approval will be granted as soon as possible since we have an October 7th delivery date for the next shipment from Davison. We will be willing to accept collect telephone calls concerning this matter in the interest of expediting this application.

Very truly yours,

D. E. MAKEPEACE DIVISION


John H. Durant
Business Manager

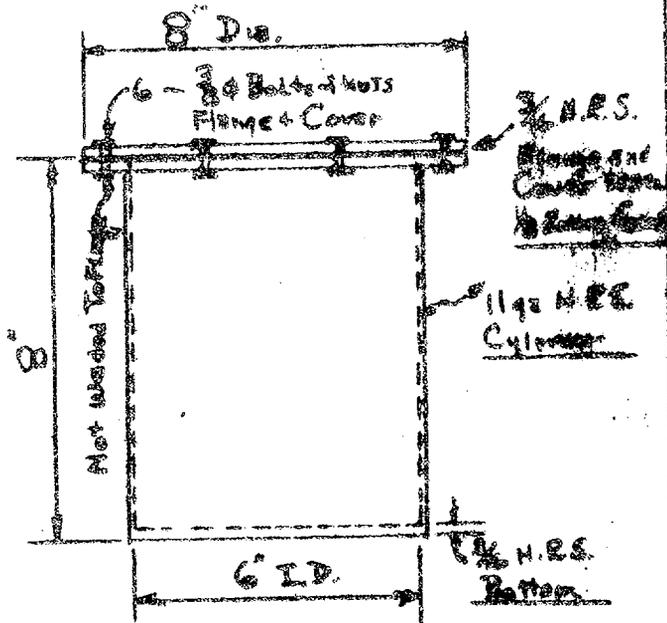
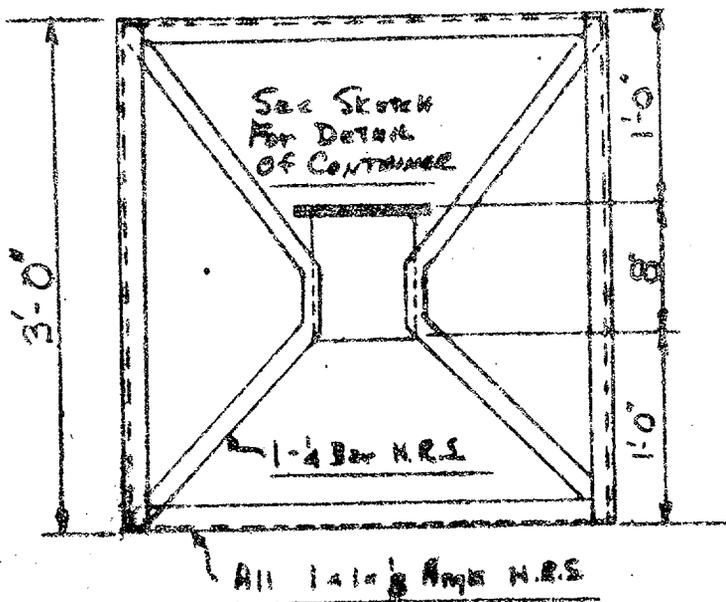
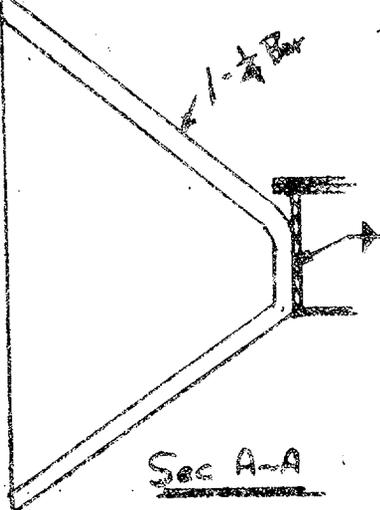
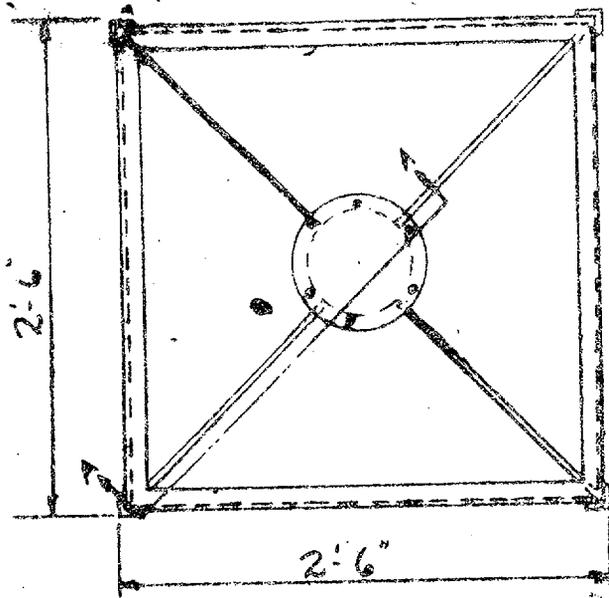
JHD/bs
encls:
via: AIR MAIL

Tower Iron Works

PROVIDENCE, RHODE ISLAND

DOCKET NO. 70-139

File ay.



STORAGE CONTAINER

WELDED CONSTRUCTION

DETAIL OF CYLINDER

WELDED WATERTIGHT

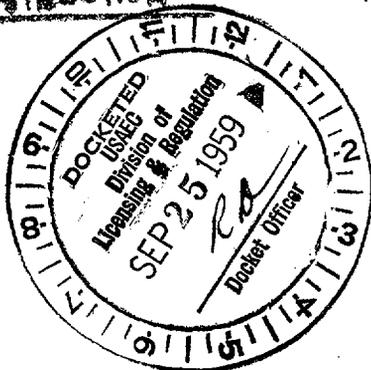


EXHIBIT A

STORAGE CONTAINERS
 For
 D. E. MAKEPEACE DIV. - ENGLEHARD IND.
 J.E. - 7-1-59

DOCKET NO. 70-139
File by

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

October 8, 1959

United States Atomic Energy Commission
Germantown
Maryland

ATTN: Mr. J. C. Delaney
Chief Materials Branch
Div. of Licensing and Regulation

REF: Request for License Amendment
Docket 70-139

Gentlemen:

see reports file

Enclosed herewith are four (4) copies of Feasibility Report DEM-8 covering fabrication of enriched uranium aluminum fuel elements for the Watertown Arsenal OMR.

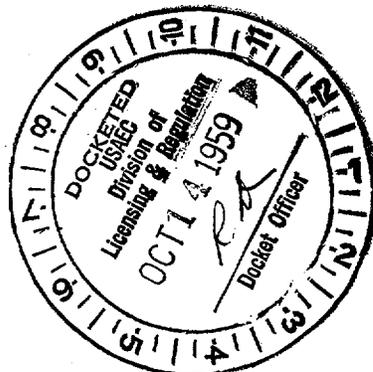
It is requested that our license SNM-185 be amended to cover the receipt, storage, and fabrication of metal. Your prompt attention to this request for amendment will assist us materially in meeting our contract commitments for delivery of finished fuel elements to the Watertown Arsenal.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Manager

JHD/bs
encls:



DOCKET NO. 70-139
Filey

ENGELHARD INDUSTRIES, INC.
D. E. Makepeace Division

September 25, 1959

United States Atomic Energy Commission
Germantown,
Maryland

ATTN: Mr. J. C. Delaney
Licensing Branch

REF: SNM-185, Docket No. 70-139

Gentlemen:

We are enclosing herewith five (5) copies each of Revision A to our Feasibility Reports DEM 5 and DEM 6. These incorporate all of the modifications and changes contained in correspondence incidental to the amendment to our license covering Fabrication of Core Subassemblies for the Enrico Fermi Fast Breeder Reactor and the Fabrication of 164 (10%) Fuel Pins for the SRE Test Program.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Manager

JHD/bs
encls:



RC SLIP - LICENSING BRANCH

Date 10/14

Price, H. L. _____	Johnson, L. E. _____	Delaney, J. G. <i>Jep</i> _____
Price, E. R. _____	Fleury, E. R. _____	McCallum, C. P. _____
Beck, C. K. _____	Edwards, C. T. _____	Doulos, N. _____
Rogers, L. R. _____	Borlik, R. F. _____	Diggs, R. _____
Morgan, G. W. _____	Karas, F. W. _____	Allen, M. _____
Mason, J. R. _____	Lee, F. C. _____	Steele, H. _____
Teets, S. A. _____	Frederick, R. J. _____	Gustavson, S. R. _____
		Johnson, R. G. _____

1 copy of attached acid for info. Should
it be filed as Suppl. only under SNM-185
(70-139) after your review?
From: Reba

Suppl only -
we will not review

DOCKET T. J. 70-139
Suppl. Only

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

October 8, 1959

United States Atomic Energy Commission
Chicago Operations Office
P. O. Box 89
Lemont, Illinois

ATTN: Mr. Donald M. Gardiner, Director
Health and Safety Division

REF: Review of Criticality Procedures

Gentlemen:

You will find enclosed in duplicate copies of our "Engelhard Industries, D. E. Makepeace Division Criticality Review" which you requested by your letter of August 11th addressed to Mr. W. F. Mittendorf.

We have attempted to make it comprehensive and trust that you will advise us whether it meets your requirements.

Very truly yours,

D. E. MAKEPEACE DIVISION

[Signature]
John H. Durant
Business Manager

SEE Reports File

JHD/bs
encls:

cc: L. Johnson

[Handwritten mark]

TAC WUC006 DL PD

INCOMING TELEGRAM

WUX PLAINVILLE MASS OCT 14 845AM

CHARLES MCCALLUM, LICENSING BRANCH

DUCKET NO. 70-139

U.S. ATOMIC ENERGY COMM. TWX UNIT

US ATOMIC ENERGY COMMISSION GERMANTOWN MD

RE DOCKET 70-139 FOLLOWING ADDENDUM TO SEPT 23RD LETTER ON STORAGE ASSUMING MASSIVE METAL AS 25.6 PERCENT ENRICHED BISCUITS

1959 OCT 14 PM 12 21

File 4

5 INCH DIAMETER 7/8 INCH THICK CONSTITUTE EVER SAFE MASS CF. TID 7019 PAGE 21 TABLE XI COLUMN 1 ACTUAL CONTENT 6.6 KG AS U-235 INTER ACTION CRITERIA SATISFIED AS GIVEN IN LINE 2 ALLOWING AVERAGE DENSITY OF 4 KG U-235 PER CUBIC FOOT WILL HAVE .25 KG PER CUBIC FOOT CONTAINER NOT APPROVED FOR STACKING WILL BE IN PLANEAR ARRAY MAXIMUM OF 16 CONTAINING 105.6 KG AS U-235 THIS AMOUNT BELOW 925 KG ESTABLISHED FOR CARLOAD LIMIT USING CONTAINERS FOR STORAGE ONLY A LESS RIGOROUS CONDITION THAN SHIPMENT. FOLLOWING ADDENDUM TO AUG 14 LETTER ON 70-24 COMPLIANCE AREA DESIGNATED FORM ROLL ONLY PARTIALLY USED FOR NUCLEAR ASSEMBLY WORK ALL LIES WITHIN 100 FT RADIUS OF SECOND WORK AREA MONITOR PROPOSED ADDITIONAL CAGED STORAGE AREA COVERED BY MONITOR IN MAIN WORK AREA UNIT A (D-1050) UNITS SET AT 15 MR FULL SCALE SENSITIVITY OVERALL RESPONSE TIME FOR AUDIBLE ALARM RANGES 1 TO 2 SECONDS WITH DETECTION SENSITIVITY SCALE AT 15 MR WEAKEST TO STRONGEST FAIL SAFE FEATURE INCLUDES PILOT LIGHT POWER FAILURE SIGNALLED BY GENERAL PLANT ILLUMINATION FAILURE QUARTERLY TEST SCHEDULE USING CALIBRATED RADIOACTIVE SOURCE RESULTING SIGNAL USED FOR EVACUATION DRILL ALSO HELD QUARTERLY PRIMARY CONGREGATION AREA 300 YDS NORTH PREVAILING SOUTHERLY WINDS UNCOMMON SECONDARY AREA AT 90 DEGREE FROM PRIMARY TO EAST

ENGELHARD INDUSTRIES D E MAKEPEACE DIVN J H DURANT

1106AME

70-139 23RD 25.6 5 7/8 CF TID 7019 21 XI 1 6.6

KG U-235 2 4 KG 7-2345 .25 KG 16 105.6 KG U-235 925

KG 14 70-24 100 A (D-1050) 15 MR 1 2 15 300 90.



INCOMING TELEGRAM

IRL:CPM

Docket No. 70-139

OCT 20 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

Enclosed is Special Nuclear Material License No.
SNM-185, as amended.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

Enclosure:
SNM-185, as amended

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No.
1. Name	Engelhard Industries, Inc.	SNM-185, as amended
2. Address	D. E. Makepeace Division Pine & Dunham Streets Attleboro, Massachusetts	4. Expiration Date
		September 30, 1962
		5. Docket No.
		70-139
6. Special Nuclear Material	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license	
Uranium enriched in the U-235 isotope.	Three hundred thirty (330) kilograms of U-235 contained in uranium enriched in the U-235 isotope.	
8. Authorized use	For the fabrication of reactor fuel elements and related activities using the procedures described in the licensee's application of July 30, 1957, as amended February 5 and December 9, 1958 and January 13 & 30, March 3, April 9, April 17(2), May 28(2), June 3, August 3, September 23 and Oct. 14, 1959.	
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part	None	

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

Authorized place of use: The licensee's fuel element processing plant located on Route #152, Plainville, Massachusetts.

For the U. S. ATOMIC ENERGY COMMISSION

OCT 20 1958

Date of issuance _____

IRL:CFM
Pocket No. 70-139

OCT 20 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

Enclosed is Special Nuclear Material License No.

SNM-185, as amended.

DISTRIBUTION

L. D. MacKay, OROO - FIN, w/encl.
D. F. Musser, w/encl.
Div. of INS, w/encl. & TWX dtd
10/14/59
H. Steele, IRL, w/encl.
S. R. Gustavson, IRL, w/encl.
S/Health, lic. only
J. C. Delaney, lic. only
Doc. Rm., w/encl.
Formal, w/encl.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

Enclosure:

SNM-185, as amended

Suppl. w/encl.
I&R - IRL Readings, w/encl.
C. P. McCallum, IRL, w/encl.

OFFICE ▶	IRL	FIN	IRL		
SURNAME ▶	<i>CP McCallum</i>	<i>m.k.r. (CPM) particular 10/16</i>	<i>Delaney</i>		
DATE ▶	10/16/59	10/16/59	10/19/59		

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No.
1. Name	Engelhard Industries, Inc.	SNM-185, as amended
2. Address	D. E. Makepeace Division Pine & Dunham Streets Attleboro, Massachusetts	4. Expiration Date
		September 30, 1962
		5. Docket No.
		70-139
6. Special Nuclear Material	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license	
Uranium enriched in the U-235 isotope.	Three hundred thirty (330) kilograms of U-235 contained in uranium enriched in the U-235 isotope.	
8. Authorized use For the fabrication of reactor fuel elements and related activities using the procedures described in the licensee's application of July 30, 1957, as amended February 5 and December 9, 1958 and January 13 & 30, March 3, April 9, April 17(2), May 28(2), June 3, August 3, September 23 and Oct. 11, 1959.		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part		
None		

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

Authorized place of use: The licensee's fuel element processing plant located on Route #152, Plainville, Massachusetts.

For the U. S. ATOMIC ENERGY COMMISSION

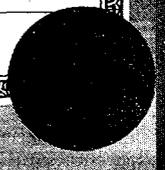
067 2 0 1959

Date of issuance _____

J. C. Delaney

Division of Licensing and Regulation

[Handwritten signatures and initials]



LRL:CPM
Docket No. 70-139

OCT 29 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

This refers to your letter of October 8, 1959 with which you submitted your Feasibility Report DEM-8, for the Fabrication of Enriched U-Al Fuel Elements for the Watertown Arsenal OMER.

In order that we may continue our analysis of the procedures contained in the referenced application, you should provide us with the additional information outlined below:

1. The administrative or procedural controls which you will use to assure that the batch sizes for various processes are within the indicated limits.
2. An indication of the amount of U-235 which will go into solution in the caustic etching process used in removing the aluminum from clad material prior to its reuse and the consideration given this amount before the introduction of a second batch of plates into the etching bath.

DISTRIBUTION

Div. of INS
Doc. Rm.
Formal
Suppl.
L&R - LRL Readings
CP, McCallum, LRL

Very truly yours,

Charles F. McCallum, Jr.
Nuclear Materials Section
Licensing Branch

OFFICE ▶	LRL				
SURNAME ▶	<i>CP McCallum</i> CPMcCallum/zp				
DATE ▶	10/29/59				

LRL:CPM

Docket No. 70-139

OCT 20 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

This refers to your letter of October 8, 1959 with which you submitted your Feasibility Report DEM-8, for the Fabrication of Enriched U-AL Fuel Elements for the Watertown Arsenal OMRR.

In order that we may continue our analysis of the procedures contained in the referenced application, you should provide us with the additional information outlined below:

1. The administrative or procedural controls which you will use to assure that the batch sizes for various processes are within the indicated limits.
2. An indication of the amount of U-235 which will go into solution in the caustic etching process used in removing the aluminum from clad material prior to its reuse and the consideration given this amount before the introduction of a second batch of plates into the etching bath.

Very truly yours,

Charles P. McCallum, Jr.
Nuclear Materials Section
Licensing Branch
Division of Licensing & Regulation

DOCKET NO.

70-139
File Cj

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

October 30, 1959

UNITED STATES ATOMIC ENERGY COMMISSION
Germantown, Maryland

Attention: C.P. McCallum
Division of Licensing and Regulation

Reference: SNML 185 - Feasibility Report - DEM - 8

Gentlemen:

In response to your questions on the subject request for amendment we submit the following additional information for your consideration:

Supplement to Feasibility Report DEM-8
Section C., Page 5 - "Fuel Plate Processing"

The potential build up of U-235 in the etching solutions will be restricted to 100 grams U-235 by limiting the number of plates which may be etched before the solution is changed. The maximum number of plates will be calculated by assuming that an over-etch into the core alloy of .002" will take place during the etching operation. This number will vary with the dimensions of the particular components to be etched.

Solutions will be sampled and placed in polyethylene carboys for temporary storage. When analytical data has been received, solutions may be combined in 30 gal. polyethylene lined drums to a maximum amount of 100 grams U-235 per drum. Drums will be retained for eventual refining and disposition.



Addendum:

Administrative Control of Material Issuance

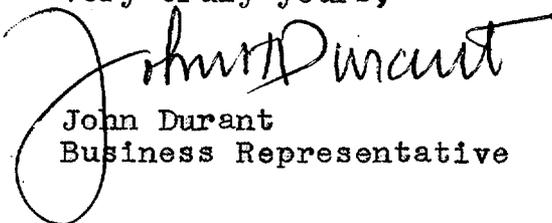
All movement of enriched uranium into or out of storage areas and through fabrication will be under the supervision of criticality control representatives. Prior approval must be obtained before material may be moved to or from a processing area. This approval will be granted only when it has been established that the amount of material allotted to a particular work area does not exceed the maximum amounts as established in this feasibility report or in any prior reports covering uranium in the Manufacturing plant. There will be no build up of material in a work area due to the different rates of speed of various operations. All material which is awaiting further processing will be removed to a temporary storage area to be stored at a 12" edge-edge separation from other lots. Only when a lot of material has completed an operation and moved to the next processing area will the succeeding lot be issued to fabrication for that particular operation.

A material control chart will be used to plot the movements of enriched material as they are made. In this way the criticality control representative can establish the location of the various lots of material which are in process.

Tote trays will be color coded by job and also to distinguish enriched uranium from natural or depleted.

We trust this will make our application acceptable to you.

Very truly yours,


John Durant
Business Representative

JD/jet

DOCKET NO. 70-134
File Cy

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

November 2, 1959

U. S. ATOMIC ENERGY COMMISSION
Germantown, Maryland

Attention: C.P. McCallum
Division of Licensing and Regulation

Reference: SNML-185, Feasibility Report-DEM-5, Revision A, Section 6,
Page 12 - "Shipping Containers for Primary Extrusions, Canned
Slugs and Secondary Coextrusions."

Gentlemen:

As a result of economic and material handling considerations, it has become necessary to redesign the shipping containers which will be used in the shipment of P.R.D.C. primary extrusions, canned slugs, and secondary coextrusions between D. E. Makepeace and Nuclear Metals, Inc.

We feel that our proposed new container will retain all the safety features of the original plus additional ones such as the 5" I.D. "always safe" pipe diameter which will be the actual storage element. The spacing to be maintained between similar adjacent units as a result of construction will be the same as that which was incorporated into the original container.

We are submitting drawings of our proposed shipping container in the hopes that your approval will be forthcoming. Your prompt action will be appreciated as construction of these units will require considerable lead time.

Very truly yours,

Norton M. Weiss
Norton M. Weiss
Criticality Officer

NMW/jet



INCOMING TELEGRAM

C-233

U. S. ATOMIC ENERGY COMM.
TWX UNIT

1959 NOV 5 PM 1 47

DOCKET NO. 70-139
File Copy

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AC WUH109 PD

WUX PLAINVILLE MASS NOV 5 122PME

CHARLES P MCCALLUM, LICENSING BRANCH

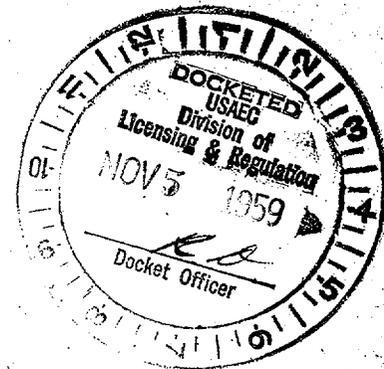
US ATOMIC ENERGY COMMISSION GERMANTOWN MD

REF 70-139 DEM 8 PAGE 5'C AND LETTER OF OCT 30TH 002" REMOVAL
GIVES 6 GMS U-235 IN CAUSTIC SOLUTION PER PLATE WILL DUMP AFTER
100 PLATES ARE STRIPPED CORRESPONDS TO 60 GRAMS U-235 CONTENT
IN SOLUTION

ENGELHARD INDUSTRIES D E MAKEPEACE DIVN J H DURANT

144P

70-139 8 5'C 30 002" 6 U-235 100 60 U-235.



INCOMING TELEGRAM

DOCKET NO. 70-139

File by

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

November 13, 1959

U. S. Atomic Energy Commission
Germantown, Maryland

Attention: Mr. C. P. McCallum, Licensing Branch

Reference: Docket 70-139
SNM 185
DEM 9

Gentlemen,

see reports file

We are enclosing herewith 4 copies of Feasibility Report DEM-9 covering "Fabrication of Enriched U-Al Fuel Elements for the Wright Field AFNETF Contract AF 33(616)-6059."

We would appreciate your amending our license to enable us to proceed with this task. Our production schedule requires that we commence work with enriched material by December 3rd, and we hope that the report can be accepted and the appropriate amendment issued by this time.

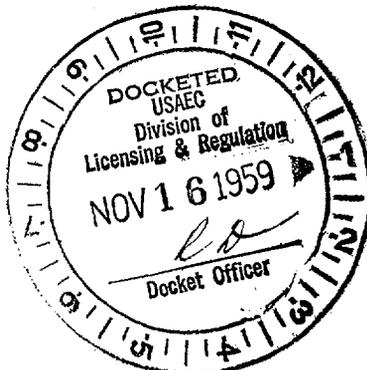
Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
J. H. Durant
Business Manager

JHD:dc

Enclosures (4)



DOCKET NO. 70-139
File by

ENGELHARD INDUSTRIES, INC.

Amend file

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

November 6, 1959

U. S. ATOMIC ENERGY COMMISSION
Germantown, Maryland

Att: Mr. Charles P. McCallum
Division of Licensing and Regulations
Licensing Branch

Ref: Docket 70 - 139
SNM 185
DEM - 5 Revision A

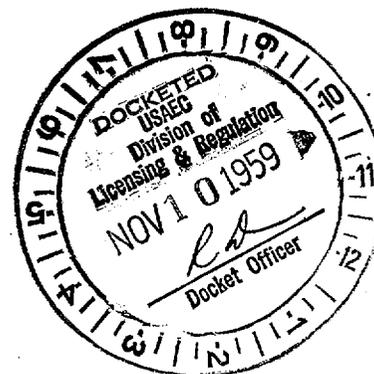
Gentlemen:

Your consideration of the following will be appreciated:

D. E. Makepeace requests that SNM license 185 (as of October 20, 1959) be amended with respect to feasibility report DEM - 5 Revision A, Section 14, pages 17 and 18 as follows:

FINISH PICKLING OF COEXTRUDED RODS

Rod size - .310" dia. x approx. 8 ft. long
Composition - Zirconium clad (25.6% enriched) 90% U - 10% Mo alloy with traces of steel U-235 content - 400 gms. per rod.



November 6, 1959

We request that we be permitted to pickle six (6) coextruded rods (2.4 kg. U-235) instead of the original three (3) (1.2 kg. U-235) in our pickle tank containing dilute (1:9) sulfuric acid. The level of solution in the tank will be held to a 1" depth by means of an overflow leading to a 5" I.D. "always safe" polyethylene container. Our pickle tank is 14 ft. long x 6" wide x 12" high.

The solution height of 1" has been chosen to assure that "always safe" conditions will be met. This condition approaches that of an infinite slab which cannot become critical at a thickness less than 1.34" (Ref. KAPL - A - CM - 1 Classified), Y-853 - Application of Criticality information to Y-12 plant problems).

In addition, an infinite slab cannot become critical if the surface density of fuel is less than 3.5 gm. / in.² (Ref. KAPL - A - CM - 1, Page 2). This figure assumes a uniform distribution of fuel through the slab which is the most reactive condition. The six (6) rods in our pickle tank would have a surface density of 2.4 gms. U-235/in.² and would be in the form of discrete rods, a less reactive condition.

The pickle solutions would be sampled after every thirty (30) rods and transferred to 5 gal. polyethylene carboys. Upon receipt of analysis, the solutions would be transferred to 30 gal. polyethylene lined drums, a maximum of 200 grams U-235 per drum.

Our data based on the pickling of depleted rods of the same alloy composition has established an average loss in weight per rod of 5.25 gms. due to pickling for one (1) hour at room temperature. If we consider this weight to be U-Mo alloy, neglecting the weight of steel removed, the U-235 loss per rod will be 1.2 grams. For the 30 rods the total accumulation of U-235 in the acid solution will be 36 grams. We feel that this is a highly conservative estimate since the great majority of the material which is removed will be steel.

A further justification for this revised operation is provided in K-1380, Studies in Nuclear Safety, Fig. 12, pages F-16 and 17. Using the information contained in Fig. 12, the minimum critical mass for a lattice of 1/8" rods (93.2% enrichment) dispersed in water is 6 kg. U-235. By the use of a safe to minimum critical ratio of 43% (Ref. K-1380, Table I, page A-21), the safe batch size for such a system would be 2.58 kg. U-235.

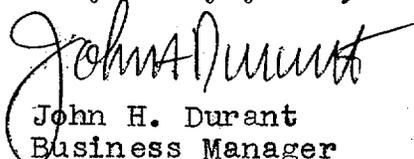
November 6, 1959

The system as described would be more reactive than the conditions under which we would operate since the enrichment is higher (93% vs. 25.6%), the diameter of the rods is smaller (1/8" vs. .310"), and optimum dispersion is assumed rather than random orientation. The application of the above safety factors to our operations will result in a safe procedure which includes the possibility of double batching.

It is hoped that on the basis of this information we will be allowed to incorporate this revised pickling procedure into our Manufacturing process.

We will accept collect telephone communications in the interest of expediting and discussion of questions which arise during the consideration of this request.

Very truly yours,


John H. Durant
Business Manager

JHD/jet

LRJ:GFM
Booket No. 70-139

NOV 19 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Durham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

Enclosed is Special Nuclear Material License No.
SNM-185, as amended.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

Enclosure:
SNM-185, as amended

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No.
1. Name	Engelhard Industries, Inc.	SIM-185, as amended
2. Address	D. E. Makepeace Division Pine & Dunham Streets Attleboro, Massachusetts	4. Expiration Date
		September 30, 1962
		5. Docket No.
		70-139
6. Special Nuclear Material	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license	
Uranium enriched in the U-235 isotope.	Three hundred thirty (330) kilograms of U-235 contained in uranium enriched in the U-235 isotope.	
8. Authorized use For the fabrication of reactor fuel elements and related activities using the procedures described in the licensee's application of July 30, 1957, as amended Feb. 5 and Dec. 9, 1958 and Jan. 13 & 30, March 3, April 9 & (2) of 17, May 28(2), June 3, July 31, Aug. 3, Sept. 23, Oct. 8, 14 & 30 (cont'd)		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part		
None		

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

Authorized place of use: The licensee's fuel element processing plant located on Route #152, Plainville, Massachusetts

8. (cont'd) and Nov. 5, 1959.

For the U. S. ATOMIC ENERGY COMMISSION

NOV 19 1959

Date of issuance _____

U. S. GOVERNMENT PRINTING OFFICE : 1956 - O-385853 **J. C. Delaney**
Division of Licensing and Regulation

INCOMING TELEGRAM

0-233

T

U. S. ATOMIC ENERGY COMM.
TWX UNIT

1959 NOV 20 PM 3 39

DOCKET NO. 70-139
File Cy.

AC

WUB096 PD

WUX PLAINVILLE MASS NOV 20 208PME

US ATOMIC ENERGY COMMISSION LICENSE BRANCH, ATTN CHARLES MCCALLUM
REF DOCKET 70-139 OCT 20 AMENDMENT TO SNM 185 INCORPORATES
OUR SEPT 23RD LETTER WHICH ADDS STORAGE OF 300 KG U-235 TO
330 PREVIOUSLY AUTHORIZED SECTION 7 SHOWS TOTAL OF 330 KG BELIEVE
THIS SHOULD READ 630 KG PLEASE CONFIRM THANKS

ENGELHARD INDUSTRIES D E MAKEPEACE DIV J H DURANT

321PME

70-139 20 185 23 300 U-235 330 7 330 630.

INCOMING TELEGRAM

PA. 11/23/59



LRL:OPM
Docket No. 70-139

NOV 18 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

Enclosed is Special Nuclear Material License No.

SNM-185, as amended.

DISTRIBUTION

Very truly yours,

- L. D. Mackay, FIN - OROO, w/encl.
Div. of INS, w/encl. & ltrs dtd
10/8, 29 & 30 & TWX dtd 11/5/59
- D. F. Musser, NMM, w/encl.
- S. R. Gustavson, LRL, w/encl.
- H. Steele, LRL, w/encl.
Doc. Rm., w/encl.
Formal, w/encl.
S/Health, lic. only
- J. C. Delaney, lic. only

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

Enclosures
SNM-185, as amended

- Suppl., w/encl.
- I&R Reading, w/encl.
- LRL Reading, w/encl.
- C. P. McCallum, LRL, w/encl.

OFFICE ▶	LRL	FIN	LRL			
SURNAME ▶	C. P. McCallum	J. C. Delaney	J. C. Delaney			
DATE ▶	11/17/59	11/19/59	11/19/59			

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No.
1. Name	Engelhard Industries, Inc. D. E. Makepeace Division	SMM-185, as amended
2. Address	Pine & Dunham Streets Attleboro, Massachusetts	4. Expiration Date
		September 30, 1962
		5. Docket No.
		70-139
6. Special Nuclear Material	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license	
Uranium enriched in the U-235 isotope.	Three hundred thirty (330) kilograms of U-235 contained in uranium enriched in the U-235 isotope.	
8. Authorized use For the fabrication of reactor fuel elements and related activities using the procedures described in the licensee's application of July 30, 1957, as amended Feb. 5 and Dec. 9, 1958 and Jan. 13 & 30, March 3, April 9 & (2) of 17, May 28(2), June 3, July 31, Aug. 3, Sept. 23, Oct. 8, 14 & 30 (con't)		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part		
None		

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

Authorized place of use: The licensee's fuel element processing plant located on Route #152, Plainville, Massachusetts

8. (con't) and Nov. 5, 1959.

For the U. S. ATOMIC ENERGY COMMISSION

Date of issuance

NOV 19 1959

J. C. Delaney
U. S. GOVERNMENT PRINTING OFFICE: 1956-O-385852
Division of Licensing and Regulation

Cy to INS

DOCKET NO. 70-139

File cy.

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

March 3, 1959

Mr, Lyall Johnson
Chief, Licensing Branch
Division of Civilian Application
United States Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Johnson: Subject: Feasibility report DEM-6

The D. E. Makepeace Division of Engelhard Industries, Inc., hereby submits 5 copies of its feasibility report on the fabrication of 164 (10%) fuel pins for the SRE test program.

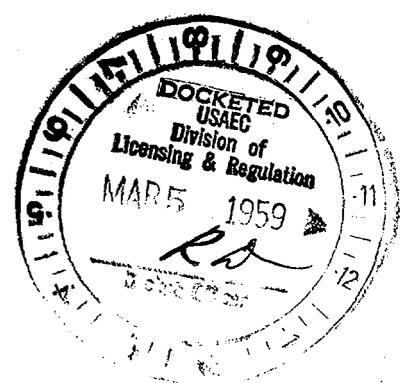
The task of fabrication is the subject of a joint purchase order between Power Reactor Development Corporation and its agents, Commonwealth Associates Inc., and co-contractors Nuclear Metals, Inc., and Engelhard Industries, Inc. The scope of the report transmitted herewith is confined to that portion of the work which will be performed by Makepeace. The Nuclear Metals' feasibility report will be submitted shortly covering the balance of the work of the contract to be performed at N.M.I. plant in Concord, Mass.

The D. E. Makepeace Division operates its fuel fabricating plant under special nuclear license #185 which expires on September 30, 1962.

We would like to call to your attention our letter of January 30th covering the presentation of the feasibility report on the construction of a core and blanket sub-assembly for the Enrico Fermi fast breeder reactor. Several of the references made in the subject report of this letter are contained in the earlier report, since the work involved is nearly identical to that of the core fabrication task.

*clm
2/6*

*Received
3/10/59*



U. S. Atomic Energy Commission

March 3, 1959

In the event that further information and clarification of the supporting documentation is required, please advise us.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Representative

JHD/ms
Enclosures:

Feasibility report DEM-6 - 5 copies
DEM drawing E-1038 - 5 copies
COO, AEC, Lemont, Ill.
NYOO, AEC, 70 Columbus Ave., New York, N. Y.
R. Rateick, PRDC W. C. Arnold, PRDC
A. White, N. M. I. Philip Thompson, N. M. I.
W. F. Mittendorf, D. E. M. G. H. Barney, D. E. M.
C. A. Canham, D. E. M. N. Weiss, D. E. M.
J. M. Young, A. I. M. J. H. Durant, D. E. M.

See Reports 72
" "

J. C. DELANEY
CHIEF, NUCLEAR MATERIALS SECTION
LICENSING BRANCH
DIVISION OF LICENSING AND REGULATION
U. S. ATOMIC ENERGY COMMISSION

PRIORITY

APRIL 1, 1959

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
ATTN: MR. JOHN H. DURANT
BUSINESS REPRESENTATIVE
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS

REFER YOUR TWX OF MARCH 30, 1959 OMA YOUR LICENSE SNM-185 AMENDED THIS
DATE TO AUTHORIZE YOU TO RECEIVE AND STORE SPECIAL NUCLEAR MATERIAL IN
ACCORDANCE WITH THE PROCEDURES DESCRIBED IN YOUR APPLICATION OF JANUARY
13, 1959 PD

CFMcCallum:rh
2:35 p.m.
Rm. No. B-129

90-139
✓

J. C. DELANEY
CHIEF, NUCLEAR MATERIALS SECTION
LICENSING BRANCH
DIVISION OF LICENSING AND REGULATION
U. S. ATOMIC ENERGY COMMISSION

PRIORITY

APRIL 1, 1959

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
ATTN: MR. JOHN H. DURANT
BUSINESS REPRESENTATIVE
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS

REFER YOUR TWX OF MARCH 30, 1959 ON YOUR LICENSE SM-185 AMENDED THIS
DATE TO AUTHORIZE YOU TO RECEIVE AND STORE SPECIAL NUCLEAR MATERIAL IN
ACCORDANCE WITH THE PROCEDURES DESCRIBED IN YOUR APPLICATION OF JANUARY
13, 1959 PD

DISTRIBUTION

D. F. Musser, NMM
J. C. Ryan, FIN, w/cy. ltr. dtd. 3/3/59
Div. of INS, w/cy. ltr. dtd. 3/3/59
& Feasibility report DEM-6, w/ drawing
& TWX dtd. 3/30/59
H. Steele, LRL
S. R. Gustavson, LRL
J. C. Delaney, LRL
Doc. Rm.
Formal
Suppl.
L&R - LRL Readings
C. P. McCallum, LRL

CPMcCallum:rh
2:35 p.m.

Rm. No. B-129

OFFICE ▶	LRL	LRL			
SURNAME ▶	CPMcCallum	J. C. Delaney			
DATE ▶	4/1/59	4/1/59			

C-233

INCOMING TELEGRAM

U S ATOMIC ENERGY COMM.
TWX UNIT

1959 MAR 30 PM 4 39

AC WUJ138 PD

DOCKET NO. 70-139

File C.

WUX PLAINVILLE MASS MAR 30 VIA HAGERSTOWN MD
ATOMIC ENERGY COMMISSION, ATTN CHARLES MCCALLUM
LICENSE BRANCH

UNDER OUR CONTRACT TO PRODUCE CORE SUBASSEMBLIES FOR
ENRICO FERMI REACTOR WE ARE SCHEDULED TO BEGIN APRIL
FIRST THIS IS COVERED IN DEM FEASIBILITY REPORT 5
SUBMITTED JANUARY 30TH REQUEST YOU GRANT APPROVAL ON
SECTION 1 COVERING RECEIVING AND STORAGE REQUEST EARLIER
BY OUR LETTER OF JANUARY 13TH HOPE TO RECEIVE INTERIM
LICENSE BY APRIL 1ST

ENGELHARD INDUSTRIES D E MAKEPEACE DIVN J H DURANT

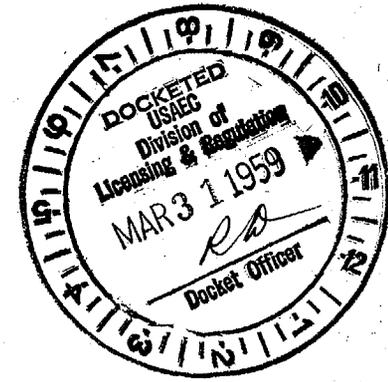
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*We have an order for
File/ep*

INCOMING TELEGRAM

*air to power 3/31/59
RD*



LRL:CFM
Docket No. 70-139

APR 6 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Representative

Gentlemen:

Enclosed is Special Nuclear Material License SEM-185, amended to authorize you to receive and store uranium metal ingots in accordance with procedures described in your January 13, 1959 submission.

In order that we may complete our review of your January 30 and March 3, 1959 applications, you should submit evidence indicating that the limit of 350 grams of U-235 dissolved in the pickling solution would be safe in view of the fact that additional U-235 will be present in the bath as undissolved ingot. Since you state in your application that the method of determining the amount of U-235 in solution will be from the weight loss of the ingot during pickling, you should also inform us of how you will compensate for the fact that part of this loss will be due to metals other than uranium entering into solution. If you will assume that all weight loss is U-235, you should so state.

In regard to the shipping procedures described in your March 3 application, you should provide us with the controls you will use to assure that inadvertent criticality will not be brought about by neutron interaction between your material and other fissionable material which may be encountered during shipment or at points of intermediate storage.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

Enclosure:
SEM-185, as amended

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No.
1. Name	Engelhard Industries, Inc.	SNM-185, as amended
2. Address	D. E. Makoposco Division Pine & Durham Streets Attleboro, Massachusetts	4. Expiration Date
		September 30, 1962
		5. Docket No.
		70-139
6. Special Nuclear Material	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license	
Uranium enriched in the U-235 isotope.	Two hundred fifty (250) kilograms of U-235 contained in uranium enriched in the U-235 isotope.	
8. Authorized use (1) For the manufacture of uranium-aluminum foil using the procedures described in the licensee's application of July 30, 1957, as amended February 5, 1958 but limited by the procedures described in the D. E. Makoposco Feasibility Report DM-2 concurrently submitted; (2) For the receipt (*con'd)		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part		
None		

CONDITIONS

- 10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above. **Authorized place of use: The licensee's fuel element processing plant located on Route 152, Plainville, Massachusetts.**
- 8. **(*con'd) and storage only of uranium metal ingots in accordance with the procedures described in the application dated January 13, 1959.**

For the U. S. ATOMIC ENERGY COMMISSION

Date of issuance **April 1, 1959**

U. S. GOVERNMENT PRINTING OFFICE: 1956-O-385852 **J. S. Delaney**
Division of Licensing and Regulation

LRL:CFM
Docket No. 70-139

APR 6 1959

DISTRIBUTION

D. F. Musser, MMM, w/encl.
J. C. Ryan, FIN, w/encl. (2)
Div. of INS, w/encl., TWX dtd.
4/1 & 3/30 & ltr. dtd. 3/3, w/
Feasibility Report DEM 6
H. Steele, LRL, w/encl.
S. R. Gustavson, LRL, w/encl.
Doc. Rm., w/encl.
Formal, w/encl.
Suppl., w/encl.
L&R - LRL Readings, w/encl.
C. P. McCallum, LRL, w/o encl.

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Representative

Gentlemen:

Enclosed is Special Nuclear Material License SM-185, amended to authorize you to receive and store uranium metal ingots in accordance with procedures described in your January 13, 1959 submission.

In order that we may complete our review of your January 30 and March 3, 1959 applications, you should submit evidence indicating that the limit of 350 grams of U-235 dissolved in the pickling solution would be safe in view of the fact that additional U-235 will be present in the bath as undissolved ingot. Since you state in your application that the method of determining the amount of U-235 in solution will be from the weight loss of the ingot during pickling, you should also inform us of how you will compensate for the fact that part of this loss will be due to metals other than uranium entering into solution. If you will assume that all weight loss is U-235, you should so state.

In regard to the shipping procedures described in your March 3 application, you should provide us with the controls you will use to assure that inadvertent criticality will not be brought about by neutron interaction between your material and other fissionable material which may be encountered during shipment or at points of intermediate storage.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

Enclosures:

	SM-185, as amended	LRM	LRM	FIN
OFFICE ▶		CPMcCallum	J. C. Delaney	CPJ
SURNAME ▶		CPMcCallum	J. C. Delaney	CPJ
DATE ▶		4/3/59	4/6/59	4/6/59

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No.
1. Name	Engelhard Industries, Inc. D. E. Makepeace Division	SML-185, as amended
2. Address	Pine & Dunham Streets Attleboro, Massachusetts	4. Expiration Date
		September 30, 1962
		5. Docket No.
		70-139
6. Special Nuclear Material	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license	
Uranium enriched in the U-235 isotope.	Two hundred fifty (250) kilograms of U-235 contained in uranium enriched in the U-235 isotope.	
8. Authorized use (1)For the manufacture of uranium-aluminum foil using the procedures described in the licensee's application of July 30, 1957, as amended February 5, 1958 but limited by the procedures described in the D. E. Makepeace Feasibility Report DM-2 concurrently submitted;(2)For the receipt(*con'd)		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part		
None		

CONDITIONS

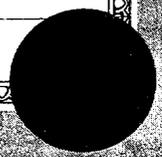
10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above. **Authorized place of use: The licensee's fuel element processing plant located on Route 152, Plainville, Massachusetts.**
8. **(*con'd) and storage only of uranium metal ingots in accordance with the procedures described in the application dated January 13, 1959.**

For the U. S. ATOMIC ENERGY COMMISSION

Date of issuance **April 1, 1959**

U. S. GOVERNMENT PRINTING OFFICE: 1955-O-385852
J. C. Delaney
Division of Licensing and Regulation

Handwritten signatures and date:
4/6/59



DOCKET NO.

70-139

File copy

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

April 9, 1959

U. S. Atomic Energy Commission
Washington, D. C.

Attention: Mr. Charles McCallum, Licensing Branch - Division of
Civilian Application

Subject: Amendment to DEM Feasibility Report #DEM-5.

Reference: DEM Application Dated January 13th. for
Amendment to Licence SNM-185.

Gentlemen,

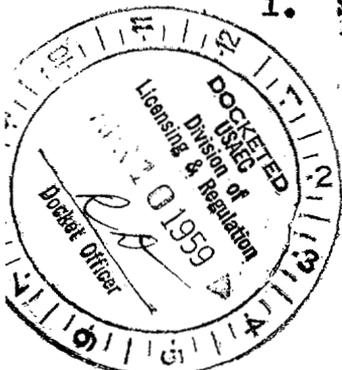
In connection with the above application and subsequent telephone conversations with Mr. Charles McCallum we submit the following amendment to allow us to receive and ship analytical samples of enriched uranium to Nuclear Metals Incorporated, Concord, Mass.

DEM desires authorization to receive and ship 25.6% enriched uranium chips to be used as analytical samples in conjunction with PRDC Project. These chips will be shipped from Davison Chemical Company in glass screw cap bottles each containing approximately 30 grams of chips (7.7 gms. U-235). These samples will be shipped in a metal birdcage of the same construction as those used to ship the enriched derbies. A maximum of 8 samples will be shipped in one birdcage by Davison (62 grams. U-235).

DEM will unpack the birdcage and weigh each bottle of chips on an analytical balance. Samples for analysis are to be sent to Nuclear Metals, Inc., Concord, Mass., via DEM truck. These samples will be shipped in the same glass bottles and wrapped with a protective material to prevent breakage. The glass bottles will be inserted into one gallon covered steel pails (max. 70 grms. U-235/pail) and shipped to NMI.

NMI will return the following types of analytical wastes:

1. Solutions - will be shipped in polyethylene carboys diluted to a concentration not to exceed 2 gms. U-235 per liter.



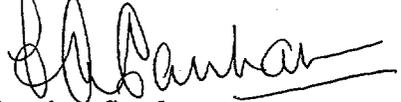
U.S. Atomic Energy Comm.
Mr. Charles McCallum
April 9, 1959
Page 2

2. Oxides - will be packed in glass, screw cap bottles, if the same container type as the original samples (1 gal. pails) max. quantity 70 gm. U-235 per pail.
3. Chips - will be packaged together with the oxides in the same containers (max. 70 gms. U-235 per pail including the content of the oxides).

Interim agreement by telephone or telegram to allow these samples to be shipped would be much appreciated since the time factor is extremely critical in our current program.

Very truly yours,

D. E. MAKEPEACE DIVISION



C. A. Canham
Project Manager

CAC:dc

J. C. DELANEY
 CHIEF, NUCLEAR MATERIALS SECTION
 LICENSING BRANCH
 DIVISION OF LICENSING AND REGULATION
 U. S. ATOMIC ENERGY COMMISSION

COLLECT

APRIL 17, 1959

ENGELHARD INDUSTRIES, INC.
 D. E. MAKEPEACE DIVISION
 ATTN: G. A. GANNAM
 PROJECT MANAGER
 PINE & DURNHAM STREETS
 ATTLEBORO, MASSACHUSETTS

YOUR LICENSE SSM-185 AMENDED THIS DATE TO AUTHORIZE SHIPMENT OF ANALYTICAL
 SAMPLES IN ACCORDANCE WITH THE PROCEDURES DESCRIBED IN YOUR APPLICATIONS OF
 APRIL 9 & 17, 1959 PD

DISTRIBUTION

D. F. Musser, NMM
 J. C. Ryan, FIN (2)
 D. of INS, w/ ltr. dtd. 4/9/59
 H. Steele, LRL
 S. R. Gustavson, LRL
 J. C. Delaney, LRL
 Document Room
 Formal
 ✓ Suppl.
 I&R Reading
 LRL Reading
 C. P. McCallum, LRL

McCallum:rh
 3:20 p.m.

Rm. No. B-129

OFFICE ▶	LRL	LRL	FIN			
SURNAME ▶	C. P. McCallum	J. C. Delaney	M. F. Kellogg			
DATE ▶	4/16/59	4/20/59	4/20/59			

J. C. DELANEY
CHIEF, NUCLEAR MATERIALS SECTION
LICENSING BRANCH
DIVISION OF LICENSING AND REGULATION
U. S. ATOMIC ENERGY COMMISSION

COLLECT

APRIL 17, 1959

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
ATTN: C. A. CANHAM
PROJECT MANAGER
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS

YOUR LICENSE SNM-185 AMENDED THIS DATE TO AUTHORIZE SHIPMENT OF ANALYTICAL
SAMPLES IN ACCORDANCE WITH THE PROCEDURES DESCRIBED IN YOUR APPLICATIONS OF
APRIL 9 & 17, 1959 PD

McCallum:rh
3:20 p.m.
En. No. E-129

INCOMING TELEGRAM

C-233

ATOMIC ENERGY COMM.
DOCKET NO. 70-139

TAC WUE174 PD

WUX PLAINVILLE MASS APR 17 328PME 1959 APR 17

PM 11 26 *File by*

US ATOMIC ENERGY COMMISSION, ATTN CHARLES MCCALLUM

LICENSING BRANCH

REFERENCE DEM LETTER APRIL 9TH AND TELECON 4/17 MCCALLUM

CONCERNING TRANSFER OF SAMPLES BETWEEN DEM AND NMI

ANALYTICAL SAMPLES OF ENRICHED URANIUM WILL BE TRANSPORTED

BETWEEN DEM AND NMI IN ACCORDANCE WITH FOLLOWING

LIMITATIONS: OUTGOING SAMPLES A MAXIMUM OF 70 GRAMS OF

U235 PER ONE GALLON PAIL ALSO MAXIMUM OF 1 PAIL PER

SHIPMENT INCOMING ANALYTICAL RESIDUES A MAXIMUM OF ONE CARBOY OF

SOLUTION AND 1 PAIL OF SOLID MATERIAL TOTAL QUANTITY

COMBINED 350 GRAMS OF U235 PER SHIPMENT

ENTELHARD INDUSTRIES D E MAKEPEACE DIVN

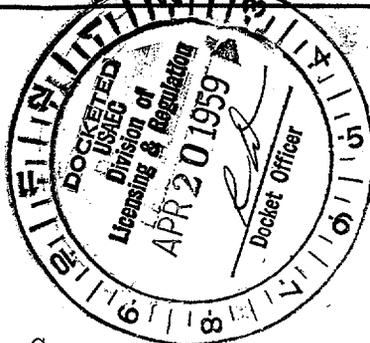
C A CANHAM

1111P

9 4/17 70 U235 1 1 350 U235.

R AC WUE174 TU MED



*File by***ENGELHARD INDUSTRIES, INC.**

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

April 17, 1959

U. S. Atomic Energy Commission
Washington
D. C.ATTN: Mr. J. C. Delaney, Chief
Nuclear Materials Section
Licensing Branch
Division of Licensing and RegulationRE: DEM SNM-185, as amended
Docket No. 70-139

Gentlemen:

Thank you very much for your letter of April 6th and the amended subject license which permits us to receive and store two-hundred fifty (250) kilograms of U-235 contained in enriched material. In response to your questions raised concerning our January 30th and March 3rd applications concerning (a) limitation of metal in pickling solutions and (b) shipping procedures, we are pleased to submit the following:

- a. In regard to the prevention of accumulation of U-235 in excess of three-hundred fifty (350) grams as dissolved material in pickling solutions, please consider the following information as a supplement to our Report DEM-5, Section "0", pages 14 and 15:

With respect to the possible accumulation of unknown quantities of U-235 in our pickling solutions, the following data has been collected:

A survey of 10 depleted uranium rods of the same alloy composition and dimensions as the enriched rods has been undertaken to reveal the extent of uranium loss in the acid solution. The zirconium clad rods were painted on each end with Unichrome #324 stop-off laquer solution to prevent contact of the bare uranium ends with the acid. The rods were pickled for 3-4 hours in 1:1 Hydrochloric acid, removed, rinsed in cold water, and dried with rags. This pickling operation is done to remove all traces of steel jacketing material before swaging. The zirconium cladding is not affected by the acid.

The average weight loss per rod as determined by before and after weighings was 1.0 gram. This corresponds to 0.9 gram uranium and 0.23 gram U-235 at a 25.6% enrichment, if we consider the entire weight loss to be U-Mo. In doing this we neglect the weight which is due to the steel which has been removed and thus provide ourselves with an additional safety factor.

It has been determined that the acid solution will have to be renewed after approximately 100 rods have been pickled. If we use this number of rods as our maximum limiting amount, then the greatest possible quantity of U-235 present in solution before changing will be approximately 23 grams. In order to determine the actual amount present, samples of the solution will be taken and analyzed for total uranium content.

The solution will then be transferred to a 13 gallon polyethylene carboy and stored in our enriched scrap area. At this small concentration of U-235 (approximately 2 grams U-235))liter of solution), storage may be close packed in a plane array.

We expect to pickle a maximum of 1550 rods which will be equivalent to 356 grams U-235 in solution for the entire job. The volume of solution involved will be approximately 200 gallons contained in 16 polyethylene containers. Solutions will be retained for eventual reclamation of U-235.

- b. In regard to the question which has been raised concerning assurance against inadvertent criticality between the subject material and other fissionable material which may be encountered during shipment or at points of intermediate storage, we wish to advise as follows:

Our contract with Power Reactor Development Corporation, Part IV, paragraph "C", states:

"The units shall be delivered to a common carrier (as determined by Owner), packaged (as specified herein), undamaged, clean, and dry."

U. S. Atomic Energy Commission
Mr. J. C. Delaney

- 3 -

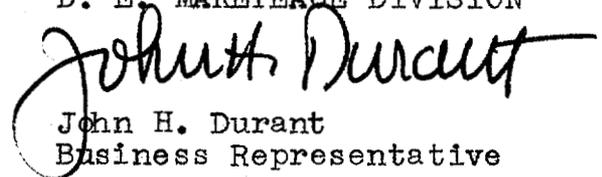
DEM SNM-185 as amend.
Docket No. 70-139
April 17, 1959

It is our interpretation from this statement that such assurance would be the responsibility of our customer in so far as the core loading is concerned.

Please advise us if this information complies with your request.

Very truly yours,

D. E. MAKEPEACE DIVISION


John H. Durant
Business Representative

JHD/bs

LRL:CPM
Docket No. 70-139

MAY 18 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Representative

Gentlemen:

In reference to your letter of April 30, 1959, this is to apprise you that we have received your application of April 17, 1959 and that the request for amendment to your Special Nuclear Material License No. SM-185 contained therein is currently under review.

You will be informed when final action is taken in this regard or if additional information is required.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

LRL:CFM
Docket No. 70-139

MAY 13 1959

MAY 13 1959

MAY 13 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Representative

Gentlemen:

In reference to your letter of April 30, 1959, this is to apprise you that we have received your application of April 17, 1959 and that the request for amendment to your Special Nuclear Material License No. ~~SR-185~~ contained therein is currently under review.

You will be informed when final action is taken in this regard or if additional information is required.

Very truly yours,

J. C. Bolaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

DISTRIBUTION

Div. of INS

Doc. Rm.

Formal

Suppl.

L&R - LRL Readings

C. P. McCallum, LRL

OFFICE ▶	LRL	LRL				
SURNAME ▶	CPMcCallum/rh	JCBolaney				
DATE ▶	5/13/59	5/13/59				

DOCKET NO.

70-139
File 4

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

April 30, 1959

United States Atomic Energy Commission
Licensing Branch
Washington, D. C.

ATTN: Mr. Charles McCallum

Gentlemen:

Please refer to our correspondence under Document 70-1-39 with regards to the amendments to extend our special Nuclear Metals License #185 to 250 kilograms of contained U-235 as enriched metal.

We have replied to the comments which were given in regard to build up of material in pickling tanks as well as comments relating to avoidance of criticality during shipment.

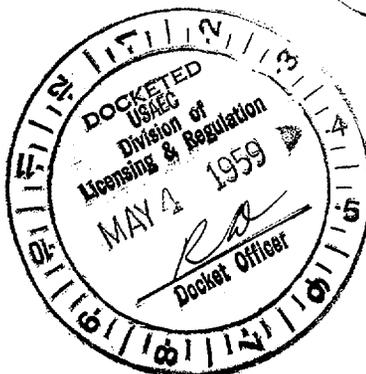
We hope it will soon be possible for us to receive our fully amended license which will permit us to proceed with the manufacturing phases of our core contract with Power Reactor Development Corporation.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Representative

JHD/bs



ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

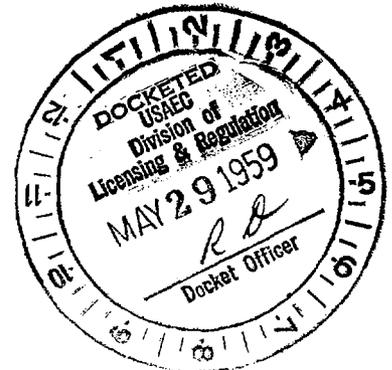
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

May 28, 1959

United States Atomic Energy Commission
Washington 25, D. C.

ATTN: Mr. J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing & Regulation

REF: SNM-185 Docket No. 70-139



Gentlemen:

In reference to the Special Nuclear Materials License transmitted to us by your letter of April 6th in which we are permitted to possess 250 Kg of U-235 contained as enriched material, we wish to request herewith that this amount be further increased.

In order for us to fulfill our contractual obligations with respect to fabrication of Power Reactor Development Corporation core sub-assemblies, we request an amendment to our license which would enable us to possess an additional 80 Kg of U-235 - thereby giving us a total of 330 Kg.

We are prepared to store this increased amount of U-235 in the same type of storage cubicles as described in our January 13th submission. They will be stored in the same vault as the others and will be subject to the same mass and spacing requirements. These additional cubicles are supported by an angle iron framework to maintain a two foot spacing in all directions. They are also built up two feet from the floor level as a precaution against possible flooding.

We are confident that it will be possible for you to grant this case in the light of our January 13th submission in view of the additional vault space which is available for storage of this larger amount of metal, using the same criticality construction.

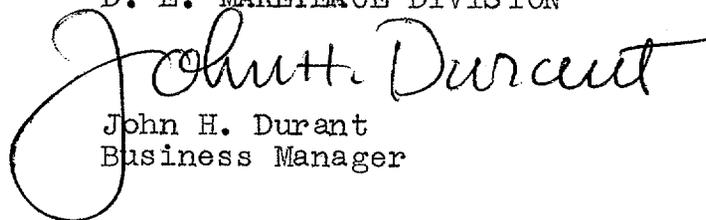
• U. S. AEC
Mr. J. C. Delaney

May 28, 1959
SNM - 185

We are contractually committed to accept enriched derbies on a uniform rate from the convertor and, hence, request that this application be given early consideration.

Very truly yours,

D. E. MAKEPEACE DIVISION

A large, stylized handwritten signature in cursive script that reads "John H. Durant". The signature is written in dark ink and is positioned over the typed name and title.

John H. Durant
Business Manager

JHD/bs
via: Air-Mail

DOCKET NO. 70-139
File by

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

May 28, 1959

United States Atomic Energy Commission
Washington 25, D. C.

ATTN: Mr. Charles McCallum
Division of Licensing & Regulation
Licensing Branch

REF: Pickling Procedure for Enriched Uranium
Feasibility Report DEM - 5



Gentlemen:

In response to your request, we are pleased to submit further information concerning the application of criticality controls to prevent accumulation of excessive quantities of enriched Uranium in pickling tanks. The question has been raised concerning the application of these controls to all of the various pickling operations in the manufacturing processes employed in the production of Enrico Fermi Fast Breeder Reactor fuel pins.

1. Any process calling for the pickling of enriched uranium, whether it be on a developmental or production basis, must be approved by the criticality officer to establish maximum safe quantities.
2. This approval will be granted by taking into consideration the mass, enrichment, shape and any other pertinent data with reference to the particular lot of material which is to be pickled.
3. The criticality officer informs the criticality representative and the production foreman of the maximum amounts which may be pickled for a particular job.
4. Enriched material which is to be pickled is weighed before and after to determine the amount of U-235 in solution.

U. S. AEC
Mr. Charles McCallum

May 28, 1959
Pickling Procedure
for Enriched Uran-
ium

5. A log which records the accumulation of U-235 in the pickle tank is maintained by the criticality representative to determine when a tank must be replaced due to reaching maximum safe quantities.
6. Pickle solutions are placed in polyethylene containers under the direction of the criticality officer or representative for storage prior to disposition.

With reference to report DEM-5, the above procedures will be followed in all pickling operations. Specifically, these would be described in paragraphs C, H, and O on pages 5, 8, and 14 respectively.

At this time, we do not have other enriched license jobs under contract; however, these procedures will apply to any future work.

Please do not hesitate to telephone us concerning any questions relating to this application.

Very truly yours,

D. E. MAKEPEACE DIVISION


John H. Durant
Business Manager

JHD/bs
via: Air-Mail

LRL:CPM
Docket No. 70-139

MAY 29 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. J. H. Durant
Business Representative

Gentlemen:

This refers to your letter of April 17, 1959 which contains information regarding the build-up of U-235 in pickling solutions during your fuel element fabrication activities.

It is noted that the information submitted pertains only to the procedures outlined in Section O, of your feasibility report, DEM-5. In order that we may continue our analysis of the entire process, you should indicate the controls you will use during all procedures involving the use of pickling solutions, (Sections C and H of DEM-5).

This information should be submitted in quadruplicate over the signature of a duly authorized corporate officer.

DISTRIBUTION
Div. of INS
Doc. Rm.
Formal
Suppl.
I&R Reading
LRL Reading
G. P. McCallum, LRL

Very truly yours,

G. P. McCallum, Jr.
Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

OFFICE ▶	LRL					
SURNAME ▶	<i>G. P. McCallum, Jr.</i> G. P. McCallum, Jr.					
DATE ▶	5/29/59					

LBL:GPM
Docket No. 70-139

MAY 29 1959

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. J. H. Durant
Business Representative

Gentlemen:

This refers to your letter of April 17, 1959 which contains information regarding the build-up of U-235 in pickling solutions during your fuel element fabrication activities.

It is noted that the information submitted pertains only to the procedures outlined in Section O, of your feasibility report, DEM-5. In order that we may continue our analysis of the entire process, you should indicate the controls you will use during all procedures involving the use of pickling solutions, (Sections C and H of DEM-5).

This information should be submitted in quadruplicate over the signature of a duly authorized corporate officer.

Very truly yours,

G. P. McCallum, Jr.
Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

June 3, 1959

United States Atomic Energy Commission
Washington 25, D. C.

ATTN: Mr. Charles McCallum
Division of Licensing & Regulation
Licensing Branch

REF: Pickling Procedure for Enriched Uranium
Feasibility Report DEM-5

Gentlemen:

In continuation of the "Pickling Procedure for Enriched Uranium" of our letter dated May 28, 1959, signed by John H. Durant (Business Manager), and in connection with a telephone conversation on June 2nd between Messrs. McCallum, Canham, and Weiss, we submit the following amendments to our Feasibility Report DEM-5:

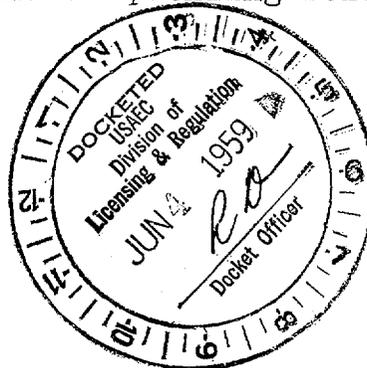
1. Addition to Section C, Page 5:

The weight of U-235 in the pickling solution will be determined as follows:

1. The ingot will be weighed before and after pickling.
2. The weight loss will be considered as U - 10% M.
3. The weight of U-235 will be calculated from the alloy (90% U) and enrichment of the Uranium (25.6%).
4. When the solution approaches 350 grams contained U-235, a sample will be taken for uranium analysis and the solution transferred to a storage container.

2. Additions to Section H, Page 8:

The weight of U-235 in the pickling solution will be determined as follows:



U. S. AEC
Mr. Charles McCallum

June 3, 1959
Feasibility Report
DEM - 5

1. The rod will be weighed before and after pickling.
2. Total weight loss will be considered as U-Mo, neglecting the weight of any copper which is removed.
3. The weight of U-235 will be calculated from the alloy (90% U) and enrichment of the Uranium (25.6%).

Example:

Total weight loss = 100 grams.
Weight U = $100 \times .9$ = 90 grams.
Weight U-235 = $90 \times .256$ = 23.04 grams.

4. When the amount of U-235 in solution approaches 358 grams, a sample will be taken and analyzed for Uranium content, and the solution transferred to a storage container.

3. Addition to Section 0, Page 14:

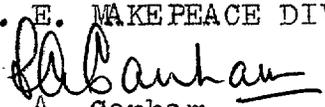
The weight of U-235 in the pickling solution will be determined as follows:

1. Rods will be weighed before and after pickling.
2. Total weight loss will be considered as U-Mo, neglecting the weight of steel which is removed.
3. Weight of U-235 in solution will be calculated from the alloy (90% - U) and enrichment of Uranium (25.6%) as in the previous example.
4. When the calculated amount of U-235 in solution approaches 350 grams, a sample will be taken and analyzed for Uranium content, and the solution will be transferred to a storage container.

We thank you for the promptness with which you dealt with this matter and would appreciate your telephone call should there be any further questions relating to this application which you would want to be clarified.

Very truly yours,

D. E. MAKEPEACE DIVISION


C. A. Canham
Project Manager

CAC/bs

DOCKET

NO.

70-139

File of

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

July 3, 1959

U. S. Atomic Energy Commission
Washington,
D. C.

ATTN: Mr. J. C. Delaney, Chief
Licensing Branch
Div. of Licensing and Regulation

REF: Docket 70-139, Special Nuclear Materials License #185
Request for Amendment to Receive and Store Enriched Uranium

Gentlemen:

In accordance with our recent conversations, we are approaching a point at which we will have on hand the maximum amount of contained U-235 which the vault capacity in our Plainville, Massachusetts Nuclear Materials Plant can accommodate. We have considerable vault storage capacity in the Attleboro, Massachusetts Plant, which was originally provided for maximum security in connection with our normal business of precious metals fabrication. We propose to clear one of these vaults entirely of all precious metals and employ this space exclusively for storage of a maximum of 300 Kgs of contained U-235 as 25.6% enriched metal derivatives. Since the supervision of the vault in the Attleboro Plant would be directly under members of our Plainville Nuclear staff, we propose that this new capacity be provided as an amendment to the current license rather than as a subject of a separate Nuclear Materials License.

The details on the vault, together with criticality considerations and other pertinent information, are given in the attached report.

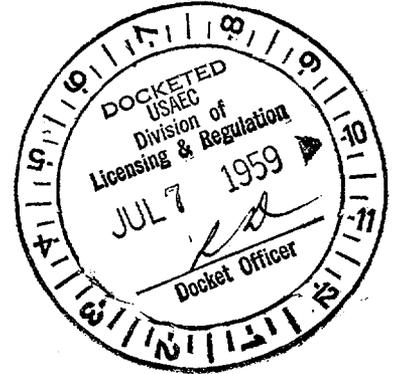
We would greatly appreciate your close attention to this matter since we are, as you may know, committed to a rigid schedule of accepting enriched material from a commercial converter which is supplying this material for use in the Enrico Fermi Fast Breeder Reactor fuel. We will be willing to accept telephone calls concerning this matter in the interests of expediting this application.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Manager

JHD/bs
encls.



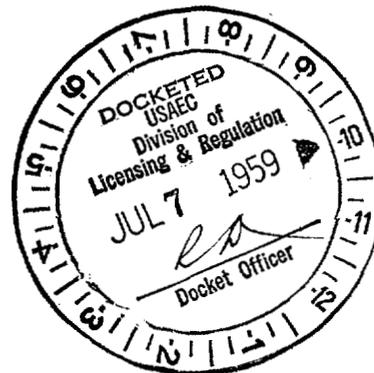
ENGELHARD INDUSTRIES, INC.
D. E. Makepeace DivisionRequest for Amendment to License SNM-185
For
An Additional 330 Kg. Contained U-235
AEC Docket # 70-139

D. E. Makepeace Division requests that its Special Nuclear Materials License be further amended to permit the storage of 25.6% enriched uranium derbies containing 330 Kg. U-235 at its Attleboro Plant located at the corner of Pine and Dunham Streets. This plant is a three story building of wooden construction occupying approximately 150,000 sq. ft. of space. Activities conducted in this building include material preparation and metal fabrication pertaining largely to the precious metals industry.

The vault which would be used for storage of the uranium is located on the ground floor of this building. It is constructed of 12" thick reinforced concrete and has a safe door which is 18" thick by 78" high by 32½" wide. Dimensions of the vault are 12 ft. wide by 20 ft. long by 8 ft. high. The vault is about three feet above regular floor level to minimize the possibility of flooding. No other material would be stored in this vault with the uranium. A qualified person in the Attleboro Plant shall be appointed as a deputy of the criticality officer to assume responsibility in case of an incident. This person will be instructed by the criticality officer as to the proper action to be taken in event of an emergency.

The derbies will be stored in steel birdcages as shown in the attached drawing with a maximum of 6.6 Kg. of U-235 per cage. When the derbies are received at our Plainville Plant in the Davison Chemical Company birdcages. They will be removed, weighed, and placed in DEM birdcages. These cages will then be sealed and transported to the Attleboro Plant via DEM truck facilities under the supervision of a qualified person. They will be unloaded from the truck and transported immediately to the vault for storage. While in Attleboro, the derbies will never be outside of the sealed cages. When necessary to use some of the material at Plainville, it will be transported there via the DEM truck in the sealed birdcages.

An audible gamma radiation monitor (Eberline RM-2) will be installed in the vault for the duration of the time that the enriched uranium will be stored there. In addition, an evacuation procedure will be drawn up and distributed to plant personnel.



ENGELHARD INDUSTRIES, INC.
D. E. Makepeace Division

July 3, 1959
AEC License SNM-185

The criticality officer or his representative will be the only persons authorized to possess the vault combination and will be present at all loading and unloading operations.

Norton M. Weiss

BY: Norton Weiss
Criticality Officer

G. H. Barney
APPROVED: G. H. Barney
Plant Manager

NW/bs

MEMO ROUTE SLIP

Form AEC-99 (Rev. May 14, 1947)

See me about this.
Note and return.

For concurrence
For signature.

For action.
For information.

TO (Name and unit)		INITIALS	REMARKS
<i>Joe Delaney</i>		<i>JLD</i>	<i>BUCKET NO. 70-139</i>
Room A-158		DATE	
TO (Name and unit)		INITIALS	REMARKS
<i>Reba</i>			<i>Please put in Makepeace</i>
		DATE	<i>sample</i>
			<i>JLD</i>
TO (Name and unit)		INITIALS	REMARKS
		DATE	
FROM (Name and unit)		REMARKS	
<i>W. B. Smith</i>		<i>As per conversation</i>	
		<i>for your files</i>	
PHONE NO.	DATE		
	<i>12/12/58</i>		

USE OTHER SIDE FOR ADDITIONAL REMARKS

16-56867-1 U. S. GOVERNMENT PRINTING OFFICE

DOCKET NO. 70-139
Suppl. Only

J. C. DELANEY, CHIEF, NUCLEAR MATERIALS
SECTION, LICENSING BRANCH, DIV. OF
LICENSING & REGULATION, USAEC,
WASHINGTON 25, D.C.

ROUTINE

DECEMBER 15, 1958

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
ATTLEBORO, MASSACHUSETTS

ATTENTION: JOHN DURANT

THIS WILL ACKNOWLEDGE YOUR TELETYPE OF DECEMBER 4, 1958 ADVISING
THAT 5.5 KILOGRAMS U-235 WILL BE USED FOR SRE RATHER THAN FOR
FERMI REACTOR.

DOCKET 70-139

JCDelaney LRL
A-158 x-4593
12-15-58 10:15 a.m.

OFFICE ▶	LRL					
SURNAME ▶	<i>Delaney</i> /cw					
DATE ▶	12-15-58					

DOCKET NO. 70-129
File cy

ENGELHARD INDUSTRIES, INC.

December 9, 1958

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

U. S. Atomic Energy Commission
Washington 25, D. C.

Attention: Mr. Lyall Johnson
Reference: Additional Requirements
Special Nuclear Material
Chapter 1, Part 70

Gentlemen:

This letter is in response to yours of November 11 in which you call attention to Title 10, Code of Federal Regulations of "Special Nuclear Material" which requires that holders of special nuclear material licenses for in excess of 500 grams of contained U-235 install adequate audible alarm systems and establish emergency evacuation procedures. We have placed our order for a criticality monitor from Nuclear Corporation of America which will be finished and installed in approximately 90 days. We are assured by the manufacturer that this equipment, which will cover all areas of our Plainville Nuclear Materials Plant, complies with your requirements.

We are also complying with your requirements on the establishment of evacuation procedures by initiating plans for evacuating all personnel from the plant through suitable exits.

We will appreciate receiving a confirmation of your receipt of this indication of our intention of complying with your regulations.

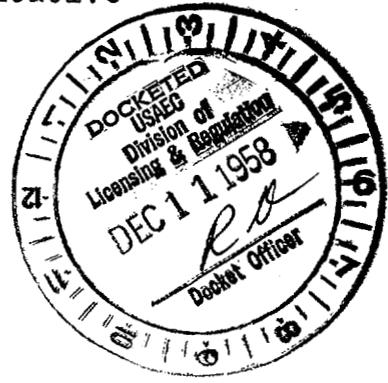
Thank you very much.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Representative

JHD/bq



SECRET NO.

70-139
suppl. only

ENGELHARD INDUSTRIES, INC.

EXECUTIVE OFFICES

113 ASTOR STREET
NEWARK 2, N. J.
BIGELOW 3-0030

December 5, 1958

U. S. Atomic Energy Commission
Washington, D. C.

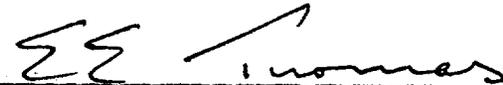
Gentlemen:

Enclosed, herewith, is a new certificate of insurance showing that our Lloyds insurance has been renewed on the same terms and conditions for a further 5-year term beginning, December 1, 1958.

This replaces the certificate which we sent you with our letter of June 3, 1958.

Very truly yours,

ENGELHARD INDUSTRIES, INC.

By 
E. E. Thomas

EET: rpd
Enclosure (1)
cc: Mr. W. F. Mittendorf

TWX INCOMING

NO.

70-139

Suppl. only

Rm A-158

ENGELHARD INDUSTRIES, D E MAKEPEACE DIVISION, ATTLEBORO MASS

1958 DEC 4 AM 11 02

U.S. ATOMIC ENERGY COMM.
TWX UNIT

MR J C DELANEY DEC 4, 1958

U S ATOMIC ENERGY COMMISSION

GERMANTOWN, MD

CONFUSION HAS ARISEN ON USE OF 5.5 KG OF U-235 IN 10 PERCENT ENRICHED AS UF-6 ALLOCATED IN YOUR LETTER OF NOVEMBER 24TH. THIS MATERIAL WILL BE USED TO FABRICATE 164 PROTOTYPE ENRICHED FUEL PINS SODIUM REACTOR EXPERIMENT. USE IS NOT FOR DEVELOPMENT STUDIES ON SECOND CORE OF ENRICCO FERMI FAST BREEDER REACTOR

ENGELHARD INDUSTRIES INC

D E MAKEPEACE DIVISION

JOHN DURANT

END

RECD OK RB TNKS

Pass. 12/15/58

TWX INCOMING

Suppl only

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

January 13, 1959

U. S. Atomic Energy Commission
Washington 25, D. C.

Attention: Mr. J. C. Delaney, Chief, Materials Section Licensing
Branch

Subject: Special Nuclear Materials License SNM-185
Application for Amendment

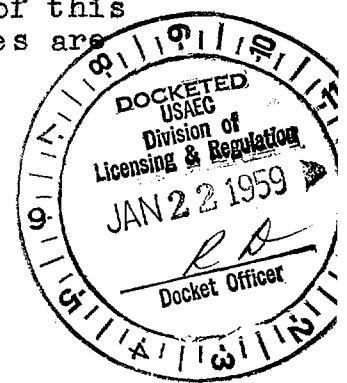
Gentlemen:

D. E. Makepeace Division of Engelhard Industries, Incorporated, hereby applies for an amendment to its Special Nuclear Materials License to provide for the performance of its contract to fabricate a core for the Enrico Fermi Fast Breeder Reactor being constructed by Power Reactor Development Corporation. The performance of the work is being handled jointly by D. E. Makepeace and Nuclear Metals, Incorporated, of Concord, Massachusetts.

The D. E. Makepeace Division present license permits the possession of a maximum of 24 kilograms of U-235 as metal enriched in U-235. This application requests that the quantity be increased by 226 kilograms to a total of 250 kilograms of U-235 contained in uranium enriched in the U-235 isotope.

In compliance with your requirement for a complete description of the D. E. Makepeace Division facility we refer to exhibits submitted with our original SNML application dated February 5, 1958 (Docket 70-139). Further in support of the proposed additional 226 kilograms we submit Section I of the Feasibility report on Power Reactor Development Corporation (DEM 5) which contains a schedule of the receipt of raw material from the converter as well as the anticipated rate of shipment of finished elements. It is recognized that the complete feasibility report must be submitted before the manufacturing process can commence. The completion of the report is underway, but only Section I covering Receipt and Storage of Raw Material is completed and is hence included here to allow time for processing of this application before March 1, 1959, when material deliveries are scheduled to commence.

*Returned
Classified 2-4-59*



It will be noted from the attached table "Accumulation of U-235 at D. E. Makepeace Plainville Facility in Production EFFBR Core" that the maximum amount anticipated to accumulate is 169.4 kilograms of contained U-235. This is calculated from the incoming material and outgoing product schedules on a First In Last Out basis. In order to provide for unforeseen delays the amount of the license extension has been increased approximately 33% to 226 kilograms.

- (A) A 5 month delay would cause an accumulation greater than 226 kilograms. This would be handled by arranging to suspend incoming shipments of raw material. It is felt that the 33% safety factor is therefore reasonable and at the same time adequate.
- (B) The available storage capacity of the vault (described in DEM 5 feasibility report Section I enclosed) is in excess of 300 kilograms of contained U-235 in this enrichment and size of derby. The basis for these calculations is given in classified report LA-2063 Nuclear Safety Guide.

ACCUMULATION OF U-235 AT D.E. MAKEPEACE PLAINVILLE FACILITY
 IN THE PRODUCTION OF ENRICO FERMI FAST BREEDER REACTOR CORE.

<u>Date</u>	<u>Incoming</u> <u>(Kg. U-235)</u>	<u>Outgoing</u> <u>(Kg. U-235)</u>	<u>Balance</u> <u>(Kg. U-235)</u>
3/1/59	28.0		28.0
4/1/59	28.0		56.0
5/1/59	28.6		84.6
6/1/59	39.6	20.8	103.4
7/1/59	45.4	25.4	123.4
8/1/59	45.4	30.4	138.4
9/1/59	45.4	35.4	148.4
10/1/59	44.8	40.6	152.6
11/1/59	44.8	40.6	156.8
12/1/59	44.8	40.6	161.0
1/1/60	44.8	40.6	165.2
2/1/60	44.8	40.6	Max.-- 169.4
3/1/60	39.6	40.6	168.4
4/1/60	39.0	40.6	166.8
5/1/60	58.2.0	40.6	126.2
6/1/60		35.4	90.8
7/1/60		35.4	55.4

307.6

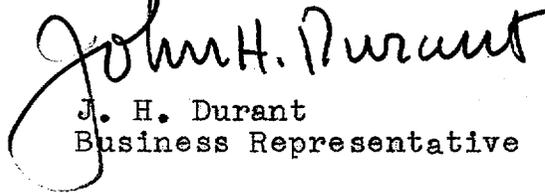
75.4

U. S. Atomic Energy Commission
January 13, 1959
Page 3

We trust that we have included sufficient information to permit you to act on our license amendment. We will be pleased to furnish any additional information you require.

Very truly yours,

D. E. MAKEPEACE DIVISION

A handwritten signature in cursive script that reads "John H. Durant". The signature is written in dark ink and is positioned over the typed name and title.

J. H. Durant
Business Representative

JHD:dc

Enclosure

PRDC FEASIBILITY REPORT DEM-5* Section I - "Receipt and Storage of Raw Material"1. Work to be Performed.

DEM in conjunction with Nuclear Metals, Incorporated, intends to fabricate, test, inspect, and deliver 100 core subassemblies to the Power Reactor Development Corporation, Detroit, Michigan. These are to be used in the Enrico Fermi Fast Breeder Power Reactor.

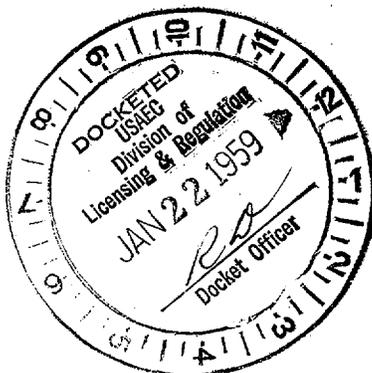
Each core subassembly will consist of a core section composed of pin-type fuel elements and an axial blanket section on either end of the core containing depleted uranium - moly elements. Core sections will contain 144 - 30-1/2" long pins each. These fuel pins will be fabricated from a 10% Mo, 90% U (25.6%enr.) alloy and clad with .004" of zirconium. Each pin will have a zirconium end cap on either end.

In addition to the core subassemblies, DEM proposes to fabricate 300 outer radial blanket subassemblies. These will be fabricated from a 2.75% Mo, 97.25% depleted uranium alloy which will be sodium bonded to stainless steel tubing.

Drawings of the fuel pins and core and blanket subassemblies are attached to facilitate a better understanding. **

(The schedule of shipments to PRDC will be as follows:

<u>Core Subassemblies</u>	<u>Blanket Subassemblies</u>	<u>Date</u>
4	12	6/1/59
5	15	7/1/59
6	18	8/1/59
7	21	9/1/59
8	24	10/1/59
8	24	11/1/59
8	24	12/1/59
8	24	1/1/60
8	24	2/1/60
8	24	3/1/60
8	24	4/1/60
8	24	5/1/60
7	21	6/1/60
7	21	7/1/60



* This feasibility report is being prepared in sections to permit the initiation of license amendment applications which require certain portions of the report before others.

** 6XN-1723 - APDA Radial Blanket Assembly.
6XN-1716 - Core Sub Assembly
5XN-1722 - Fuel Pin Detail

SEE Reports File Affix.

2. Material to be Supplied.

PRDC will supply 4,835 pounds of 25.6 enriched uranium in the form of pickled derbies approximately 5" in diameter and weighing approximately 11 pounds (5kg.) each. The material will be shipped from Davison Chemical Company, Erwin, Tennessee, in birdcages containing 55 lbs. each of uranium (6.4 kg. U-235). A maximum of 390 lbs. (45.4 kg. U-235) will be sent in any one shipment according to the following schedule:

<u>Date</u>	<u>Pounds Uranium</u>	<u>Kg. U-235 (25.6% enr.)</u>
3/1/59	240	28.0
4/1/59	240	28.0
5/1/59	245	28.6
6/1/59	340	39.6
7/1/59	390	45.4
8/1/59	390	45.4
9/1/59	390	45.4
10/1/59	385	44.8
11/1/59	385	44.8
12/1/59	385	44.8
1/1/60	385	44.8
2/1/60	385	44.8
3/1/60	340	39.6
4/1/60	335	39.0

We estimate that the maximum amount of U-235 on hand at any one time at DEM will be approximately 170 kg.

In addition to the enriched material, we will receive 58,540 lbs. depleted uranium from Davison Chemical Company, in the form of 12" dia. derbies cut into 3 slices each. This depleted material will be shipped at a maximum rate of 15,000 lbs. per month and will be used for blanket material.

3. Receiving and Storage.

Birdcages containing enriched uranium derbies will be received at DEM plant, Plainville, Mass. A maximum of 7 birdcages will be received at any one time. Each birdcage will contain 5 derbies weighing 5 kg. each. The maximum amount of U-235 per birdcage will be 6.4 kg. The total amount of U-235 for 7 birdcages will be approximately 45 kg.

Birdcages will be stored in our enriched vault until ready for production. This vault is constructed of 12" thick concrete and is 7' 11" wide x 13' 0" long x 7' 11" high with a Mosler combination safe door.

The birdcages will be unbolted one at a time, and the derbies weighed to verify the accuracy of the shipper's weights. The five derbies will be replaced in the original birdcage if they are to be melted within a month after receipt. This is necessary due to the fact that birdcages must be returned to Davison Chemical Company one month after delivery.

Those derbies which are to remain in storage for a period longer than one month will be placed in metal cubicles in the vault. We anticipate building 10 such cubicles, each capable of holding 5 derbies (6.4 Kg. U-235). If more space is necessary, we can add additional cubicles to hold in excess of 300 Kg. U-235 in a safe configuration at this enrichment level. OK

Cubicles will be of all welded construction using 1/8" steel plate as material. They will be 6-1/2" x 6-1/2" x 6" deep with a hinged door containing a rubber gasket and a latch. The cubicles will be lagged to the concrete wall with two steelbolts each. There will be a 2 foot spacing in all directions between cubicles. OK

Additional cubicles may be added as required by extending the wall sections upward and by building additional center sections in angle iron framework maintaining the same spacing requirements. A drawing (#1033) of 10 such wall cubicles is enclosed for reference.

*see Report #1033
in vault*
In addition to vault storage for enriched derbies, we intend to store enriched scrap (chips, cropped ends, etc.) in the locked caged area surrounding the vault. Containers to be used will be covered steel 1 gal. and 5 gal. containers. They will be stored in vertical and horizontal arrays on unistrut sections with bucket clamps to fasten the containers in position thus assuring the maintenance of spacing requirements. The individual containers and types of scrap will be discussed in the body of the report under fabrication procedure.

Another concrete vault 8 ft. wide x 12'3" long x 8 ft. high on the opposite side of the mfg. area will be used for storage of finished pins prior to assembly. In addition, it will be used to store analytical and metallographic samples.

Other enriched material which may be processed concurrently with the PRDC material will be stored in this vault also. We estimate that this will amount to approximately 15 Kg. U-235 in the form of a 26% U-Al alloy to be used for making tubular fuel elements for the Argonne CP-5 reactor. A copy of our feasibility report DEM-4 will serve to describe this fabrication and storage procedure.

In-process PRDC material will be stored in a locked cage of dimensions 19-1/2 ft. long x 15 ft. wide adjoining the aforementioned vault. A third cage surrounds the vault and at this time is being held in reserve for such storage as may be necessary.

D. E. Makepeace Division - Engelhard Industries, Inc.
Norton Weiss Criticality Officer

Norton M. Weiss

DOCKET NO. 70-139

*File by
Cross. 1/30/59 LK.*

Engelhard Industries, Inc.

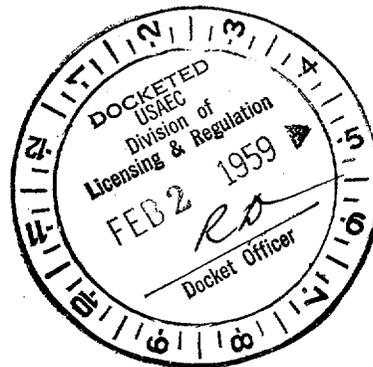
D. E. Makepeace Division

Feasibility Report DEM-4

Contract No. 51-109-38-978

Subcontract No. 1

Subject: Fabrication of Tubular Fuel Elements for
the Argonne Nat. Lab. CP-5 Reactor.



Written by: N. Weiss

September 26, 1958

Table of Contents

1. Proposed Work
2. Material to be Supplied
3. Receiving, Storage, Shipping
4. Fabrication Procedures
5. Accountability Procedures
6. Health - Safety
7. Security
8. General Information

1. Proposed Work:

DEM proposes to fabricate 72 tubular fuel element assemblies for Argonne Nat. Lab., in association with Nuclear Metals, Inc. These fuel elements will be fabricated from a 26% uranium-aluminum alloy and are to be used in the Argonne CP-5 reactor. Enrichment of the uranium will be approx. 93%.

DEM will perform the following operations, to be explained in detail in further sections:

- 1) Casting 26% U-Al billets.
- 2) Cutting and assembly of composite billets.
- 3) Cold drawing of finished clad tubes.
- 4) Assembly of finished elements.
- 5) Quality control.
- 6) Packing and Shipping.

Nuclear Metals will perform all extrusion work both on cast billets and composite billets as well as chemical analysis.

2. Material to be Supplied:

Highly enriched uranium for this job (93% U-235) will be supplied by Argonne Nat. Lab. in the form of pellets or broken buttons. A total of 55 kg. of uranium has been requested. High purity aluminum (99.99%) will be used for alloying material.

3. Receiving, Storage, Shipping:

Uranium will be received in standard Oak Ridge bircages and stored in our enriched materials vault in the original containers. Material for melting will be issued from the vault to production as required, subject only to criticality and health-safety regulations. Scrap and waste materials will be stored in steel containers in the caged area surrounding the vault.

Finished assemblies will be packed in lots of four in 55 gal. drums. The assemblies will be wrapped together with masking tape and centered in the drum with steel wool packed around them. Shipping containers will be supplied by NMI.

4. Fabrication Procedures:

The project engineer will assume full responsibility for the compliance of fabrication procedures with this report. Criticality, accountability, and health-safety representatives will work in conjunction with the project engineer to see that their functions are duly performed.

All movement of material between work and storage areas will be cleared through the criticality officer and moved when permissible by him or his representative.

A. Preparation and Weighing of Melting Charge:

The total charge will consist of 11,760 gm. Al. and 4,110 gm. 93% enriched U (3,820 gm. U-235).

The uranium in the form of broken buttons or pellets will be transferred from the original bircage to a weighing container and transported

to the weighing area where it will be weighed on a Toledo metrogram balance to the nearest .1 gram. Excess uranium will be immediately removed to the vault and placed in its original birdcage.

The Al. rod cut into 1/2" pieces will be weighed on the same balance ^{to} .1 gram.

B. Furnace Charging and Melting:

A Kinney vacuum induction furnace will be used for melting. The crucible to be used is 1" thick graphite, 7" I. D. and 12" high with a 1" diam. graphite stopper rod extending through to the bottom. The charge will fill approximately 2/3 of the crucible volume when melted. The crucible is surrounded by firebrick which in turn is surrounded by copper induction coils.

The aluminum will be charged directly into the crucible and the uranium placed in a vibrating additions chute located directly over the crucible. When the aluminum is molten, the uranium will be added with stirring.

C. Pouring and Casting:

After heating is completed, the stopper rod will be pulled, and the melt bottom poured into a copper, water-cooled, cored mold. The bottom portion of the mold is 6 5/8" in diam., 8 1/2" high

with a graphite core $2 \frac{3}{4}$ " or 3" in diam. depending on which size casting is to be made. A graphite hot top 7" diam. and 2" high will set on top of the mold. The molten metal will be poured through a graphite strainer $7 \frac{1}{8}$ " in diam. and $3 \frac{3}{4}$ " high with six $\frac{5}{8}$ " diam. holes.

After casting, the ingot will be cooled and then removed from the mold. Scum and strainer drippings will be weighed and placed in one gal. steel covered pails. The pails will be stored on racks properly spaced (20" c-c, 12" edge-edge) when not in use. A maximum of 1000 gm. alloy (242 gm. U-235) will be placed in any one pail.

D. Cutting Hot Top and Machining:

The rough casting will be moved to the cutting area where the hot top will be removed by a mechanical hacksaw. This cutting will be done under oil and the chips will be retained in a one gal. steel pail. Chips from various ingots may be combined in one pail, however, a maximum of 1000 gm. alloy (242 gm. U-235) per pail will not be exceeded.

After cutting, both billet and hot top will be weighed for accountability purposes. The hot top

will then be transferred to a 5 gal. pail, sealed, and removed to the storage area surrounding the vault. The weight of the hot top will be approx. 6 kg. of alloy (1.5 kg. U-235). All 5 gal. pails in storage will be spaced mechanically at a 2 ft. center to center distance from other enriched material.

The rough billet will be moved to the machining area where the I. D. will be bored on a lathe under oil. Type 1 ingots will be bored to 2.825" and type 2 ingots to 3.069". Turnings will be placed in one gal. steel pails with covers. A maximum of 1000 gm. alloy will be placed in any one pail at which time it will enter the storage area.

Machined billets will be placed in 5 gal. sealed steel containers. These billets will be sent to Nuclear Metals for Primary Extrusion in lots of two (total 4.6 kg. U-235). Transportation is to be provided by DEM truck and billets will be fastened to assure a 2 ft. center to center separation between enriched units.

E. Assembly and Fabrication of Billets for Final Extrusion:

Extruded billets will return from NMI having the following dimensions:

Type 1 - 4.250" O. D., 2.800" I. D. x approx. 21" long

Type 2 - 4.250" O. D., 3.044" I. D. x approx. 25" long

The billets will be moved to the mechanical hacksaw, cut in half, and both ends cropped.

Saw chips and cropped ends will be retained in one gal. steel pails, a maximum of 1000 gm. alloy in each pail. The cut billets will then be moved to the machining area where they will be machined on a lathe to the following dimensions:

Type 1 - 4.032" O. D., 2.927" I. D. x 0.956" long

Type 2 - 4.093" O. D., 3.167" I. D. x 1.194" long

Approximately eight rings will be cut from each half of the billet. Chips from each ring will be retained individually and analyzed for total uranium content. No more than four rings (350 gm. U-235) will be placed in a one gal. steel pail for in-process storage. Pails will be stored with a 2 ft. center to center spacing in the storage area.

When ready for assembly, a composite billet will be made up as per drawing No. 1022 attached. Components will have been previously cleaned with trichlorethylene, cleaned in a hot solution of Diversey #36 detergent, etched in a dichromate solution, and then washed in water. They will then be vacuum dried, partially assembled and held together by tape. No more than

two composite billet components (320 gm. U-235) will be in any cleaning solution at any one time. A maximum of twelve composite billets (1.9 kg. U-235) will be sent to NMI at any one time for extrusion. Billets will be shipped by DEM truck in sealed metal containers containing four billets each (approx. 625 gm. U-235). Each container will be mechanically secured in the truck to assure a 2 ft. center to center spacing between units.

F. Final Fabrication and Assembly:

Co-extruded clad tubes will be returned from NMI having the following dimensions:

Type 1	- O. D. 2.319"	I. D. 2.152"
Type 2	- O. D. 2.723"	I. D. 2.556"

Each tube will contain two fuel sections and be approx. 60" long. Tubes will be pickled in 50% HNO₃ to clean all surfaces. A maximum of two tubes (300 gm. U-235) will be in the acid at any one time. Since the aluminum cladding completely covers the uranium, no U235 will go into solution. Acid solutions will be stored in polyethylene containers for eventual disposition.

Pickled tubes will be sent to DEM, Pine St. Plant in Attleboro for cold drawing to finish size. Transportation will be via DEM truck under the supervision of the criticality officer. A maximum

of eight tubes (1150 gm. U-235) will be in Attleboro at any one time. Protective clothing will be worn by all personnel involved in fabrication and decontamination procedures will be set up to prevent spread of fixed contamination. Air sampling will be done to determine airborne contamination. Maximum limits for fixed and airborne contamination will be as specified in our health-safety manual previously submitted. Work will be done in the presence of a cleared person at all times.

After drawing, tubes will be transported to the Plainville plant by DEM truck. The tubes will then be radiographed to locate the fuel sections. After these have been located, the tubes will be cut through the Mg-Al sections. The resulting tubes (two from each extrusion) will contain a central U-Al fuel section surrounded by 3/4" sections of Mg-Al. Type 1 tubes will contain approx. 65 gms. U-235 and type 2 tubes approx. 75 gms. U-235.

The tubes will then be cut to final length:

Type 1 - I. D. 2.112", Wall .062", Length--21 13/16"-23 13/16"

Type 2 - I. D. 2.516", Wall .062", Length--21 13/16"-25 13/16"

The cut tubes will be matched so that each set (one type 1 and one type 2) will contain 141.7 ± 2 grams of U-235. Matched tubes will then be lobed three times at each end equally spaced 120° apart. Lobing will be done on a press with a die. Each tube will then be individually ultrasonic tested for cladding thickness.

The inner (type 1) and outer (type 2) tubes will then be spot welded in three places at each end.

The outer tube will be spot welded to an aluminum sheath tube in three places at each end.

Finished tubes and assemblies will be stored in cardboard tube containers until ready for packing.

A maximum of eight tubes or four assemblies (575 gm. U-235) will be stored together separated by two foot distances from other enriched units.

5. Accountability:

Uranium as received will be weighed to verify accuracy of shipper's weights. Weighings will be made on a Toledo metrogram balance to the nearest .1 gram. One sample from each lot of uranium will be sent to M. & C. Nuclear for isotopic analysis.

In-process weighings will be made at the following steps:

1. Weigh scull and strainer drippings to the nearest gram.
2. Weigh billet and hot top after cutting.
3. Weigh billet and turnings after boring I. D.
4. Weigh extruded billets as received from NMI.
5. Weigh billet after cutting and cropping ends.
6. Weigh rings and chips after machining.
7. Weigh composite billet before shipping to NMI.
8. Weigh co-extruded clad tubes upon receipt from NMI.
9. Weigh finished assemblies before shipment.

All weighings will be recorded on material balance cards by the accountability representative. Whenever scrap is generated, the appropriate deductions will be made leaving a

material balance at all times. A master control card will be placed in the vault to control the issue of uranium for melting.

6. Health-Safety:

Health-Safety procedures to be followed will be those outlined in our manual previously submitted. Respirators will be worn at any operation generating vapor or fines. All personnel will be informed about precautions to be observed before beginning operations. All work done at our Attleboro plant will be under the supervision of health-safety representatives.

7. Security:

Security will be under the direction of H. M. Crowther and will conform to procedures as set forth in our manual.

8. General Information:

The following personnel will be concerned with this project:

T. Tarpey	NMI	Project Leader
A. J. Schulte	DEM	Project Manager
N. Weiss	DEM	Criticality, Health-Safety
R. Vogt	DEM	Project Engineer
E. O'Neil	DEM	Accountability

Nuclear Metals will submit a feasibility report describing their portion of the fabrication.

Julia Coy.**ENGELHARD INDUSTRIES, INC.**

January 30, 1959

U. S. Atomic Energy Commission
Washington, D. C.Attention: Mr. Lyall Johnson,
Chief, Licensing Branch - Division of Civilian Application

Subject: Feasibility Report #DEM-5

Gentlemen:

D. E. Makepeace Division (DEM) of Engelhard Industries, Inc., hereby submits 5 copies of its feasibility report on the fabrication of 100 enriched uranium sub-assemblies for The Enrico Fermi Fast Breeder Reactor currently under construction at Lagoona Beach, Michigan by Power Reactor Development Corporation.

The task of fabrication, which also includes the fabrication of depleted uranium axial and longitudinal blanket sub-assemblies, is the subject of a joint contract dated October 31, 1958, between Power Reactor Development Corporation and co-contractors Nuclear Metals, Inc., and Engelhard Industries, Inc. The scope of the report transmitted herewith is confined to that portion of the work which will be performed by DEM. The Nuclear Metals, Inc. (NMI) feasibility report will be submitted shortly and will cover the balance of the work of the contract, to be performed at NMI's plant at Concord, Massachusetts.

We ask that in the meanwhile immediate action be taken to process the enclosed DEM feasibility report since this embraces the majority of the production processes involved in the whole of the contract.

DEM operates its fuel fabricating plant under Special Nuclear Materials License 185 which expires on September 30, 1962. By its amendment application dated January 13, 1959, DEM has requested that the amount of U-235 as metal enriched in U-235 be increased to 250 Kilograms.

Advance copies of Section I of the enclosed report covering Receipt and Storage of Raw Material were submitted at this time.

A complete and independent check of all criticality calculations and requirements involved in this report has been made by our consultant Dr. Stephen F. Malaker. Dr. Malaker is a former consultant to Oak Ridge National Laboratory and currently Professor of Nuclear Engineering at Newark College of Engineering.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

It will be noted the proposed schedule contemplates the commencement of raw material receipts on March 1, 1959. It is requested that the enclosed material may receive early attention. In the event that further information, clarification or supporting documentation is required please advise us.

Very truly yours,

John H. Durant
John H. Durant
Business Representative

JHD:dc

Appendix A - 5 copies of DE. Makepeace Division feasibility report #DEM-5 with 5 copies each of the following enclosures:

- (1) Flow charts for enriched fuel pin fabrication (3)
- (2) Copy of DEM Accountability Manual. *(4 cys. rec'd)*
- (3) Copy of DEM feasibility report DEM-4
- (4) Print #6XN-1723 - Radial blanket assembly (APDA)
6XN-1716 - Core sub-assembly (APDA)
5XN-1722 - Fuel pin detail (APDA)
6XN-1718 - Stainless Steel birdcage *(6 cys. rec'd)*
- (5) Makepeace Prints #1033-1 - Vault cubicles for enriched derby storage.
1033-2 - Shipping and storage containers for enriched ingots.
1033-3 - Shipping container for enriched secondary billets - details.
1033-4 - Shipping container for enriched secondary billets - details.
1033-5 - Storage container for 150 enriched pins.
- (6) Print of Makepeace vacuum annealing fixture for enriched ingots.
- (7) Print of Makepeace vacuum annealing fixture housing for enriched pins.
- (8) Print of Nuclear Metals vacuum annealing fixture housing for enriched pins, #3902.

Appendix B - Nuclear Metals, Inc., feasibility report. (To follow as a submission from Nuclear Metals, Inc.)

*See Reports
FILE*

*See Reports
FILE*

*See Reports
FILE*

U.S. Atomic Energy Comm.

January 30, 1959

Page 3

Distribution:

Chicago Operations Office - AEC - Chicago, Illinois

New York Operations Office - AEC * New York City

Mr. R. Rateick - Power Reactor Development Corporation, Detroit, Michigan

Mr. W.C. Arnold - Power Reactor Development Corporation, Detroit, Michigan

Mr. A. White, Nuclear Metals, Inc., Concord, Massachusetts

Mr. P. Thompson, Nuclear Metals, Inc., Concord, Massachusetts

Mr. W.F. Mittendorf (DEM)

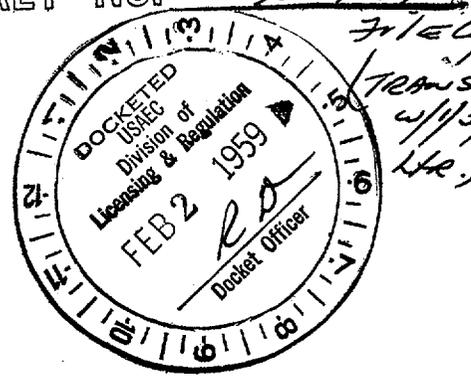
Mr. H. Barney (DEM)

Mr. C.A. Canham (DEM)

Mr. N. Weiss (DEM)

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
ATTLEBORO, MASSACHUSETTS

ACCOUNTABILITY PROCEDURES



1. SS Accountability Representative

1. All matters concerning accountability will be directed to the representative who will be responsible for accounting for receipts, shipments, and inventories of SS materials. The representative will sign all correspondence concerning the accountability of the material. The accountability for SS material is under the jurisdiction of the Comptroller's Office of D. E. Makepeace Division.

2. Receipt of Material

1. Upon receipt of SS material the receiving clerk will inform the Accountability officer and the Criticality officer. They will proceed to unpackage and weigh in the material. The "safe" rules as directed by the Criticality officer will determine the mass to be weighed and the number of lots the receipt should be segregated into.

2. Upon weight verification with the accountability representative, the receiving clerk will assign a lot number, prepare a receiving report, and a metal transfer showing the date, description of material, the weight and any other pertinent information that is available. The forms will then be forwarded to the accountability representative.

3. The Health and Safety officer will run a measurement analysis of the receipted material and inform the receiving clerk of the results so the information can be inserted on all receiving papers. The independent verification will be made by an approved laboratory for analysis of isotopic content of uranium.

4. The accountability representative will compare the material receipt transfer as to weight, description, etc., with the Form AEC-101 pertaining to the receipt. In the event an important shipper-receiver difference occurs, it will be the responsibility of accountability to notify the receiving clerk of this difference. The shipper should be notified immediately of the difference and in the event a satisfactory conclusion cannot be agreed upon, then the Manager of Operations must be notified, and after investigation, will inform us of our procedure. The receiver should therefore preserve intact all material and the papers concerning the receipt of the material until the lot has been approved to issue to production.

5. A control lot card or route card shall be prepared which shall remain with the material and be stored in the vault in the space as designated by the Criticality Officer.

3. Internal Control Records

1. With each lot issue of material, the withdrawal shall be recorded off the control card as issued to the parent batch. A route card shall be prepared showing the weight, description, number of pieces, order number, etc. This route card should stay with the lot of material for the complete production cycle. Scrap should be recorded as a withdrawal on the route card. The weight and number of pieces as shown on the route card should identify the material at all times. A lot should not be broken up and moved to another operation without first consulting the clerk.

Accountability Procedures, continued

2. A Control Record shall be maintained by the clerk showing the date, lot number, and weight of each lot of material. As shipments are made the date, transfer number, and weight of shipment shall be credited to the Control Record.
3. (a) As scrap dispositions are made, the clerk shall record the adjusted weight of the material to the route card.
3. (b) A container for each lot of material shall be supplied. Each batch of scrap shall be weighed and recorded to a tag attached to the scrap container. The tag shall show the lot number assigned to the scrap container and the weight of each batch of scrap. A total of the weights on the tag shall balance to the container weight at all times.
3. (c) When the container is filled to the capacity as directed by the Criticality officer, it should be sealed, weighed and stenciled. The net weight should correspond to the weight as shown on the tag. The tag shall then be credited to the Control Record sheet.
3. (d) A separate Control Sheet shall be set up entitled "Scrap Control". As a barrel is closed and sealed the information of lot number, and gross, tare, and net weights shall be recorded to this control.
3. (e) The perpetual inventory lot control record shall indicate the balance of all material in production plus open scrap containers. The scrap inventory control record shall indicate the balance of scrap as contained in sealed drums.
4. As lots are finished and inspected, the material shall be returned to the vault clerk to be weighed and shipped. A metal transfer charged to Sales shall be prepared and forwarded to the accountability representative for recording and the preparation of the AEC-101 forms. The finished material together with the green copy of the order should be forwarded to the Shipping Department for shipment. The route card shall be balanced and the working loss from the route card shall be posted to the Control Record sheet.
5. The Metal Control office shall control the overall accountability of the material using a double entry system, and using the #101 form as a source document. Material as received shall be recorded to the ledger from the information as contained in the AEC-101 form; and transfers to Sales shall be credited to the ledger.

4. Transfers of SS Materials

SS Shipping form AEC-101 shall be completed and distributed each time SS material is transferred from this station. The code symbol of the shipping and receiving stations shall be shown in the transfer series blanks. Shipping forms of each transfer series shall be consecutively numbered, so that any misplaced shipping form will be indicated by a break in the series of numbers. Details of shipments on specific jobs will be covered in the respective feasibility studies.

1. From (Shipper) our company name and the name of our accountability representative shall be shown in this space.
2. To (Receiver) the name of the receiving accountability station to the attention of their accountability representative shall be shown in this space.

Shippers Data

1. Material transferred shall be described completely in this space. The physical state, such as bars, rods, type of alloy and the name of the SS material contained.
2. In all cases the net weight shall be shown, and whenever feasible, the gross and tare weights.
3. When the material is not 100% SS metal, we shall show in the appropriate column the net SS content of each SS material.
4. If the SS material is uranium depleted or enriched in the U-235 isotope, the weight U-235 shall be shown in the column to the right of the SS net column.
5. Column totals for all weight columns shall be shown immediately following the listing of individual batches.
6. Shippers measurement methods used shall be shown in the proper space. If we weighed the material but determined that the net SS content by estimate rather than by analysis, this information will be shown.

Receivers Data

1. When receiving material, it is our responsibility to determine independently our weights and measurements.
2. Our measurements shall be recorded in the Receivers Data space in the same manner as that outlined for Shippers Data.
3. If we accept a measurement without verification, the comment "shippers SS contents accepted without verification" recorded in the measurement methods space.

Distribution of Copies

Copies 1, 2, 3, 5 and 6 shall be forwarded to the receiver.

Copy 4 to the shippers AEC Operation Office

Copy 7 to the receivers AEC Operation Office

Copy 8 for file

In the event both shipper and receiver are under the same operation office, copies 6, 7 and 8 can be eliminated and use of copy 5 for our file copy is permissible. SS Shippers forms shall be issued the day of shipment and when receiving material the forms should be receipted and transmitted as promptly as possible.

Container number

1. In any shipment consisting of items which we have measured separately the several containers shall be marked with a number or symbol in order that the receiver may identify.
2. A packing slip identifying the material shall accompany each shipment.

5. SS Material Balance Reports

1. Form AEC-577 as supplied by the AEC shall be used.
2. All quantities shall be expressed in metric units.
3. Separate material balance reports shall be prepared for normal uranium; depleted uranium; enriched uranium less than 75 weight percent U-235; enriched greater than 75% U-235; plutonium; thorium; and U-233.
4. An inventory of SS material shall be taken as of the last day of each calendar month, and reported to the A.E.C. on Form AEC-577.
5. The inventory and material balance report shall explain the methods used to determine the various portions of the ending inventory (weight, chemical analysis, etc). Portions of the inventory not measured shall be so described.
6. Receipts and shipments shall be subdivided to show separately different consignors or consignees, grouped by operations offices. However, it is not necessary to list separately different shipments to or receipts from any one accountability station unless the material types or isotopic contents differ significantly.
7. The composition of the ending inventory of the material balance report shall be reported on an attached sheet. The inventory shall be broken down as to alloys, scrap, etc.

A. Line Numbers on the Report and Specific Instructions

1. Enter inventory as of the first day of the month covered by the report. For the year to date section, this figure shall always be the inventory as of July 1.
2. Material procured under regular contractual arrangements with suppliers under the raw materials procurement programs. A sub-schedule shall be attached to the report indicating acquisitions by sources.
3. Materials purchased by the AEC from licensees. A sub-schedule shall be attached indicating the sources.
4. Miscellaneous purchases other than reported on lines 2 and 3.
5. Materials obtained through transmutation of elements.
- 6 & 7. Blank
8. Materials returned to the AEC by licensees, which materials were held by licensees under lease.
9. Blank
10. Receipts from other material balances only (when normal uranium becomes depleted uranium). This transaction would be indicated by entering quantity involved as a receipt into depleted uranium material balance. An entry for the same quantity on line 40 of the normal uranium balance report would follow.

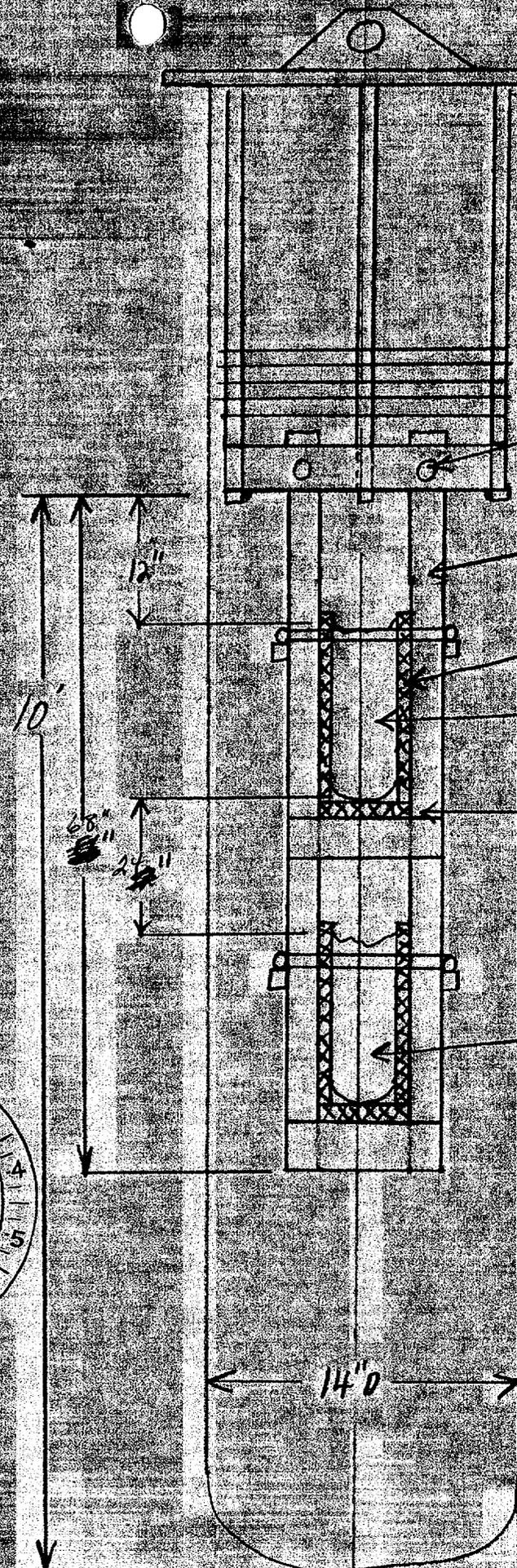
11. Blank
- 12-23. Enter on these lines the total receipts per forms AEC-101 subdivided by operation office totals during the month and year to date. Sub-schedules shall be attached showing the breakdown of the receipt quantities by giving the totals by transfer series composing any entry on these lines.
24. Blank
25. Enter the total of lines 2 through 24.
26. Enter the total of lines 1 and 25.
27. Enter the amount necessary to bring a book inventory into agreement with a physical inventory.
28. Enter approved write-off quantities.
29. Materials by transfers to a licensee in which the licensee obtains title of the material.
30. Enter transfers to other countries wherein title to the materials passes to the other countries.
31. Enter transfers to licensees when title to the material transferred remains with the AEC.
32. Enter transfers to other countries wherein title to the material transferred remains with the AEC.
- 33-34. Blank
35. Blank
36. Blank
37. Enter material consumed as a result of exposure in a reactor.
38. Enter the amount of tritium which is lost through decay each month.
39. Blank
40. Enter removals to other material balances. See line 10.
41. Blank
- 42-53. Enter the total removals per forms AEC-101 subdivided by operations office totals, during the month and year-to-date. A subschedule shall be attached showing the breakdown of the removal quantities by listing the total by transfer series composing any entry on these lines.
54. Blank
55. Total of lines 27 through 54.
56. Enter the physical inventory as of the last day of the month.
57. Enter the total of lines 55 and 56.

6. General

1. If it is impractical to recover or restore SS material to usable form, it may be removed from the accounting records by the following procedure:

- A. The accountability representative will submit to the responsible AEC Office an application describing the material, specifying its SS content and explaining why recovery is not considered feasible. The composition of such waste materials will be determined by chemical assay and/or counting procedures. (Where a continuing operation produces unrecoverable waste, write-off specifications and limits will be established and authorized on a continuing basis, rather than making a separate application and approval on each batch of this waste material).
 - B. A record will be maintained showing the location of unrecoverable materials which have been removed from the material control records. The record will contain the results of quantitative chemical and/or counting method determinations. Disposition arrangements will be periodically determined by instructions from the A.E.C.
2. A. A study of production losses shall be maintained by the physical weighing of material by lots at the different stages of manufacture.
- B. For normal uranium alloys, standards will be established which will indicate the stage or stages of production where losses occur and the maximum amount to expect. These standards will be derived from continued quantitative laboratory checks.
 - C. For enriched uranium, weighing of the metal at each operation for each lot as it goes through production will be standard procedure. Where operational losses can occur, such as in pickling, dust accumulations, etc., control will be maintained not only by weight differential but by quantitative, chemical analytical procedures to insure conformance with criticality controls, and to determine the distribution of the materials in the media indicated above.
 - D. In order to prevent any mix-up between enriched and natural material, separate vaults and several separate work areas have been provided. There are separate work areas for weighing and storing enriched uranium, machinery, pickling, assembly, and inspection. Similar areas are established for processing normal uranium. In other work areas which can be used for either enriched or normal uranium, only one type of material will be in the area at a time. Before the other type is moved in for processing, the first shall be moved out and the area thoroughly cleaned.
 - E. After working hours or when processing stops due to a change over to another normal or enriched lot, the material will be returned to the vault, locked cage surrounding the vault, or smaller locked storage containers located adjacent to manufacturing areas, for storage, as determined by the Criticality Officer and the Accountability Clerk.

DOCKET NO. 70-137
File #
(Trans. info. of
4/30/59)



1/2" Dia Inconel Pins

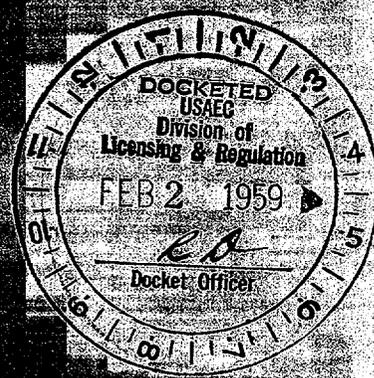
1/2 x 3" INCONEL

1/2" Graphite Skew

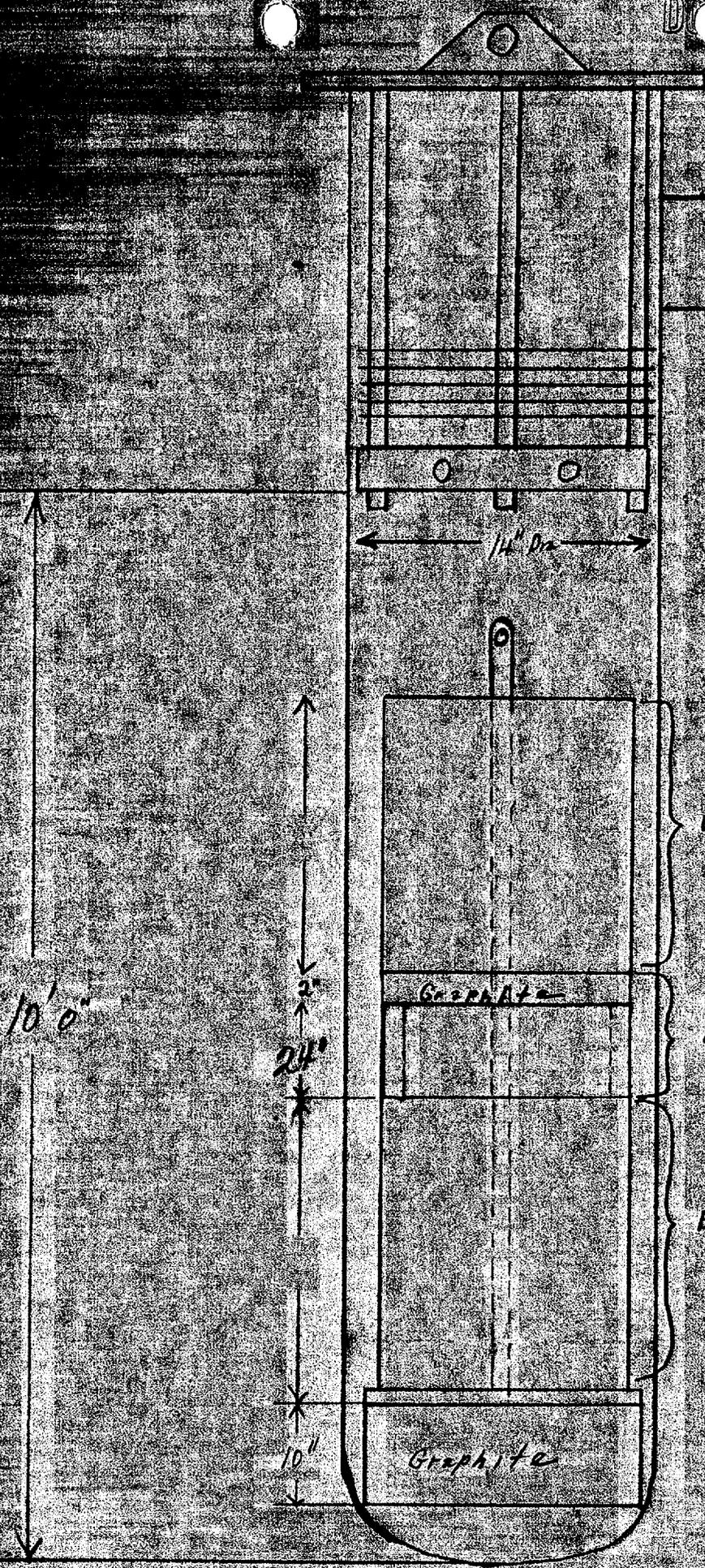
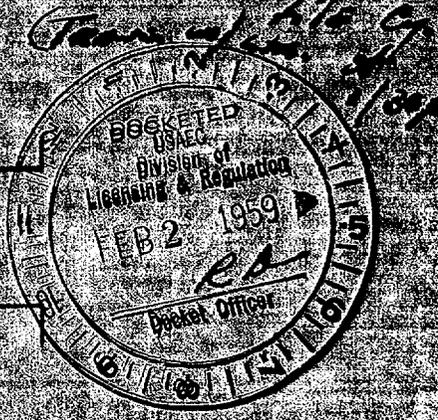
Ingot
4" DIA 16" LONG

1/2" Graphite Plate

Ingot
4" Dia 16" Long



PRDC INGOT
ANNEALING FIXTURE



Enriched Pin Fixture
Per N.M.I.
DWG. 3902

RING
SPACER

Enriched Pin Fixture
Per N.M.I.
DWG. 3902

PRDC PIN
ANNEALING
FIXTURE

DOCKET NO. 70-139

*File G.
Covers w/ 1/13/59*

Engelhard Industries, Inc.
D. E. Makepeace Division
Feasibility Report DEM-4
Contract No. 31-109-38-978
Subcontract No. 1

Subject: Fabrication of Tubular Fuel Elements for
the Argonne Nat. Lab. CP-5 Reactor.

Written by: N. Weiss

September 26, 1958

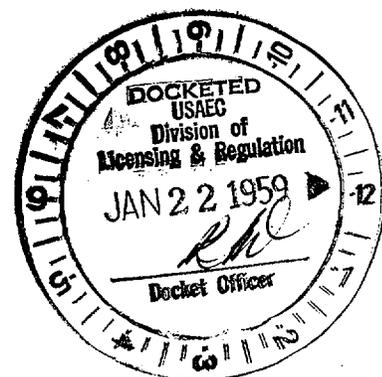


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2. Material to be Supplied
3. Receiving, Storage, Shipping
4. Fabrication Procedures
5. Accountability Procedures
6. Health - Safety
7. Security
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1. Proposed Work:

DEM proposes to fabricate 72 tubular fuel element assemblies for Argonne Nat. Lab., in association with Nuclear Metals, Inc. These fuel elements will be fabricated from a 26% uranium-aluminum alloy and are to be used in the Argonne CP-5 reactor. Enrichment of the uranium will be approx. 93%.

DEM will perform the following operations, to be explained in detail in further sections:

- 1) Casting 26% U-Al billets.
- 2) Cutting and assembly of composite billets.
- 3) Cold drawing of finished clad tubes.
- 4) Assembly of finished elements.
- 5) Quality control.
- 6) Packing and Shipping.

Nuclear Metals will perform all extrusion work both on cast billets and composite billets as well as chemical analysis.

2. Material to be Supplied:

Highly enriched uranium for this job (93% U-235) will be supplied by Argonne Nat. Lab. in the form of pellets or broken buttons. A total of 35 kg. of uranium has been requested. High purity aluminum (99.99%) will be used for alloying material.

3. Receiving, Storage, Shipping:

Uranium will be received in standard Oak Ridge birdcages and stored in our enriched materials vault in the original containers. Material for melting will be issued from the vault to production as required, subject only to criticality and health-safety regulations. Scrap and waste materials will be stored in steel containers in the caged area surrounding the vault.

Finished assemblies will be packed in lots of four in 55 gal. drums. The assemblies will be wrapped together with masking tape and centered in the drum with steel wool packed around them. Shipping containers will be supplied by NMI.

4. Fabrication Procedures:

The project engineer will assume full responsibility for the compliance of fabrication procedures with this report. Criticality, accountability, and health-safety representatives will work in conjunction with the project engineer to see that their functions are duly performed.

All movement of material between work and storage areas will be cleared through the criticality officer and moved when permissible by him or his representative.

A. Preparation and Weighing of Melting Charge:

The total charge will consist of 11,760 gm. Al. and 4,110 gm. 93% enriched U (3,820 gm. U-235).

The uranium in the form of broken buttons or pellets will be transferred from the original birdcage to a weighing container and transported

to the weighing area where it will be weighed on a Toledo metrogram balance to the nearest .1 gram. Excess uranium will be immediately removed to the vault and placed in its original birdcage.

The Al. rod cut into $1/2$ " pieces will be weighed on the same balance ^{to} .1 gram.

B. Furnace Charging and Melting:

A Kinney vacuum induction furnace will be used for melting. The crucible to be used is 1" thick graphite, 7" I. D. and 12" high with a 1" diam. graphite stopper rod extending through to the bottom. The charge will fill approximately $2/3$ of the crucible volume when melted. The crucible is surrounded by firebrick which in turn is surrounded by copper induction coils.

The aluminum will be charged directly into the crucible and the uranium placed in a vibrating additions chute located directly over the crucible. When the aluminum is molten, the uranium will be added with stirring.

C. Pouring and Casting:

After heating is completed, the stopper rod will be pulled, and the melt bottom poured into a copper, water-cooled, cored mold. The bottom portion of the mold is $6 \frac{5}{8}$ " in diam., $8 \frac{1}{2}$ " high

will then be transferred to a 5 gal. pail, sealed, and removed to the storage area surrounding the vault. The weight of the hot top will be approx. 6 kg. of alloy (1.5 kg. U-235). All 5 gal. pails in storage will be spaced mechanically at a 2 ft. center to center distance from other enriched material.

The rough billet will be moved to the machining area where the I. D. will be bored on a lathe under oil. Type 1 ingots will be bored to 2.825" and type 2 ingots to 3.069". Turnings will be placed in one gal. steel pails with covers. A maximum of 1000 gm. alloy will be placed in any one pail at which time it will enter the storage area.

Machined billets will be placed in 5 gal. sealed steel containers. These billets will be sent to Nuclear Metals for Primary Extrusion in lots of two (total 4.6 kg. U-235). Transportation is to be provided by DEM truck and billets will be fastened to assure a 2 ft. center to center separation between enriched units.

E. Assembly and Fabrication of Billets for Final Extrusion:

Extruded billets will return from NMI having the following dimensions:

with a graphite core $2 \frac{3}{4}$ " or 3" in diam. depending on which size casting is to be made. A graphite hot top 7" diam. and 2" high will set on top of the mold. The molten metal will be poured through a graphite strainer $7 \frac{1}{8}$ " in diam. and $3 \frac{1}{4}$ " high with six $\frac{5}{8}$ " diam. holes.

After casting, the ingot will be cooled and then removed from the mold. Scum and strainer drippings will be weighed and placed in one gal. steel covered pails. The pails will be stored on racks properly spaced (20" c-c, 12" edge-edge) when not in use. A maximum of 1000 gms. alloy (242 gm. U-235) will be placed in any one pail.

D. Cutting Hot Top and Machining:

The rough casting will be moved to the cutting area where the hot top will be removed by a mechanical hacksaw. This cutting will be done under oil and the chips will be retained in a one gal. steel pail. Chips from various ingots may be combined in one pail, however, a maximum of 1000 gm. alloy (242 gm. U-235) per pail will not be exceeded.

After cutting, both billet and hot top will be weighed for accountability purposes. The hot top

Type 1 - 4.250" O. D., 2.800" I. D. x approx. 21" long

Type 2 - 4.250" O. D., 3.044" I. D. x approx. 25" long

The billets will be moved to the mechanical hacksaw, cut in half, and both ends cropped.

Saw chips and cropped ends will be retained in one gal. steel pails, a maximum of 1000 gm. alloy in each pail. The cut billets will then be moved to the machining area where they will be machined on a lathe to the following dimensions:

Type 1 - 4.032" O. D., 2.927" I. D. x 0.956" long

Type 2 - 4.093" O. D., 3.167" I. D. x 1.194" long

Approximately eight rings will be cut from each half of the billet. Chips from each ring will be retained individually and analyzed for total uranium content. No more than four rings (350 gm. U-235) will be placed in a one gal. steel pail for in-process storage. Pails will be stored with a 2 ft. center to center spacing in the storage area.

When ready for assembly, a composite billet will be made up as per drawing No. 1022 attached. Components will have been previously cleaned with trichlorethylene, cleaned in a hot solution of Diversey #36 detergent, etched in a dichromate solution, and then washed in water. They will then be vacuum dried, partially assembled and held together by tape. No more than

two composite billet components (320 gm. U-235) will be in any cleaning solution at any one time. A maximum of twelve composite billets (1.9 kg. U-235) will be sent to NMI at any one time for extrusion. Billets will be shipped by DEM truck in sealed metal containers containing four billets each (approx. 625 gm. U-235). Each container will be mechanically secured in the truck to assure a 2 ft. center to center spacing between units.

F. Final Fabrication and Assembly:

Co-extruded clad tubes will be returned from NMI having the following dimensions:

Type 1 - O. D. 2.319" I. D. 2.152"

Type 2 - O. D. 2.725" I. D. 2.556"

Each tube will contain two fuel sections and be approx. 60" long. Tubes will be pickled in 50% HFO₃ to clean all surfaces. A maximum of two tubes (300 gm. U-235) will be in the acid at any one time. Since the aluminum cladding completely covers the uranium, no U235 will go into solution. Acid solutions will be stored in polyethylene containers for eventual disposition.

Pickled tubes will be sent to DEM, Pine St. Plant in Attleboro for cold drawing to finish size. Transportation will be via DEM truck under the supervision of the criticality officer. A maximum

of eight tubes (1180 gr. U-235) will be in Attleboro at any one time. Protective clothing will be worn by all personnel involved in fabrication and decontamination procedures will be set up to prevent spread of fixed contamination. Air sampling will be done to determine airborne contamination. Maximum limits for fixed and airborne contamination will be as specified in our health-safety manual previously submitted. Work will be done in the presence of a cleared person at all times.

After drawing, tubes will be transported to the Plainville plant by DEM truck. The tubes will then be radiographed to locate the fuel sections. After these have been located, the tubes will be cut through the Mg-Al sections. The resulting tubes (two from each extrusion) will contain a central U-Al fuel section surrounded by $3/4$ " sections of Mg-Al. Type 1 tubes will contain approx. 65 gms. U-235 and type 2 tubes approx. 75 gms. U-235.

The tubes will then be cut to final length:

Type 1 - I. D. 2.112", Wall .062", Length--21 $13/16$ "--25 $13/16$ "

Type 2 - I. D. 2.516", Wall .062", Length--21 $13/16$ "--25 $13/16$ "

The cut tubes will be matched so that each set (one type 1 and one type 2) will contain 141.7 \pm 2 grams of U-235. Matched tubes will then be lobed three times at each end equally spaced 120° apart. Lobing will be done on a press with a die. Each tube will then be individually ultrasonic tested for cladding thickness.

The inner (type 1) and outer (type 2) tubes will then be spot welded in three places at each end. The outer tube will be spot welded to an aluminum sheath tube in three places at each end.

Finished tubes and assemblies will be stored in cardboard tube containers until ready for packing. A maximum of eight tubes or four assemblies (575 gm. U-235) will be stored together separated by two foot distances from other enriched units.

5. Accountability:

Uranium as received will be weighed to verify accuracy of shipper's weights. Weighings will be made on a Toledo metrogram balance to the nearest .1 gram. One sample from each lot of uranium will be sent to M. & C. Nuclear for isotopic analysis.

In-process weighings will be made at the following steps:

1. Weigh scull and strainer drippings to the nearest gram.
2. Weigh billet and hot top after cutting.
3. Weigh billet and turnings after boring I. D.
4. Weigh extruded billets as received from NMI.
5. Weigh billet after cutting and cropping ends.
6. Weigh rings and chips after machining.
7. Weigh composite billet before shipping to NMI.
8. Weigh co-extruded clad tubes upon receipt from NMI.
9. Weigh finished assemblies before shipment.

All weighings will be recorded on material balance cards by the accountability representative. Whenever scrap is generated, the appropriate deductions will be made leaving a

material balance at all times. A master control card will be placed in the vault to control the issue of uranium for melting.

6. Health-Safety:

Health-Safety procedures to be followed will be those outlined in our manual previously submitted. Respirators will be worn at any operation generating vapor or fines. All personnel will be informed about precautions to be observed before beginning operations. All work done at our Attleboro plant will be under the supervision of health-safety representatives.

7. Security:

Security will be under the direction of H. M. Crowther and will conform to procedures as set forth in our manual.

8. General Information:

The following personnel will be concerned with this project:

T. Tarpey	NMI	Project Leader
A. J. Schulte	DEM	Project Manager
N. Weiss	DEM	Criticality, Health-Safety
R. Vogt	DEM	Project Engineer
E. O'Neil	DEM	Accountability

Nuclear Metals will submit a feasibility report describing their portion of the fabrication.

NEW

from
the

GROUND

UP

DOCKET NO. 70-139
File by

NUCLEAR REACTOR CORE MATERIALS FABRICATION PLANT

for **SHIP PROPULSION**

for **POWER PRODUCTION**

for **RESEARCH**



The D. E. Makepeace Division of Engelhard Industries Inc., with its background of experience in fabricating precious metal mill products and manufacturing complex devices, for critical chemical, physical and electrical applications has accepted the challenge offered by the requirements of the nuclear reactor core. Makepeace has built a new fuel element fabricating plant — new from the ground up. It has equipped it with the latest designs of specialized equipment; it has staffed it with skilled craftsmen and an experienced engineering and supervisory staff.

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
ATTLEBORO, MASS.

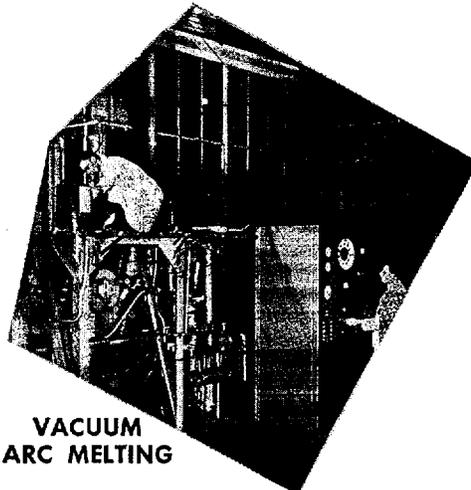
BROAD EXPERIENCE in NUCLEAR APPLICATIONS

Engelhard Industries Inc. is associated with numerous vital aspects of the development of Atomic Energy.

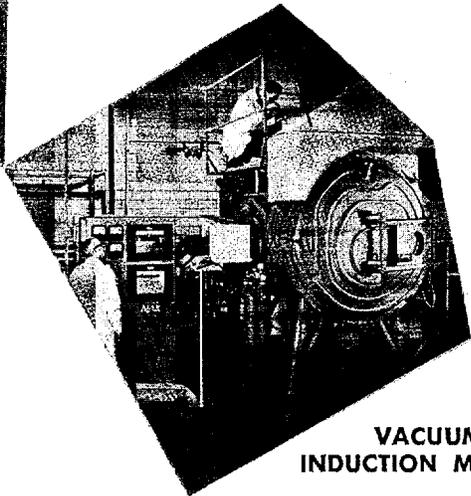
This association began with the company's work on catalysts used in the production of heavy water. The special properties of precious metals have solved many problems for the nuclear energy program. Engelhard Inc. became the first private organization to enter the business of recovering enriched uranium from metallic fabricating scrap, an operation vital to the future economic feasibility of electric power production.

Its most extensive venture is in the fabrication of nuclear fuel elements and core components which is conducted by the D. E. Makepeace Division in Attleboro, Massachusetts. The following illustrates the facilities and outlines the talents of the Plainville Nuclear Materials Plant which is a recognized fabricator of reactor core components and fuel elements.

FORGING

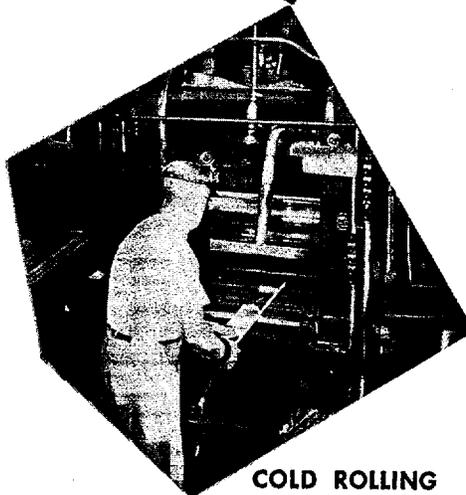


VACUUM
ARC MELTING



VACUUM
INDUCTION MELTING

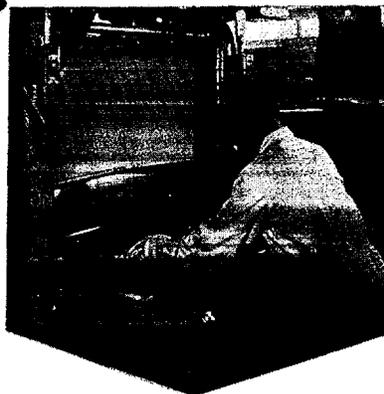
MAKEPEACE
*is experienced in
the handling of nuclear
fuels and poisons in
METALLIC, OXIDE,
or other POWDER FORMS*
ALSO
*STRUCTURAL and
Cladding materials
in
ALUMINUM
STAINLESS STEEL
ZIRCONIUM
and
ZIRCALOY*



COLD ROLLING



ANNEALING



HOT ROLLING

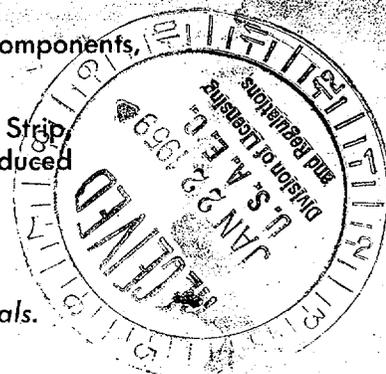
MILL SERVICES BACK NUCLEAR FUEL FABRICATION

In addition to its interests in the fabrication of fuel elements and core components, Makepeace also produces a variety of mill products which include:

Rods and Tubing both round and rectangular, Wire, Sheet, Strip, Foils, and Contour rolled shapes. Many of these can be produced with a variety of metal cladding.

Makepeace has fabricating experience with the following metals.

ALUMINUM	IRON	TANTALUM
BORON	LEAD	THORIUM
CADMIUM	MAGNESIUM	TIN
COLUMBIUM	NICKEL	TITANIUM
COPPER	PALLADIUM	URANIUM
GOLD	PLATINUM	VANADIUM
HAFNIUM	RHODIUM	ZINC
INDIUM	RUTHENIUM	ZIRCONIUM
IRIDIUM	SILVER	



AMERICAN PLATINUM AND SILVER DIVISION

AMERSIL QUARTZ DIVISION
BAKER SETTING DIVISION
BAKER CONTACT DIVISION
BAKER PLATINUM DIVISION
BAKER DENTAL DIVISION
CHEMICAL DIVISION
EAST NEWARK INDUSTRIAL CENTER DIVISION
HANOVIA LAMP DIVISION
HANOVIA LIQUID GOLD DIVISION
IRVINGTON-BAKER REFINING DIVISION
NATIONAL ELECTRIC INSTRUMENT DIVISION
RESEARCH AND DEVELOPMENT DIVISION
H. A. WILSON DIVISION

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
ATTLEBORO, MASSACHUSETTS

APPROVED and LICENSED for NUCLEAR MATERIALS

These specialized facilities which enable Makepeace to handle the nuclear metals are supported by tool room, equipment, engineering, administrative and management of D. E. Makepeace Division in its main plant. Much of the equipment is duplicated in the main plant which permits economical production of components which do not require handling in an exclusion area.

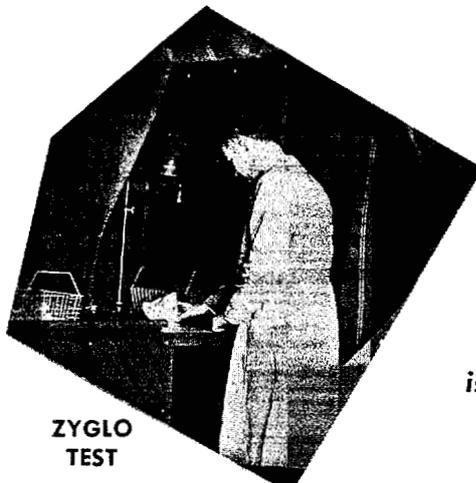
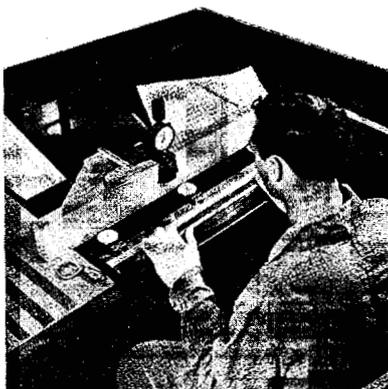
Situated between Boston, Mass. and Providence, Rhode Island within a half a mile of U. S. route 1. Makepeace is easily reached by public or private transportation.

Makepeace facilities are suited for fabrication of fuel elements and components for ship propulsion, research and training or electric power generating application.

Details on equipment and capacities are given in a separate list which is periodically revised to keep pace with new acquisitions and expansion.

A copy of the Makepeace Nuclear Facilities List will be furnished upon request.

**DIMENSIONAL
INSPECTION**



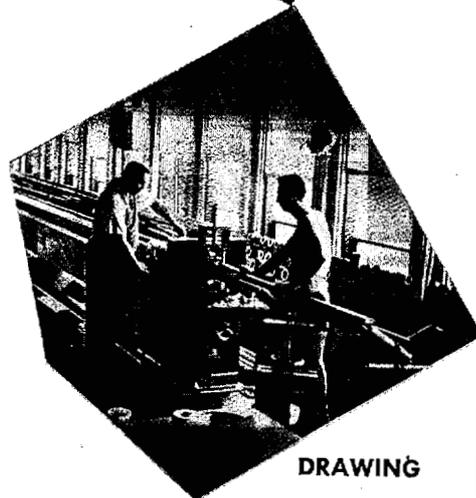
**ZYGLO
TEST**



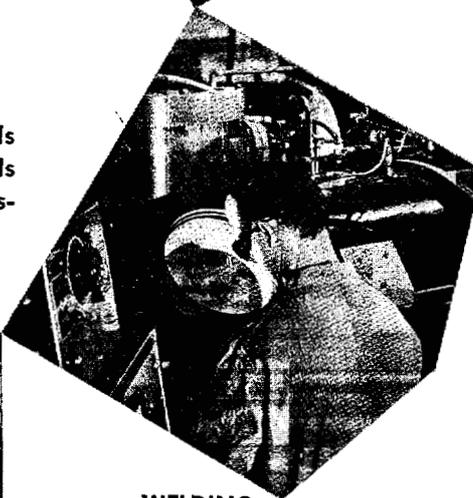
**ULTRASONIC
INSPECTION**

**The MAKEPEACE
PLAINVILLE NUCLEAR
FACILITY**
*is Atomic Energy Commission
approved for*
**ACCOUNTABILITY
CRITICALITY
HEALTH and SAFETY
SECURITY**

It holds A E C Source Materials
and Special Nuclear Materials
Licenses to assure maximum cus-
tomer convenience.



DRAWING



WELDING



MACHINING

DOCKET NO. 70-139
Foley

ENGELHARD INDUSTRIES, INC.

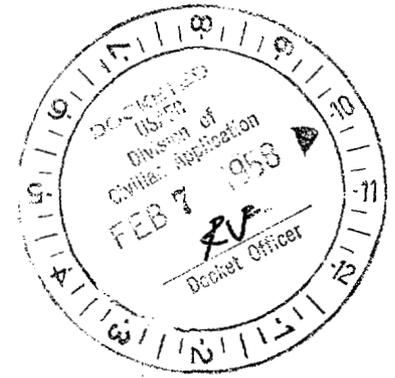
D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

February 5, 1958

United States Atomic Energy Commission
Division of Licensing and Regulation
Germantown, Maryland

Att: J. C. Delaney, Chief Materials Section

Docket 70-139



Gentlemen:

This letter is in response to yours of Aug. 26, 1957, and presents additional information in support of our application for a special Nuclear Materials License.

We wish to change the name of the applicant from D. E. Makepeace Co., Division Union Plate & Wire Co., to D. E. Makepeace Division, Engelhard Industries, Inc. This new designation became effective on January 3, 1958 when our organization, as well as several other companies wholly owned by Engelhard Industries, became divisions. Principal officers of the company are as follows:

- C. W. Engelhard - Chairman of Board
- G. V. Richdale - President
- S. R. Bryant - Senior Vice President
- W. F. Mittendorf - Vice President, Division Manager
- L. Hoguet - Vice President & Treasurer
- K. Huber - Vice President & Secretary
- W. Irving - Vice President, Asst. Division Manager
- J. R. Bell - Asst. Secretary & Division Controller

In specific reference to the questions you have raised, we submit the following.

1. We hereby make application for a license to possess a total of 100 Kilograms of contained uranium 235. The enrichment levels would range from low to highly enriched material - in both pure and alloyed form. The chemical form would be metallic, except as discussed below. The physical form would vary in accordance with established fabrication procedures, including ingot, rods, plates, tubes, bars, foil, and scrap generated therefrom.

2. The operations planned and for which the facility is equipped include melting, casting, forging, rolling, welding, roll bonding, machining, heat treating, chemical and abrasive cleaning, and storage in two separate vaults for special nuclear Material. A separate in-process area is also provided for residence between process steps, as well as a third vault for the storage of normal uranium. Dimensions of enriched vaults are:

1. 8' high x 12' wide x 20' long.
2. 7'11" high x 8' wide x 10' long.

See Exhibit A - "Facilities for Production of Nuclear Fuel Elements and Components."

3. Exhibit B illustrates the exclusion area, showing equipment locations and demarcation areas which separate material inventories are maintained. These are indicated in the plant by high contrast colored lines painted on the floor.

4. (a) The permissible accumulations of materials at the individual inventory points are dictated by the alloy analysis enrichment level, and physical form of a specific project. See Exhibit C for a typical Feasibility Report which specifies these limits.

(b) The "margin of safety" situation again would be dictated by degree of enrichment being processed. In general the facility is regulated to remain subcritical by a factor of at least two to protect against analytical and sampling errors.

5. Criticality calculations are based upon the following references:

- A. LA - 2063
Nuclear Safety Guide
D. Callihan, W. J. Oziroff, H. C. Paxton, C.L.Schuske
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H. C. Paxton, Glen A. Graves
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N. Ketzlach, E. A. Coppinger
- D. K - 643
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E. Critical Masses of Orallo Alloy Assemblies

G. A. Graves, H. C. Paton LASL Nucleonics, 6/57

F. Nuclear Safety in Processing Reactor Fuel Solutions

D. Callihan ORNL Nucleonics, July, 1956

6. An outline of procedures for adherence to specified limits in various process inventories is contained in Exhibit D - "General Program for Criticality Control."

7. Process Points where probability of hazards is greatest from the criticality point of view are:

A. Pickling: At this step material gets into chemical form, occasionally combined with finely divided metallic form. It is planned to predetermine the amount of material removed per unit time, form, solution concentration, and temperature of solution in the solution. This rate would determine the accumulation of isotope in the solution, which would not be permitted to exceed 10 grams per liter. A liquid waste disposal system, which comprises an integral portion of the plant's utilities, is employed to collect insoluble material down to 5 micron particle size. An ion exchange system is provided to collect dissolved materials, which are then suitably packed for return as instructed.

B. Vapor Blasting: A vapor blast cleaning unit also generates small particles in an aqueous suspension. Amount of material removed per pass will be determined to indicate the frequency of removing accumulations below the 10 gram/liter limit.

C. Melting: In the event of a mishap or equipment failure in melting, which could spill molten metal outside the furnace, the total mass in the designated area would be kept subcritical at any given time for the case of a water reflector.

D. General: In other operations presently contemplated the metal will be handled in the solid state. In all such cases the maximum permissible amount in any storage or work area would be subcritical by a factor of 2 under complete flooding conditions.

8. The distinction between normal and abnormal waste disposal is interpreted to mean waste containing no source or special nuclear material, as distinguished from wastes containing such material.

Normal material which may contain pyrophoric metals such as zircaloy are collected in dry particle solid or liquid form,

separated from organic material by burning where feasible, or by settling from liquids. A determination is made concerning the health and safety or accountability requirements. Further refining or concentration may be required, otherwise, wastes deemed harmless are disposed of through normal industrial channels. In cases where health and safety demands it, materials are collected by an approved dangerous waste contractor.

Abnormal waste, after collection by the liquid waste disposal system, the ventilation system, or by vacuum cleaners, is concentrated using appropriate chemical, filtration or incinerating techniques, and packaged for shipment as directed by customers or the AEC.

Monitoring procedures are outlined in Exhibit F - Health & Safety Manual.

9. Avoidance of accidental criticality during shipment to and from our plant on our order is the responsibility of the criticality officer. Bird cage or other packing containers which assure separation would be employed where necessary, and are furnished where necessary in connection with incoming and outgoing shipments of special nuclear material. Assurance of compliance with criticality considerations is assured by providing an informed courier who accompanies shipments where necessary and supervises loading, unloading, and temporary storage in transit. Specific jobs involving shipment of special nuclear material would be the subject of individual applications which would include such information as quantity, isotopic composition by individual containers and the entire shipment, container specification, anticipated safeguards, transportation method and general evaluation of adequacy in the event of accidental fires, floods, or wrecks.

Very truly yours,

D. E. MAKEPEACE DIVISION



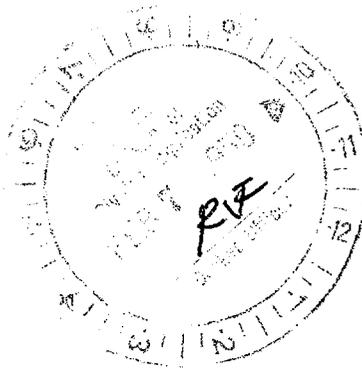
W. F. Mittendorf
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D. E. Makepeace Division, Engelhard Industries, Inc.

Special Nuclear Materials License Application

List of Exhibits

- A. Facilities for Production of Nuclear Fuel Elements and Components
- B. Nuclear Area Floor Plan, Dwg. 2-AE
- C. Typical Feasibility Report (Nuclear Metals)
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No

Very truly yours,

D. E. MAKEPEACE DIVISION

W. F. Mittendorf
W. F. Mittendorf
Vice President and Division
Manager



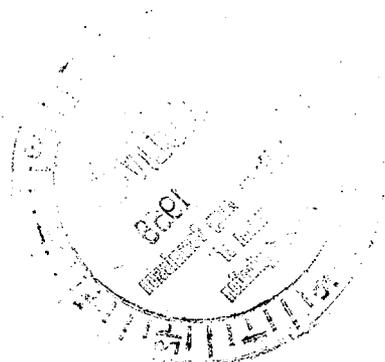
JA

D. E. Makepeace Division, Engelhard Industries, Inc.

Special Nuclear Materials License Application

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DOCKET NO.

70-139-

Working file only

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

February 18, 1958

United States Atomic Energy Commission
Division of Licensing and Regulation
Washington 25, D. C.

Attention: Mr. Lyall Johnson

Gentlemen: Docket 70-139

We are enclosing herewith 3 copies each of Exhibits A to E to our application for a Special Nuclear Materials License.

Also enclosed are two additional copies of our letter of February 5, 1958. Please observe that on page one in the final paragraph on the sixth line from the bottom the word "highly" has been substituted for the word "fully". Would you please make this change on the two copies of this letter in your possession. We have incorporated this change in all other copies of this letter.

*Done
RD
2/28*

Please let us know if there is any further information required in connection with this application.

Very truly yours,

D. E. MAKEPEACE DIV.

W. F. Mittendorf

W. F. Mittendorf
Vice President and Division Manager

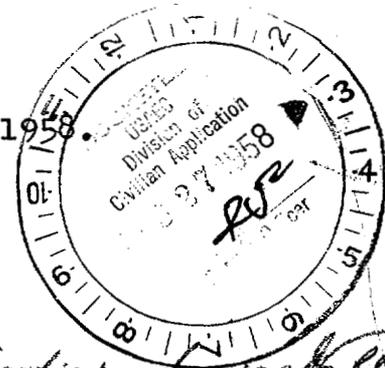
*Subscribed and sworn to before me
this 21st day of February 1958
Henry M. Crockett*

My Commission Expires May 24, 1963

WFM:dac

- Enclosures: 3 Copies Exhibit A - E
- 3 Copies List of Exhibits
- 2 Copies Letter of Feb. 5, 1958 with change incorporated as of Feb. 17, 1958.

Letter Notarized

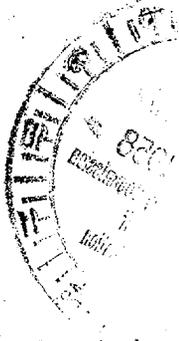


*No cys. of this ltr. to
Pu. Doc. Room because of identification of work*

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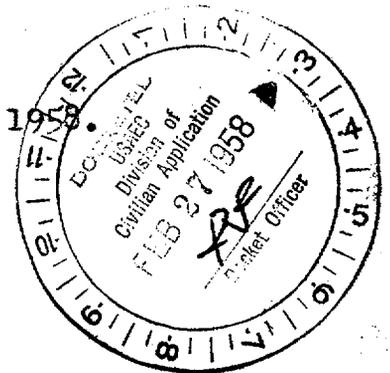
W. F. Mittendorf
Vice President and Division Manager

*Subscribed and sworn to before me
this 21st day of February 1958
Henry M. Knauth
My Commission Expires 10-24-1958*

WFM:dac

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70-139
Suppl file 4

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

February 5, 1958

John Durant

United States Atomic Energy Commission
Division of Licensing and Regulation
Germantown, Maryland

*Class. Review
not required
G.D./B*

Att: J. G. Delaney, Chief Materials Section

Docket 70-139

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Cy sent Jan 3-17-58

*2 cop. of ltr. & 1 cop. ea. of exhibits rec'd - Rec'd 2/10
Mrs. McCallum req. (by phone) 2 addtl. cop. of ltr. &
2 cop. ea. of expo. to complete files. Ltr. should ask us to
let to ...*

D. E. MAKEPEACE COMPANY

FACILITIES FOR PRODUCTION OF NUCLEAR FUEL

ELEMENTS AND COMPONENTS

70-139
Journal file

The D. E. Makepeace Company has recently completed a new plant to produce nuclear fuel elements and components. Long a recognized leader in the supply of precious metal clad products; precision fabricated strip, wire and tubing; electrical contacts; and complex sliding contact and slip ring devices, the company is also a principal producer of precision rolled shapes in steel, high temperature alloys, titanium and zirconium.

A skilled engineering and production staff operating with a comprehensive array of facilities is ideally suited to fabricate difficult materials into precise and complex geometries required by the nuclear field. These talents and equipments are often useful in solving unusually difficult fabrication problems in rare metals and high temperature alloys where special electrical, physical and chemical properties are required.

The following is a summary of facilities in the new Plainville plant.

- MELTING AND CASTING -

Vacuum Induction Melting Furnace

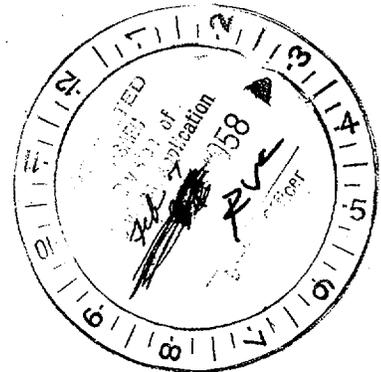
Combination tilt pour and bottom pour
Capacity 300 pounds of uranium or 125 pounds of steel

Vacuum Arc Melting Furnace

Consumable or non-consumable electrode
Capacity 20 to 100 pounds of steel or equivalent weight of other metals

Ingot Surface Conditioner

Vacuum Arc inert gas operation
Capacity 6 inch diameter, 18 inches long



- PRESSES -

Forge Press

300 ton hydraulic

Forge Press

200 ton hydraulic

Punch Press

100 ton

Punch Press

75 ton

- ROLLING AND SLITTING -

Hot Mill

10" x 30"

Hot Mill

14" x 14"

Cold Mill

9" x 12"

Cold Mill

8' x 8"

Cold Mill

3" x 7" four high

Turks Head

Sendzimir Mill

8" width (Attleboro Plant)

- HEATING -

Vacuum Annealing Furnace

Vertical Pit - temperature to 1100°C

Hot Zone 14" diameter, 10 1/2' long

Controlled Atmosphere Annealing Furnace

Gas Fired - dissociated ammonia atmosphere

Conveyor Type - temperature to 2250°F

Hot Zone 6" x 8" x 8' with cooling chamber

Electric Furnace

Hot Zone 18" x 12" x 36" to 1700°F

Electric Furnace

Hot Zone 32" x 24" x 60" to 1700°F

Electric Furnace

Hot Zone 12" x 8" x 12' to 1600°F

Salt Bath

6" x 12" x 5' to 1700°F

- CLEANING AND SURFACE TREATMENT -

Wet Blast Unit

3' x 3' chamber with conveyor loading

Vapor Degreaser

For 6' lengths

Pickling Tanks with Scrubbers

For 6' lengths

Picture Frame Scrub Tanks

Wet Sander

Desiccator

For 6' lengths

Frame Evacuation Unit

and Can Evacuation Manifold

- JOINING -

Vacuum Weld Box

Capacity 6 to 10' continuous welds

Spot Welder

75 KVA

Heliarc Welder

- MACHINE TOOLS -

Squaring Shear

Capacity 3/8" thick, 6' wide

Alligator Shear

Hack Saw

Capacity 14"

Band Saw

Throat 16"

Drill Press

Low Spindle Speed 3/4"

Engine Lathe

14" swing, 5' between centers

7 Milling Machines

Table travel from 24 to 62"

- WEIGHING AND CHARGE PREPARATION -

Double Cone Blender

Magnetic Separator

Balance

10 Kilogram to 0.1 gm.

Ratio Balance

5 Kilogram

Balance

20 Grams to 0.00001 gm.

- QUALITY CONTROL & TEST -

X-ray and Fluoroscope

250 KVA

Zygo Surface Inspection Unit

Ultrasonic Test Unit

Scans lengths to 10' 0.5 to 10 megacycles

Autoclave

5" diameter, 12' deep. 3200 P.S.I. at 750°F

Autoclave

10" diameter, 6' deep. 3200 P.S.I. at 750°F

Helium Sensitive Mass Spectrometer Leak Detector

with portable exhaust system

Wet Chemical Control Laboratory

Metallurgical Control Laboratory

- SPECIAL UTILITIES -

Deionized Water Supply (1 megohm)

Liquid Waste Disposal System

Approved Ventilation System with individual service to all operations capable of generating airborne particles

Vaults

For the storage of fissionable materials

Makepeace is prepared to consider development problems as well as production requirements large or small.

Inquiries should be addressed to:

D. E. Makepeace Company, Dept. D

Attleboro Massachusetts

FACILITIES FOR CONTOUR ROLLING

D. E. Makepeace Company operates a form rolling division in Plainville adjacent to the nuclear materials plant. This activity specializes in the production of shapes of complex cross section to close dimensional tolerances. Form rolling supplants costly machining and produces products having superior physical properties to extrusions. Form rolled metal parts from aluminum to zirconium are used in aviation, electronics, industrial and office machinery and in nuclear applications.

- ROLLING -

<u>2 Cold Mills</u>	4" x 6"
<u>3 Cold Mills</u>	5" x 8"
<u>7 Cold Mills</u>	8" x 10"
<u>2 Cold Mills</u>	12" x 14"
<u>2 Edge Rolling Mills</u>	3" x 5"
<u>Power Turks Head</u>	2" face

- HEATING -

<u>Tempering Furnace</u>	15" x 20" x 9'
<u>Bar Heating Furnace</u>	18" x 24" x 12'

- GRINDING -

<u>4 Edge Sanders</u>	Abrasive Belt 4" width
<u>Flat Sander</u>	Abrasive Belt 10" width
<u>4 Contour Sanders</u>	Abrasive Belt 2" width
<u>3 Sizing Machines</u>	7" disks

- OTHER EQUIPMENT -

<u>Power Straightener</u>	
<u>3 Abrasive Cut Off Machines</u>	10" - 15"
<u>Power Cutoff Shears</u>	
<u>3 Deburring Sanders</u>	
<u>3 Buffers</u>	6" x 1"
<u>Jack Lathe</u>	15"

- SERVICE AND INSPECTION -

Fully Equipped Tool Room

Hardness, Tensile, Surface Finish Test Instruments

Optical Comparator, Linear Measuring Instruments and Gauges.

D. E. MAKEPEACE COMPANY

Attleboro, Mass.

NO. 70-139
File Cy.

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

October 24, 1958

United States Atomic Energy Commission
Germantown, Maryland

Attention: Mr. Lyall Johnson

Gentlemen:

*No claim
rev reg
9/29
10/31/58*

We wish to obtain a stock of highly enriched uranium (90 to 93%) in the amount of 3 to 4 kilograms to enable us to render prompt delivery to customers requiring small quantities for research and development purposes.

Our special nuclear material license No. 185, we believe, covers this type of requirement, and it is the purpose of this letter to request your furnishing us with requisite forms and instructions for us to make application for this allotment.

We have already held discussions with commercial convertors of material. We would wish to receive only your assistance in the allocation and preparation of uranium draft.

Thank you very much.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Representative

JHD/bq

Cy to INS



EXHIBIT C

D. E. MAKEPEACE CO.

POCKET NO. 70-139
Journal

FEASIBILITY REPORT

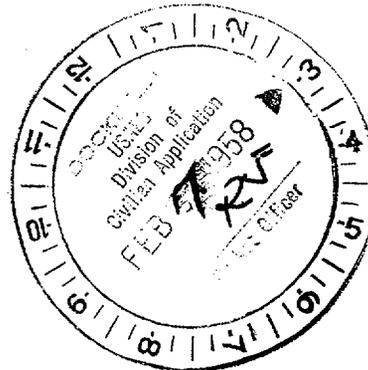
NO. DEM-2

CONTRACT NO.

SUBJECT SPONSOR

Agreement S33 with AVI-NM Ink Contract AT (30-1) (-1565)

Subject: Rolling and Blanking of Partially Enriched
U-A1 For Nuclear Metals Inc.



INDEX

- I. Work To Be Performed.
- II. Material To Be Supplied.
- III. Receiving, Storage, Shipping.
- IV. Fabrication Procedures.
- V. Accountability Procedures.
- VI. Criticality Precautions.
- VII. Health And Safety Procedures.
- VIII. Security.
- IX. General Information.
- X. Drawings.

I. WORK TO BE PERFORMED.

D. E. Makepeace proposes to fabricate Uranium-Aluminum foils not to exceed 7000 units for Nuclear Metals Inc. The foils will be cold rolled to .015" from bars 1/8" thick x 1.150" wide x 36' average length. The cold rolled foil will then be blanked to 0.980" wide x 24" long.

II. MATERIAL TO BE SHIPPED.

D. E. Makepeace will receive from NMI 54 coils of 14 w/o U-Al alloy in the form of bars 1/8" thick x 1.150" wide x 36' average length. Material will be received approximately December 15, 1957 and is scheduled for completion 2 months from date of receipt.

Each coil will have a 2 ft. I. D. and 2 ft. 6" O. D. The weight of each coil will be approximately 3095 gms. of which 433.3 gms. will be 93.15% enriched Uranium equivalent to 403.6 gms. U-235 per coil. Each shipment of 9 coils will contain 3900 gms. Uranium equivalent to 3633 gms. U-235.

III. RECEIVING, STORAGE, AND SHIPPING.

NMI will be responsible for shipping the coils to our Plainville plant. The coils will be shipped in lots of 9 in two shipments per week until completion in 3 weeks time.

In order to assure proper spacing between coils NMI will provide shipping crates designed to criticality standards ("bird cages") as mentioned in their feasibility report No. FR-12. Upon receipt at D. E. Makepeace, the coils will be individually weighed and placed in our vault in the original shipping crate until ready for processing. This vault is used for storage of enriched material only and has dimensions of 13' long x 8' wide with 1 ft. thick concrete walls.

The coils will be placed in the vault in bins according to the specifications of Report LA-2063, "Nuclear Safety Guide" by A. D. Callihan, W. J. Ozoroff, H. C. Paxton, and C. L. Schuske. Spacing between centers of bins will be at least 2 ft. with individual bins containing less than the amount specified in LA-2063 which for this case represents 27.855 total kilograms or 3.900 kg. Uranium, 3.633 kg. U-235.

Receiving, shipping, issue from and return to storage will be conducted in accord with procedures established by criticality, security, accountability, and radiation safety considerations to be explained in more detail in succeeding sections.

The finished foils will be stored and shipped in wooden boxes. Each box will contain the foils resulting from a single coil representing a total weight of 2.325 kg. of which .3255 kg. is Uranium and .303 kg. U-235.

The resulting scrap from a lot of 9 coils (total wt. 6.93 kg., 0.97 kg. U, 0.90 kg. U-235) will be divided in half and placed in water-tight sealed metal containers provided by NMI. The filled containers will be picked up by NMI and replaced with empty ones with each "bird cage" shipment. Containers will be stored in a rack provided by NMI assuring a spacing of at least 2 ft. between them.

IV. FABRICATION PROCEDURES.

In order to aid in following procedures, a floor plan of the plant has been enclosed showing routes to be followed for movement of material and location of work areas.

Each coil will be removed from the "bird cage", weighed, and marked for identification. All marking and weighing will be done in the caged area surrounding the vault (Area VII). No more than one coil will be out of the "bird cage" at any time.

After weighing and marking have been completed, the "bird cage" will be transported to work area I, for cold rolling. Since the time required for rolling is less than the time necessary for annealing, we will adhere to the following rolling cycle for maximum efficiency:

- a. Coil #1 removed from "bird cage" and rolled to .070" on the 8" x 8" Ruesch mill (mill #1).
Approximately 5 passes will be required.
- b. Coil #1 introduced into annealing furnace (#490) at 920° F. for 25 minutes.
- c. Coil #2 removed from "bird cage" and rolled to .070".
- d. Coil #2 transported to furnace area and stored on table near furnace.
- e. Coil #3 removed from "bird cage" and starts rolling.
- e'. Coil #1 leaves furnace and is transported to roll mill area (Area I) for storage on table near mill.
- e". Coil #2 enters annealing furnace.

- f. Coil #3 finished rolling to .070" and is removed to table near furnace.
- g. Coil #1 is rolled on 8" x 8" mill to .035" x 1.275" x 116". (Approx. 8 passes.)
- g'. Coil #2 removed from furnace and stored on table near mill #1.
- g". Coil #3 enters furnace.
- h. Coil #1 finishes second rolling and is stored on table near furnace.
- i. Coil #2 starts second rolling.
- j. Coil #3 leaves furnace and is stored on table near mill #1.
- k. Coil #1 enters furnace for second anneal at 920° F. for 15 - 20 minutes.
- l. Coil #2 finishes second rolling^{and} is stored on table near furnace.
- m. Coil #3 starts second rolling.
- n. Coil #1 removed from furnace, transferred to four high mill (mill #119), and rolled to .015" x 1.337" x 258". (Approx. 12 passes.)
- n'. Coil #2 enters furnace for second anneal.
- n''. Coil #3 finished rolling and is transferred to table near furnace.
- n'''. Coil #4 is removed from "bird cage" and rolled.
- o. Coil #2 leaves furnace and is transferred to table near mill #119.
- o'. Coil #3 enters furnace for second anneal.
- o''. Coil #4 is transferred to table near furnace.
- o'''. Coil #1 moved to shearing area (Area III) and cut to 24½" length (approx. 130 pcs. per coil).
- p. Coil #2 is rolled on mill #119.
- p'. Coil #3 leaves furnace and is removed to table near mill #119.
- p''. Coil #4 enters furnace.
- p'''. Coil #5 is removed from "bird cage" and starts cycle.

This cycling procedure continues at all stations. We note that at no time do we ever have two coils in one process or one location simultaneously.

For purposes of clarification, we will now follow one coil through to completion noting that the criticality hazard has been overcome by the cycling indicated above.

Each coil will be removed from its "bird cage" and rolled to .070" on the 8" x 8" mill (Area I) using approx. 5 passes. Kerosene will be employed as the roll lubricant.

The rolled coil will be placed in the annealing furnace (#490) and heated at 920° F for 25 minutes.

Using approx. 8 passes, the coil will be again rolled on the 8" x 8" mill to an overall thickness of .035" to 1.275" x 116'.

The coil is again transferred to the annealing furnace and heated at 920° F. for 15 - 20 minutes.

Upon completion of the heating cycle, the coil will be rolled on the four high mill (#119) in Area II. to .015" x 1.337" x 258' requiring approx. 12 passes.

After rolling is completed, the coil will be weighed for accountability purposes and then transported to the cutting area (Area III).

The coil will be cut to 24 $\frac{1}{2}$ " lengths on the shears (approx. 130 pieces/coil). The pieces will be stacked together and treated as one lot.

The stacked pieces will then be sent to the level roller (Area IV.) and level rolled individually after which they will be removed to the inspection area (Area V.) for cleaning with trichlorethylene and acetone.

The cleaned foils will be removed to the blanking press (Area VI.) and blanked to size (.980" x 24"). If necessary, the blanked foils will be deburred under a hood with a stone.

The foils will be again removed to the inspection area for final cleaning and inspection.

Finished foils from each coil will be weighed and placed in 1 ft. space frame packing cases for shipping. Shipment to Brookhaven will be the responsibility of NMI.

Trim scrap from a lot of 9 coils will be divided in half and placed in sealed metal containers for return to NMI. Containers will be stored in the vault.

V. ACCOUNTABILITY PROCEDURES.

Fifty-four coils of 14 w/o U-Al alloy will be shipped from NMI to DEM. Each coil will weigh approx. 3095 gms. Each shipment will be weighed by DEM to insure the accuracy of the shipper's weights.

The degree of enrichment is 93.15% U-235. It is understood that NMI will accept the original analysis of U and U-235. DEM will accept the U-235 analysis as represented by NMI. No operation is being performed at DEM that will affect the alloy analysis. Analytical samples amounting to approx. 128 gms. will be cut from the trim scrap and sent to NMI for analysis.

Accountability will be under the supervision of E. N. O'Neill. All weighings will be recorded on stock control cards. At the end of each day, a material balance report will be submitted to the accountability representative.

The scale to be used for weighing is a Fairbanks-Morse. Weights will be recorded to the nearest 0.1 gm. Weighings will be performed according to the following procedure:

1. Weigh upon receipt of material at DEM.
(Approx. wt/coil 3095 gms.)
2. Weigh before cutting.
(Approx. wt./coil 3095 gms.)
3. Weigh foils and trim after cleaning and deburring.
(Approx. wt./foils 2525 gms.)
(Approx. wt./trim 770 gms.)
4. Weigh scrap from each lot of 9 coils.
(Approx. wt. scrap 6930 gms.)

Material Balance:

We expect to receive a total of 167,148.40 gms. of U-Al alloy bars containing 23,400.78 gms. of enriched Uranium, enrichment 93.15% U-235. At the end of our operations, estimated results will be as follows:

	<u>Alloy (gms.)</u>	<u>U (gms.)</u>	<u>U-235 (gms.)</u>
U-Al Foils, 14% U	125,539.24	17,575.50	16,371.58
Scrap, Trim, etc.	<u>41,609.16</u>	<u>5,825.28</u>	<u>5,426.25</u>
Total	167,148.40	23,400.78	21,797.83

VI. CRITICALITY PRECAUTIONS.

A. Personnel:

Criticality control will be under the supervision of N. Weiss in the processing and storage areas. He will work under the direction of Dr. S. S. Friedland, a reactor physicist, supplied by Nuclear Corp. of America with whom we have a consulting contract.

B. Criticality Criteria:

The criticality criteria for safe quantities for handling of the material has been obtained from Report LA-2063. We have assumed the worst possible cases of completely dissolving and surrounding the metal in water and have verified that the quantity of enriched Uranium is at least a factor of two less than a critical mass. In all cases, we are maintaining a geometry to reduce the ratio of Hydrogen to Uranium concentration in case of a flooding accident.

C. Receiving and Storage:

One "bird cage" four ft. square and four ft. high will be received from NMI at any one time and stored in the vault. Each "bird cage" will contain 9 coils of 14 w/c U-Al alloy, enrichment 93.15%. Total weight of Uranium in each "bird cage" will be approx. 3.9 kg. equivalent to 3.633 kg. U-235.

Coils will be positioned 10 7/8" from the edges of the "bird cage" with a 5" spacing between each coil. Coil dimensions are 1/8" thick x 1.150" wide x 36' average length. A total of six "bird cages" will be received from NMI, individual shipments being made 2 per week until completion (6 shipments).

A table of weights and dimensions is included for reference:

<u>Material</u>	<u>Dimensions</u>	<u>Total Mass (Kg.)</u>	<u>Mass U (Kg.)</u>	<u>Mass U-2</u>
Coil As Arrived	1/8" x 1.150" x 36'	3.095	.433	.403
Finished Foil	.015" x .980" x 24"	.017	.0023	.0022
Stack of 130 Foil.	1.95" x .980" x 24"	2.325	.325	.303
Scrap Per Coil		0.77	.107	.100
Scrap Per "Bird Cage"		6.93	.963	.900

D. Movement of Material:

When ready for processing, the crated coils will be transported one at a time from the vault to the work station under the supervision of the criticality officer. Movements of material from one work station to another will be controlled by the criticality officer at all times. No material will be allowed to move until permission has been granted and direct supervision obtained.

We will have only one "bird cage" of coils in process at any time. Only one coil will be in process at any work station at any time.

A table will be placed at each work station to hold any coil which is waiting for processing.

Before processing, each coil will be removed from the "bird cage", marked for identification, and weighed individually in the caged area surrounding the vault. Each coil will be returned to the "bird cage" after marking and weighing.

The "bird cage" will then be transported to the 8" x 8" Ruesch Mill area (Area I.) as shown on the floor plan. At no time during manufacturing operations does the "bird cage" leave this area except to return to the vault for storage.

One coil will be removed from the "bird cage" and rolled to .070" requiring approx. 5 passes. After rolling has been completed, the coil will be moved to the electric furnace (#490) for annealing at 920° F. for 25 minutes.

While coil #1 is being annealed, a second coil is removed from the "bird cage" and rolled to .070". In the event that the rolling of coil #2 is completed before the annealing of coil #1, coil #2 will be transported to the furnace area and stored outside the furnace on a work table until coil #1 has been annealed. Coil #2 will then be put in the furnace while coil #1 will be transported back to the 8" x 8" mill area for further rolling. If a third coil has already been started through the mill, coil #1 will be placed on a work table near the mill until such time as coil #3 finishes rolling. At this time coil #1 undergoes a second rolling to .035" after coil #3 has been transported to the table in the furnace area.

As previously mentioned under fabrication procedures, this cycling is set up in order to prevent the possibility of two coils being in process at the same work area at the same time.

Coil #1, having been rolled to .035", is transported to the furnace for its second anneal at the first opportunity in the course of its cycle. Reference may be made to section IV for a detailed description of the cycling procedure.

After its second anneal (15-20 min. at 920° F.), coil #1 is removed to the four high mill (#119) for final rolling to .015". This will require approx. 12 passes after which the coil is moved to the shearing area where it is cut to 24½" lengths on the squaring shear. There will be approx. 130 pieces cut from any one coil, having a total weight of 2.99 kg. of which .419 kg. is Uranium and .390 kg. U-235. The pieces cut from a single coil will be stacked together and treated as one lot.

Each lot of sheared pieces will be sent to the level roll area to be flattened. After level rolling, individual lots will be transferred to the inspection area for cleaning. Pieces will be cleaned with trichlorethylene and acetone.

The cleaned pieces will be transported to the blanking press area. They will be blanked to a size of .980" x 24" generating a trim scrap in the process.

Trim scrap generated by the blanking operation will be placed compactly in sealed metal containers for return to NMI. Approx. .77 kg. of scrap will be generated from each coil (.107 kg. U, .100 kg. U-235). The ends of the trim scrap from the first lot of foils will be cut and reserved for analytical samples to be sent to NMI (approx. 128 gms.).

The blanked foils will be deburred if necessary. This operation will be done under a hood with a stone. Adequate precautions will be taken to prevent inhalation of dust generated by deburring operations.

A final cleaning will be given to the foils with acetone in the inspection zone. The finished foils from one coil will then be packed in a wooden box having a 1 ft. clearance on all sides of the foils. A piece of paper will be placed between each foil to prevent marring. The total weight of foils per box will be 2.325 kg., equivalent to .325 kg. Uranium, .303 kg. U-235. Boxes will be stored in our vault with 2 ft. spacing for shipment to Brookhaven which is the responsibility of NMI.

Trim scrap from each lot of 9 coils will be divided in half and placed in sealed, water tight, metal containers to be provided by NMI. These containers will be stored in a cart "bird cage" also to be provided by NMI which will maintain a separation of at least 2 ft. between containers. The cart "bird cage" will be stored in the vault. The capacity of the containers is approx. 1 gal. They are 7" high, 7½" in diameter at the top and 6½" in diameter at the bottom. Each container has 8 lugs for sealing with a rubber gasket.

Filled containers (approx. .45 kg. U-235) will be exchanged for empty ones with each shipment of a new "bird cage" by NMI.

VII. HEALTH - SAFETY PROCEDURES.

Health and Safety procedures will be under the direction of Mr. Ray A. Blackler, and will conform to the requirements of the AEC for safe operation. Overall supervision for the health and safety program will be handled by the health physicists of the Nuclear Corp. of America. A copy of our Health and Safety Manual is enclosed describing in detail the procedures to be followed.

VIII. SECURITY.

The technical operations of this project are unclassified. DEM will adhere to standard security measures designed for the handling and storage of enriched Uranium. Security will be under the direction of Mr. H. C. Crowther. A copy of our Security Manual is enclosed.

IX. GENERAL INFORMATION.

It is understood that financial responsibility to the AEC for the material remains with NMI.

The following DEM personnel will be concerned with this project.

Mr. Haskell Barney	--	Manager Nuclear Products
Mr. A. J. Schulte	--	Chief Engineer
Mr. Ray Blackler	--	Health - Physics Officer
Mr. N. M. Weiss	--	Criticality Officer
Mr. A. Hebert	--	Group Leader

The following NMI personnel are associated with this project.

Mr. I. B. Roll	--	Project Engineer
Mr. Paul Lowenstein	--	
Mr. J. P. Thompson	--	Contractual Officer
Mr. Andrew Cotreau	--	Accountability Officer.

GENERAL PROGRAM FOR CRITICALITY CONTROL1. Criticality Officer:

The control of criticality hazards shall be the responsibility of a Criticality Officer. His function will be to advise engineering and production personnel on all matters pertaining to criticality hazards, to control the flow of fissionable materials to and from storage vaults and areas and from one processing area to the next, and to establish safe designs for storage in vaults and other areas. In addition, he will establish safety rules and police the effective following of such rules.

It will be the Criticality Officer's responsibility to establish Criteria of safety with respect to mass, volume, density, degree of enrichment, conformation and juxtaposition of fissionable materials. The safety rules will be based on fully flooded and reflected conditions. Wherever possible "always safe" systems with respect to dimensions and mass will be employed. Whenever the "always safe" criteria is not practical or economical, a factor of safety of at least three will be applied to volume and/or mass parameters. Every process lot defined as a "subcritical mass" will be separated from other similar process lots by a minimum distance of two feet of air.

The Criticality Officer will work under the direction of a reactor physicist supplied by Nuclear Corporation of America with whom we have a consulting contract. It will be the responsibility of the Criticality Officer to prepare a feasibility report on each proposed job involving the processing of enriched uranium, making use of the consulting services of NCA when required.

2. Storage of Materials:

In order to prevent interaction between enriched and natural material, separate vaults and separate work zones have been provided. The vaults, constructed of twelve inch reinforced concrete, are separated by a distance of ninety feet. The vault for the enriched uranium has inside dimensions of 8' x 10' x 8' high. The vault for normal uranium is 8' x 13' x 8' high. Enriched uranium will be stored in "bird cages" in the vault, when received. Racks in the vault will provide additional storage space on the walls, on two foot centers, for pipes containing completed and partially completed fuel assemblies.

There have been established separate work zones for weighing and storing enriched uranium, machining, pickling, assembly, and inspection. Similar areas have been established for processing only normal uranium. In work zones which will be used for both enriched and normal uranium, only one type of material will be in the zone at a time. Before the other type of material is moved in for processing, the first shall be moved out and the zone thoroughly cleaned.



3. The Building:

The manufacturing facility of the D. E. Makepeace Company in which fissionable material will be received, stored, processed, and shipped is of complete fire proof construction consisting of tile inner faced concrete blocks, concrete slab roof, steel girder construction, and concrete floor. No overhead sprinklers will be in the area to cause accidental flooding. Floor drains are provided approximately every twenty feet, the flow from which goes into holding tanks located outside the building housing the storing and manufacturing areas.

4. Receipt of Fissionable Material:

Upon receipt of fissionable material into the D. E. Makepeace Co., plant, the material will be received into a locked cage surrounding the enriched uranium vault. Each parcel will be placed in storage racks in the cage so constructed that any two parcels will not be located except other as determined by the Criticality Officer. Parcels will be unpacked and weighed under the joint supervision of the Criticality Officer and Accounting Supervisor. The contents will be separated into lots safe for vault storage and for zone processing and recorded as to weight on a lot control card. Each lot will then be stored in bottles or compartments of non-poisonous construction in the vault in a safe condition as heretofore described, together with the lot card containing the weight and full description of the item. Each succeeding lot will be handled and stored in a similar manner and with full consideration being given by the Criticality Officer to the mass and dimensions of the material previously placed into the vault.

5. Movements Within The Plant:

When material is released to manufacturing for processing, it will be removed from the vault by the Criticality Officer and checked out as to weight by the Accountability Supervisor. The material will be personally delivered to the initial work zone by the Criticality Officer and thereafter moved from one zone to another only by him. All working personnel will be instructed and policed to make sure that they do not themselves move materials from their zone to another.

6. Accountability:

Close coordination will be maintained between the Criticality Officer and the Accounting Supervisor, to keep lot records of weights and working losses during each major processing step and to maintain control of all material released, at all times.

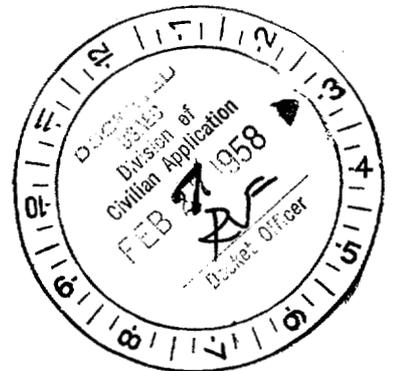
7. In-Process Storage:

Material in process will be returned to the vault, locked cage surrounding the vault, or smaller locked storage containers located adjacent to manufacturing zones for storage as determined by the Criticality Officer after working hours or when processing stops due to a change over to another normal or enriched lot.

EXHIBIT E

70-139
Journal

HEALTH AND SAFETY MANUAL



HEALTH AND SAFETY MANUAL

1. Purpose: DEM Co. is required to conform to the requirements of the U. S. Atomic Energy Commission for safe operation of the nuclear facility. This manual is prepared as a guide to all features of personnel and plant safety.
2. General Description of Plant: The DEM Co., Nuclear Division new plant is located on Route 152 near Plainville, Mass. In this facility it is planned to process both natural and enriched uranium and uranium alloys as well as zirconium and other metals associated with the Atomic Energy Industry.

Among the operations will be:

- a. Vacuum, induction and arc melting.
- b. Hot and cold rolling.
- c. Hot bonding by rolling.
- d. Forging.
- e. Vacuum annealing.
- f. Machining.
- g. High pressure corrosion testing.
- h. Vacuum and atmosphere welding.
- i. X-raying.
- j. Special inspection procedures.

The process area comprises 25,000 sq. feet of space in a building having a hardened cement floor, tile walls, concrete slab roof with transite ceiling. The building has locker and change rooms as well as showers for personnel. A waste system is provided as well as a ventilation and dust control arrangement.

3. Supervision: The health and safety program is under the direction of Mr. Ray A. Blackler, a qualified analytical chemist, who has background in metallurgy and accounting. Mr. Blackler has supervised the DEM Co. health and safety program for the year of operation restricted to normal uranium operations.
4. Medical Examinations And Badge Control: Upon hiring, new employees for the Nuclear Department will be required to have urine analyses and blood tests. Urine analyses will then be taken at three month intervals and blood tests at six month intervals.

Film badges will be worn by all employees and visitors entering the nuclear facility. A film badge service will be maintained by an outside service company who will provide permanent record facilities in this field.

Complete medical history of each employee will be maintained in accordance with the requirements of our insurers.

5. Procedure For Personnel Entering Work Areas.

All personnel must enter the plant through the employees entrance where they will be checked in by a security guard. Personnel will pass along a corridor to the locker room. All outer clothing, including shoes and socks must be removed. Individual lockers will be provided

as a depository for personal belongings. Clean socks, "T" shirts, shorts, coveralls and surgical caps will be provided for all personnel and are put on preparatory to entering the work area. Film badges will be provided and are to be put on before leaving the Locker Room. Paper slippers will be provided to be worn in the Locker Room and for passage through the Shower Room to a room designated as a Contaminated Clothing Room. In this room, shoes, which will be provided by the Company, will be donned for wearing in the work area. A rack will be provided in the Contaminated Clothing Room for the shoes. Each individual will have a designated space on this rack.

6. Procedure For Personnel Leaving The Work Area.

Personnel leaving the work areas will enter the contaminated clothing room and remove their contaminated clothing. If such clothing is to go to the laundry, a receptacle will be available for their disposal. Racks will be provided on which to hang clothing that may be rework. Shoes will be placed in their proper position in the rack. The paper slippers that were worn on entering the Contaminated Clothing Room may be worn while disrobing and to the door of the Shower Room. Personnel entering the Shower Room from the Contaminated Clothing Room must discard the paper slippers at the door. Receptacles for the disposal of the contaminated slippers will be provided. New paper slippers will be available to wear while taking a shower and must be discarded in the proper receptacle at the door to the Locker Room. New paper slippers will be available at the Shower Room door for use while resuming street wear. These slippers may then be worn for reentrance to the Contaminated Clothing Room. Film badges will be placed in the cabinet provided prior to leaving the Locker Room.

7. Facilities Provided For Personnel In The Locker Room.

- a. Clothes lockers will be provided for each employee.
- b. Each employee will be furnished socks, "T" shirt, shorts, coveralls and surgical caps.
- c. Benches will be provided in front of each row of lockers.
- d. Radiation monitors will be provided for employees to check themselves prior to leaving the area.
- e. Paper slippers.
- f. A rack for film badges and the film badges.

8. Facilities Provided For Personnel In The Shower Room.

- a. Two banks of showers having five shower heads each.
- b. Bath towels.
- c. Paper slippers.

9. Facilities Provided For Personnel In Contaminated Clothing Room.

- a. Shoes and a shoe rack.
- b. Clothing rack.
- c. Clothes hamper.
- d. Two, foot-controlled, circular, hand sinks.
- e. Hand towels.

10. Work Areas:

The plant will be considered a contaminated area. However, certain sections will be more highly contaminated than other sections. Therefore, the more highly contaminated sections will be marked off or partitioned off from the general area. Foot coverings will be provided for personnel working in the more contaminated areas and for any person or persons requiring entrance to such areas.

a. Pickling Area.

1. Acid proof clothing, fullview masks with neoprene caps and rubber gloves will be furnished each employee.
2. An emergency shower head and eye wash fountain.
3. Exhaust system to remove acid fumes.

b. Personnel in melting, annealing and hot working areas will be furnished face shields, asbestos gloves and sleeves.

c. Personnel handling uranium material that is oil coated will be furnished neoprene gloves.

d. Personnel handling dry uranium material will be furnished cotton gloves.

e. High efficiency respirators for fumes, dusts and smoke will be available in all areas for emergency use.

f. All personnel will be furnished safety goggles.

11. Liquid Waste Disposal.

Our nuclear facilities will have four drainage systems:

1. A sanitary system that will connect directly to septic tanks and then to a leaching field.
2. Three systems will be as follows:

Each area within the nuclear facility will be equipped with drains to carry off water used for decontamination purposes. All of the drainage facilities, except the laundry, showers and laboratory system, will connect with either of two main drainage systems. This is necessary to provide for separation of normal uranium and enriched uranium operations. Laundry, shower and laboratory water will be connected to the fourth drainage system.

The water from each system will discharge into a separate sump tank. A sump pump will pass the water through a filter rated to remove particles 50 microns or larger and then through a second filter rated to remove particles 5 microns or larger. Each system will have its own two stage filter. The effluent from all systems will discharge into a 2500 gallon tank. When this tank is filled, the effluent will be switched to a second 2500 gallon tank. The filled tank will be connected to a pump and the solution recirculated until homogeneity is effected. A sample will then be taken and checked for radioactivity.

If the solution is within the allowable dumping tolerance as stated in Title 10, Part 20 of Federal register and in Handbook 52 (7 x 10 UC/ml), the solution will be discharged to the leaching field. However, if the solution has too high an activity to dump, it will be pumped through an ion-exchange column and the effluent retained in a third 2500 gallon tank. This solution will be recirculated, sampled, and checked in a similar manner as described. This solution should be practically barren of radioactivity. After proving conformity by the laboratory, the solution will be discharged to the leaching field. It is anticipated that the ion-exchange column will only have to be used in case of accident.

The filtering media will be combustible so that by incineration, bulk will be reduced to a minimum. An analysis will be made on each set of filters for accountability purposes. It is not anticipated to obtain amounts economical to reclaim.

12. Ventilation.

All operations that will generate dust will be hooded and the air passed through a roughing filter (Fiberfrox - manufactured by Carborundum Co.) located near the source. The effluent will then be carried to a final filtration bank of Flanders Mill, Series D, filters located at ground level outside the plant and then exhausted above roof level. We will have three complete systems with a total exhaust of approximately 32,000 C.F.M. The pickle tanks will be hooded and exhausted above roof level. We will have two complete pickeling installations and the exhaust will be 2.50 C.F.M. over the surface of each foot of tank area. All systems will be monitored.

The maximum limits of activity will be governed by Title 10, Part 20, of the Federal Register and/or Handbook #52.

13. Decontamination Procedures.

Frequent air samples will be taken, using a vacuum pump for collecting the airborne dust on millipore filter paper. The alpha activity will then be checked in a proportional flow counter. The same technique will be employed when sampling the air being exhausted from the building. High readings will immediately institute an investigation to determine the cause and corrective measures will be taken. Floors, walls, ceilings, machinery and tools will be checked by the smear technique. The alpha activity will be checked in the proportional flow

counter. Maximum allowable activity throughout the work area will be 100 dpm/per square foot. Clean areas will be held to 10 dpm/per square foot. Floors will be mopped daily. Walls and ceilings will be wiped down whenever testing shows the need. All tools leaving the area will be decontaminated and checked before leaving the area. All clothing from employees will be washed in our laundering facilities which will comprise a 50 pound automatic washer and a 50 pound extractor and two 50 pound gas dryers. Clothing will be checked to insure removal of radioactivity by means of a survey instrument.

14. Waste Disposal.

The liquid waste disposal system is described under that title. Combustible waste will be burned in the incinerator located in the boiler room area and the effluent from the incinerator will be exhausted in the same stack used to carry off fumes from the boilers. This area will be partitioned off to prevent the spread of contamination. The effluent from the incinerator will be filtered prior to discharge. The resulting ash obtained from the incinerator will be analyzed for uranium content and accountability purposes. As it is not expected to obtain reclaimable quantity of uranium from this source, the ashes will be placed in 30 gallon drums. After receiving written approval from the AEC, it will probably be given to Crossroads Marine Disposal Corp., for sea burial. Reclaimable amounts of material uranium such as millings, drillings, etc., will be sent to National Lead Co., AEC Facility, Mount Healthy Station, Cincinnati, Ohio. Such material will be packed in 30 gallon drums to approximately the half-way mark and covered with approximately two inches of #2 fuel oil. Shipment of such scrap will be made by D. E. Makepeace Co., truck or a truck specifically hired for this purpose, or by AEC truck. One of the men on this truck will be in charge of the shipment and will be an "L" cleared D. E. Makepeace Co., employee. He will carry a letter stating this fact. Each drum will carry a red class D poison label and a yellow flammable label. The truck will display 3 placards reading Danger Class D Poison, one on each side of the truck, and one on the rear. Each 30 gallon drum will be placed inside a 50 gallon drum. Personnel will be instructed regarding health and safety regulations and procedures in the event of an accident. Enriched material will be shipped to Oak Ridge and will have a "Q" cleared person in charge of the shipment. The equipment carried on the truck will be as follows: coveralls, plastic shoe covers, gloves, respirators, film badges, 200 feet of magenta and yellow rope, 8 stakes, 10 radiation cards, and 2 shovels.

15. All records obtained by the Health Hygiene Department will be maintained in a permanent manner and will be available for inspection by authorized AEC personnel.

16. Instrumentation.

a. 2 - Proportional Flow Counters

b. 2 - Portable G - γ - Survey Meters

c. 1 - Portable Alpha Survey Meter

Packet No. 70-119

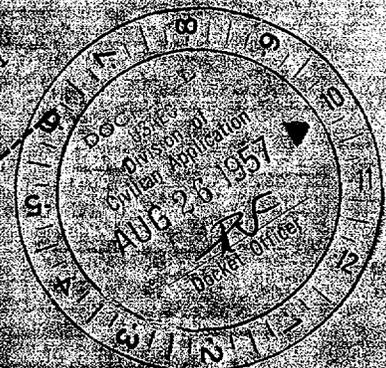
ADL:CPH

AUG 28 1957

D. E. Mahopace Company
Attleboro, Massachusetts

Attention: Mr. W. F. Mittendorf
Vice President

RECEIVED
AUG 28 1957
DIVISION OF CIVILIAN APPLICATIONS



Gentlemen:

Reference is made to your application for special nuclear material license dated July 30, 1957. Before we may further consider issuance of the license, the following additional information should be submitted in support of your application.

1. A statement of the amount of material, its chemical and physical form, and the enrichment levels to be possessed for processing through operations now visualized by the applicant.
2. An outline and description of steps in any processing now planned by the applicant, including an indication of the amount and chemical condition of the material involved in each step of the process, including storage.
3. A floor plan of the manufacturing area, with an indication of material flow and demarcation of separate areas where material inventories would be necessary in the manufacturing process.
4. A tabulation of
 - (a) The permissible accumulations of materials specified for each inventory point.
 - (b) The "margin of safety" or difference between the permissible amount of material at each point and that amount which would result in accidental criticality for the material, under the conditions prevailing.
5. An outline of calculations or other data which are necessary to support the information on which the figures contained in paragraph 4 above are based.

...procedures, plans, or safeguards by which
...to the specified limits in the various process
...would be maintained.

...analysis of the points in the process where probability
...are the greatest and an appraisal of the adequacy
...safeguards which are provided such as the provisions
...criticality in the event of misoperation or
...of equipment.

...description of both the normal and abnormal waste disposal
...filtering procedures the applicant will employ.

...procedures the applicant will follow to assure avoidance
...criticality during shipment of material to you
...your order or from you to the Commission or other licensees.

In essence, what we require is that you establish adequate criteria to
protect health and avoid accidental criticality, and then provide a
detailed description of the administrative procedures and other procedures,
facilities and equipment that you will utilize to assure that your use of
special nuclear material will be in conformance with these basic criteria.
This description must be sufficiently detailed so that on the basis of the
description alone we may make an independent determination of the adequacy
of criteria established to protect health and minimize danger to life or
property. Clarification of the duties and responsibilities of the account-
ability engineer would be helpful in this regard.

As stated in Section 70.21(a), you may incorporate by reference in this
application, information contained in your previous applications, provided
that such references are clear and specific.

Your application should be submitted in letter form in quadruplicate, and
signed under oath or affirmation.

Upon receipt of the additional information, we will further consider your
application.

Very truly yours,
SIGNED

G. Blinn
Special Representative
Division of Atomic Applications

Docket No. 70-139
CAL:CFM

AUG 26 1957

D. E. Makepeace Company
Attleboro, Massachusetts

Attention: Mr. W. F. Mittendorf
Vice President

Gentlemen:

Reference is made to your application for special nuclear material license dated July 30, 1957. Before we may further consider issuance of the license, the following additional information should be submitted in support of your application.

1. A statement of the amount of material, its chemical and physical form, and the enrichment levels to be possessed for processing through operations now visualized by the applicant.
2. An outline and description of steps in any processing now planned by the applicant, including an indication of the amount and chemical condition of the material involved in each step of the processes, including storage.
3. A floor plan of the manufacturing area, with an indication of material flow and demarcation of separate areas where material inventories would be necessary in the manufacturing process.
4. A tabulation of
 - (a) The permissible accumulations of materials specified for each inventory point.
 - (b) The "margin of safety" or difference between the permissible amount of material at each point and that amount which would result in accidental criticality for the material, under the conditions appertaining.
5. An outline of calculations or appropriately referenced sources of information on which the figures contained in paragraph 4 above are based.

OFFICE ▶							
SURNAME ▶							
DATE ▶							

6. An outline of procedures, checks, or safeguards by which adherence to the specified limits in the various process inventories would be maintained.
7. An analysis of the points in the process where probability of hazards are the greatest and an appraisal of the adequacy of the safeguards which are provided such as the provisions for avoiding criticality in the event of misoperation or failure of equipment.
8. A description of both the normal and abnormal waste disposal and monitoring procedures the applicant will employ.
9. The procedures the applicant will follow to assure avoidance of accidental criticality during shipment of material to you on your order or from you to the Commission or other licensees.

In essence, what we require is that you establish adequate criteria to protect health and avoid accidental criticality, and then provide a detailed description of the administrative procedures and other procedures, facilities and equipment that you will utilize to assure that your use of special nuclear material will be in conformance with these basic criteria. This description must be sufficiently detailed so that on the basis of the description alone we may make an independent determination of the adequacy of criteria established to protect health and minimize danger to life or property. Clarification of the duties and responsibilities of the accountability engineer would be helpful in this regard.

As stated in Section 70.21(a), you may incorporate by reference in this application, information contained in your previous applications, provided that such references are clear and specific.

Your application should be submitted in letter form in quadruplicate, and signed under oath or affirmation.

Upon receipt of the additional information, we will further consider your application.

Very truly yours,

SIGNED
and

WITNESSED
J. C. Delaney
Chief, Materials Section
Licensing Branch
Division of Civilian Application

Enclosure:
10 CFR 70

OFFICE ▶	CAL	CAL	CA:HEB		
SURNAME ▶	CP McCallum/jc <i>McCallum</i>	JC Delaney <i>Delaney</i>	CK Beck <i>Beck</i>		
DATE ▶	8/22/57	8/23			

EPM —

Concurred, as
requested in your
Johnson to Beck memo
of 4/1/58.

Looks like a very
good presentation of
the one job they
describe.
— AS

ROUTE SLIP - LICENSING BRANCH

Date 1/22

Price, H. L. _____
Pittman, F.K. _____
McCullough, C.R. _____
Price, E. R. _____

Johnson, L. E. _____
Fleury, E. R. _____
Edwards, C.T. _____
Borlik, R.F. _____
Karas, F.W. _____

~~Delaney, J. G. _____~~
Doulos, N. _____
McCallum, C.P. _____
Sullivan, P.G. _____
Frederick, R.J. _____
Diggs, R. _____
Steele, H. _____

From: 

13-125

MAY 19, 1958

ALICE M. CORLEY
CHIEF, RESEARCH SERVICES BRANCH
RESEARCH AND DEVELOPMENT DIVISION
USAEC, OAK RIDGE, TENNESSEE

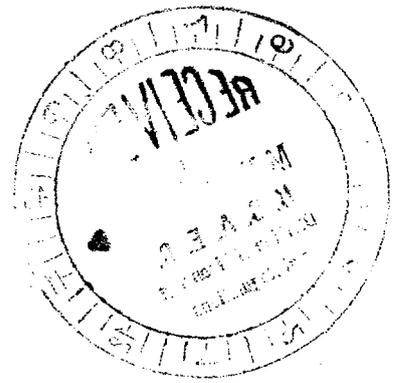
Alice M. Corley
PRIORITY

ORIGINAL SIGNED BY
J. E. ROUNSAVILLE, JR., ACTING

O. H. JONES
THE BABCOCK & WILCOX CO.
LYNCHBURG, VIRGINIA

REF LETTER FROM LYALL JOHNSON TO YOU DTD MAY 13 RE RETURN OF B&W NUCLEAR MATERIAL RECOVERED BY ENGELHARD INDUSTRIES. BEFORE WE CAN SUPPLY INSTRUCTIONS FOR RETURN OF MATERIAL WE WILL NEED TO KNOW: (1) QUANTITY (2) U-235 ASSAY (3) CHEMICAL AND PHYSICAL SPECS OF MATERIAL (4) WHAT TYPE SHIPPING CONTAINERS. INFORMATION ON CHEMICAL SPECS SHOULD INCLUDE ANY UNUSUAL CHEMICAL IMPURITIES SUCH AS THORIUM. INFORMATION ON SHIPPING CONTAINERS SHOULD INCLUDE GENERAL DESCRIPTION OF THEM AND NUMBER OF KG OF MATERIAL PER CONTAINER. THIS INFORMATION MAY BE SUPPLIED BY B&W OR ENGELHARD. ALSO PLEASE ADVISE US IF WE ARE TO SEND INSTRUCTIONS FOR RETURN OF MATERIAL TO B&W OR ENGELHARD. END REF ORS:WEM

CC: LYALL JOHNSON, HEADQUARTERS ✓
G. A. KELLER
L. D. MacKAY



McMahon:km
10:30 a.m.
4671 Rm 474

Res.Ser. Br. Production

McMahon:km

Docket No. 70-139
L&R:CPM

MAY 2 1958

Engelhard Industries, Inc.
D. E. Wakepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. W. F. Mittendorf
Vice President and Division Manager

Gentlemen:

Enclosed is Special Nuclear Material License SEM-185.

You will note that the procedures authorized under the terms of this license are limited to those described in your feasibility report DEM-2. In the event that you still desire the full authority requested in your application of February 5, 1958, you should submit more detailed information on any additional processes you intend to use. Such information should include, but not be limited to, a description of the processes, specific batch sizes, method of separation between batches in processing, the specific criteria used in computing always-safe masses, including calculations where applicable, details regarding always-safe equipment and your administrative procedures to assure that these criteria are met.

Upon receipt of this additional information an amendment to your license to include this additional authorization will be given our prompt consideration.

DISTRIBUTION:
Formal Docket, w/encl.
Suppl. Docket, w/encl.
Document Room, w/encl.
M. M. Mann, INS, w/encl.
D. F. Musser, NMM, w/encl.
J. C. Ryan, FIN, w/encl. (2)
H. Steele, L&R, w/encl.

Sincerely yours,

H. L. Price
Director
Division of Licensing and Regulation

Enclosure:
License SEM-185

H.E. B
4/29

OFFICE	S. R. Gustavson, L&R, w/encl. Br. & Div. Read'g files,	L&R McClellan/mad	FIN M.K. Kellogg	L&R L. Johnson	L&R H.L. PRICE
SURNAME	w/encl.	J. C. Delaney			
DATE		5-19-58	4/29/58	5/1/58	5/2/58

onm

UNITED STATES
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No. SMS-185
1. Name	Engelhard Industries, Inc. D. E. Makepeace Division	4. Expiration Date September 30, 1962
2. Address	Pine & Dunham Streets Attleboro, Massachusetts	5. Docket No. 70-139

6. Special Nuclear Material Uranium enriched in the U-235 isotope	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license ⁷⁵⁰ Twenty-four (24) kilograms of U-235 contained in uranium enriched in the U-235 isotope.
---	--

8. Authorized use **For the manufacture of uranium-aluminum foil using the procedures described in the licensee's application of July 30, 1957, as amended February 5, 1958 but limited by the procedures described in the D. E. Makepeace feasibility report DM-2 concurrently submitted and for the receipt and storage only of uranium.**

9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part
None

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.
Authorized place of use: The licensee's fuel element processing plant located on Route 152, Plainville, Massachusetts.

Date of issuance **MAY 2 1958**

FOR THE U. S. ATOMIC ENERGY COMMISSION

H. L. Price
H. L. Price

Director, Division of Licensing & Regulation

1133-8

ENGELHARD INDUSTRIES, INC.

EXECUTIVE OFFICES
113 ASTOR STREET
NEWARK 2, N. J.
BIGELOW 3-0030

May 21, 1958

Mr. R. W. Cook, Acting General Manager
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Cook:

Re: Government Excess Insurance for
Reactors, Fuel Fabricators and Others

Pursuant to your letter of November 14, 1957, to
C. R. Bergherm, Vice President of our company, L. Burman
and I attended the conference in your Washington office
on December 10, 1957.

We were and are very much interested in obtaining the
protection of the Government Excess Insurance for the
fuel fabrication plant of our D. E. Makepeace Division
at Plainville, Massachusetts, as well as for the uranium
refining plant of our Irvington-Baker Refining Division
at Newark, New Jersey.

At the December 10 meeting there was discussion concerning
what factors should be considered by A.E.C. in deciding
how much primary insurance a plant should buy in order
to qualify for the excess insurance and what yardstick
should be used to determine the amount of premium each
plant should pay for the excess insurance.

We believe some practical answers to these questions were
received and we write to ask whether or not the Government
insurance will be made available to us soon. If there is
anything we can do to assist, we would be most happy to
do so.

Very truly yours,

ENGELHARD INDUSTRIES, INC.

EE
E. E. Thomas
6/4/58
rept

E. E. Thomas

EET/bv

NO. 70-139
File Cy.

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
FINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

October 24, 1958

United States Atomic Energy Commission
Germantown, Maryland

Attention: Mr. Lyall Johnson

Gentlemen:

We wish to obtain a stock of highly enriched uranium (90 to 93%) in the amount of 3 to 4 kilograms to enable us to render prompt delivery to customers requiring small quantities for research and development purposes.

Our special nuclear material license No. 185, we believe, covers this type of requirement, and it is the purpose of this letter to request your furnishing us with requisite forms and instructions for us to make application for this allotment.

We have already held discussions with commercial convertors of material. We would wish to receive only your assistance in the allocation and preparation of uranium draft.

Thank you very much.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Representative

JHD/bq

Cy to INS



*No claim
rev req
9/29
10/31/58*

JUN 4 1958

Mr. E. E. Thomas
Engelhard Industries, Inc.
113 Astor Street
Newark 2, N. J.

Dear Mr. Thomas:

Thank you for your letter of May 21, 1958, to Mr. Cook, regarding the extension of Government indemnity under the Price-Anderson Act to licensees of nuclear materials.

Our work thus far in the indemnity program has been concerned primarily with the development of the regulatory requirements applicable to persons licensed to possess and operate nuclear reactors. We have not as yet determined whether to include materials licensees in the indemnity program. You may be assured, however, that in reaching a decision on this question, we will give careful consideration to the views and suggestions offered by you and others during the Advisory Conference of Reactor Fuel Processors which was held last December.

I should like to add that in the event the Commission decides to apply the provisions of the Price-Anderson Act to materials licensees, the proposed regulation would be published as a notice of proposed rule making in order that the interested public may offer comments and suggestions.

Very truly yours,

(Signed) H. L. Price

H. L. Price, Director
Division of Licensing and
Regulation

CC: R. W. Cook
Dist: DLR:SK ← DLR:ERPrice
DLR:RF

185
70-139

OFFICE ▶	DLR:Asst.Dir.	DLR:Dir.			
SURNAME ▶	ERPrice/fla	H.L.Price	DLR	6/4/58	
DATE ▶		6/4/58			

ROUTE SLIP - LICENSING BRANCH

Date 6/6/58

Price, H. L. _____
Price, E. R. _____
Beck, C. K. _____
Rogers, L. R. _____
Morgan, G. W. _____
Mason, J. R. _____
Teets, S. A. _____

Johnson, L. E. _____
Fleury, E. R. _____
Edwards, C. T. _____
Borlik, R. F. _____
Karas, F. W. _____
Lee, F. C. _____

~~1~~ Delaney, J. C. _____ *Sprints*
Doulos, N. _____
~~2~~ McCallum, C. D. _____
Frederick, R. J. _____
~~3~~ Diggs, R. _____
Raffa, J. _____
Steele, H. _____
Gustavson, S. R. _____

From: *Rela*

DOCKET NO. 70-139

*Suppl. Only
File by.*

ENGELHARD INDUSTRIES, INC.

EXECUTIVE OFFICES

113 ASTOR STREET
NEWARK 2, N. J.
BIGELOW 3-0030

June 3, 1958

U. S. Atomic Energy Commission
Washington
D. C.

Gentlemen:

We enclose herewith Certificate of Insurance No. 100 issued to U. S. Atomic Energy Commission and covering your uranium while in the possession of our D. E. Makepeace Division.

This certificate takes the place of Certificate No. 103 dated June 20, 1957, which showed the assured to be Baker & Co., Inc. and subsidiaries. Our reason for sending you the new certificate is that the name of Baker & Co., Inc. was changed on January 1, 1958, to Engelhard Industries, Inc. and at the same time several affiliated corporations, including D. E. Makepeace Company, were merged with Engelhard Industries, Inc.

Very truly yours,

ENGELHARD INDUSTRIES, INC.

E. E. Thomas

E. E. Thomas

EET/bv
Enc.



No copy to Doc. Room 6/6/58

CERTIFICATE OF INSURANCE
UNDERWRITERS AT LLOYD'S LONDON
(Not Incorporated)

THIS IS TO CERTIFY THAT certain Underwriters at Lloyd's London have issued Policy No. 53/4501 Cover Note No. - covering as stated which is in force as of the date hereof.

NAMED ASSURED: ENGELHARD INDUSTRIES, INC. AND COMPANIES OR CORPORATIONS which are Subsidiaries of and/or operated, controlled or owned by them.

LOCATION: 113 Astor Street, Newark, New Jersey

TERM OF INSURANCE: December 1st 1953 TO: December 1st 1958 both days at Midnight Standard Time

DESCRIPTION OF COVERAGE

LIMITS

Against all risks of loss or damage whilst in care, custody and control of Engelhard Industries, Inc. or while in transit as per terms and conditions of Lloyd's Blanket Contract 53/4501 issued to Engelhard Industries, Inc.

\$15,000,000 except 3,500,000 while in transit

Covering uranium of the Atomic Energy Commission while in the care, custody and control of D. E. Makepeace Division of Engelhard Industries, Inc.

Loss, if any, to be adjustable and payable to:

U. S. Atomic Energy Commission.

In the event of any material change in or cancellation of said insurance Lukis, Stewart & Company will expect to notify the party to whom this certificate is issued of such change or cancellation, but Lukis, Stewart & Company assume no responsibility by reason of any failure to do so.

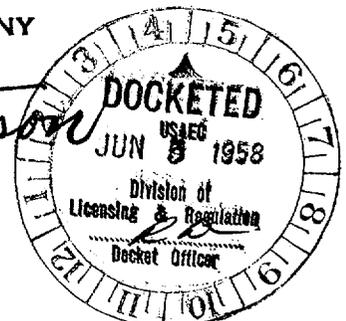
DATED THIS 3rd DAY OF June 1958

ISSUED TO U. S. Atomic Energy Commission

ADDRESS Washington, D. C.

LUKIS, STEWART & COMPANY

PER: R. D. Patterson



70-139
LRL:JCD

NOV 5 1958

SNM-185

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Representative

Gentlemen:

As requested in your letter of October 24, 1958, we are hereby allocating four kilograms of U-235 contained in uranium enriched to about 93% in the U-235 isotope as UF₆. For details regarding procurement of the allocated material, you should communicate with our Oak Ridge Operations Office, U. S. Atomic Energy Commission, P. O. Box E, Oak Ridge, Tennessee, Attention: Dr. H. M. Roth.

Very truly yours,

Distribution:
OROO Attn: H.M.Roth
DFMusser NMM
MMann INS
JCRyan FIN (2)
HSteele
SRGustavson
Document room
Formal file
Suppl. file
Br & Div rf's

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing & Regulation

THE ALLOCATION DESCRIBED HEREIN
HAS BEEN ASSIGNED ALLOCATION
NO. DCA- *225*

OFFICE ▶	LRL			FIN	NMM
SURNAME ▶	<i>Delaney</i> CW			<i>[Signature]</i>	<i>[Signature]</i>
DATE ▶	<i>10-31-58</i>			<i>11/3/58</i>	NOV 4 1958

u/5/56

NUCLEAR MATERIAL DRAFT

<p>TO (Supplying Operations Office):</p> <p style="text-align: center;">Oak Ridge Operations Office USABC</p> <p style="text-align: center;">Attn: Dr. H.M.Roth</p>	<p>DELIVER TO OR ORDER OF (SS Material Representative and Address):</p> <p style="text-align: center;">Engelhard Industries, Inc. D. E. Makepeace Division Pine & Dunham Streets Attleboro, Massachusetts</p>	<p>IDENTIFICATION NO.</p> <p style="text-align: center;">7000/SMM-185/205</p> <p>ON OR ABOUT (Date of Delivery):</p> <p style="text-align: center;">Prior to June 30, 1959</p>
--	---	--

THE FOLLOWING NUCLEAR MATERIAL:

ORDERED		DESCRIPTION AND NOTES	SHIPPED	
Kg.	Wt. %		Kg.	Wt. %
4	About 93%	U-235 as UF ₆		

DATED: NOV 5 1958 *[Signature]*
11/5/58

<p>Ordering Operations Office</p>	<p style="text-align: center;">J. C. Delaney, Chief, Nuclear Materials Section, Licensing Branch, Division of Licensing & Regulation</p> <p style="text-align: center;">Headquarters Division Director</p>	<p>CERTIFIED</p> <p style="text-align: center;">I HEREBY CERTIFY THAT THE ABOVE QUANTITY WILL NOT EXCEED MATERIAL APPROVED FOR THIS DIVISION FOR FISCAL YEAR 1959.</p> <p style="text-align: center;"><i>[Signature]</i> D. F. Master, Dir., Div. of Nuclear Materials Management</p> <p style="text-align: center;">Director, Division of Nuclear Materials Management</p> <p style="text-align: right;">NOV 4 1958</p>
-----------------------------------	---	---

70-139
EKL:JCB

NOV 5 1958

Engelhard Industrial, Inc.
P. O. Mahopack Division
Five & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John E. Durant
Business Representative

Gentlemen:

As requested in your letter of October 24, 1958, we are hereby allocating four kilograms of U-235 contained in uranium enriched to about 93% in the U-235 isotope as UF₆. For details regarding procurement of the allocated material, you should communicate with our Oak Ridge Operations Office, U. S. Atomic Energy Commission, P. O. Box 2, Oak Ridge, Tennessee, Attention: Dr. E. M. Roth.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing & Regulation

Formal file

DOCKET NO. 70-139

File Cy.

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

November 11, 1958

Atomic Energy Commission
Washington 25, D. C.

Attention: Mr. J. C. Delaney
Reference: 70-139

Gentlemen:

Thank you very much for your letter of November 5, and your prompt attention to our request for an allocation of four kilograms of U-235, 93% enriched.

We have an additional requirement in connection with our contract to build a core for the Enrico-Fermi reactor being constructed by PRDC. We would like to obtain an additional allocation, which I believe our present special nuclear materials No. 185 also provides for this requirement, for having 55 kilograms of contained uranium 10% enriched in the 235 isotope (5.5 kilograms contained U-235). We intend to have this material converted by Mallinckrodt Chemical and will use it to produce 165 pins under order for PRDC.

We will appreciate your continued assistance in processing this request.

Thank you very much.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Representative

JHD/bq

Cy to IN
5.5 10% on U F₆



70-139
LRL:JCB

NOV 24 1958

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant

Gentlemen:

By this letter, you are allocated 55 kilograms of uranium 10% enriched in the U-235 isotope as UF_6 . For details regarding procurement of this allocated material, you should communicate with our Oak Ridge Operations Office, U. S. Atomic Energy Commission, P. O. Box E, Oak Ridge, Tennessee, Attention: Dr. H. M. Roth.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing & Regulation

Distribution:
ORCO Attn: Dr.H.M.Roth
DFMusser NMM
MMMann INS
JCRyan FIN (2)
HSteele
SRGustavson
Document room
Formal file
Suppl.file
Br&Div rf's

THE ALLOCATION DESCRIBED HEREIN
HAS BEEN ASSIGNED TO ALLOCATION
NO. DCA-205-185

OFFICE ▶	LRL			FIN	NMM
SURNAME ▶	Delaney, J.C.			[Signature]	Worme
DATE ▶	11-24-58			11/18/58	NOV 20 1958

FORM AEC-437
(11-57)

U. S. ATOMIC ENERGY COMMISSION

NUCLEAR MATERIAL DRAFT

TO (Supplying Operations Office):

**Oak Ridge Operations Office
USARC**

Attn: Dr. H. M. Roth

DELIVER TO OR ORDER OF (SS Material Representative and Address):

**Engelhard Industries, Inc.
D. E. Mahoney Division
Pine & Dunham Streets
Attleboro, Massachusetts**

IDENTIFICATION NO.

7000/SSM-185/205(2)
ON OR ABOUT (Date of Delivery):

Prior to June 30, 1959

THE FOLLOWING NUCLEAR MATERIAL:

ORDERED		DESCRIPTION AND NOTES	SHIPPED	
Kg.	Wt. %		Kg.	Wt. %
5.5	10%	Uranium enriched in the U-235 isotope as UF ₆		

DATED: NOV 24 1958

95/11/11
[Signature]
**J. C. Delaney, Chief, Nuclear Materials
Section, Licensing Branch.
Division of Licensing & Regulation.**
Headquarters Division Director

CERTIFIED

**I HEREBY CERTIFY THAT THE ABOVE QUANTITY WILL NOT EXCEED
MATERIAL APPROVED FOR THIS DIVISION FOR FISCAL YEAR 1959.**

[Signature]
D. F. [Name], Director, Division of Nuclear Materials Management

Ordering Operations Office

Director, Division of Nuclear Materials Management

NOV 20 1958

70-139
LAL:JGD

NOV 24 1958

Engelhard Industries, Inc.
D. E. Makepeace Division
Pine & Dunham Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant

Gentlemen:

By this letter, you are allocated 55 kilograms of uranium 10% enriched in the U-235 isotope as UF_6 . For details regarding procurement of this allocated material, you should communicate with our Oak Ridge Operations Office, U. S. Atomic Energy Commission, P. O. Box E, Oak Ridge, Tennessee, Attention: Dr. H. M. Roth.

Very truly yours,

J. C. Delaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing & Regulation

Formal file

D. E. Makepeace Co. *File 4*

DIVISION OF
UNION PLATE AND WIRE CO.

Industrial Department

Precious Metals, Solid and Laminated, Contacts, Collector Ring Assemblies, Precision Wave Guides

SALES OFFICES

NEW YORK, N.Y.
CHICAGO, ILL.
LOS ANGELES, CALIF.

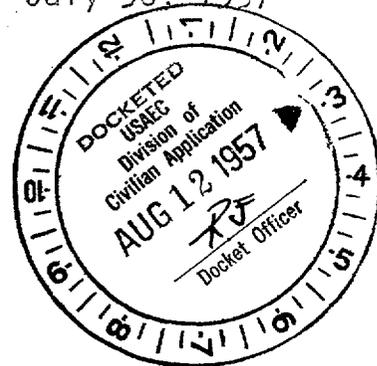
MAIN OFFICE AND FACTORY

ATTLEBORO, MASS.

Telephone 1-0088

July 30, 1957

*Class Approved
not required
15/8/57
8/13*



Mr. Lyall Johnson
Chief, Licensing Branch
Division of Civilian Applications
U.S. Atomic Energy Commission
Washington 25, D.C.

Dear Mr. Johnson:

The D. E. Makepeace Co., herewith makes application of license under Part 70 - Special Nuclear Material for permission to receive, possess, use, and transfer special nuclear material in connection with its proposed operations in a new facility for the manufacture of atomic fuel elements. Specifically, we will be equipped to melt uranium alloys of all enrichments, and to cast, roll, and machine bare and clad uranium alloys. The finished products will be bare and clad fuel plates.

Beginning in July, 1956, this company entered the field of uranium fuel processing under a series of contracts negotiated with the Westinghouse Electric Corporation, Bettis Field operation. On October 1, 1956, the D. E. Makepeace Co., was designated an approved accountability station by the Chicago Operations Office, under the jurisdiction of the Pittsburgh Area Office. For security purposes, access to "secret" restricted data is authorized under access permit Q-110 held jointly with Baker and Co., Inc., our parent company.

We are proposing to expand our interest in atomic fuel processing through the construction of new facilities which will enable us to increase our scope and capacity to process plate-type fuel elements for delivery to the Commission and its contractors, and to the Commission's licensees in the commercial research and power fields. The building for this expansion is located on Route 152 in Plainville, Mass., and is virtually complete. We are beginning to move in machinery and we would expect to be ready for limited operations by the end of August. We have designed the building in accordance with accepted practices after discussions with the Chicago Operations Office of the Atomic Energy Commission with regard to water disposal, security, vaults, etc.

*to Div 15/57
8/13/57*

ENGELHARD INDUSTRIES

July 30, 1957

1. Information concerning D. E. Makepeace Co.

At present, the D. E. Makepeace Co., is legally known as the D. E. Makepeace Co., Division of Union Plate & Wire Co. However, we are in the process of changing the name to the D. E. Makepeace Co., a Massachusetts corporation located in Attleboro, Mass. The Union Plate & Wire Co., is wholly owned by Baker and Co., Inc., Newark, New Jersey, with whom we believe you are well acquainted. Upon conversion of the name to the D. E. Makepeace Co., Baker and Co., Inc., will remain as the sole owner of the company. In this application, we will use "D. E. Makepeace Co.," as representing the applicant.

Our principal business is the melting, alloying and fabrication of the precious metals (platinum, gold, silver, etc.) for decorative and industrial use. Among our products are many miscellaneous shapes for the jewelry industry which are precision rolled and machined, electrical contacts, inlay material and electrical sub-assemblies such as slip ring contacters, clad bi-metals such as rolled gold plate, silver clad base metals as sheet, rod and seamless tubing.

Following is a listing of the officers and directors of D. E. Makepeace Co:

1. Charles W. Engelhard, Chairman of the Board
2. Gordon V. Richdale, President
3. W. F. Mittendorf, Vice-President and Director
4. S. R. Bryant, Vice-President
5. Ross Bayes, Director
6. Lawrence Hogue, Treasurer
7. W. Irving, Assistant Treasurer and Director
8. R. P. Pasley, Assistant Treasurer
9. *John Bell*

Each of the above is a citizen of the United States except Gordon V. Richdale, a British subject, who on March 4, 1954, filed first citizenship papers in the United States and S. R. Bryant a citizen of the Union of South Africa who has applied for naturalization papers. Mr. Peter W. Marshall, a director of Baker and Co., Inc., is a British subject with headquarters in Switzerland from which point he directs several foreign operations of Baker and Co., Inc. Mr. Marshall, though a director of Baker & Co., Inc., is not associated with the D. E. Makepeace Co., operation. There is no other control or ownership exercised over D. E. Makepeace Co., by any alien, foreign corporation, or foreign government.

The address of Mr. Mittendorf, Mr. Irving, and Mr. Bell is D. E. Makepeace Co., Pine and Dunham Sts., Attleboro, Mass. The address of each of the remaining officers of the company is at Baker and Co., Inc., 113 Astor St., Newark 5, New Jersey. The location of the facility under construction is Route 152, Plainville, Mass.

II. Activity for which the Special Nuclear Material is requested.
License

The special nuclear material for which/is requested is required for use in:

1. The rolling and machining of pure uranium (of various enrichments up to fully enriched) including the rolling of uranium foil.
2. The melting of uranium-aluminum, uranium-zirconium and other uranium bearing alloys in induction and arc melting equipment of suitable design.
3. The vacuum heat treating of uranium and uranium bearing alloys.
4. The rolling and machining of uranium alloys.
5. The roll bonding and machining of clad plate-type fuel elements.
6. The corrosion testing of clad fuel elements at high pressure and at high temperature in autoclaves of suitable design.

will In general, we anticipate being called upon to perform these services both individually and in sequence. For example, we will heat or machine or corrosion test at the request of our customers; or we will provide the complete sequence of operations from melting to corrosion testing, as the case may be.

III. Term of License.

A license is requested for an initial term of five years.

IV. Amounts and Specifications of Special Nuclear Material Required.

Since we do not yet hold orders from other licensees for fuel elements, we are not able to specify the amounts nor the form in which we will require special nuclear material. In practice, we expect that our licensed customers will themselves obtain allocations of special nuclear material which will in turn be passed along to us. At some later date, it might become economically desirable for the D. E. Makepeace Co., to itself have an allocation of special nuclear material in order to better serve its customers. We therefore reserve the right to ask for an allocation at a later date. However, we ask permission to receive, possess and use special nuclear material without limitation as to quantity for use in the manufacture of fuel elements, the allocations to be provided by our licensed customers.

V. Technical qualifications of Staff.

G. H. Barney, metallurgist, assistant superintendent in charge of facility.

Mr. Lyall Johnson

-4-

July 30, 1957

A. J. Schulte, B S degree in metallurgy, general engineer for nuclear work.

Ray Blackler, Chemist, responsible for health and hygiene as well as all chemical applications. He will have the assistance of the chemical and tool engineers of our main manufacturing plant in Attleboro (6 miles away), as well as the advisory assistance of the research department of Baker and Co., Inc., our parent company in Newark, New Jersey. There are over 40 graduate scientists on research work and metallurgical problems at Baker and Co., Inc., and in addition, we have a consulting contract with Nuclear Corporation of America to supply criticality service and a check up health and hygiene service.

Criticality will be directed by Dr. Friedland and hygiene by Lester Smith.

VI. Equipment and Facilities to Protect Health and Property - Waste Disposal.

Please refer to manual attached herewith.

VII. Procedures to Protect Health - Criticality - Personnel Monitoring.

Please refer to manual attached herewith.

VIII. Financial Responsibility.

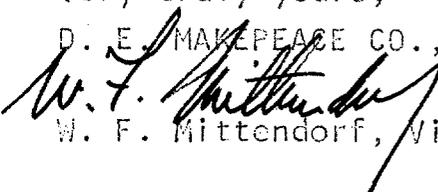
Neither D. E. Makepeace Co., nor Baker & Co., Inc., our parent company, publish annual reports nor profit and loss statements. Baker and Co., Inc., holds a license under Part 70 in connection with its operation of a cold enriched uranium scrap plant. With its application under Part 70, Baker and Co., Inc., submitted certain financial information and insurance certificate which has been deemed sufficient by the Commission for the granting of a license under Part 70.

With this application, we submit an original and three copies of a similar insurance certificate noting that D. E. Makepeace Co., is covered under the identical insurance policy. The certificate, as requested by the Commission Finance Division, is endorsed to indicate payment direct to the Commission in the event any payments under the policy are required.

We trust that the information contained in this application is in keeping with your requirements. If additional information is required, we shall be pleased to hear from you.

Very truly yours,

D. E. MAKEPEACE CO., DIV.


W. F. Mittendorf, Vice-President

WFM/ms
Enclosures

LUKIS, STEWART & COMPANY NY

360 ST. JAMES STREET WEST
MONTREAL 1, CANADA

103

CERTIFICATE OF INSURANCE

THIS IS TO CERTIFY THAT certain Underwriting members at Lloyd's London ~~and~~
~~the Underwriters~~ have issued Policy No. 53/4501 Cover Note No.
covering as stated which is in force as of the date hereof.

NAMED ASSURED: BAKER & CO. INC. AND COMPANIES OR CORPORATIONS which are
Subsidiaries of and/or operated, controlled or owned by them.

LOCATION: 113 Astor Street, Newark, New Jersey.

TERM OF INSURANCE: December 1st 1953 TO: December 1st 1958.
both days at Midnight Standard Time.

DESCRIPTION OF COVERAGE LIMITS

Against all risks of loss or
damage whilst in care, custody and
control of Baker & Co. Inc. or
while in transit as per terms and
conditions of Lloyd's Blanket

\$15,000,000 except
3,500,000 while in transit
Covering fissionable material
of the Atomic Energy Commis-
sion while in the care,
custody and control of
D. E. Makepeace Company.

Contract 53/4501 issued to
BAKER & CO. INC.

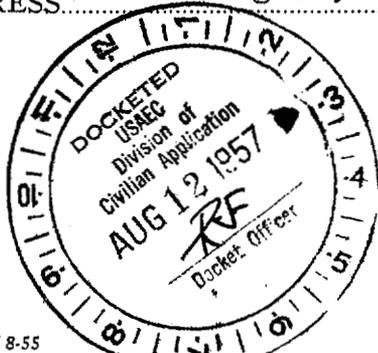
Loss, if any, to be adjustable and payable to:
U. S. Atomic Energy Commission.

In the event of any material change in or cancellation of said insurance Lukis, Stewart &
Company will expect to notify the party to whom this certificate is issued of such change
or cancellation, but Lukis, Stewart & Company assume no responsibility by reason of any
failure to do so.

DATED THIS 20th DAY OF June 1957

ISSUED TO U. S. Atomic Energy Commission

ADDRESS Washington, D. C.



LUKIS, STEWART & COMPANY

PER: *R. D. Patterson*

Suppl. 70-139

Guaranty Trust Company of New York

New York Offices
140 Broadway
Fifth Avenue at 44th St
Madison Avenue at 60th St
40 Rockefeller Plaza

140 Broadway
New York 15, N. Y.

Foreign Offices
London
Paris
Brussels

March 21, 1957

In replying please refer to C-19

Mr. Lyall Johnson
Chief, Licensing Branch
Division of Civilian Applications
United States Atomic Energy Commission
Washington, D. C.

Dear Mr. Johnson:

This letter is confidential and written without prejudice, as a matter of business courtesy, with the understanding that its source and contents will not be divulged, and that no responsibility therefor is to attach to this Company or any of its Officers or Agents. It contains information and expressions of opinion subject to change without notice, and, while obtained from sources deemed reliable, the accuracy of any statement herein made is not vouched for in any way.

We are writing to you at the request of our valued clients, Baker & Company, Inc., of Newark, New Jersey, who have pending before the Commission an application for a special nuclear license (Docket #70-90).

In support of this application, we are pleased to inform you that Baker & Company, Inc. have been substantial clients of ours since 1924. We are the principal bank for the company and extend loans on an unsecured basis for seasonal borrowings and are also granting a term loan running to 1964. Maximum total debt with us last year approximated \$10,000,000 and all obligations have been handled as agreed. In addition to our relationship with this company, we are favored with other substantial business from concerns in the group commonly known as the Engelhard Group and have been in close touch with the affairs of the various organizations for a long period of time. On the basis of our knowledge of Baker & Company, Inc. and its related concerns we have no hesitation in recommending them as deserving of your favorable consideration.

The subject company does not publish its financial reports although statements are furnished to us periodically on a confidential basis. While we cannot go into detail relative to the figures, we can advise you that the balance sheet of Baker & Company, Inc. and domestic subsidiary companies dated December 31, 1955 disclosed a working capital in excess of \$16,000,000 and a substantial net worth with operations on a profitable basis.

For background information our records reflect the subject was originally started in 1874 and has been under present control since 1903. The company represents an important factor in the refining and manufacture of precious metals and has made consistent progress over the years. The management has been long identified in the line and are people of unquestioned integrity and fully capable of handling the affairs of the enterprise.

Very truly yours,

Paul J. O'Neill
Paul J. O'Neill
Second Vice President