

IRL: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,

DISTRIBUTION

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

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

Enclosure:
SNM-185, as amended

Heav

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	Sagelhard Industries, Inc.	SNM-185, as amended
2. Address	D. E. Mahopace Division Five & 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.	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 1959

U. S. GOVERNMENT PRINTING OFFICE: 1956-O-385852

J. C. Delaney
Division of Licensing and Regulation

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 G, 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:

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

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

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 ANO_3 . 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 $0.23 \text{ Mg/CM}^2/\text{Min}$. 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

WELSHARD INDUSTRIES, INC.

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

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ATTLEBORO, MASS.

ATTLEBORO 1-0090

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) after which 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
John H. Durant
Business Manager

JHD/bs

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 BranchREF: 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:

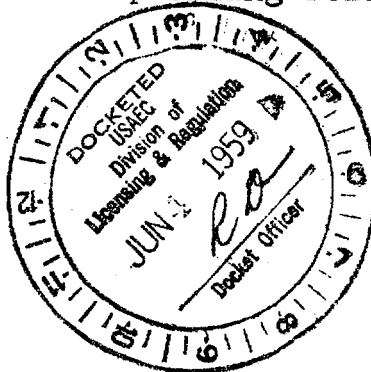
1. Addition to Section C, Page 5:

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:



DOCKET NO. 70-139
For Div of Inspection

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

May 28, 1959

Mr. J. C. Delaney

SNM - 185

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ROSLINDALE, MASS.

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

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant

John H. Durant
Business Manager

JHD/bs

via: Air-Mail

LEL:CPH
Docket No. 70-139

MAY 29 1959

Ingallard Industries, Inc.
D. E. McKeown Division
Pine & Danvers 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.

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Div. of INS

Very truly yours,

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

NYDO INSPECTION DIVISION

JUN 29 1959

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Clear

ENGELHARD INDUSTRIES, INC.

DOCKET NO. 70-139
Kra for Eng

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 Regulation

RE: 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 r. This pickling operation is done to remove all tracer steel jacketing material before swaging. The zirc cladding is not affected by the acid.

April 17, 1959

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ATTLEBORO, MASS.

ATTLEBORO 1-0090

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

~~EXCELRAD INDUSTRIES, INC.~~

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

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS

ATTLEBORO, MASS.
ATTN: EBORO 1-0090

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
John H. Durant
Business Representative

JHD/bs

ENGELHARD INDUSTRIES, INC.

Xtra for Insp

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ATTLEBORO, MASS.

ATTLEBORO 1-0090

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 Malaker**. Dr. Malaker is a former consultant to Oak Ridge National Laboratory and currently Professor of Nuclear Engineering at Newark College of Engineering.

FEB 19 1959

RECEIVED

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.
- (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
- (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 submission from Nuclear Metals, Inc.)

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)