

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

LR:JED REFER TO:
70-139

APR 5 1962

Engelhard Industries, Inc.
D. E. Mahopess Division
Pine & Dunbar Streets
Attleboro, Massachusetts

Attention: Mr. Edward O'Neill

Gentlemen:

As requested by your letter of March 20, 1962, you are hereby allocated 4,738.8 grams of U-235 contained in 5,087.2 grams of uranium for procurement as metal scrap by transfer to your license from Program 4000. Arrangements for the transfer should be made with the Oak Ridge Operations Office, Attention: Mr. H. J. McAlduff.

Very truly yours,

Donald A. Hunsbauer, Chief
Source and Special Nuclear Materials Branch
Division of Licensing and Regulation

Distribution:

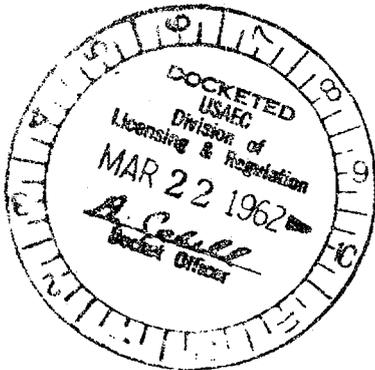
H. J. McAlduff, ORRO, w/RMD
Allen C. Johnson, ICO, w/RMD(2)
D. George, RMI, w/RMD
H. Steels, LR
Compliance, w/cy 3/20/62 ltr
C. Speed, RD, w/RMD
V. D'Amico, IP, w/RMD

DIV. OF COMPLIANCE
REG. 1, USAEC, N. Y.
RECEIVED

APR 16 3 17 PM '62

ENGELHARD INDUSTRIES, INC.

For Div of Compliance



D. E. MAKEPEACE DIVISION
 PINE & DUNHAM STREETS
 ATTLEBORO, MASS.
 ATTLEBORO 1-0080
 AREA CODE 617 - CASTLE 2-5500
Mr. Nelson M. Wines
 March 20, 1962

Mr. Lyll Johnson
 Division of Licensing Regulation
 U. S. Atomic Energy Commission
 Washington 25, D. C.

Dear Mr. Johnson:

Will you please authorize transfer to our License SNM-185 under Lease Agreement 126, 5,087.2 grams of SS Net and 4,738.8 grams of U-235. The metal is in the form of scrap held on our premises under Nuclear Material Draft No. IDO-4000-130.

We are responsible for the recovery and return to Oak Ridge of the above mentioned metal and a more economical recovery by our company can be made if we incorporate it with a quantity of licensing scrap of a similar enrichment.

We have discussed the transfer with Mr. H. McAlduff and he suggested that we receive your approval to transfer the scrap from Program 4000 to 7000.

Since our license material is being shipped to recovery, this week it is of the utmost importance that we receive prompt consideration of this request. Please call me collect in the event that more information is necessary.

Very truly yours,

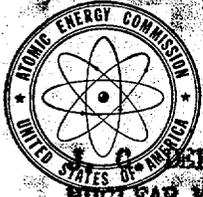
D. E. MAKEPEACE DIVISION

Edward O'Neil
 Edward O'Neil

EON:bla

Copy To:

D. E. George, DNMM, Hdqtrs.
 S. Kops, COO
 H. McAlduff



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

W. C. MELANEY, CHIEF
NUCLEAR MATERIALS BRANCH
DIVISION OF LICENSING & REGULATION
USAEC - GERMANTOWN, MARYLAND

COLLECT

FEBRUARY 23, 1961

ENGLEHARD INDUSTRIES
D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS
ATTENTION: MR. NORTON M. WEISS

LICENSE SM-185, AS AMENDED, IS FURTHER AMENDED THIS DATE TO AUTHORIZE
THE FABRICATION OF FAST NEUTRON CONVERTER ELEMENTS ACCORDING TO THE PRO-
CEDURES DESCRIBED IN APPLICATION DATED DECEMBER 23, 1960, AS SUPPLEMENTED
FEBRUARY 13, ^{and 23} 1961. REFERENCE DOCKET 70-139

NYOO COMPLIANCE DIVISION

MAR 1 1961

RECEIVED

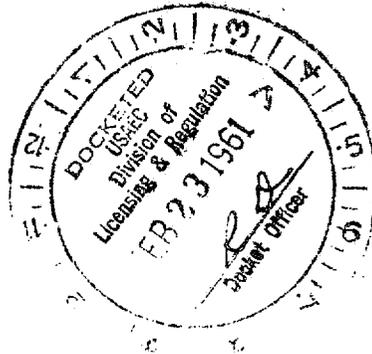
JJLanc:bj
12:30 p.m.
C-151
Ext. 4593

Br. npl. C-159

INCOMING TELEGRAM

ATOMIC ENERGY COMM.
TWR UNIT

1961 FEB 23 PM 12 02



DOCKET NO. 70-139
For Div of Compliance

ACA003 1200P EST FEB 23 61 PA218 BC166

B ALA049 PD WUX PLAINVILLE MASS 23 1105A EST

JOHN LANE US ATOMIC ENERGY COMMISSION

DIVISION OF LICENSING AND REGULATION GERMANTOWN MD

WITH REFERENCE TO OUR TELEPHONE CONVERSATION OF THIS MORNING

D E MAKEPEACE DIVISION WILL INSIST ON A STATEMENT FROM THE

AIRLINE WHICH IS TO CARRY THE OKURA ELEMENTS TO SEATTLE THAT

THIS MATERIAL WILL NOT BE COMINGLED WITH ANY OTHER URANIUM

WHILE IN TRANSIT

ENGELHARD INDUSTRIES D E MAKEPEACE DIV N WEISS HEALTH AND

SAFETY.

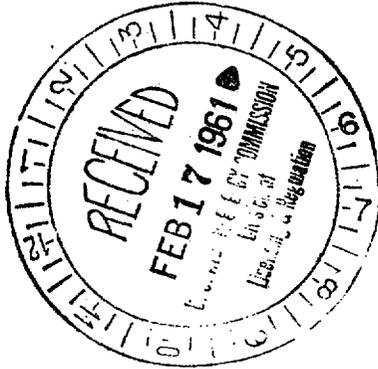
INCOMING TELEGRAM

INCOMING TELEGRAM

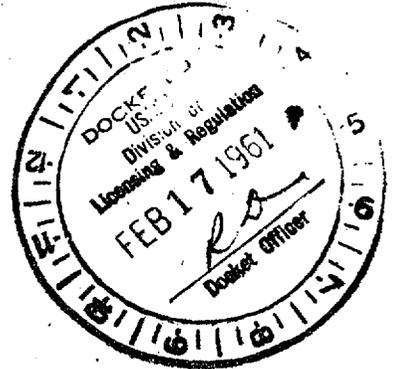
C-252

U. S. ATOMIC ENERGY COMM.
TWX UNIT

1961 FEB 17 PM 2 38



DOCKET NO. 70-139
For Div of Compliance



ACAO03 233P EST FEB 17 61 PC107 BF311

B ALA079 LONG PD WUX PLAINVILLE MASS 17 207P EST

U S ATOMIC ENERGY COMMISSION ATTN JOHN LANE

DIVISION OF LICENSING AND REGULATION GERMANTOWN MD

REFERENCE: DOCKET 70-139 SNM-185 TELEGRAM 2/10/61 LETTER 2/13/61

SHIPPING CONTAINER FOR OKURA FAST NEUTRON CONVERTER ASSEMBLY

WILL HOLD ALL ELEMENTS IN THE FORM OF A SLAB WHICH IS APPROXIMATELY

2" THICK AND CONTAINS 3.0 KG U-235 NO MORE THAN TWO SUCH SLABS

COULD FIT INTO THE CONTAINER DUE TO ITS CONSTRUCTION SINCE

THIS SINGLE SLAB REPRESENTS THE ENTIRE ORDER

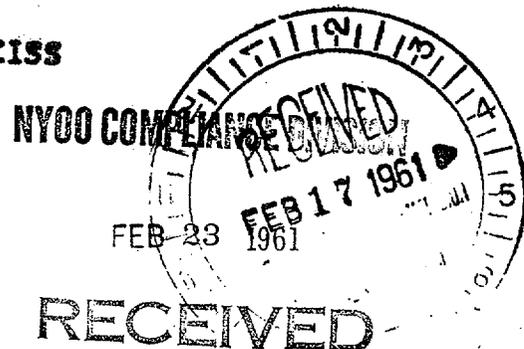
TWO SUCH SLABS WILL NEVER OCCUR ONLY ONE SHIPPING CONTAINER

WILL BE TRANSPORTED TO M&C NUCLEAR CORP. AND TO THE FINAL DESTINATION

ENGELHARD INDUSTRIES D E MAKEPEACE DIVISION N WEISS

70-139 SNM-185 2/10/61 2/13/61 2" 3.0 U-235.

INCOMING TELEGRAM



DOCKET NO.

70-139

Mr Div of Compliance

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

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

MYrtle-5-9358

February 13, 1961

U.S. Atomic Energy Commission
Division of Licensing and Regulation
Germantown, Maryland

ATTENTION: Mr. John Lane

Reference: Docket 70-139 SNM - 195 Telegram 2/10/61

Gentlemen:

With reference to your telephone call of 2/10/61, the following additional information should be incorporated into our request for license amendment dated 12/23/60:

Charge weight of 4.6 Kg. U-235 falls well under safe mass limit of 11 Kg. U-235 (Ref. TID-7016, Table 1, Page 7) for thick water reflector. This would assure a safe condition in the event of a cooling coil rupture in the melting furnace.

Hot rolled plates will be separated by 12" edge-edge during all subsequent operations or storage, prior to vacuum annealing (Ref. TID-7016, Page 15, Rules for Interacting Units, Paragraph 5). The vacuum annealing operation will be omitted from the process along with the flash pickling operation.

After the shearing operation, plates will be divided into lots of six (6) plates maximum (1520 gms. U-235) which will be separated by at least 12" edge-edge from each other. When in storage or transit, plates in each lot will be stacked to form a slab which is .342" thick, to conform with the safe slab thickness of 0.7" for thick water reflection (Ref. TID-7016, Table 4, Page 9). In process storage is done in a locked, caged area under Criticality supervision.

Route cards and process sheets which travel with the material, specify the Criticality Control limits applicable to each operation. The responsibility for adhering to these limits rests with the area supervisor who in turn, is monitored by Criticality

Noted on file copy JF

February 13, 1961

U.S. Atomic Energy Commission
Division of Licensing and Regulation
Germantown, Maryland

Control personnel. The dimensions of the tank to be used for pickling of the hot rolled plates are 12" wide by 84" long by 12" high. The volume of solution to be used is 9 gallons.

Shipment of finished pieces to M & C Nuclear Corp. will be made in the same container which is to be used for final shipment. A drawing of the container is enclosed (SK-83). There will be no commingling of uranium during shipment to and from M & C Nuclear.

Should further information be required, do not hesitate to telephone collect. We would appreciate your prompt attention to this request since fabrication and shipment must be completed by March 1961.

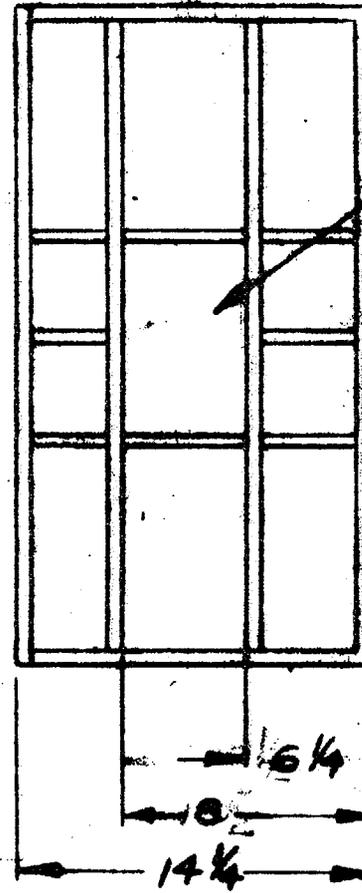
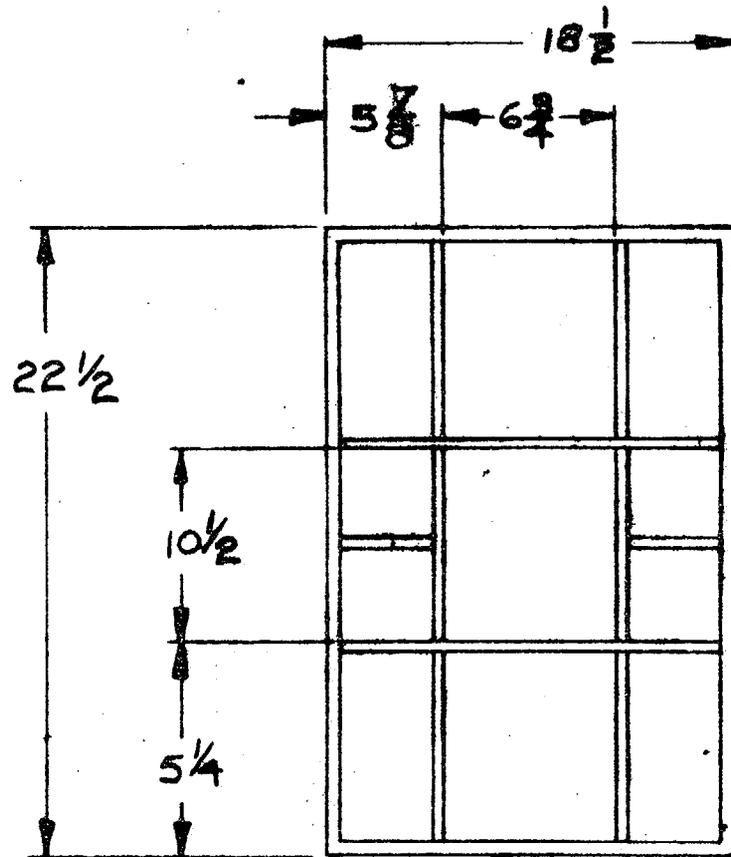
Very truly yours,

Norton M. Weiss
Norton M. Weiss
Health & Safety Manager

NMW/sl

ENC:

CHS. LET.	DESCRIPTION	DATE	BY	APP.	CHS. NO.
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OKURA UNITS
INCLOSED IN A (GOGA)
SHEET METAL CONT.
WITH BRAZED OR
SOLDERED CONST.
VV 1/2 SPONGE
RUBBER PROTECTION
FOR UNITS

NOTE

TOP TO BE STRAPPED TO BOX
AFTER ELEMENT IS PACKED
W/ STEEL STRAPPING

G-2	G-1	ITEM NO.	DRAWING NO.	DESCRIPTION	PROJECT NO.	USED ON ASS'Y
QUANTITY						

TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL ±.005 FRACTIONAL ±1/64" ANGULAR ± 1/2° BREAK ALL SHARP EDGES REMOVE ALL BURRS	APPROVED	DATE	FINISH & SPECIFICATION	TITLE
	DRAWN		MATERIAL & SPECIFICATION	SHIPPING CONTAINER
	CHECKED		FOR OKURA CONVERTER	
	APPROVED			

ENGHARD INDUSTRIES, INC. D. E. MAKEPEACE DIVISION ATTLEBORO, MASS.	SCALE	SIZE	DRAWING NO.	REV.
	~	A	SK-83	

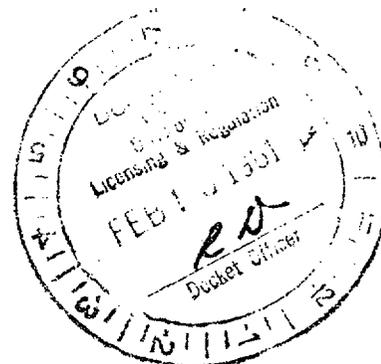
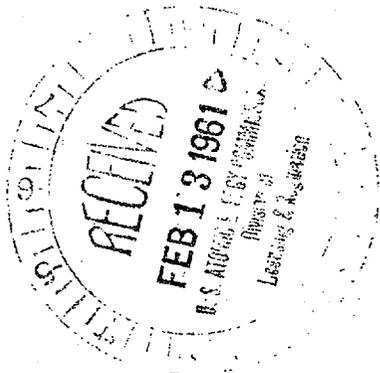
INCOMING TELEGRAM

SECRET

70-139

For Div of Compliance

1961 FEB 10 11 6 10



ACA009 617P EST FEB 10 61 PB328 BE560

B ALA154 LONG PD WUX PLAINVILLE MASS 10 513P EST

JOHN LANE U S ATOMIC ENERGY COMM

DIV OF LICENSING AND REGULATIONS GERMANTOWN MD

REF: DOCKET 70-139 SNM-185 WITH REFERENCE TO YOUR TELEPHONE CALL OF 2/10/61. THE FOLLOWING ADDITIONAL INFORMATION SHOULD BE INCORPORATED INTO OUR REQUEST FOR LICENSE AMENDMENT DATED 12/23/60: CHARGE WEIGHT OF 4.6 KG. U-235 FALLS WELL UNDER SAFE MASS LIMIT OF 11 KG U-235 (REF TID-7016, TABLE 1, PAGE 7) FOR THICK WATER REFLECTOR THIS WOULD ASSURE A SAFE CONDITION IN THE VENT OF A COOLING COIL RUPTURE IN THE MELTING FURNACE HOTE ROLLED PLATES WILL BE SEPARATED BY 12" EDGE-EDGE FURING ALL SUBSEQUENT OPERATIONS OR STORAGE PRIOR TO VACUUM ANNEALING (REF TID-7016, PAGE 13, RULES FOR INTERACTING UNITS, PAR 3) THE VACUUM ANNEALING OPERATION WILL BE OMITTED FROM THE PROCESS ALONG WITH THE FLASH PICKLING OPERATION AFTER THE SHEARING

Noted on File 9/1

INCOMING TELEGRAM

OPERATION, PLATES WILL BE DIVIDED INTO LOTS OF 6 PLATES MAXIMUM (1320 GMS U-235) WHICH WILL BE SEPARATED BY AT LEAST 12" EDGE-EDGE FROM EACH OTHER WHEN IN STORAGE OR TRANSIT, PLATES IN EACH LOT WILL BE STACKED TO FORM A SLAB WHICH IS 342" THICK, TO CONFORM WITH THE SAFE SLAB THICKNESS OF 0.7" FOR THICK WATER REFLECTION (REF TID-7016 TABLE 4 PAGE 8) IN-PROCESS STORAGE IS DONE IN A LOCKED, CAGED AREA UNDER CRITICALITY SUPERVISION ROUTE CARDS AND PROCESS SHEETS WHICH TRAVEL WITH THE MATERIAL SPECIFY THE CRITICALITY CONTROL LIMITS APPLICABLE TO EACH OPERATION THE RESPONSIBILITY FOR ADHERING TO THESE LIMITS RESTS WITH THE AREA SUPERVISOR WHO IN TURN IS MONITORED BY CRITICALITY CONTROL PERSONNEL. THE DIMENSIONS OF THE TANK TO BE USED FOR PICKLING OF THE HOT ROTLED PLATES ARE 12" WIDE BY 84" LONG BY 12" HIGH THE VOLUME OF SOLUTION TO BE USED IS 9 GALLONS

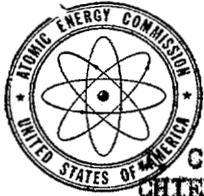
INCOMING TELEGRAM

SHIPMENT OF FINISHED PIECES TO M&C NUCLEAR CORPORATION WILL
BE MADE IN THE SAME CONTAINER WHICH IS TO BE USED FOR FINAL
SHIPMENT. A DRAWING OF THE CONTAINER WILL BE SENT UNDER SEPARATE
COVER THERE WILL BE NO COMMINGLING OF URANIUM DURING SHIPMENT
TO AND FROM M&C NUCLEAR. A LETTER WILL BE SENT CONFIRMING THE
ABOVE STATEMENTS WE WOULD APPRECIATE YOUR PROMPT ATTENTION
TO THIS MATTER

ENGELHARD INDUSTRIES D E MAKEPEACE DIVN N M WEISS

70-139 SNM-185 2/10/61 12/23/60 4.6 U-235 11 U-235 TID-7016
1 7 12" TID-7016 13 3 6 1320 U-235 12" 342" 0 7" TID-7016 4
8 12" 84" 12" 9.

INCOMING TELEGRAM



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

C. DELANEY
CHIEF, NUCLEAR MATERIALS SECTION
LICENSING BRANCH
DIV. OF LICENSING AND REGULATION
USAEC - GERMANTOWN, MARYLAND

ROUTINE - COLLECT

JULY 29, 1960

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

ATTENTION: N. WEISS

YOUR LICENSE SMM-185 AMENDED THIS DATE TO AUTHORIZE MODIFICATIONS IN SHIPPING
CONTAINER IN ACCORDANCE WITH THE PROCEDURES DESCRIBED IN YOUR MESSAGE OF
JULY 26, 1960. REFERENCE DOCKET NO. 70-139.

IVOC COMPLIANCE DIVISION

AUG 3 1960

RECEIVED

TGMCreless:sjs
8:50 a.m.
Ext. 4593
Rm. No. C-159

Compliance
C-159

INCOMING TELEGRAM

0-139

U S ATOMIC ENERGY COMM.
TWX UNIT

1960 JUL 26 PM 3 20

ACA006 317P EDT JUL 26 60 PB213 EB438
B ALA067 LOND PD WUX PLAINVILLE MASS 26 300P EDT
U S ATOMIC ENERGY COMMISSION, J C DELANEY

DOCKET NO. 70-139
For Div of Compliance

DIVN LICENSING AND REGULATION GERMANTOWN MD

REFERENCE DOCKET 70-139 SNM-185 FEASIBILITY REPORT DEM-10,
DRAWING SK3, SHIPPING CONTAINER FOR FOUR WTR FUEL ELEMENTS
REQUEST AMENDMENT TO OUR LICENSE WHICH WOULD PERMIT MINOR MODIFICATION
TO OUR PROPOSED SHIPPING CONTAINER FOR WTR FUEL ELEMENTS
AS FOLLOWS: NUMBER OF FLANGED SUPPORTS TO MAINTAIN CENTER SPACING
REDUCED FROM FOUR TO TWO WITH FOUR 1" CUT OUTS 90 DEGREE APART
SPACE BETWEEN INNER CONTAINER AND OUTER CONTAINER TO BE COMPLETELY
FILLED WITH VERMICULITE AS PACKING MATERIAL CONFIRMING LETTER
AND SKETCH WILL FOLLOW WE WOULD APPRECIATE YOUR PROMPT ATTENTION
AS WE WOULD LIKE TO MAKE OUR FIRST SHIPMENT BY AUGUST 3
ENGELHARD INDUSTRIES D E MAKEPEACE DIVN N WEISS



INCOMING TELEGRAM

70-139 SNM-185 -10 SK3 WTR 1" 90 3.



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

IN REPLY REFER TO:

LEM: YGM
Pocket No. 70-139

JUN 21 1960

Engelhard Industries, Inc.
D. E. Wakepeace Division
Pine and Dunham Streets
Atholboro, Massachusetts

Attention: Mr. John H. Durant
Business Manager

Gentlemen:

Reference is made to your application for amendment to License SEM-135 dated May 17, 1960, with which you requested approval of shipping procedures for solutions of 25.6% enriched uranium.

It is our opinion that the 18 gage inner container that you have proposed is not structurally substantial enough for shipments of this type. It is believed that the inner container should be equivalent to Schedule 40 stainless steel pipe, with welded bottom and flanged and gasketed top. An example of such a container is shown on page 47 of TID-7019, "Guide to Shipment of U-235 Enriched Uranium Materials". Therefore, it will be necessary for you to provide additional information to either justify the adequacy of your proposed container or to amend your request by the inclusion of a more structurally sound inner container before further action can be taken on your application.

Please furnish also, a description of the arrangements which you propose to make to insure that no other special nuclear material will be combined with your shipment enroute to the selected refiner.

Upon receipt of the information requested, we will continue the review of your application.

Very truly yours,

NYOO INSPECTOR DIVISION

JUN 24 1960

RECEIVED

Lyell Johnson
Chief, Licensing Branch
Division of Licensing and Regulation

Div. of Comp.

70-139

70-139
For Div of Inspection

ENGELHARD INDUSTRIES, INC.

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

May 17, 1960

United States Atomic Energy Commission
Germantown, Maryland

Attention: J.C. Delaney-Licensing Branch
Materials Branch

Reference: SNM-185 - Docket 70-139

Subject: Request For Amendment To Ship Acid Solutions

Gentlemen:

In connection with our nuclear fuel fabricating activities and in particular the manufacture of the core for the Enrico Fermi Fast Breeder Reactor the requirement has arisen to transport an accumulation of several containers of acid pickle solutions containing 25.6% enriched uranium from our Plainville Massachusetts fabricating plant to a licensed commercial refiner of enriched uranium. This action requires an amendment to our license.

D. E. Makepeace requests further amendment to SNM-185 authorizing the shipment of acid solutions containing 25.6% enriched uranium to a commercial refiner for reprocessing. These solutions are generated through the nitric acid pickling of end croppings from PRDC co-extrusions. (Ref. DEM-5 Rev. A., Section 14, Page 17.) The pickling operation is performed in order to salvage as much uranium as possible for recycling purposes. In the course of this operation, some of the uranium goes into solution along with the copper, nickel, and zirconium which is being removed. This operation is done in batches of 6 liters of solution and averages 50 grams U-235 per batch with individual variation running from 18 to 170 grams. U-235/

NYOO INSPECTION DIVISION

MAY 26 1960

RECEIVED

J.C. Delaney
United States Atomic Energy Commission
Germantown, Maryland

Page Two

We propose to ship these solutions in containers holding a maximum volume of 12 liters with a maximum mass of 350 grams U-235 per container. The container will consist of a 58 gallon open head steel drum which contains a 6-1/2" diameter galvanized cylinder closed at one end and centered in the drum by means of a wooden support. Three one gallon polyethylene screw cap jars will be inserted into the cylinder in an end to end configuration. The jars are 6" in diameter and 11" tall. Vermiculite will be tightly packed at the top and bottom of the cylinder and between each jar. A top cover will then be placed over the cylinder and the barrel will be sealed for shipment.

The criticality justifications for this container are derived from TID-7019, Guide To Shipment Of U-235 Enriched Uranium Materials. For a 30% enrichment uranium solution, the infinite cylinder diameter is given as 6.3" (Ref. TID-7019, Table II; page 13). Since our polyethylene containers are 6" in diameter, this criterion is met. Also, in table I; page 12, the maximum permissible value for U-235 solutions is given as 350 grams which will be adhered to as our limit. The spacing between adjacent containers is maintained at 18" edge to edge or 24" center to center by virtue of their design. This is in accord with the minimum spacing for 55 gallon drums listed in Table X; page 20 as 1.5 ft. for an in line array.

We propose to ship a maximum of 5 of these containers in an in line array. The barrels will be shored to assure that this configuration is maintained in transit. In the event that the refiner to be selected is Irvington-Baker Division of Engelhard Industries, shipments will be made via Baker truck to be loaded and shored by D. E. Makepeace personnel. There will be no other uranium transported on the vehicle with these shipments.

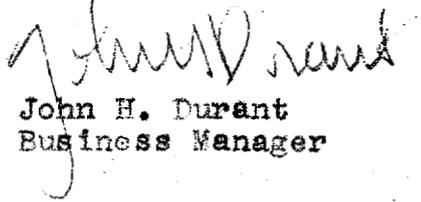
If other licensed commercial sources are employed, the same method of shipment will be used with D. E. Makepeace personnel loading and shoring the refiner's truck.

Page Three

We will appreciate your early action and decision on our request. Collect telephone calls will be accepted on this subject if they will expedite the processing of this request.

Very truly yours,

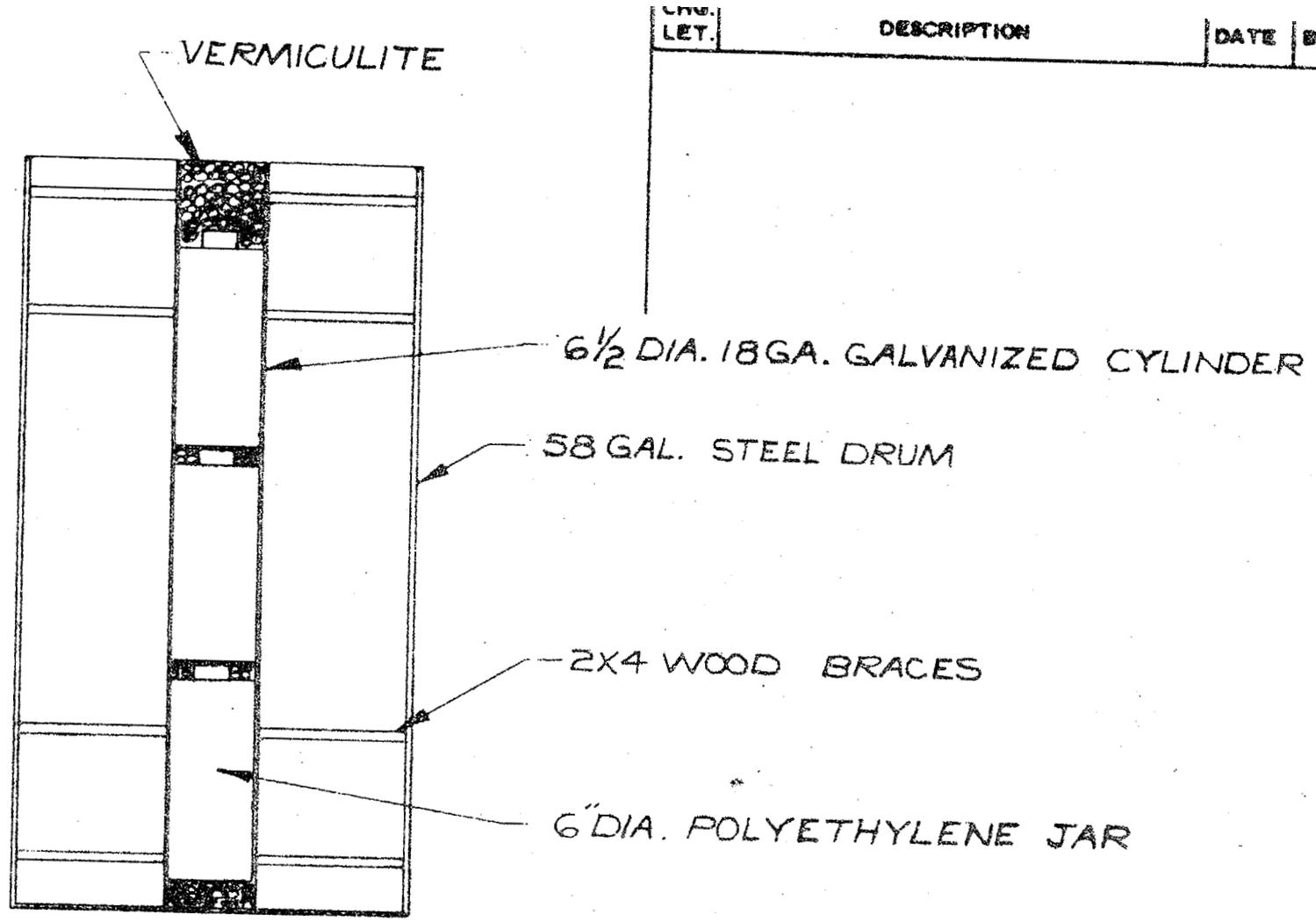
D. E. MAKEPEACE DIVISION


John H. Durant
Business Manager

JHD/jet

Enclosure: Drawing #50065 container

SOCKET NO. 70-133
 For Div of Inspection



CHG. LET.	DESCRIPTION	DATE	BY	APP.	CHG. NO.

G-2	G-1	ITEM NO.	DRAWING NO.	DESCRIPTION	PROJECT NO.	USED ON ASS'Y		
TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL ± .005 FRACTIONAL ± 1/64" ANGULAR ± 1/2°		APPROVED DRAWN <i>A. J. Fuller</i> CHECKED APPROVED <i>K. M. Weiss</i> 5/17/60		DATE FINISH & SPECIFICATION MATERIAL & SPECIFICATION	TITLE SHIPPING CONTAINER FOR ENRICHED PICKLE SOLUTIONS			
BREAK ALL SHARP EDGES REMOVE ALL BURRS		ENGELHARD INDUSTRIES, INC. D. E. MAKEPEACE DIVISION ATTLEBORO, MASS.			SCALE 	SIZE A	DRAWING NO. 50065	REV.

DOCKET NO.

~~70-139~~

For Div of Inspection

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

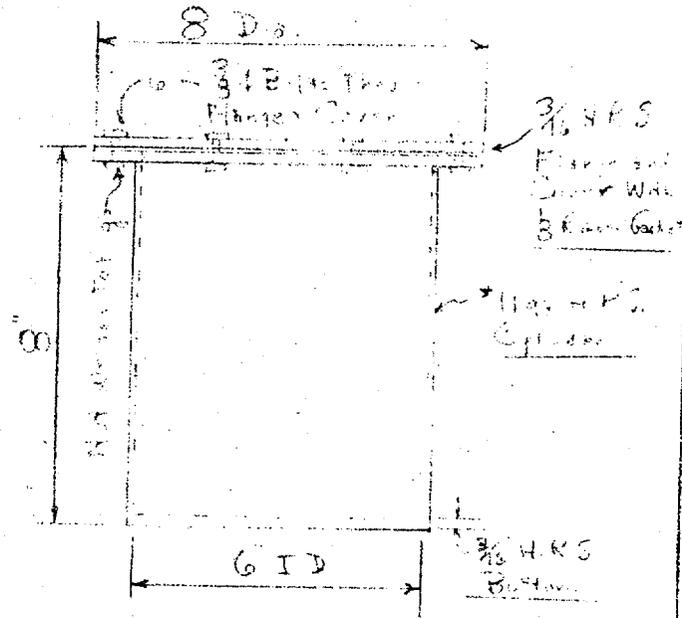
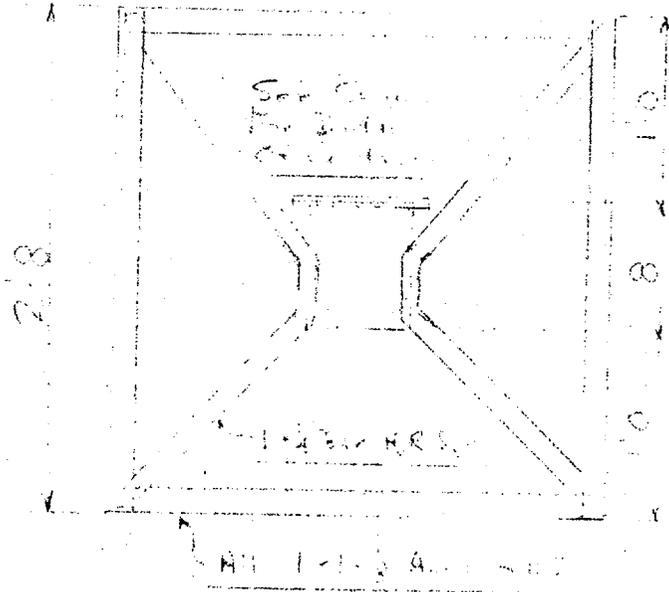
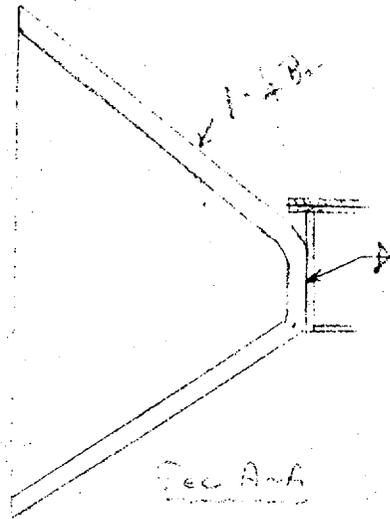
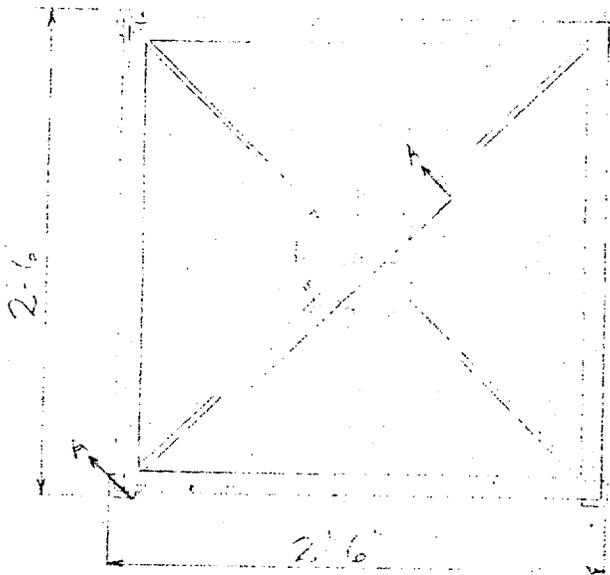
NMW:jo

Enclosure - 3 *pgs.* of 1 *Dwg.*



Tower Iron Works

PROVIDENCE, RHODE ISLAND



STORAGE CONTAINER

WELDED WATER-TIGHT

DETAIL OF CYLINDER

WELDED WATER-TIGHT

STORAGE CONTAINER
 For
 D. E. HARRINGTON DIV - ENGLEHARDT CO.
 J.E. - 7-1-19

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 SM-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 AND REFERENCE
YOUR DOCKET NO. 70-139

DISTRIBUTION

D. F. Misser, NMM
E. A. Shepherd, FIN (2)
Div. of INS

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

Clear

70-139

IRL: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, SRT-185, be amended to authorize the receipt and storage of enriched uranium durbies 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 durbies 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.

Kleen

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 birdsages per shipment and the array in which these birdsages 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

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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 exclusive for storage of a maximum of 350 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

ENGELHARD INDUSTRIES, INC.
D. E. Makepeace Division

Request 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

LPL:CFM
Docket No. 70-139

MAY 13 1959

Engelhard Industries, Inc.
D. E. Maloney Division
Pine & Duane Streets
Attleboro, Massachusetts

Attention: Mr. John H. Durant
Business Representative

Gentlemen:

In reference to your letter of April 30, 1959, this is to
advise you that we have received your application of April
17, 1959 and that the request for amendment to your Special
Nuclear Material License No. SN-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. Dolaney
Chief, Nuclear Materials Section
Licensing Branch
Division of Licensing and Regulation

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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.

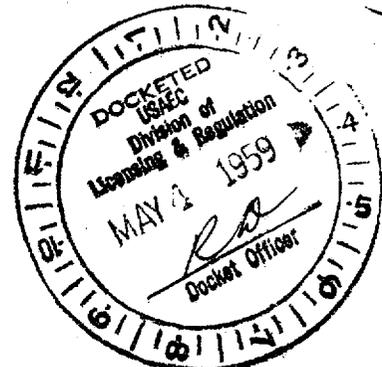
We hope it will soon be possible for us to receive our fully amended license which will permit us to proceed with the manufacturing phases of our core contract with Power Reactor Development Corporation.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Representative

JHD/bs



70-139

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. CANNAN
PROJECT MANAGER
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS

YOUR LICENSE SM-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. MURPHY, ENR
J. C. RYAN, FID (2)
D. of TENS, w/ ltr. dtd. 4/9/59

NYOO INSPECTION DIVISION
JUN 5 1959
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McCallum:rh
3:20 p.m.
Em. No. B-129

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INCOMING TELEGRAM

COMM.

DOCKET NO. 70-139

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Xtra file

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



INCOMING TELEGRAM

ENGELHARD INDUSTRIES, INC.

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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.

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Division of
Licensing & Regulation
Nuclear Officer
APR 10 1959

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

DOCKET NO. 70-139

For Div of Compliance

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ATTLEBORO, MASS.

ATTLEBORO 1-0090

Myrtle-5-9358

April 18, 1961

U.S. Atomic Energy Commission
Division of Licensing and Regulation
Germantown, Maryland

Attention: Mr. Joseph C. Delaney Chief,
Nuclear Materials Section

Reference: Docket 70-139; SNM-185

Subject: Request for Amendment to Mix Shipments of PRDC
and CP-5 Material.

Gentlemen:

In order to fulfill current scheduling requirements, D.E. Makepeace Division requests an amendment to SNM License 185 to permit mixed shipments of enriched uranium to Nuclear Metals, Inc., Concord, Mass., subject to the following conditions:

Current license amendments allow shipment of enriched ingots and canned slugs in quantities and containers as outlined in Feasibility Report DEM-5, Revision A, Sept. 4, 1959. This material is to be fabricated into PRDC Enrico Fermi Fast Breeder Reactor fuel elements. The maximum quantity of this material to be shipped to Nuclear Metals will be the equivalent of four enriched ingots or a total of 54 Kg. U-235.

In addition to PRDC material, DEM proposes to ship enriched uranium-aluminum composite billets which are to be extruded as fuel tubes for the Argonne CP-5 Reactor. Drawings of the composite billet (No. 1113-5) are enclosed. Each billet contains two uranium-aluminum fuel rings with a maximum U-235 loading of 76.5 grams each. The maximum billet loading is therefore 153 grams U-235.

JUN 15 1961

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

Page 2.

April 18, 1961

It is proposed to pack two composite billets (306 gms. U-235) in a 5 gallon steel bucket. Packing material will be added to prevent damage to the material while in transit. A maximum of three such buckets fastened to the truck at a 12" edge-edge distance from all other enriched uranium will be shipped to Nuclear Metals via DEM truck.

Justification for the individual units are taken from TID-7019, Table I, which lists 350 gms. U-235 as the maximum permissible value for any U-235 enrichment. The spacing criteria were taken from TID-7019, Section 3.3, 1.d.

We trust that sufficient information has been presented to allow amendment to our license. Further information will be supplied upon request to the writer.

Very truly yours,

Norton M. Weiss
Norton M. Weiss
Health & Safety Manager

NMW/al

Enc:

LRL:CPM
Docket No. 70-139

DISTRIBUTION

D. F. Musser, RRM, w/encl.
J. C. Ryan, FIN, w/encl. (2)
Div. of INS, w/encl., T&X dtd.
4/1 & 3/30 & ltr. dtd. 3/3, w/
Feasibility Report DEM 6

APR 6 1959

70-139

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

Attention: Mr. John H. Durant
Business Representative

Gentlemen:

Enclosed is Special Nuclear Material License SNM-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:

Alan
SNM-185, as amended

DONALD A. NUSSBAUMER, CHIEF
SOURCE & SPECIAL NUCLEAR MATERIALS BR.
DIVISION OF LICENSING & REGULATION
U.S. ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

ROUTINE - COLLECT
FEBRUARY 27, 1962

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS
ATTENTION: MR. N. M. WEISS

PURSUANT TO 10 CFR, PARTS 70 AND 71, LICENSE SNM-185 AS AMENDED IS HEREBY
FURTHER AMENDED TO AUTHORIZE THE CONVERSION OF METALLIC URANIUM SCRAP TO
URANIUM OXIDE AND THE SHIPMENT OF THE URANIUM OXIDE BOTH IN ACCORDANCE
WITH THE PROCEDURES AND CONDITIONS DESCRIBED IN YOUR APPLICATION OF
FEBRUARY 9, 1962, FOR LICENSE AMENDMENT.

IN REVIEWING YOUR REQUEST WE MUST ASSUME THAT THE 5-INCH DIAMETER
PIPE WOULD NOT EXCLUDE WATER AND THAT THE CONTENTS COULD THEREFORE BECOME
MODERATED. HOWEVER, SINCE TABLE X, TID-7010 APPLIES IN THE CASE OF OXIDE
SHIPMENTS OF THIS TYPE TO SYSTEMS OF OPTIMUM MODERATION WE HAVE GRANTED
THE AUTHORIZATION. REFERENCE DOCKET 70-139

DISTRIBUTION:

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H. J. McAlduff, Jr., OROO
D. George, NMM
Div. of Compliance
H. Steele, LR
State Health
D. A. Nussbaumer
Br. & Div. Reading files

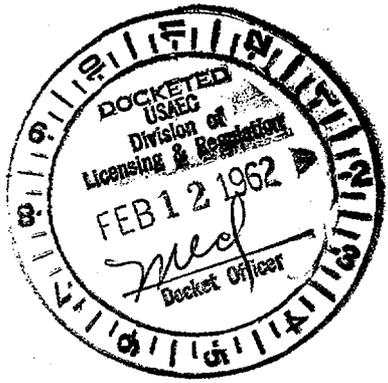
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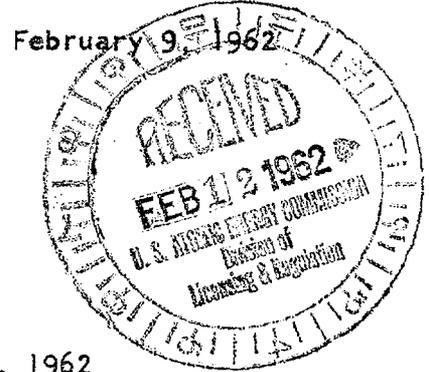
DOCKET NO. 70-139

ENGELHARD INDUSTRIES, INC.

For Div. of Compliance



D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090
Phone: No. Attleboro
MYrtle 5-9358



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

Attention: Mr. Donald Nussbaumer

Reference: Docket 70-139; SNM-185; Our letter of January 5, 1962
Davison Chemical Company: Docket 70-143; SNM-124

Gentlemen:

As indicated in our letter of January 5, 1962, we have a considerable quantity of enriched uranium-containing scrap material which we anticipate shipping to a refinery for reclamation. In order to effect this reclamation in the most economical manner, we propose to convert the metallic uranium to the oxide form before shipping. The procedure to be used for oxidation of the uranium will be as follows:

The uranium alloy (90% U, 10% Mo, 25.6% U-235) will be cut into pieces no greater than 1" in length, and will be spread in a thin layer (less than 1/2" high) in a stainless steel tray which is lined with refractory powder. The maximum batch weight to be used will be 5 kg. of alloy, corresponding to 1.15 kg. U-235. After loading, the tray will be charged into a 6" diameter horizontal electric furnace which will be brought up to a temperature of 800 - 900° C., where it will be held for a period of time necessary to effect 100% oxidation. Oxygen or air will be introduced at a metered flow rate to aid in the oxidation of the uranium. The furnace door will be exhaust vented, with vapors being pulled through a ceramic pre-filter and then an absolute filter. After oxidation has been completed, the container will be covered and allowed to cool in an enclosed hood. When cool, the oxide will be vacuumed from the container into a polyethylene bag using an industrial vacuum cleaner equipped with an absolute filter on the exhaust vent. The bag will be weighed, and they placed in a 4-3/4" diameter metal can 10" long for storage prior to shipment.

DIV. OF COMPLIANCE
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United States Atomic Energy Commission

February 9, 1962

- 2 -

The shipping container will consist of a 5" diameter schedule 40 pipe which is welded in position in the center of a 55 gallon steel drum. The top of the pipe will be flanged and gasketed to prevent any access of water. Three metal cans containing the oxide will be placed in each pipe which will then be sealed for shipment.

This container design has been previously submitted, and approval has been received by Davison Chemical Company (Drawing No. RMG-46, Bureau of Explosives Permit No. 1078) for a maximum U-235 limit of 11 kg. of oxide per container. We propose to receive empty containers from Davison Chemical Company, pack them with material, and return for refining via exclusive use vehicle.

Criticality criteria which were used in determining the nuclear safety of this operation were derived from TID-7016, Rev. 1, specifically from figures 3 and 4, page 15. Assuming that flooding occurred in the tray which is 5" x 40" x 1-1/2" high, the H/X ratio for the batch size of 1.15 kg. U-235 has been determined to be 105.5, corresponding to a U-235 density of .235 kg. per liter. A safe thickness for the above condition is seen to be greater than 1.5" from figure 4. We propose to limit the thickness of uranium to 1/2" maximum which will be safe under any conditions for isolated slabs.

In order to determine the safe mass to be packed in the shipping container, we have used data from figure 3 which gives safe diameters of isolated cylinders. We have determined that a maximum mass of 6 kg. U-235 per container will be safe assuming full flooding conditions. This has been determined by the H/X ratio which is calculated as 27.6 with a U-235 density of .62 kg. per liter. The data from figure 3 shows a maximum safe diameter of 5" under the above conditions.

Our shipping criteria have been derived from TID-7019, table X, page 20. Since the inner pipe containing the fissionable material will be gasketed and bolted, we have ruled out the possibility of internal flooding. The material will thus be considered as a dry salt and will fall within such limits as are specified in table X. The safe spacing for an infinite square array of 5" dia. containers 2.5 ft. long is given as 18" edge to edge. Our containers assure a 19" edge - edge configuration by virtue of their construction. Angle irons in the form of a tripod will be welded on each barrel to prevent stacking.

We propose to ship thirty (30) barrels in two (2) parallel rows of 15 each on an exclusive use vehicle. All barrels will be braced sufficiently to prevent movement while in transit. Solid angle calculations have been performed to verify the safety of the proposed spacing. The interaction solid angle between the central container and an adjacent unit has been determined to be .191 steradians. The total solid angle subtended by all containers on the central container is less than 1.88 steradians. Since the k for a 5"

United States Atomic Energy Commission

February 9, 1962

- 3 -

diameter cylinder is 0.58 (Ref. TID-7019, Table IX, page 19) we find that the maximum allowable total fractional solid angle for this multiplication factor is 25% of 4π steradians. Our total solid angle of 1.88 steradians is equivalent to only 15% of 4π which assures us a safe configuration with an additional safety factor. The proposed shipment therefore will meet the provisions of TID-7019, table X, and paragraph 3, pages 20, 22, and 23.

This request by virtue of its nature will serve to cancel our previous request of January 5, 1962. We trust that sufficient information and justification has been transmitted to allow for a rapid, although complete, evaluation and subsequent approval. It is extremely urgent that we begin scrap recovery as soon as possible, and therefore, it is requested that your immediate attention be devoted to this matter. Should further information be required, do not hesitate to contact us by collect telephone call.

Very truly yours,

ENGELHARD INDUSTRIES, INC.
D. E. Makepeace Division

Norton M. Weiss

Norton M. Weiss
Health & Safety Manager

NMW:pmr

DOCKET NO. 70-139

ENGELHARD INDUSTRIES, INC.

For Div. of Compliance

D. E. MAKEPEACE DIVISION

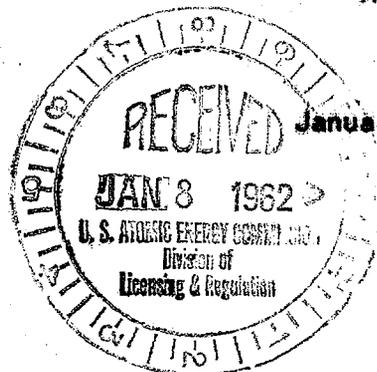
PINE & DUNHAM STREETS

ATTLEBORO, MASS.

ATTLEBORO 1-0090

Phone: No. Attleboro

MYrtle 5-9358



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

Attention: Mr. Donald Nussbaumer

Reference: Docket 70-139; SNM-185

Subject: Request for License Amendment to Authorize Shipment
of Enriched Uranium Scrap to a Refinery

Gentlemen:

In the course of fabricating two core loadings for the Enrico Fermi Fast Breeder Reactor, we have accumulated a considerable quantity of scrap material which must be sent to a refinery for recovery of enriched uranium. It is our intention to package and ship this material via exclusive use vehicle in accordance with safe criticality criteria. There is a possibility that a certain quantity of the scrap may be sent to a potential user rather than to the refinery; however, the criticality criteria will be the same in either event.

Composition of the material is 90% uranium, 10% molybdenum alloy, with a U-235 enrichment of 25.6%. Some of the material is clad with zirconium, while the remainder is bare alloy. The scrap is broken down into the following categories and weights:

<u>Description</u>	<u>Approx. Size</u>	<u>U-235 Weight (kg.)</u>
1. Solid scrap	1.5" dia. x 1" length	39.2
2. Melt skull	Irregular chunks	27.4
3. End croppings	.310" dia. x 1/2"-1"	4.6
4. Turnings & saw chips	Compacts 3" dia. x 1/2" thick	31.2
5. Pin scrap	.158" dia. x 1/2" (zirc clad)	52.0
6. Sludge, sweepings, etc.		3.8
	Total	<u>158.2 kg.</u>

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The containers which will be used for packing the scrap in categories 1, 2, 3, and 5 will consist of steel pipe 2½" in diameter by 36" long, placed inside a 3½" diameter pipe which is welded to a ¼" steel plate support. The attached drawing (No. 50034, Rev. A) shows the construction and spacing of a typical unit which has previously been approved for storage of enriched fuel pins. These units will be bolted to the bed of a 40 foot trailer in order to prevent any movement while in transit. The minimum spacing between adjacent units will be 18" edge to edge.

The maximum number of units to be placed aboard the truck will be 40, arranged in two parallel rows of 20 units each. Material to be placed inside each container will be limited to mass in accordance with the following table:

<u>Description</u>	<u>Max. U-235/container (kg.)</u>	<u>Reference</u>
1. Solid Scrap	5.0	TID-7016, Rev. 1, Fig. 3
2. Melt Skull	1.5	TID-7016, Rev. 1, Fig. 3
3. End croppings	5.0	TID-7016, Rev. 1, Fig. 3
4. Chips & Turnings	1.0	TID-7016, Rev. 1, Fig. 3
5. Pin Scrap	5.0	TID-7016, Rev. 1, Fig. 3

Material in categories 1, 3, and 5 when packed will have a U-235 density of 1.72 kg. per liter and a corresponding H/X ratio of 20.8 assuming full flooding. Since the U-235 density of the proposed container is greater than the density corresponding to the H/X ratio in figure 3, a correction factor of .581 (Po/P) has been applied to the container linear dimension of 5". The correction factor gives a maximum safe diameter of 2.9" under full reflection conditions. Since our container is 2.5" in diameter, it meets this criterion for individual unit safety.

Since the skull material is in the form of irregular chunks, a more restrictive limit of 1.5 kg. U-235 has been established as maximum per individual container. The H/X ratio has thus been calculated as approximately 53, with a corresponding U-235 density of 0.517 kg. per liter. Since this corresponds to the density value as shown in figure 3, no correction factor need be applied. However, the 2.5" diameter pipe will serve as the container for the skull giving us an additional safety factor.

Turnings and saw chips will be shipped in birdcages consisting of a 5" diameter pipe centered in a cubical framework of 1¼" welded angle iron. Cube edges will be 2 feet long, which will assure a spacing of 19" edge - edge between adjacent units. Inner metal containers will be of sufficient diameter to fit inside the 5" pipe. The turnings will be shipped in the form of compacts approx. 3" in diameter by ½" thick, placed under sufficient fuel oil to cover them with a layer of at least 2" on top. A sketch of the birdcage container is enclosed for reference.

- 3 -

The H/X ratio for the birdcage has been calculated to be 54.7 with a U-235 density of 0.388 kg./liter. In accordance with figure 3, a maximum safe diameter will be 5' under full water reflection.

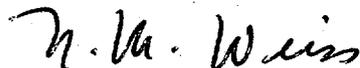
Spacing and shipping criteria have been derived from TID-7019, Table X, Page 20. Since the H/X ratio is greater than 20 in all cases, assuming flooding, the material will be considered as moderated uranium. We propose to use a minimum 18" edge - edge spacing between individual units which is in accord with spacing requirements for an infinite square array of 5" ID containers which are 2.5 ft. long. When individual containers have been packed, they will be sealed, and pipe caps securely attached. The maximum number of containers to be shipped in any one truck load will be 40.

Solid angle calculations have been made in accordance with TID-7016, Pages 34 - 36 to further assure that interaction between containers will not exceed safe limits. The solid angles subtended by central units of the pipe and birdcage containers are .169 and .105 steradians respectively, which are well below safe limits.

We trust that sufficient information and justification has been submitted to allow approval of our request in a minimum length of time. Should further information be required, please contact the writer by collect telephone.

Very truly yours,

ENGELHARD INDUSTRIES, INC.
D. E. Makepeace Division



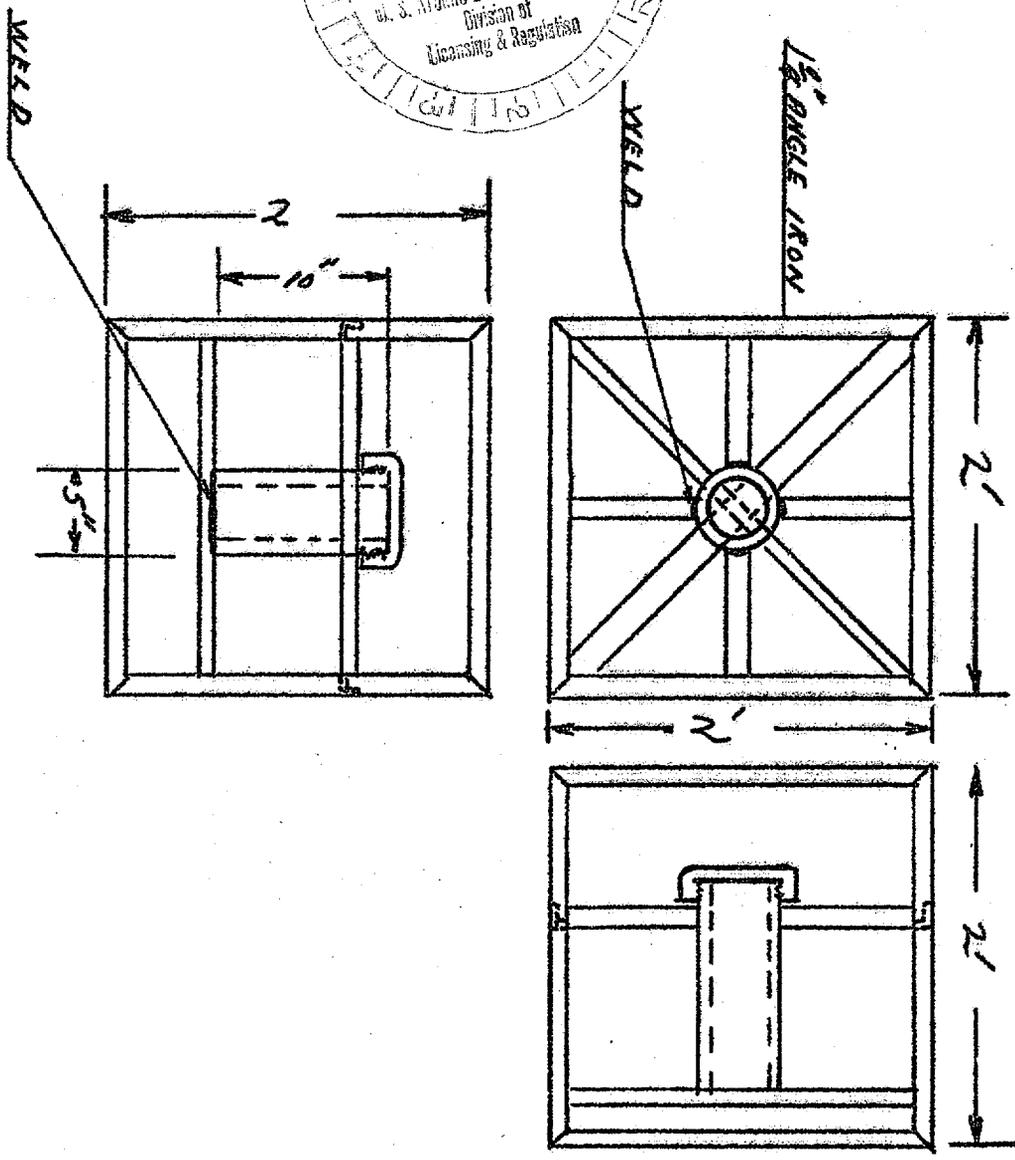
N. M. Weiss
Health and Safety Manager

NMW:pmr

DOCKET NO. 70-139



For Div. of Compliance



ENGLEHARD INDUSTRIES INC.
DE. WAKEFIELD DIV. PLAINVILLE, MASS.
PROPOSED BIRDCAGE FOR SHIPMENT OF URANIUM TURNINGS

USAEC, GERMANTOWN, MARYLAND
DONALD A. NUSSBAUMER, CHIEF
SOURCE & SPECIAL NUCLEAR MATERIALS BR.
DIVISION OF LICENSING AND REGULATION

ROUTINE COLLECT

JANUARY 18, 1962

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
FINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS
ATTENTION: MR. H. M. WEISS

PURSUANT TO 10 CFR 71 YOU ARE HEREBY AUTHORIZED UNDER LICENSE SNM-185 TO
SHIP AT ONE TIME UP TO 7.6 KG U-235 IN ACCORDANCE WITH THE CONDITIONS
AND PROCEDURES DESCRIBED IN YOUR APPLICATION DATED DECEMBER 20, 1961.
ALTHOUGH THE FOLLOWING CONSIDERATIONS WERE NOT A FACTOR IN OUR REVIEW OF
THE PROCEDURES, PLEASE NOTE REGARDING YOUR STATEMENT THAT THE TOTAL
FRACTIONAL SOLID ANGLE IS LESS THAN 0.05 WHICH IS SAFE FOR A K OF GREATER
THAN 0.80, THAT WHEN K EXCEEDS 0.80, DIRECT EXPERIMENTAL DATA OR VALUES
REDUCED DIRECTLY FROM SUCH DATA SHOULD BE USED INSTEAD OF SOLID ANGLE
CALCULATIONS. FURTHER, IN APPLYING SOLID ANGLE CRITERIA THE TOTAL SOLID
ANGLE SUBTENDED BY ALL CONTAINERS ON A CENTRAL CONTAINER MUST BE CONSIDERED
RATHER THAN ONLY THE INTERACTION SOLID ANGLE BETWEEN THE CENTRAL UNIT AND ONE
ADJACENT UNIT. REFERENCE LR:JCD DOCKET 70-139

Distribution:

H. J. McAlduff, Jr. CROO

D. George, NMM

H. Steele, LR

Compliance, w/cy 12/20/61 appl.

DIV. OF COMPLIANCE
REG. 1, USAEC, N. Y.
RECEIVED

JAN 25 3 31 PM '62

December 20, 1961

- 2 -

We trust that the above information will serve to facilitate your appraisal of our request, since it is urgent that we ship this material as soon as possible. Should further information be required, do not hesitate to call by collect telephone.

Very truly yours,

ENGELHARD INDUSTRIES, INC.
D. E. Makepeace Division

H. H. Weiss

H. H. Weiss
Health & Safety Manager

NW:pmr

70-139

ENGELHARD INDUSTRIES, INC.

For Div of Compliance

D. E. MAKEPEACE DIVISION

PINE & DUNHAM STREETS

ATTLEBORO, MASS.

ATTLEBORO 1-0090

Phone: No. Attleboro
NYrie 5-9358

December 20, 1961

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

Attention: Mr. Donald Nussbaumer

Reference: Docket 70-139; SNM-185

Subject: Request for License Amendment to Allow Shipment of
Enriched Uranium Acid Solutions to a Refinery

Gentlemen:

We have presently in our possession approximately 2000 gallons of acid solutions containing an estimated quantity of 7 kg. of U-235 content. These solutions are stored in 50 gallon polyethylene lined drums, each drum limited to a maximum concentration of 2 grams U-235 per liter.

It is the purpose of this letter to propose shipping procedures for the transport of this material to a refinery, and to request amendment to our Special Nuclear Materials License 185, which would authorize us to do so at the earliest opportunity. Nuclear Safety data has been obtained from TID-7019, Guide to Shipment of U-235 Enriched Uranium Materials.

We propose to ship a maximum of 20 barrels of solution at one time for recovery. Shipment will be made via exclusive use vehicle. The barrels will be spaced to maintain a 2 foot edge - edge separation in accordance with conditions specified in TID-7019, Table X, Page 20, for a two dimensional infinite square array. The spacing between individual units will be maintained by a wooden framework fastened to the truck bed and sides. A sketch showing the construction and spacing of a typical shipment is attached for reference.

In order to obtain additional verification as to the nuclear safety of the proposed configuration, solid angle calculations have been made in accordance with TID-7019, Appendix 4, B.1., Page 74, and Appendix 5, Page 75. The interaction solid angle between a central unit and an adjacent unit is 0.569 steradians. The total fractional solid angle is less than .05 which is safe for a k of greater than 0.80. The k for each container is well under 0.80, since the H/X ratio has been calculated as approximately 13,000.

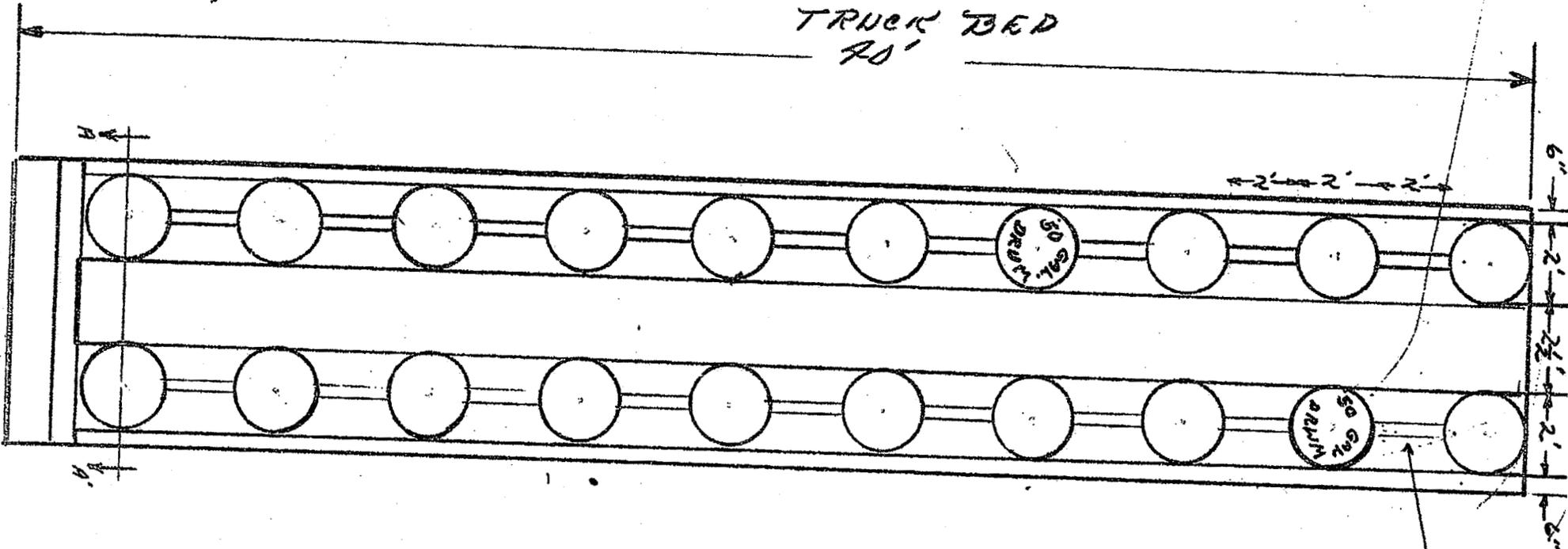
→ For cases where $k > 0.80$, direct experimental data or values reduced directly from such data should be used.

655

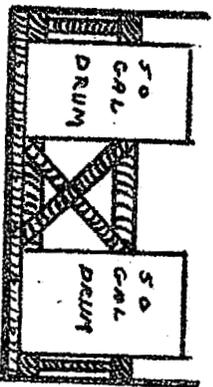
ENGLEHARD INDUSTRIES
D. E. MAKEPEACE DIVISION
PLAINVILLE, MASS.

PROPOSED SPACING AND BRACING ARRANGEMENT FOR SHIPMENT
OF ENRICHED URANIUM ACID SOLUTIONS TO REFINERY

TRUCK BED
40'



BRACING



SECTION A-A

BRACING STRUCTURES
OF 2" X 4" & 2" X 6"
LUMBER

Donald A. Nussbaumer, Chief
Source & Special Nuclear Materials Br.
Division of Licensing & Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

ROUTINE - COLLECT

NOVEMBER 23, 1961

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

ATTENTION: MR. NORTON M. WEISS

PURSUANT TO 10 CFR 71 YOU ARE HEREBY AUTHORIZED UNDER YOUR LICENSE SNM-185
TO SHIP SCRAP MATERIALS CONTAINING ENRICHED URANIUM IN ACCORDANCE WITH THE
PROCEDURES AND CONDITIONS DESCRIBED IN YOUR APPLICATION DATED OCTOBER 20,
1961, AS AMENDED BY TELEGRAM OF NOVEMBER 20, 1961 END REF: 70-139; L&R:JCD

DISTRIBUTION:

Formal & Suppl. Dockets

Document Room

✓ Div. of Compliance

State Health

H. Steele, L&R

D. George, NMM

H. J. McAluff, Jr., OROO

Br. & Div. Reading files

NYCO COMPLIANCE DIVISION

DEC 4 1961

RECEIVED

DOCKET NO. 70-139

For Div. of Compliance

1961 NOV 20 AM 11 25

U.S. ATOMIC ENERGY COMM.
T W X UNIT

ALAO21 PD WUX PLAI.VIL

E MASS 20 956A EST

US ATOMIC ENERGY COMM DIV OF LICENSING AND REGULATION

GERMANTOWN MD

REFERENCE DOCKET 70-139 SNM-185 OUR LETTER OF 10/20/61. PLEASE
 REVISE AMENDMENT REQUEST AS PER THE FOLLOWING 1. CHANGE DIAMETER
 OF SCHEDULE 40 PIPE FROM 63 TO 5" BY 30" LONG. 2. ANGLE IRON
 TRIPODS WILL BE WELDED ON TOP OF BARRELS TO PREVENT STACKING.
 3. MAXIMUM NUMBER OF CONTAINERS TO BE SHIPPED WILL BE 20. JUSTIFICATIO
 N 1. SOLID ANGLE CALCULATIONS VERIFY SAFE SPACING BETWEEN THE
 MOST CENTRAL CONTAINER IN A TWO DIMENSIONAL PLANAR ARRAY AND
 ADJACENT UNITS (1.43 STERADIANS) MULTIPLICATION FACTOR FOR INDIVIDUAL
 CONTAINER IS 0.58 (REF TID-7019, TABLE IX, PAGE 19) 2. CONTAINERS
 WILL BE SHIPPED IN A PLANAR ARRAY WITH A 19" EDGE-EDGE SPACING
 BETWEEN UNITS THIS MEETS REQUIREMENTS OF AN INFINITE SQUARE



ARRAY PER TID-7019, TABLE X, PAGE 20. OUR PROMPT ATTENTION
 AND NOTIFICATION WILL BE APPRECIATED

ENGELHARD INDUSTRIES DE MAKEPEACE DIVISION MORTON M WEISS

70-139 SNM-185 10/20/61 1 40 6" 5" 30" 2 3 20 1 1.43 STERADIANS
 0.58 TID-7019 IX 19 2 19" TID-7019 X 20

NUCC COMPLIANCE DIVISION

DEC 4 1961

INCOMING TELEGRAM

RECEIVED

DOCKET NO. 70-139

ENGELHARD INDUSTRIES, INC.

For Div. of Compliance

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

Phone: No. Attleboro
MYrtle 5-9359

October 20, 1961

U.S. Atomic Energy Commission
Division of Licensing & Regulation
Germantown, Maryland

Attention: Mr. Donald Nussbaumer

Reference: Docket 70-139; SMA-185

Subject: Request for License Amendment to Ship Enriched Scrap Material
to a Refinery

Gentlemen:

In the course of fabricating fuel elements, a considerable quantity of scrap material is generated which must be sent to a refinery for salvage of the enriched uranium. This scrap exists in numerous forms such as solid chunks, turnings, melting dross, and other uranium-containing residues.

The purpose of this letter is to propose a method of packing and shipping enriched scrap to a refinery in accordance with safe criticality criteria. Reference is made to TID-7016 Rev. 1, Nuclear Safety Guide, specifically to page 15, figure 3, as the source for nuclear safety data.

The scrap will be packaged in sheet metal cans, each 5.75" in diameter and 11" long with a tight fitting cover. Three of these inner containers will be placed inside a 6" diameter schedule 40 pipe which has a 1/4" plug welded at the bottom and is centered inside a 55 gallon steel drum by means of a 1" x 1" x 3/16" angle iron framework. The top of the pipe will be flanged and gasketed to prevent the possibility of internal flooding. The maximum amount of contained U-235 per container will be limited to 1500 grams.

The criticality justifications for the safety of the proposed unit shipping container have been calculated from the atomic ratios of safe

NUC COMPLIANCE DIVISION

OCT 30 1961

October 20, 1961

diameter cylinders under fully reflected conditions. Assuming that internal flooding occurred in and around the inner containers, the H/U-235 ratio has been calculated as 212. For this ratio, the safe cylinder diameter from figure 3, page 15 is seen to be 5.75"

Shipment of the individual containers to a refinery will be done via exclusive use vehicle to prevent the possibility of commingling while in transit. The maximum density of the proposed container is .16 kg. U-235/ft.³, which is well under limits established for controlled shipments as outlined in Table VI, page 28 of TID-7016. The total amount of U-235 in a single shipment will not exceed 50 units as prescribed in Table IV of the same publication.

Your immediate attention to this request would be appreciated since it is urgent that we dispose of our scrap material at the earliest opportunity. Should further information be required, do not hesitate to call me collect.

Very truly yours,

Norton M. Weiss
Norton M. Weiss
Health & Safety Manager

NW:dc

DONALD A. NUSSBAUMER, CHIEF
SOURCE & SPECIAL NUCLEAR MAT. BRANCH
DIVISION OF LICENSING & REGULATION
USAEC - GERMANTOWN, MARYLAND

ROUTINE - COLLECT

MAY 26, 1961

ENGELHARD INDUSTRIES, INC.
D. B. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASSACHUSETTS
ATTENTION: MR. N. M. WEISS

LICENSE SM-185, AS AMENDED, IS HEREBY FURTHER AMENDED TO AUTHORIZE FOR
STORAGE ONLY, AN ADDITIONAL 118 KGS OF U-235 CONTAINED IN 24 CORE SUB-
ASSEMBLIES IN ACCORDANCE WITH THE PROCEDURES SUBMITTED IN YOUR APPLICATION
DATED MAY 18, 1961, AS SUPPLEMENTED MAY 25, 1961. REFERENCE DOCKET 70-139.

NY30 COMPLIANCE DIVISION

JUN 2 1961

RECEIVED

JJL:ajsjs
4:10 pm
Rm. C-151
Ext. 4593

Compl. C-151

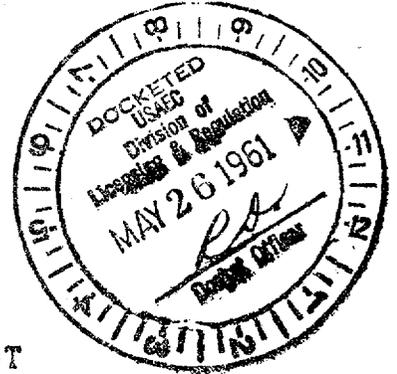
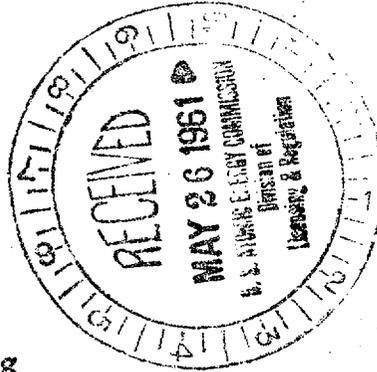
INCOMING TELEGRAM

6-733
70-139

SENT NO.

For Div. of Compliance

1961 MAY 25 PM 7 35



ACA012 722P EDT MAY 25 61 PB328

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US ATOMIC ENERGY COMMISSION, DIVISION OF LICENSING, NUSSBAUMER
CHIEF

SOURCE AND SPECIAL NUCLEAR MATERIALS BRANCH ATTN MR DONAL
GERMANTOWN MD RTE WUX WASHDC
REFERENCE: DOCKET 70-139; SNM-185 WITH REFERENCE TO TELEPHONE
CONVERSATIONS THIS DATE WITH DR. CHARLES LUKE AND MR WARREN
EISTER, THE FOLLOWING INFORMATION SHOULD BE ADDED TO OUR AMENDMENT
REQUEST OF MAY 18, 1961 THE PROPOSED ADDITIONAL STORAGE AREA
FOR PRDC CORE SUB ASSEMBLIES IS LOCATED IN THE METAL BUILDING
PREFERRED TO IN OUR REQUEST DATED MARCH 11, 1960 THIS BUILDING
IS LOCATED AT A MINIMUM DISTANCE OF 170 FEET FROM OUR PRESENT
CORE STORAGE ROOM AS OUTLINED ON OUR DRAWING SK-86 PREVIOUSLY
SUBMITTED WITHIN THE BUILDING THERE IS A MINIMUM DISTANCE OF
25 FEET BETWEEN THE PRESENT FUEL PIN STORAGE AREA AND THE PROPOSED

NY90 COMPLIANCE DIVISION

Noted as file 4

MAY 29 1961

INCOMING TELEGRAM

RECEIVED

CORE STORAGE CAGE WE FEEL THAT THIS REPRESENTS SAFE SPACING
BETWEEN THE TWO ARRAYS (AREAS) SHOULD FURTHER INFORMATION BE
REQUIRED, PLEASE CALL THE WRITER COLLECT

ENGELHARD INDUSTRIES INC, D E MAKEPEACE DIVN NORTON WEISS
HEALTH AND SAFETY MANAGER

70-139 SNM-185 18 196111 1960 170 SK-86 25 .

NO. 70-139

For Div of Compliance

ENGELHARD INDUSTRIES, INC.

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

May 18, 1961

Myrtle-5-9358

U.S. Atomic Energy Commission
Division of Licensing and Regulation
Germantown, Maryland

ATTENTION: Mr. J. C. Delaney Chief,
Nuclear Materials Section

REFERENCE: Docket 70-139; SNM-185; Our letter of March 1, 1961.

SUBJECT: Request for Amendment to Store Additional PRDC Core
Subassemblies.

Gentlemen:

Due to the unforeseen delays in the grinding of colmonoy pads on PRDC core subassemblies, it has become necessary to provide storage for an additional 24 of these assemblies. Per your telegram of March 21, we have authorization to store 191 Kg. of U-235 content in 39 core subassemblies in accordance with procedures submitted in our application dated March 1, 1961. We now request authorization for the storage of an additional 24 core subassemblies (118 Kg. of U-235) in accordance with the same storage procedures as previously submitted.

It is our intention to construct a caged area 8 feet wide by 20 feet long to be located in a locked metal storage building. This building is adjacent to our main plant building and is included in our plant security program. The storage building is equipped with a radiation detection alarm, since PRDC fuel pins are currently stored in this building. Movement into and out of the storage cage and building will be controlled by Criticality Control personnel.

COMPLIANCE DIVISION

MAY 29 1961

RECEIVED

Mr. John C. Delaney Chief
Nuclear Materials Section

Page Two

May 18, 1961

The building itself is not heated or sprinklered and, therefore, the possibility of flooding is negligible although it has been considered in setting up spacing requirements between individual units. We refer particularly to Exhibit 8, to application for special Nuclear Materials License submitted by Power Reactor Development Company, which indicates that a 14" center-to-center spacing is safe under full or partial flooding conditions. Our spacing will be 19" center-to-center between adjacent units which gives an additional safety factor.

Cores will be suspended in the same manner as specified on our drawing SK-87 previously submitted. Only one (1) core will be moved into or out of the storage cage at any one time.

We trust that since the procedures to be followed in our new storage area are exactly the same as those previously approved, a minimum of processing will be necessary for your approval.

Should further information be required, do not hesitate to call the writer collect. Your earliest attention to this matter will be appreciated in order that our production schedule will not be seriously disrupted.

Very truly yours,

Norton M. Weiss
Norton M. Weiss
Health & Safety Manager

NMW/sl





UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

DELANEY
NUCLEAR MATERIALS BRANCH
DIVISION OF LICENSING & REGULATION
USABC - GERMANTOWN, MARYLAND

ROUTINE - COLLECT
MARCH 20, 1961

ENGELHARD INDUSTRIES, INC.
D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATLEBORO, MASSACHUSETTS
ATTENTION: MR. N. M. WEISS

YOUR LICENSE SIM-185 IS HEREBY AMENDED TO AUTHORIZE FOR STORAGE ONLY,
~~IN ACCORDANCE WITH~~
191 KGS OF U-235 CONTAINED IN 39 CORE SUBASSEMBLIES ~~AS SET FORTH IN~~ THE
PROCEDURES SUBMITTED IN YOUR APPLICATION DATED MARCH 1, 1961. REFERENCE
DOCKET 70-139

Distributions:

H. J. McAlduff, Jr.
D. George, MM
S. R. Gustavson, L&R
H. Steele, L&R
J. C. Delaney, L&R
J. J. Lane, L&R

RECEIVED

MAR 23 1961

HAZARD COMPLIANCE DIVISION

JJLane:sjs
10:50 a.m.
Rm. C-151
Ext. 4593

Health Compl. C-151

ENGELHARD INDUSTRIES, INC.

For Div of Compliance

D. E. MAKEPEACE DIVISION

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

Wirtle-8-9358

March 1, 1961

U.S. Atomic Energy Commission
Division of Licensing and Regulation
Germantown, Maryland

ATTENTION: Mr. J. C. Delaney Chief,
Nuclear Materials Section

REFERENCE: Docket 70-139; SNM-185

SUBJECT: Request for Amendment to Store PRDC Core Subassemblies.

Gentlemen:

It has become necessary, in the course of producing PRDC core subassemblies, to set up temporary storage facilities for 39 of these units. This situation has arisen due to unforeseen delays in the procurement and installation of a fixture for grinding colmonoy pads on wrapper tubes. The fixture is expected to be in operation by the first week of April, at which time, stored subassemblies will be ground and packaged for shipment to PRDC.

It is anticipated that storage of the core subassemblies will be done in the following manner:

Fifteen subassemblies will be packed in always safe shipping containers which will be placed in a locked metal storage building under Security surveillance. These containers hold one unit each, at a 14" center to center separation from adjacent units, and have previously been approved for shipment. A drawing of the container (No. 643A1) is enclosed.

The remainder, or 24 core subassemblies, will be stored in a room which will be constructed adjacent to our assembly area. This storage room will be 8 ft. wide, 20 ft. long, and 10 ft. high, with a sloping, watertight ceiling. A sketch showing the construction and relative location of the room is attached for reference (SK-86).

Noted on file 4

Core subassemblies will be stored in a vertical position on wall racks, 12 on each side of the room. Spacing of these units will be 19" center to center with 14" at each end. A drawing which shows the construction and layout of the wall racks (SK-87) is enclosed. The wall racks will be identical to present blanket storage racks except for spacing, and angle iron floor guides. They will also have barrier rods which must be removed prior to insertion of cores into the rack. This is to avoid the possibility of inadvertently placing a core on the transport truck closer than 14" to one which is already in position on the rack.

There are two doors at opposite ends of the room, one of which will be permanently locked. The other door will provide the only entrance to the storage room and will be unlocked only with the prior approval of Criticality Control personnel. No more than one core subassembly will ever be outside the rack at any time.

A transport truck (Ref. Sketch No. SK-88) will be used for all movements of cores into and out of storage. Angle irons will be set on the floor in an inverted "v" position in order to prevent the possibility of a unit in transport from coming closer than 14" to any hanging unit. All transportation will be done with units in a vertical position.

Criticality criteria which have been used to derive spacing requirements were taken from Exhibit 8 To Application For Special Nuclear Materials And Source Materials License Submitted By Power Reactor Development Co., copies of which are attached. This lists minimum spacing of 14" center to center as effectively isolating each core subassembly under either full or partial flooding conditions. The multiplication factor for an infinite array would, therefore, be essentially the same as for an individual core which is approximately 0.6. We propose to store core subassemblies on 19" centers which is even more conservative with respect to the above data.

A tight administrative control will be enforced over all movement of material into or out of the core storage room. Prior approval of any anticipated movement must be obtained by the area supervisor from Criticality Control personnel. No more than one core subassembly will be in transit at any time. In addition, only one core is allowed in each of the

Mr. J. C. Delaney Chief,
Nuclear Materials Section

Page 3

March 1, 1961

three clean rooms for processing. A red light system is in operation which indicates the presence of an enriched core in a particular room. When the red light is on, no enriched material is allowed to enter the room.

We trust that sufficient information has been provided to grant approval of this request. Should further information be required, do not hesitate to call the writer by collect telephone. Your earliest possible attention to this matter is requested, since any lengthy delay will seriously disrupt our production schedule.

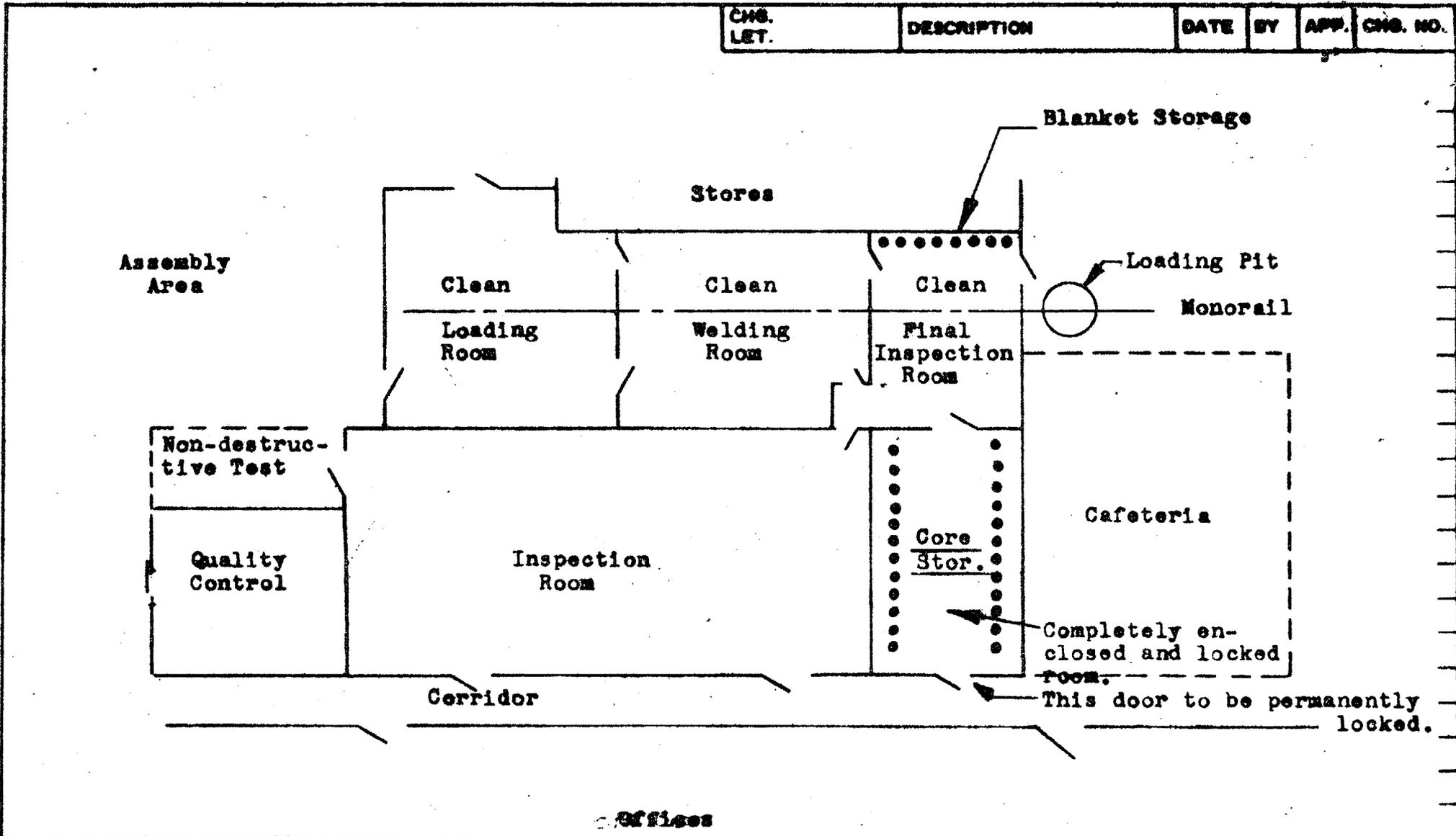
Very truly yours,

Norton M. Weiss

Norton M. Weiss
Health & Safety Manager

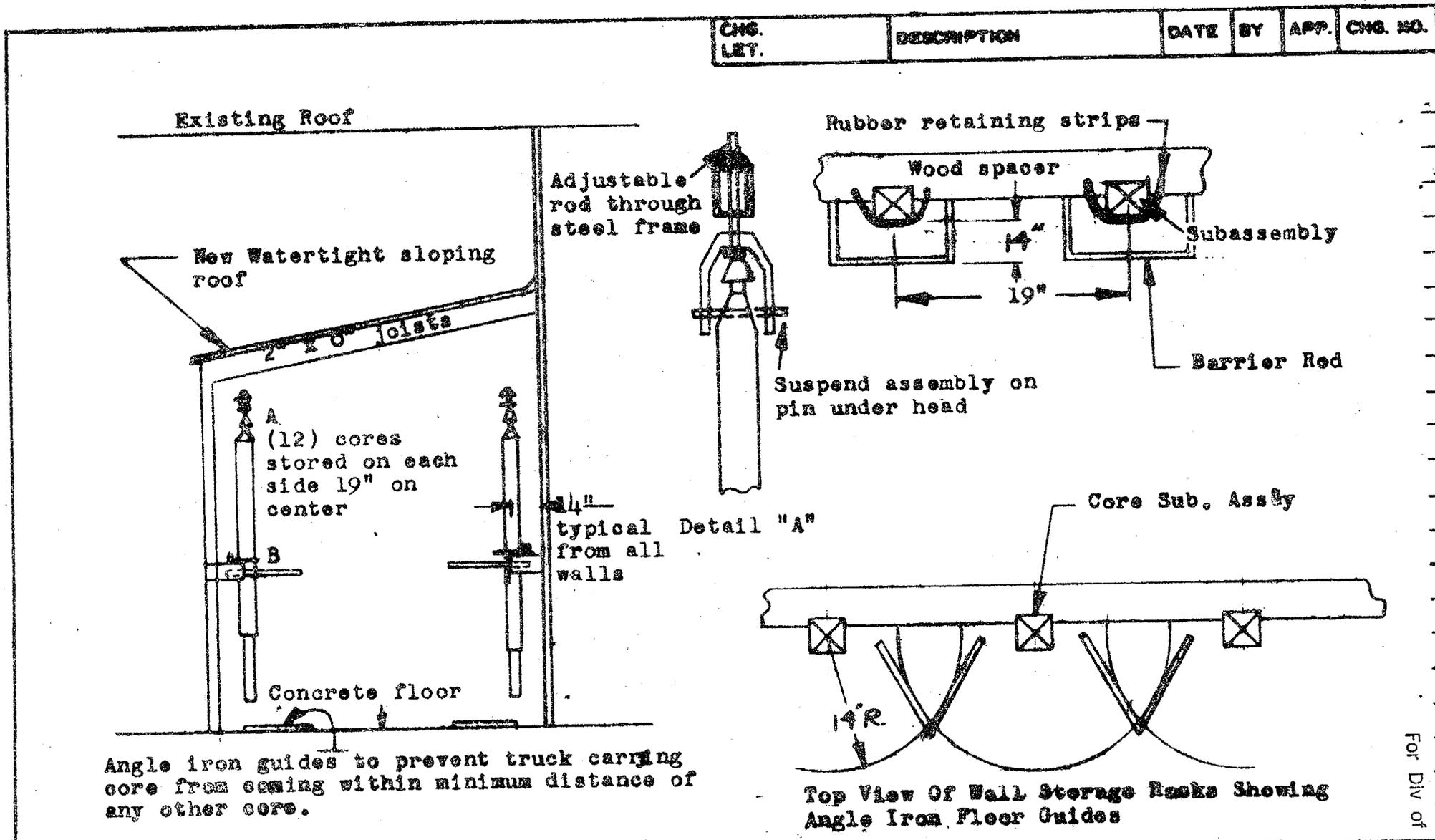
NMW/sl

Attachments (5)



G-2	G-1	ITEM NO.	DRAWING NO.	DESCRIPTION	PROJECT NO.	USED ON ASS'Y
QUANTITY						
TOLERANCES UNLESS OTHERWISE SPECIFIED		APPROVED	DATE	FINISH & SPECIFICATION	TITLE	
DECIMAL	± .005	<i>A. J. P.</i>	2-28-61	MATERIAL & SPECIFICATION	Layout of Core Storage and Surrounding Area	
FRACTIONAL	± 1/64"	<i>R. Ware</i>	3-1-61			
ANGULAR	± 1/2°	<i>H. H. Weiss</i>	3-1-61			
BREAK ALL SHARP EDGES REMOVE ALL BURRS		ENGELHARD INDUSTRIES, INC. D. E. MAKEPEACE DIVISION ATTLEBORO, MASS.		SCALE ~	SIZE A	DRAWING NO. SE-86

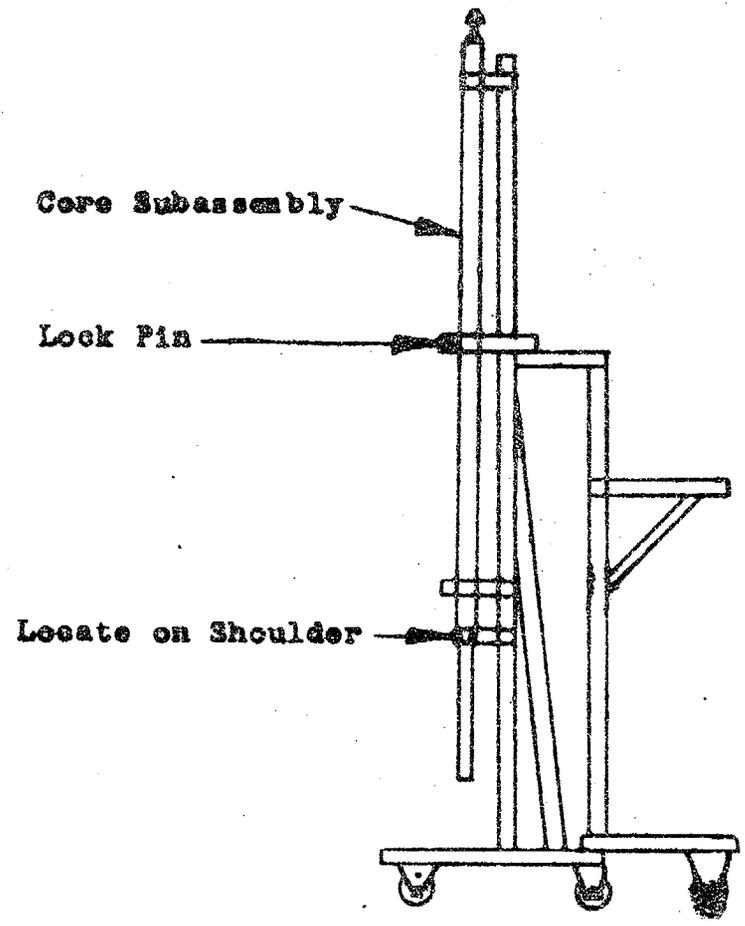
For Div of Compliance
20-139



For Div of Compliance

Q-2		Q-1	ITEM	DRAWING NO.	DESCRIPTION	PROJECT NO.	USED ON ASS
QUANTITY			NO.				
TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMAL ± .008 FRACTIONAL ± 1/64" ANGULAR ± 1/2°				APPROVED A. J. F. 2-28-61 R. Ware 3-1-61 H. M. Weiss 3-1-61	DATE 2-28-61 3-1-61 3-1-61	FINISH & SPECIFICATION MATERIAL & SPECIFICATION	TITLE Detail of Storage Racks For FRDC Core Subassemblies.
BREAK ALL SHARP EDGES REMOVE ALL BURRS				ENGELHARD INDUSTRIES, INC. D. E. MAKEPEACE DIVISION ATTLEBORO, MASS.		SCALE 	SIZE A DRAWING NO. Sk-67 REV.

CHG. LET.	DESCRIPTION	DATE	BY	APP.	CHG. NO.
--------------	-------------	------	----	------	----------



G-2 QUANTITY	G-1 ITEM NO.	DRAWING NO.	DESCRIPTION		PROJECT NO.	USED ON ASS'Y
TOLERANCES UNLESS OTHERWISE SPECIFIED		APPROVED	DATE	FINISH & SPECIFICATION	TITLE	
DECIMAL	± .005	DRAWN	A. J. P.	2-28-61	Transport Truck For PRDC	
FRACTIONAL	± 1/64"	CHECKED	R. Ware	3-1-61	Core and Blanket Subassembly	
ANGULAR	± 1/2°	APPROVED	N. M. Weiss	8-1-61		
BREAK ALL SHARP EDGES REMOVE ALL BURRS		ENGELHARD INDUSTRIES, INC. D. E. MAKEPEACE DIVISION ATTLEBORO, MASS.		SCALE ~	SIZE A	DRAWING NO. SE-88
						REV.

For Div. of Compliance

26-139

EXHIBIT 3 TO APPLICATION FOR SPECIAL NUCLEAR
MATERIALS AND SOURCE MATERIALS LICENSE SUBMITTED
BY POWER REACTOR DEVELOPMENT COMPANY

Criticality Considerations

A. Summary

The design of the fuel storage area is such as to assure a substantially subcritical configuration either when the area is dry or in the event of partial or complete flooding. The flooded condition dictates the spacing requirement since, at any given spacing, a flooded array of highly enriched metallic uranium is more reactive than a dry array. A 14-inch center-to-center square pitch was selected because this spacing in water effectively isolates each subassembly; i. e., the multiplication factor for an infinite array is essentially the same as that for a single subassembly and equal in this case to approximately 0.6. Under dry conditions the multiplication factor for an infinite array with 14-inch spacing is approximately 0.2. At intermediate levels of flooding the array is also substantially subcritical, with the multiplication factor varying from 0.2 to 0.6 as the level is raised.

B. Dry Storage

Each core subassembly for the Enrico Fermi reactor has a central 144-pin section containing 19.16 kg of uranium - 10 w/o molybdenum alloy. The uranium component of this alloy is enriched to 25.6 percent and each subassembly therefore contains 4.90 kg of U-235. In the reactor, these subassemblies will be placed immediately adjacent to each other in approximately cylindrical geometry.

The enriched uranium core will be surrounded by depleted uranium axial and radial blankets and the void regions will be filled with sodium coolant. Multigroup diffusion theory calculations of this configuration predict that approximately 91 of the enriched uranium containing subassemblies will have to be loaded in the central region in order to achieve criticality. If the sodium coolant is removed, approximately 15 additional core subassemblies are needed to achieve criticality since sodium increases reactivity in the neutron spectrum of the reactor.

The calculations referred to above have been verified by a critical experiment carried out in the ZPR-III facility of Argonne National Laboratory at Arco, Idaho. Calculated and experimental values for critical mass agreed within three percent.

As a check on dry storage criticality, two calculations have been made. The first of these calculations was done to obtain the multiplication of a single subassembly in air, assuming however that the subassembly was infinitely long. This calculation was done by Los Alamos for PRDC as a part of a series of special criticality calculations. Using the S_n method, k was found to be about 0.2. The second calculation was done by APDA to obtain the multiplication of an infinite array of subassemblies stored on 14-inch centers. This was a multigroup, diffusion theory, homogeneous calculation, which gave a k equal to 0.1. This result is less than the correct value because homogenizing such a widely spaced array does not account for self-multiplication of individual subassemblies. The result, however, does show that leakage from the array is very high so that individual units are effectively isolated from each other. The multiplication

factor for the array is then approximately the same as that of a single sub-assembly which, because of the assumed infinite length, is conservatively estimated by the Los Alamos calculation to be 0.2.

These calculations together with the results of the critical experiment show, if dry storage only was considered, that a separation of only a few inches would be sufficient to assure subcriticality of 200 subassemblies.

C. Flooded Storage

Fuel subassemblies for the Enrico Fermi reactor are highly enriched since a fast reactor is unmoderated. At optimum spacing in water, far less than a normal core loading of subassemblies would be needed to form a critical array. As a first precaution, all storage and handling of fresh fuel will be done dry with every effort made to prevent fuel from becoming immersed in water. All handling of fresh fuel to be stored will be done singly, all shipment or storage will be with a minimum of 14-inch center-to-center spacing.

The storage area using 14-inch center-to-center tubes to hold subassemblies is substantially subcritical when flooded with water. On Figure 1 attached is a summary of calculated data obtained for Enrico Fermi core subassemblies spaced in water in square lattices of different pitch. The points shown were obtained by the use of 2-dimensional, 3-group, diffusion theory calculations using the PDQ code on an IBM-704 computer. Constants needed for the calculation were obtained by ²the method outlined by R. W. Deutsch.* The

*R. W. Deutsch, "Computing Three-Group Constants for Neutron Diffusion," *Nucleonics* 15:1, 47-51, January, 1957.

results of these calculations agree with information given in various AEC documents, **in that units separated from each other by one foot of water are shown to be effectively isolated from each other; i. e., the multiplication for an infinite array with center-to-center spacing equal or greater than 12 inches is essentially the same as that of a single subassembly.

D. Partially Flooded Condition

In the case of partial flooding, direct calculational evidence that the multiplication will not increase above 0.6 is very difficult to obtain. A direct calculation would require the use of 3-dimensional geometry to adequately describe the flux shape and multigroup methods to describe the spectral variation from one region to the other. In situations such as this where k need not be known accurately, the usual practice in reactor theory is to compute a simple problem which is known to be more reactive than the complex one, and/or to resort to experimental measurements.

For the particular geometry involved here, it is very difficult to define a simple problem which is known to be a little more reactive than the actual problem to be solved. Our most reliable information thus must be obtained from experiments and from the interpretation of these experiments by people closely associated with this type of work.

Babcock & Wilcox Company has performed many critical experiments in their facilities at Lynchburg, Virginia, and they have given PRDC the results

**See, for example, TID-7019, Guide to Shipment of U-235 Enriched Uranium Material, p. 10

of two water height experiments which were performed in connection with their thermal reactor design work. Data from these experiments are plotted in Figures 2 and 3 for Cores I and II as described in Table I.

Core I had a metal to water ratio of 1.119 and was undermoderated. Core II had a metal to water ratio of 0.48 and was somewhat overmoderated. The PRDC storage facility, when flooded, is more overmoderated than Core II. Note that, with 80 cm of fuel above the water level, the reflector savings due to dry fuel is 9.5 cm in the case of the undermoderated core, and 6.2 cm in the case of the overmoderated core. Eighty cm of fuel is more than the full length of Enrico Fermi Reactor fuel pins and in both experiments there was more U-235 per linear inch of height than will be the case with Enrico Fermi Reactor fuel stored on 14-inch centers. Based on these experiments it is seen for Fermi subassemblies that with any available dry fuel above a flooded level the reflector savings would be significantly less than 6.2 cm. Therefore, the facility is most critical, having an effective multiplication of 0.6, when completely flooded.

In Figure 1, k is equal to 0.62 for a spacing of 10.65 inches. The k of 0.62 was obtained assuming an axial buckling of 0.00164 cm^{-2} corresponding to the Fermi fuel length of 77.5 cm. When B^2 was reduced to zero, thus assuming no end leakage, k increased only a very small amount, to 0.64. Very large reflector savings thus have little influence on the multiplication of well-spaced arrays.

Referring again to Figures 2 and 3 note that the absolute value of the slope of the curves is very much less than 1 and is smaller in Figure 3 (the

overmoderated case) than in Figure 2. Thus, at all water levels, bare fuel above the core is worth less in reactivity than is the same height of fuel plus water, so that k continually decreases as the water level is lowered. Since the PRDC storage spacing has even less U-235 per linear inch of height than was present in either of these experiments, k will similarly reduce in value as the water level is lowered.

In the absence of water flooding, there is no moderator present in the fuel region of the PRDC storage facility. PRDC is not aware of any reactor or criticality experiment in which reactivity has increased as a result of lowering the moderator level about solid fuel which is otherwise unmoderated.

E. Blanket Subassemblies

Blanket subassemblies are made of uranium depleted to 0.36 percent U-235. Criticality is not possible either dry or in water, regardless of how many or in what geometry they are stored.

TABLE I
PHYSICAL DATA

<u>Pin Lattice</u>	<u>Core 1</u>	<u>Core 2</u>
Pin pitch (square), in.	.3805	.4810
Pin O.D., in.	.3120	.3090
Clad thickness, in.	.0190	.0340
Pellet diameter, in.	.2740	.2340 (1)
Pellet density, gm/cm ³	8.20	8.45
Metal-to-water	1,119	.480
N ₀₂ /N ₂₅	25.8	25.34
Fuel length, in.	48	60
K infinite	1.15(effective)	1.287
Clad Material	SS-304	Al-25
Pellet Composition	(ThO ₂ , UO ₂ - U ₃ O ₈)	
<u>Core</u>		
Radius, in.	38.8	24.27 (2)
Control rods	21	None
Can (Al) thickness, in.	.1875	None

(1) Nominal 3.5 mill air gap

(2) In Core 2 experiments the core radius was varied for criticality

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 Pine & Dunham Streets Attleboro, Massachusetts	SNM-185, as amended
2. Address		4. Expiration Date September 30, 1962
		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 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 (*cont)		
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 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

J. C. Delaney
Division of Licensing and Regulation

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
FIVE & DORRAN STREETS
ATLEBORO, MASSACHUSETTS

REFER YOUR TMI 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. Nusser, MM
J. C. Ryan, FM, w/cy. ltr. dtd. 3/1/59
Div. of DS, w/cy. ltr. dtd. 3/3/59
& Feasibility report DS-6, w/ drawing
& TMI dtd. 3/30/59

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

clean

DOCKET NO. 70-139
Xtra for Eng

ENGELHARD INDUSTRIES, INC.

D. E. MAKEPEACE DIVISION
PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0000

January 13, 1959

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

Attention: Mr. J. G. 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.

NYOO INSPECTION DIVISION

FEB 19 1959

RECEIVED



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.

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 steel bolts each. There will be a 2 foot spacing in all directions between cubicles.

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.

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
Norton Weiss | Criticality Officer

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
9	24	11/1/59
0	24	12/1/59
0	24	1/1/60
0	24	2/1/60
0	24	3/1/60
0	24	4/1/60
0	24	5/1/60
0	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

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.

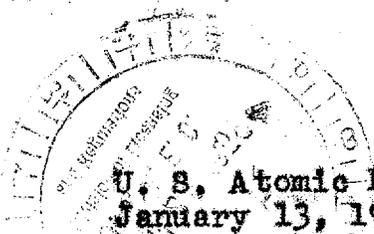
It will be noted from the attached table "Accumulation of U-235 at D. E. Makepeace Plainville Facility in Production EPFBR Core" that the maximum amount anticipated to accumulate is 169.4 kilograms of contained U-235. This is calculated from the incoming material and outgoing product schedules on a First 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	169.4
3/1/60	39.6	40.6	168.4
4/1/60	39.0	40.6	166.8
5/1/60		40.6	126.2
6/1/60		35.4	90.8
7/1/60		35.4	55.4

Max.--



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

John H. Durant
J. H. Durant
Business Representative

JHD:dc

Enclosure

70-139
LRL:JCD

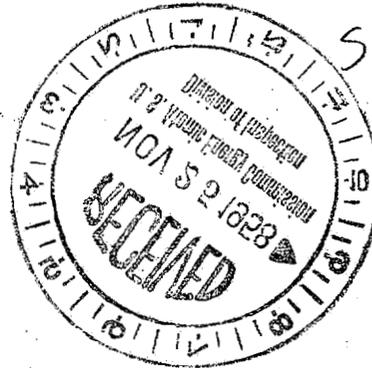
NOV 24 1958

SM-185

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 UF₆. 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,

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

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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.

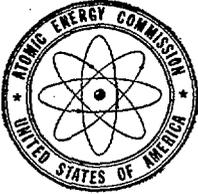
Thank you very much.

Very truly yours,

D. E. MAKEPEACE DIVISION

John H. Durant
John H. Durant
Business Representative

JHD/bq



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

IN REPLY REFER TO:

70-139
IRL:JCD

NOV 5 1958

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,

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

Distribution:

OROO Attn: H.M.Roth

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Kirkman, NY

*Xtra for Insp***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:

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.

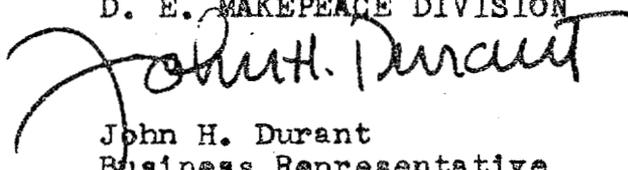
Our special nuclear material license No. 185, we believe, covers this type of requirement, and it is the purpose of this letter to request your furnishing us with requisite forms and instructions for us to make application for this allotment.

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
Business Representative

JHD/bq