

ENGELHARD INDUSTRIES, INC.
Horton H. Weiss
Attleboro, Mass.

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DESCRIPTION: (Must Be Unclassified) Ltr. furnishing procedure to be used for oxidation of the uranium as indicated in their ltr of 1/5/62		REFERRED TO	DATE	RECEIVED BY	DATE
ENCLOSURES:		D. A. Muesbauer	2/12		
REMARKS: Mail Room Distribution: Helen Steele		w/file & cy for compl.			
		AEC-PDR			

DOCKET NO. 70-139

ENGELHARD INDUSTRIES, INC.

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

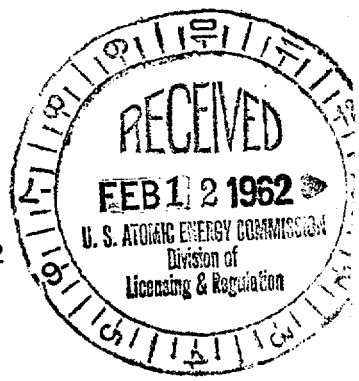
February 9, 1962

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, utilizing 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.

*Compliance
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J. E.*

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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. *ok for trans*

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. *ok for shipping container*

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. *ship array*

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"

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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