DOCKET NO. 70-58

NUCLEAR DIVISION
Baltimore, Maryland
21203

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MARTIN COMPANY

Refer to: ACC 269

March 20, 1964

U.S.A.E.C.
Division of Licensing & Regulation
Washington, D. C.

Attention: Donald A. Nussbaumer, Chief
Source and Nuclear Materials Branch

Subject: Proposed Amendment No. 20 to Special Nuclear Material License No. 53

Gentlemen:

We are happy to supply the additional information requested in your March 12, 1964 letter, in order that you may complete your review and authorize shipment of air filters to Davison Chemical Company for uranium recovery. Our discussion will follow the format of your letter.

We trust that this additional information will permit you to authorize shipment of the filters in the very near future.

Very truly yours,

Martin Marietta Corporation

CWKeller

C. W. Keller,
Nuclear Materials Manager

CWK/nj

DOCKETED USAEC LICENSING & REGULATION MAR 20 1964 DOCKET OFFICER

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ACKNOWLEDGED

THE AEROSPACE DIVISION OF MARTIN MARIETTA

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ADDITIONAL INFORMATION TO PROPOSED AMENDMENT NO. 20 TO SPECIAL NUCLEAR MATERIAL LICENSE NO. 53

1. Packaging of Filters

In the packaging of the small (8" x 8" x 6") filters, no more than twenty filters, containing a maximum of 800 gms U-235 will be packaged in any one 55 gallon drum. Preliminary packing has indicated that a maximum of 20 filters can be packed orderly in a drum. The following proportionate U-235 limits shall apply for drums containing less than 20 filters:

16 filters per drum	640 gms U-235
14 filters per drum	560 gms U-235
12 filters per drum	480 gms U-235

The filters will also be packed such that no drum will contain only filters with the higher concentration of U-235.

2. Description of Shipping Containers

The following tabulation describes the shipping containers to be used in the shipment of the air filters. A [illegible] of the [illegible] container for the 24" x 24" x 12" [illegible] is included.

[illegible] Filter	Container	[illegible]	Average Total Weight
8 x 8 x 6	[illegible] 55 gal. drum	20	134 LBS.
[illegible]	[illegible] gal. drum	10	110 LBS.
[illegible]	[illegible]	10 container in lid	[illegible] LBS

3. [illegible]

Per the age diffusion method of calculating steady state reactor conditions the standard effective multiplication factor (K_{eff}) is given by:

$$K_{eff} = \frac{K_\infty e^{-B^2\tau}}{1 + L^2 B^2} \quad \text{(Reference 1)} \qquad (1)$$

However, when ordinary water is the moderator, the spatial distribution of neutrons cannot be described by a simple exponential of the form $e^{-B^2 t}$. Therefore, the following equation must be used:

$$K_{eff} = \frac{K_{\infty}}{(1+L^2B^2)\,(1+L_1^2B^2)\,(1+L_2^2B^2)\,(1+L_3^2B^2)\,(1+L_4^2B^2)} \qquad (2)$$

(Reference 2)

Where: K_{∞} = $\epsilon p f \eta$, four factor equation

L = 2.85 cm, diffusion length for thermal neutrons [illegible]

(Reference 3)

L_1 = [illegible] cm

L_2 = [illegible] cm — Experimental spatial distribution for fast neutrons in ordinary water.

L_3 = 2.[illegible] cm

(Reference 2)

L_4 = 1.00 cm

B^2 = Geometric Buckling Factor

[illegible] buckling for an 18" x 18" x 6" filter is given as follows:

$$B^2 = \left(\frac{\pi}{a}\right)^2 + \left(\frac{\pi}{b}\right)^2 + \left(\frac{\pi}{c}\right)^2 \qquad (3)$$

[illegible] are expressed in centimeters.

[illegible] $= 0.0[illegible]\ cm^{-2}$

[illegible] equation (2) reduces to:

[illegible]

where,

ϵ = 1.0 (Fast fission factor)

p = 1.0 (Resonance Escape)

η = 2.1 (Fast Fission Neutrons)

f = 1.0 (Thermal Utilization - The maximum of 1.0 has been chosen for conservatism in the final determination of k_{eff})

Therefore;

$$K_{eff} = \frac{2.1}{[illegible]} = 0.[illegible]85$$

Conclusion:

For this [illegible] [illegible] assembly is [illegible] [illegible] [illegible] 3.7 is [illegible] [illegible] [illegible]

References:

(1) [illegible]

(2) [illegible]

(3) [illegible]

[illegible] No. [illegible]

[illegible] 88.

[illegible] No. 23 - [illegible] 53

4. Methods of Shoring

We have recently negotiated with Tri State Motor Transit Company of Joplin, Missouri to obtain their specialized equipment for this shipment. The routing will be the same as shown in our original submission.

To prevent shifting of the containers while in transit, wood blocking will be secured to the bed of the truck. The blocking will be installed in a manner to prevent shifting of the containers in all directions. 4 x 4 longitudinal blocking and 2 x 4 cross blocking will be installed between each container and/or group of like containers. To provide additional restraint, top hold-down blocking will be installed. Metal banding will be employed to secure the top hold-down. The truck is equipped with 42 tie-down fittings of 5000 lbs. capacity each. The metal banding will be attached to the tie-downs and tensioned. For maximum safety, all restraining devices will be attached to the bed of the truck. As an additional safety measure, a wood bulk-head will be installed between the medium size filters and the large filters, as indicated on the drawing.

Pages 10 through 11 redacted for the following reasons:
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(b)(4)