70-36
File Cy.

MALLINCKRODT
NUCLEAR
CORPORATION

SAINT LOUIS 7, MISSOURI · U.S.A. · CENTRAL 1-8980

June 29, 1959

DOCKETED
USAEC
Division of
Licensing & Regulation
JUL 2 1959
Docket Officer

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

Dear Mr. Johnson:

SUBJECT: Special Nuclear Material License No. SNM-33

This letter is a request for an extension of our Special Nuclear Material License No. 33 for the bulk shipment of uranium dioxide pellets. The shipping container proposed is basically the drum in a drum arrangement described in our letter of February 9, 1959. The inner package of pellets will be contained in a 7.8 inch diameter cylinder 15 inches high. Also, this cylinder will contain a maximum of one "limited safe" batch of pellets.

The interaction calculation for purposes of nuclear safety will be on the basis of a multiplication factor (K) of .65. An active volume 7.8 inches in diameter by 15 inches high will be considered. The external drum which limits the closest approach of other packages is a 55 gallon drum 24 inches in diameter and 38 23/32 inches high. A drawing of the shipping container is enclosed.

#13369-4 — see Reports File

A solid angle interaction calculation for an extreme array has been made and is attached. The total solid angle for interaction for this array (which is both too high and too wide to fit into a boxcar or a truck) is 2.5 steradians and meets the interaction requirements designated by an interaction K factor of .65.

Some details of the package contained within the 7.8 inch diameter cylinder are described to substantiate package integrity. Pellets are rolled into open-faced 15 inch wide corrugated boxboard, over wrapped with paper, and taped. One or more such rolls of pellets are

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$h = 20.1$

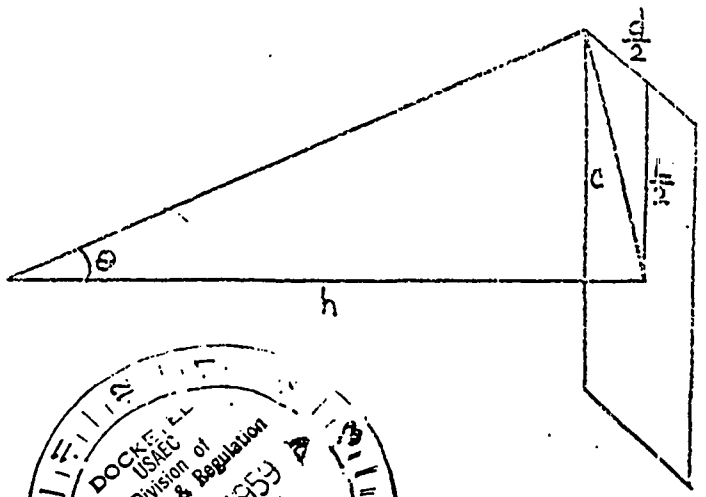
$\frac{L}{2} = 7.5$

$d = 7.8$

$c = \sqrt{\left(\frac{d}{2}\right)^2 + \left(\frac{L}{2}\right)^2}$

$\tan \theta = \frac{c}{h}$

$\Omega = \frac{2d}{h} \sin \theta$



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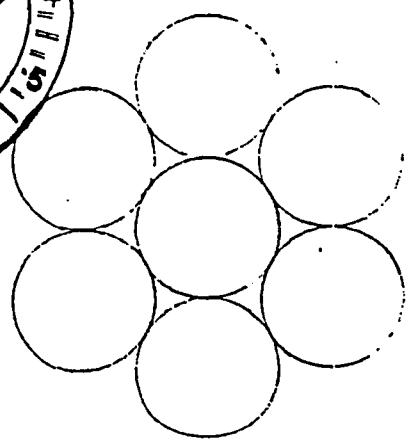
$c = \sqrt{15.21 + 56.25} = \sqrt{71.5} = 8.5$

$\tan \theta = \frac{8.5}{20.1} = 0.423$

$\sin \theta = -.389$

$\Omega = \frac{15.6}{20.1} (0.389) = 0.776 (0.389) = 0.302$

$6\Omega = 1.81$



Second Neighbor

$h = 37.7$

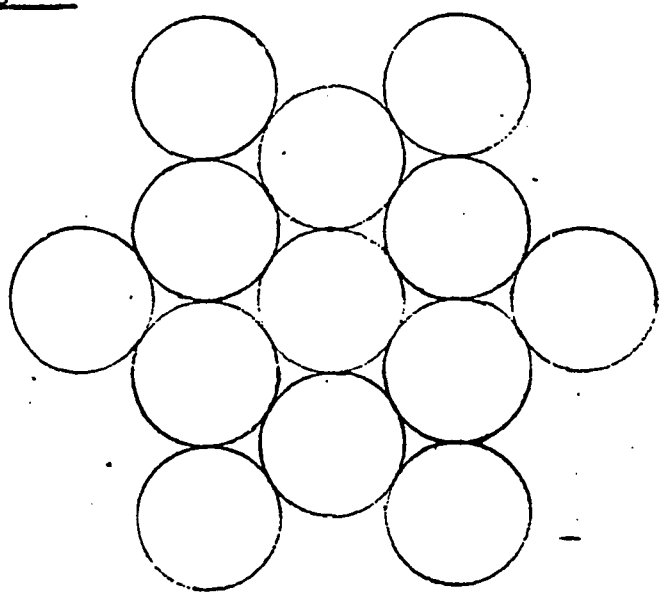
$\frac{L}{2} = 7.5$

$d = 7.8$

$c = \sqrt{\frac{d}{2}^2 + \frac{L}{2}^2} = 8.5$

$\tan \theta = \frac{c}{h}$

$\Omega = \left(\frac{2d}{h}\right) \sin \theta$



$\tan \theta = \frac{15.5}{37.7} = 0.1[illegible]$

$\sin \theta = 0.220$

$\Omega = \frac{15.5}{37.7}(0.220) = 0.091$

$6\Omega = 0.55$

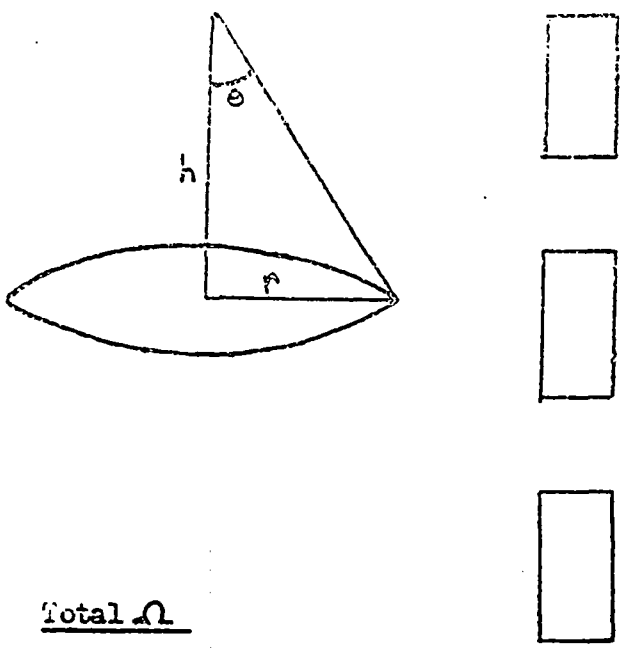
Layers Above and Below

$h = 23.7$

$r = 3.9$

$\tan \theta = \frac{r}{h}$

$\Omega = 2\pi(1-\cos\theta)$



$\tan \theta = \frac{3.9}{23.7} = 0.165$

$\cos \theta = 0.987$

$\Omega = 2(3.14)(1-0.987) = 0.082$

$2\Omega = 0.16$

Total Ω

First Neighbor	1.81
Second Neighbor	.55
Layers Above and Below	.16
	2.52