

Memorandum

From CIB

Project SVM

Docket 70-36

Subject: Mallinckrodt Chemical Works

We have reviewed the October 31, 1958  
and the additional information submitted in November 14,  
request of Mallinckrodt Chemical  
Works, for AEC approval of two shipping  
containers.

Mallinckrodt proposes to use a 5 gallon  
drum supported inside a 55 gallon "shorter" drum  
with 1" x 1" x 3/16" steel tee members fashioned  
into tripods at top and bottom to brace the  
5 gallon drum in the larger drum. <sup>(limited safe)</sup>atches  
to be shipped in each container will vary  
from 88 lb of 3% enrichment <sup>(1.2 kg U-235)</sup> to 13 lb of  
10% enrichment <sup>(0.6 kg U-235)</sup>. The maximum quantity  
to be shipped in any one load will be  
full truck or freight car, with the  
containers placed side by side and  
stacked three high. (No)

88, 88, 03

B-15

12-16-58

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General:  $\frac{\text{Cross sect area}}{\text{Sep. Dist}^2} = \frac{11.25 \times 13.50}{18.37^2} = 0.45$  for one drum

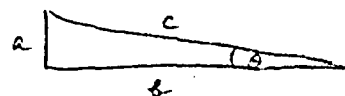
Mallinckrodt  
SNM-8  
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for 6 drums,  $\eta = 6 \times 0.45 = 2.70$

vs. 2.45

End to End  $\frac{.785(11.25)^2}{18.5^2} = .29$

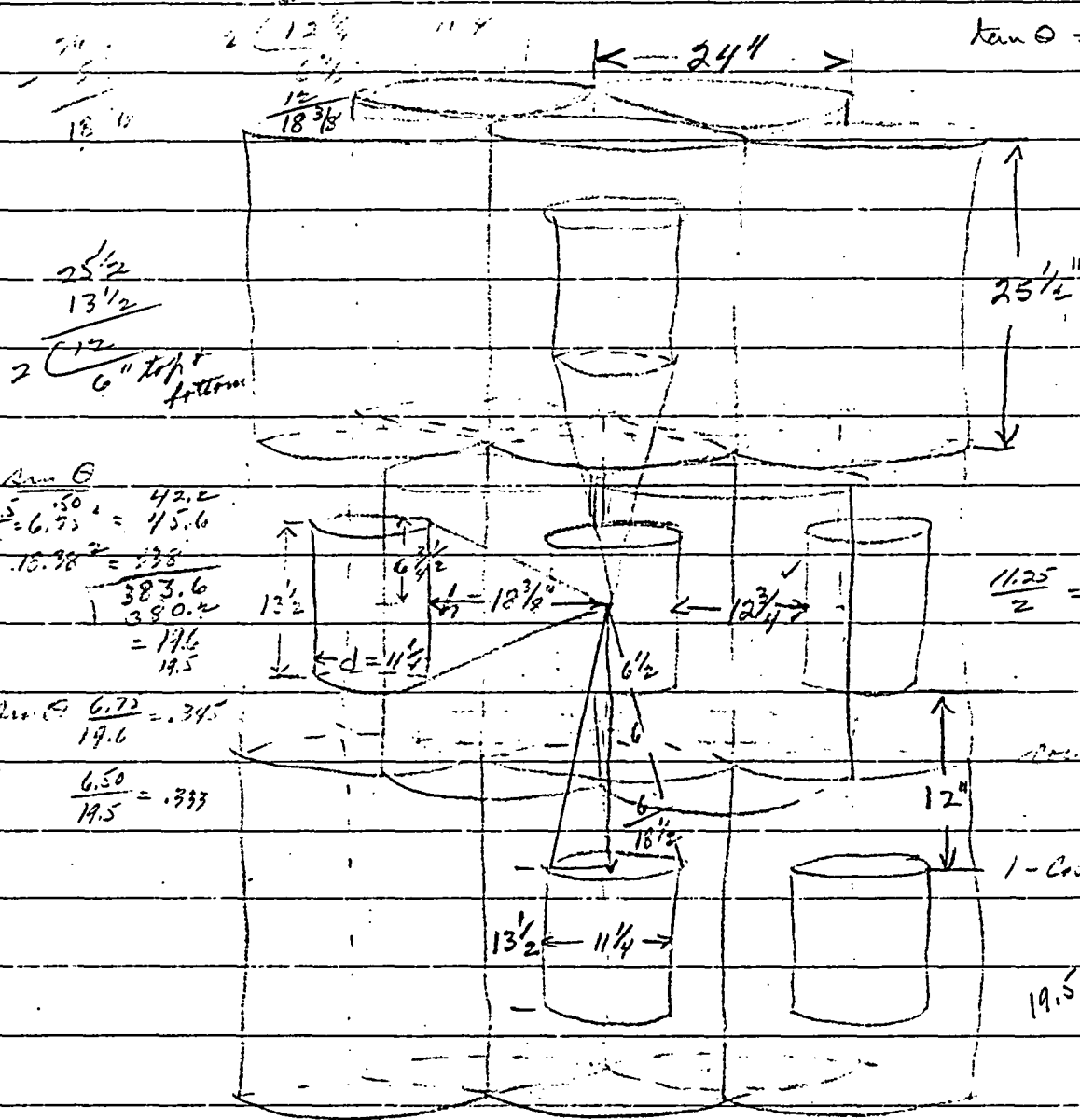
2 drums  $\eta = 2 \times .29 = 0.58$  vs 0.55



$\sin \theta = \frac{a}{c}$

$\cos \theta = \frac{b}{c}$

$\tan \theta = \frac{a}{b} = \frac{\sin \theta}{\cos \theta}$



$\frac{13.5}{2} = 6.75$   
 $\frac{.50}{2} = .25$   
 $6.75 + .25 = 7.0$   
 $18.38^2 = 338$   
 $\frac{383.6}{380.2} = 1.006$   
 $19.5$

$\frac{11.25}{2} = 5.625$   
 $\frac{18.5^2}{2} = 171.875$   
 $\frac{342}{32} = 10.6875$   
 $171.875 - 10.6875 = 161.1875$   
 $\sqrt{161.1875} = 12.696$

$\frac{6.72}{19.6} = .343$

$\frac{6.50}{19.5} = .333$

$\sin \theta = \frac{18.5}{19.35} = .956$

$1 - \cos \theta = \frac{185}{19.35} = (.044)$

For 6 coplanar drums  $\eta = 6 \left[ 2 \frac{d''}{12} \frac{1}{h'} \sin \theta \right] = 12 \frac{11.25}{18.38} (.333)$   
Using relation  $\frac{\text{Cross Sect. Area}}{(\text{Sep. Dist})^2} = \frac{13.5 \times 11.25}{(18.38)^2} = 0.45$   
 $6 \times 0.45 = 2.70$

for drums above and below  $\eta = 2 \left[ 2\pi (1 - \cos \theta) \right] = 2(6.29)(1 - .956)$   
 $\frac{.785(11.25)^2}{(18.5)^2} = .29$   
 $.29 \times 2 = .58$

Total angle =  $2.45 + 0.55 = 3.00$

$\frac{3}{12\pi} = 23.9\%$  OK if  $k=0.58$  Single layer  $\rightarrow 2.45/4\pi = 19.5\%$  for  $k=0.65$   
Var 8% for  $k=0.8$