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Docket 70-36 ①
2-5-59

[illegible] (... 50 ... 12), [illegible] .2%
[illegible]

Mallinckrodt 2/5/59

Proposal

(A) 5 gallon drum in "55 shorty" — K-1019 Lim Safe

3%	88 lb. U	1.2 kg — 2.64 lb. U-235	2.65 lb.	(OK)
$\frac{13\times}{2.2\times.88}$ = 6.7 kg UO_2 — 10%	13 lb. U	.59 kg — 1.3 lb. U-235	1.3 lb.	

% moisture 0.2% (12/30/55) $H/U\text{-}235 = \frac{.002\times 6.7}{18/2}\times\frac{235}{6} = .58\ H/_{235}$

5 gallon drum 11¼" dia. × [illegible] ([illegible]) (2.2 [illegible])

55 shorty 24" dia. [illegible] ([illegible]) (190 [illegible]) (6.7 [illegible])

E to E 12¾"

C to E 18⅜"

C to C 24"

Max truckload, 70 drums; Max rail 90 drums

3% (1.2 kg U-235/unit)
- Truck 1.2 × 70 = 84 kg U-235
- Rail 1.2 × 90 = 108 kg U-235

} TID 7016

10% (.6 kg U-235/unit)
- Truck 42 kg U-235
- Rail 54 kg U-235

Surface Density [illegible]. V + [illegible] array, 1 drum, 6.76
24 × 25½ × (2.5)² = 3950 cm^2
3% 1200/3950 = .304 g/cm^2
10% 590/3950 = .150

Density in stacked cubical array

Volume 24 × 24 × 25½/1728 = 8.5 cu. ft.

Volume 55 shorty $\frac{.785(24)^2(25\frac{1}{2})}{1728}$ 6.7 cu. ft.

÷ 8.5 overall — ÷ 6.7 (in 55 gal drum) — Table 7 TID-7016

	overall		in 55 gal drum	H/X 2-20	H/X ≥ 20
ρ 3% enr.	1.2/8.5 (6.7) = 0.141 kg U-235/c.f.	$\frac{22}{6.7}$ = 3.3	0.179 kg/cf	1 kg/cf	0.8 l/cf
ρ 10% enr.	.59/8.5 (6.7) = 0.070 kg U-235/c.f.	3% $\frac{14.2}{6.7}$ = 2.1	0.088 kg/cf	1 kg/cf	0.8 [illegible]

[illegible] / [illegible] 55 ÷ 56.7 = [illegible] (1.4 [illegible]) [illegible] = [illegible]

Shipping limits H/X, 2-20, 225 kg/car [50 units, Max]

3% 225/1.2 = 188 50 max — H/X [illegible] 15 ([illegible])

10% 225/.59 = 381 50 max — [illegible] = 825

B-27

$$H/x = \frac{22}{9} \times \frac{235}{.6} = 955$$

$$H/x = \frac{12.1}{1} \times \frac{}{1.2} = 202$$

$$H/x = \frac{300}{7} \times \frac{235}{22\%} = 27.7$$

$$H/x = \frac{300}{9} \times \frac{235}{20\%} = 92.5$$

Check, $\frac{3}{10.5}\,92.5 = 27.7$ Checks OK

$$10\%\ \text{wt.}\quad H/x = \frac{22}{9} \times \frac{235}{.6} = 58.5$$

$$3\%\ \text{wt.}\quad H/x = \frac{22}{9} \times \frac{235}{.3} = 196$$

See Mell 10/31 and my interaction calc. for this crane case. When 55 gal slurry drums are stacked in cubical array,

$n = 3/4\pi = 23.9\%$ OK for $k = 0.58$

Mell 3/5, when loaded in plane array Mell computes $n = 3.06$ or 24.3%, $k = .58$

(13) 15 gallon drum in 88 gallon container

Enrichment ≤ 3% assay

Quantities, "Limited Lab" = 350 lb. assy.

350 × 1/26.7 = 13.1 gallons.

Shipment, 42 drum (truck), 50 drum (R.R.), single layers

Inner drum 16" ID × 18.5" high

Outer drum 30¾" OUT dia; $\frac{88}{7.48} \times \frac{1}{5.15} = 2.29$ ft. 34¾ OH, 27½" HT. Vol = 14.7 cf. Vol = 110 gal

Density in 88 gal drum, 3% assy, lim. calc = 1.2 kg U-235

ρ = 1.2/14.7 = .082 kg/cu ft vs. 1 kg/cu ft H/X 2-20 TID 7016

Volume, 3% $\frac{88 \text{ lb. UO}_2}{.88} \div 26.7 \text{ lb. UO}_2/\text{gal} = 3.75 \text{ gal.}$ or 14.2 liters

3.75/15 = 25% filled

l/cu ft = 14.2/14.7 = 0.97 vs 0.8 l/cf TID 7016

Interaction, planar array:

Mall 2/5/59 N = 4.85 ster/4π = 32.3% of 4π one-in k = .49