Here we have made use of the fact that f (a) = 0 instead of f $(a + x_0) = 0$ as was the case for the slab. Inserting the quantities B_i given by Eq. 58, one obtains from Eqs. 60 and 61 the following relation from which the critical radius may be obtained:

$$\cot k_0(a + x_0) = \frac{\sum_{i=1}^{3} [F_i/(1 - 1/\alpha_i a)][1 - k_0^2 e^{\alpha_i A_i}/(k_0^2 + \alpha_i^2)] - \frac{(1 + f)(a + l\sigma)}{\nu (a + 1)}}{k_0 \sum_{i=1}^{3} [F_i/(1 - 1/\alpha_i a)][\alpha_i e^{\alpha_i A_i}/(k_0^2 + \alpha_i^2)} \qquad (62)$$

where a = R o, R = critical radius in cm, and $k_0/\tan^{-1} k_0 = 1 + f > 0$.

The above critical equation cannot be expected to yield a satisfactory critical radius for active material of high enrichment (i.e., small a) because then $e^{-\alpha_i a}$ is not negligible and inclusion of the factors $(1 - 1/\alpha_i a)$ is inconsistent with the neglection of the exponential terms.

V. APPLICATION TO WATER-TAMPED SLAB AND SPHERE OF ENRICHED SOLID UF_6

The three values of F_i were calculated according to Eqs. 9, 14, and 21 for six enrichments of a UF_6 (density = 4.68 gm/cm^3) half water tamped slab; (25)/(25 + 28) = 6, 8, 15, 25, 50, and 100%. In each case the penetration length, l, corresponds to a degradation of neutron energy from E_I to $E_I/39 = E_0$, where E_I is a guess at the average energy of the neutrons that are incident on the water tamper and E_0 is their energy in the water at age $\tau_0 = l^2$ when they are considered as an isotropic source for further age diffusion. Below is tabulated the percentage enrichment, (25)/(25 + 28), incident energy E_I, penetration length l, the three fission rates per unit incident current, and their sum.

TABLE I

(25)/(25 + 28)	E_I Mev	l cm	F_1	F_2	F_3	F_S
6%	0.92	3.0	0.024	0.071	0.304	0.399
8%	1.05	3.25	0.027	0.081	0.286	0.394
15%	1.27	3.60	0.038	0.107	0.265	0.410
25%	1.38	3.76	0.048	0.126	0.253	0.427
50%	1.47	3.88	0.064	0.148	0.242	0.454
100%	1.51	3.94	0.080	0.167	0.233	0.480

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