CRITICAL DIMENSIONS OF WATER-TAMPED SLABS AND SPHERES OF ACTIVE MATERIAL

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ABSTRACT

The magnitude and distribution of the fission rate per unit area produced by three energy groups of moderated neutrons reflected from a water tamper into one side of an infinite slab of active material is calculated approximately in section II. This rate is directly proportional to the current density of fast neutrons from the active material incident on the water tamper.

The critical slab thickness is obtained in section III by solving an inhomogeneous transport integral equation for the fast-neutron current density into the tamper. Extensive use is made of the formulae derived in THE MATHEMATICAL DEVELOPMENT OF THE END-POINT METHOD by Frankel and Goldberg. (cf. LA-258, LADC-76, or AECD-2056.)

In section IV slight alterations in the theory outlined in sections II and III were made so that one could approximately compute the critical radius of a water-tamper sphere of active material.

The derived formulae were applied to calculate the critical dimensions of water-tamped slabs and spheres of solid UF_6 leaving various (25) isotope enrichment fractions. (cf. Fig. 6.)

I. INTRODUCTION

The primary effect of placing water on one side of a slab of active material is to return slow neutrons to the slab. Fissions produced by the slow neutrons reflected from the water give rise to a

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