

PHYSICS GROUP III - 17

W. H. Zinn - 10

Neutron Absorption of the Argonne Concrete Shield (A. Wattenberg, R. Nobles, H. Lichtenberger)

The neutron intensity throughout the concrete shield surrounding the Argonne pile was measured by placing indium foils on concrete blocks which could be slid into one of the 1' x 1' openings at the center of the east face of the pile. The table gives in the first column the distance of the foil from the outside surface of the dead graphite of the pile. At this point in the pile there are 16-1/2" of dead graphite. The second column gives the saturated activity observed in the indium foils, the higher intensity points being corrected for the long-lived activity. The third column gives the number of neutrons/sec/cm²/K.W. It is clear from the data that a fast neutron component is present and that it raises appreciably the intensity in the outer points of the shield. For the slow neutrons an exponential relaxation distance of 7.9 cm is indicated. It should be noted that the concrete blocks in which the measurement was made were rather "green" and it is possible that in time some further drying out will take place with a consequent loss in absorbing power. Nevertheless, the number of neutrons escaping from the shield is well below the physiological tolerance amount at the highest power (100 K.W) at which the Argonne pile is ordinarily operated. Gamma-ray measurements on the concrete shield have not as yet been carried out, but measurements of the gamma-ray intensity in the room surrounding the shield indicate that for gamma-rays the shield is also quite adequate. Some typical gamma-ray measurements are the following: 10' from the north face of the pile, .0002 R/K.W.H.; directly in front of the lead shield covering the removable stringer, .0015 R/K.W.H.; on top of the pile midway between the center and side, .001 R/K.W.H. Since the Argonne pile is not operated on the average more than 10 K.W. hours per day, it is seen that these levels are well below the tolerance dose.

Table I

Distance of Indium Foil from Graphite Face

<u>cm.</u>	<u>In Counts/min.</u>	<u>n/sec/cm²/K.W.</u>
0	2.37 x 10 ⁸	2.0 x 10 ⁷
15.2	3.64 x 10 ⁷	3.1 x 10 ⁶
30.2	5.06 x 10 ⁶	4.4 x 10 ⁵
60.4	1.13 x 10 ⁵	9.9 x 10 ³
90.6	5.04 x 10 ³	440
120.8	8.91 x 10 ²	78
151	1.88 x 10 ²	16

Tests of the Iron Shield Proposed for "W" (A. Wattenberg, H. Lichtenberger, R. Nobles, H. A. Fowler & J. M. West)

Experimental shields of iron and mixtures of iron and paraffin were constructed and the neutron and gamma-ray intensities were measured throughout the shield by means of foils, counters, and electroscopes. The iron plates were laid up in a column 5' on the side and thicknesses of iron up to 30" and of iron and paraffin up to 43" were tested. Some of the results