A-84-019
57-7

[redacted]

1 - A. H. Compton
2 - C. H. Greenewalt
3 - E. Fermi
4 - W. H. Zinn
5 - File
6 - H. L. Anderson
~~7 - Chronological~~

[redacted]

VERIFIED UNCLASSIFIED
JA BROWN OS-6 TSM 12/1/93

July 24, 1943

PUBLICLY RELEASABLE
OS-6 JB 12/1/93

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

RECEIVED
NOV 19 1998
OSTI

TO: DR. A. H. COMPTON

FROM: H. L. ANDERSON

REPORT OF WEEK ENDING JULY 24, 1943

Control Rods

The Engineering Department has prepared some drawings for a round control rod. The rod is 3" O.D. and about 74' long, the last 36' of its length being provided with a rack so that a motor-driven pinion gear moves the rod in and out of the pile.

Helium leak is prevented by a packing gland through which the rod enters the pile. The rod is water cooled, water enters an inner concentric tube and leaves by the outer annulus. Such a rod puts rather a large hole in the shield, and to prevent radiation leak a screw is inserted inside the interior tube and also in the annulus to provide some shielding. Thus water spirals in inside the inner tube and out around the annulus.

The rod is to be made of boron steel. The whole rod is rather heavy (2,000 lbs.) and the manufacture of the two screws, each 36' long will be an impressive machining job. For a high-speed drive, a fairly good size motor is required, 5 to 7 H.P.

Alternatively, a flat light rod is being considered. This will enter the pile inside an aluminum thimble so as to prevent a helium leak. The thimble will be filled with graphite in the pile proper and with iron lined with graphite in the shield region.

FINAL DETERMINATION
UNCLASSIFIED
L. M. Redman
JAN 14, 1981

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

21197 02534

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973

This rod may consist of a sandwich of thin cadmium between 1/16" strips of dural, or possibly copper, and will be about 3" wide. The radiation leak is made small by virtue of the small opening. Even this opening is sufficiently filled with matter so that most of the radiation will be scattered into the shield proper. The rod will be much faster than the round rod and will require a lighter drive. Heat dissipation is actually less than for the round rod because only about 2% of the cadmium gamma rays are absorbed in the rod. All of the boron disintegration energy must be dissipated in a boron rod. A quite serious problem is the matter of induced radioactivity in the control rod. For the flat aluminum rod, a man standing one meter away from the rod immediately after it is withdrawn from the pile operating at 2×10^5 kw will receive about 1 r/sec., and altogether about 200 r during the decay of the 2.4 minute life. The initial rate due to the 10.2 minute Al(n,p) activity may be one thousandth of this, and similarly for the Al(n,γ) 14.8 hr. activity. The gamma rays from the cadmium 2.5 day activity may give about 5×10^{-3} r/sec. at one meter. This means that the active portions of the rod will have to be fairly heavily shielded with lead (about 6"). Long-lived activities might make it impossible for a man to service the rod within a reasonable length of time. This may rule iron out for making control rods. Certainly more information is needed about the cross sections and gamma radiations from constructional materials. In particular, the high cross section of the 12.5 hr. activity induced in copper might not be too disagreeable if it is true that no gamma rays are emitted.

Location of Ionization Chambers

Present plans call for installation of four 8" conduits to be laid in the concrete underneath the pile for ionization chambers. These conduits will be about 6' underneath the bottom portion of the thermal shield and holes in the concrete connect these conduits with the bottom part of the thermal shield. Near the center it is planned to replace a 24" square section of the thermal shield with lead directly over a 16" hole through which the ionization chamber can see this lead window. By moving the chamber away from the hole, it may be operated at considerably lower intensities. This scheme provides a lot of flexibility and should prove to be an adequate solution to the problem. In addition, some aluminum thimbles will extend into the pile so that an ionization chamber or BF_3 counter may be inserted for low intensity work.

HLA

2197 0235

CLASSIFICATION CANCELLED
PER DOC REVIEW JAN. 1973