ISOSPIN TARGET-ION SOURCE SHIELDING

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We will study a shielding casemate built closely around an isospin target for a radiation level of 1 mrem/h (2.778 $n/sec.cm^2$), i.e. one where people can work 8 hours a day. We assume a proton beam of 6.25 10^{14} p/sec., and an energy of 600 MeV, i.e. a beam power of 60 KW. Taking the values measured at CERN for a beam of this energy, we find a secondary high energy neutron production of .6 per steradian and proton at 0^0, .1 at 60^0 and .04 at 90^0 from the forward direction. One calculates the following numbers of mean free paths to attenuate the resulting neutron fluxes to the value mentioned above: 20.6 at 0^0 and 18.76 at 60^0 for a distance of 4 meters and 18.42 at 90^0 for a distance of 3 m. To keep dimensions small, we will take steel, and surround it with 3 ft. of ordinary concrete (2 mean free paths) to absorb the iron window neutrons. Then we find the thicknesses of steel needed: 3.23 at 0^0, 2.91 m at 60^0 and 2.84 m at 90^0. The bunker would have the shape shown in figs. 1 (plan), 2 (transverse section), 3 (longitudinal section). The shielding needed on top can be calculated to be 14.4 mfp for skyshine to have 25 mrem/yr at a site boundary 50 meters away, which can be divided in 2.15 m of steel and 0.9 m of concrete. The philosophy of placing the whole shielding at the target gives the minimum shielding volume and dimensions. When this is achieved, one has more freedom in the placement of several target stations to be served by the same accelerator, and to engineer the front end in order to distribute the radioactive beams from the different ion-sources to all the analyzing systems.

Fig. 1. Plan

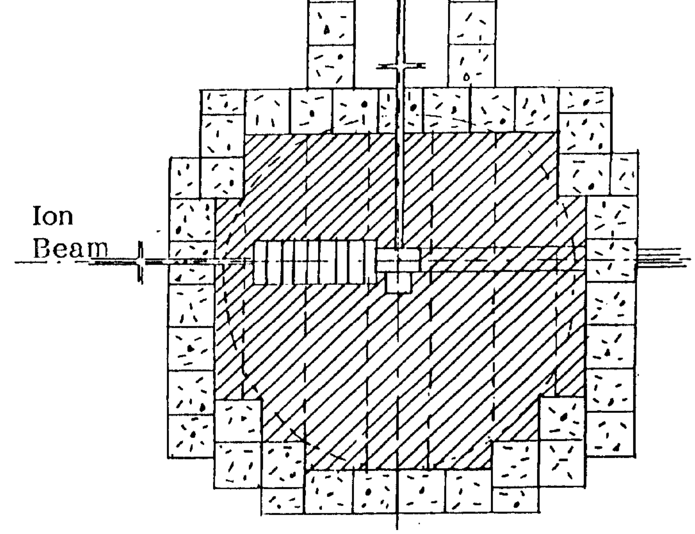


Fig. 2. Transverse Section

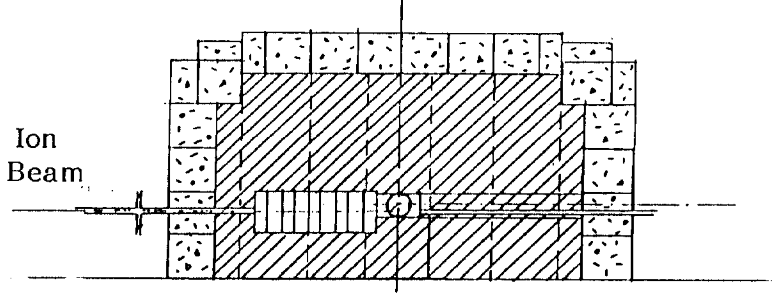
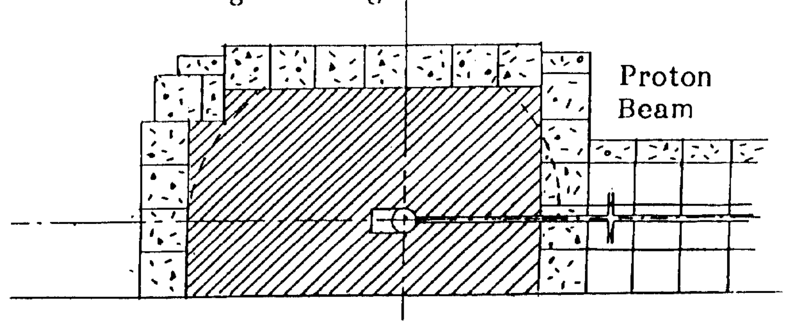


Fig. 3: Longitudinal Section



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