AbstractID: 6653 Title: An Evaluation of the Use Factor (U) for Instantaneous Dose Rates for Cyberknife Shielding Design

Introduction:
A small use factor (U = 0.05) has been widely accepted and used in Cyberknife shielding design. Since the use factor is small and the cross sectional area of the beam is small, the overall workload (W) for a given barrier wall to be shielded in any one direction is small. The small U and small W tends to reduce the required shielding when considering the integrated dose.

Methods:

Given the distance from 1 foot outside of the primary wall to the isocenter is (d) 4.84 m. Primary workload is 250 Gy/week at 0.8 m. The leakage workload is 250 *15 = 3750 Gy/week at 0.8 m with a head attenuation rate of 0.001. For a controlled area the occupy factor (T) is 1, and permissible dose limit for the control area is 10^{-4} Gy/week, which is 10% of the allowed. From the Equation $B = Pd^2/ WUT$, the number of TVL's required for the barrier is 3.64. However, when this value for the number of TVL's is used and the instantaneous dose rate is determined at the barrier calculation point, the instantaneous dose rate is determined to be 63.5 mr/hr for the 600 MU/min output rate.

It was determined from the room survey that the maximum dose rate in the control area was 160mrem/h, and the area of the barrier that has a dose rate of 60mrem/h or higher is around 50cm x 50 cm.

Conclusion & Discussion:
Using the small Use factor of 0.05 as recommended in NCRP report 151 in the barrier shielding equation for a Cyberknife facility reduces the integral dose to below 10% of the regulatory limits. When considering the instantaneous dose rate in the control area of the unit, the dose rate will be considerably higher than the customary limit.