Purpose: To calculate the percentage depth dose of any irregular shape electron block using the lateral build-up-ratio method.

Methods: Percentage depth dose (PDD) curves were measured using 6, 9, 12, and 15 MeV electron beam energies for applicator cone sizes of 6×6, 10×10, 14×14, and 20×20 cm². Circular cutouts for each cone were prepared from 2.0 cm diameter to the maximum possible size for each cone. In addition, three irregular cutouts were prepared. The scanning was done using a water tank and two diodes - one for the signal and the other a stationary reference outside the tank. The water surface was determined by scanning the signal diode slowly from water to air and by noting the sharp change of the percentage depth dose curve at the water/air interface.

Results: The lateral build-up-ratio (LBR) for each circular cutout was calculated from the measured PDD curve using the open field of the 14×14 cm² cone as the reference field. Using the LBR values and the radius of the circular cutouts, the corresponding lateral spread parameter (sigma) of the electron shower was calculated. The PDD curves of the irregular cutout sizes were calculated using the sigma values of the 2 cm and the 3 cm diameter cutout sizes. Finally, the calculated PDD curves were compared with measurements of the irregular cutouts.

Conclusions: The PDD curves for the irregular cutout calculated using the sigma value of the 2.0 cm diameter cutout agreed with the measured PDD curves within 2% for 6MeV and 4% for 12 MeV. On the other hand, using the average sigma values of the 2 and 3 cm diameter cutouts reduced the difference by a factor of two. The result of the calculated sigma value showed that at a given depth and energy, the sigma value increases with cutout size.