The contrast to noise ratio (CNR) is significantly degraded in areas with sub-optimal x-ray beam penetration. A patient specific area beam equalization technique is being investigated as a method to reduce the dynamic range in the detected image. The initial uncompensated images of a Humanoid chest phantom was segmented into a 16x16 matrix. The average gray level within each segmented region was used to calculate a 16x16 matrix of attenuator thickness. A 16x16 array of square pistons (1.6 mm) were used to generate a template in a deformable attenuating mask (2.5x2.5x1 cm^3). Each individual piston was manually adjusted to the appropriate depth using a micrometer. The mask was placed in a predetermined position close to the focal spot before acquisition of equalized images. The scatter fraction in the unequalized and equalized images were measured using an array of beam stops. In the equalized images, the scatter fraction was significantly reduced in the under-penetrated regions. The equalized images showed a significant improvement in image quality over the under-penetrated regions. The increased primary radiation and the reduced scatter fraction in the under-penetrated regions increased the CNR in the equalized images by up to a factor of 10. In conclusion, this patient specific area x-ray beam equalization technique allows the entire image to be acquired with optimal CNR.