Journal of Clinical & Experimental Radiology

Short Communication a SciTechnol journal

The Use of Local Alternative Materials as Structural Shielding for Diagnostic Radiological Facilities

Schimze Sagon, Petal Padmini Surujpaul

Purpose: X-ray radiation shielding is based on the principle of attenuation, which is the ability to reduce the initial intensity of radiation through a barrier material. The research aimed to obtain the most efficient shielding material to attenuate ionizing radiation in the diagnostic range (0-150 kV) using locally available clay soil, lateritic soil and white sand combined with Portland limestone cement.

Methods and materials: A mix design was used to determine the mix ratio that would attain the highest density and compressive strength, hence more suitable for radiation protection. Sample blocks of dimensions 20 cm x 15 cm and thicknesses 4 cm, 8 cm, 12 cm, 16 cm and 20 cm were prepared. Using a RayMax Medical Corp conventional x-ray machine and RaySafe X2 dosimeter, in narrow beam geometry, kerma readings were obtained at energy output of 46.5 kVp, 65.3 kVp, 84.1 kVp, 102.5 kVp, 120.9 kVp and 134.5 kVp without the presence of any block, then with blocks in the path of the beam. The percent transmission for each block type and thickness at the measured X-ray energy was calculated.

Results: Blocks that preserved a lower cement to aggregate ratio attained a higher density and compressive strength. Percentage transmission was reduced from 100 % to below 10 % with the presence of each block thickness.

Conclusion: Blocks composed of cement and white sand and cement and clay soil, with mix ratios of 1:3 for the former and 1:3 and 1:4 for the latter, can be used as structural shielding. Of the mixtures, cement and white sand attained the highest density and compressive strength, however, cement and clay soil proved to be most stable, both in its engineering properties and attenuating ability.

Keywords: Alternative materials, lateritic soil, clay soil, structural shielding, radiation shielding, radiation protection

Note : This research was partly presented at world congress on Radiology and Oncology scheduled during July 16-17, 2018 at Dubai, UAE.

Author Affiliations

[1]*The University of Guyana, Georgetown, Guyana2. Georgetown Public Hospital, Georgetown, Guyana* Corresponding author. Current address:Turkeyen Campus, Georgetown, Guyana. schimzesagon@gmail.com*