

Evaluate the Slab Thickness of the new LINAC Bunker as Shielding at the INMP, AERE, BAEC, Bangladesh

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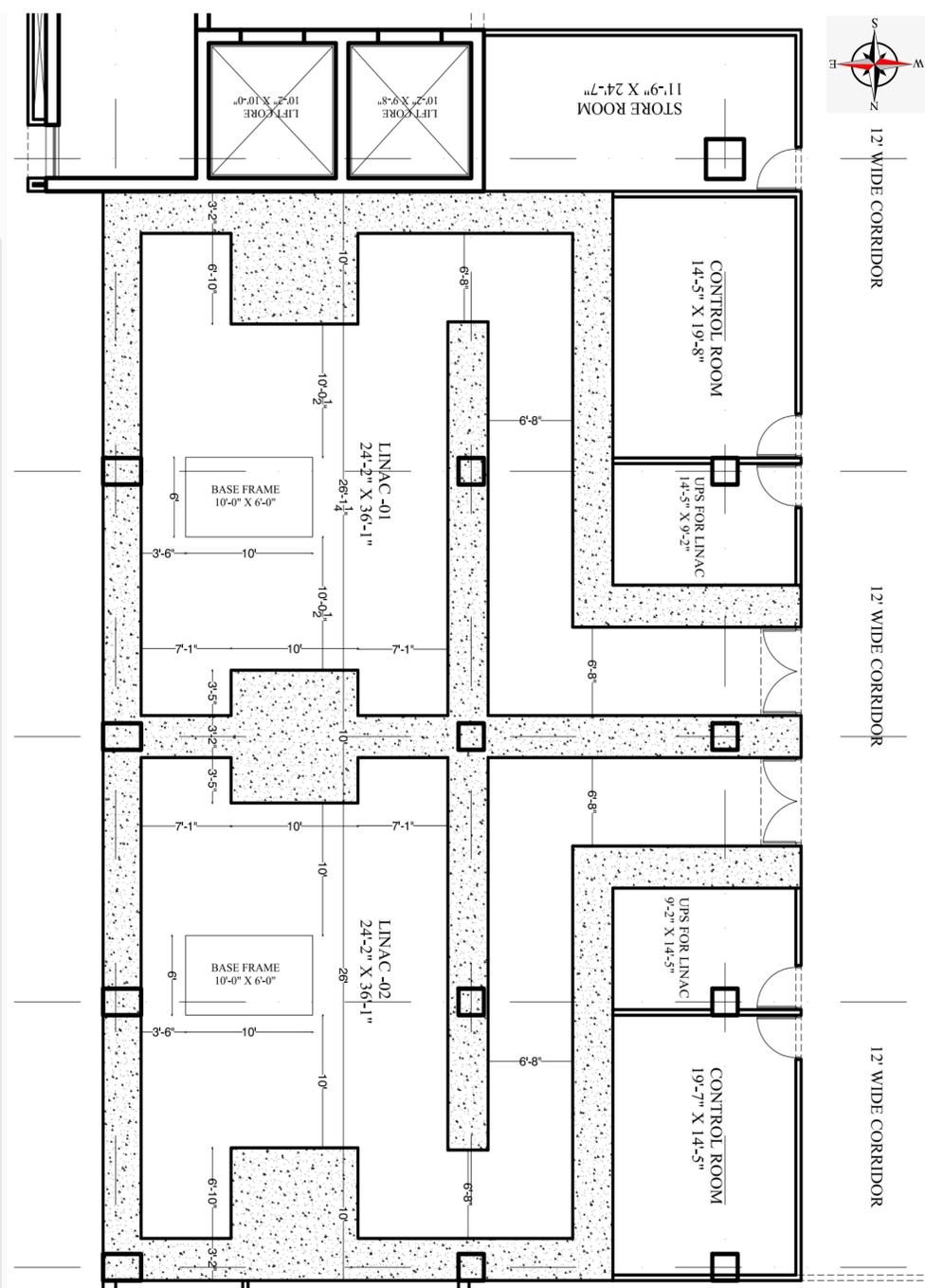
INTRODUCTION

Radiation shielding is crucial in the design of a linear accelerator (LINAC) bunker. The thickness of the concrete slab used for shielding purposes is an essential factor in reducing the radiation dose to acceptable levels. In the Institute of Nuclear Medical Physics (INMP), Savar, Dhaka, there is a plan to install 2nd clinical LINAC which bunker is now under construction under the ground.

OBJECTIVE

In this study, we evaluate the slab thickness of the new LINAC bunker to determine if it provides adequate radiation shielding.

Figure.1 : Top View of Bunker of 2 LINACs



MATERIALS AND METHODS

The LINAC will use a maximum energy photon beam of 18 MV. The internal height of the bunker is 610 cm and the distance from the iso-center to the slab is 480 cm. The slab is constructed with concrete (2.35 gm/cm^3) as the shielding material.

To calculate the required shielding thickness, we used a theoretical shielding calculation model, we assumed that the LINAC will treat a maximum of 50 patients per week, with an equal distribution of 6 MV and 18 MV photon energies and 3DCRT and IMRT treatment techniques. Based on NCRP-151 and Safety Series 47, we set the occupancy factor (T) to 1, the use factor (U) to 0.263 for the gantry angles of $0^\circ/180^\circ$ and the dose limit factor (P) to 5 mSv/y. Finally, we calculated the shielding thickness of the slab according to all factors.

RESULT

According to our theoretical model, the required shielding thickness for the LINAC bunker is 231.59 cm. However, the slab thickness currently under construction is 304 cm, which is more than sufficient to provide the necessary shielding.

CONCLUSION

Our study confirms that the thickness of the slab for the new LINAC bunker at the INMP in Savar, Dhaka, provides adequate radiation shielding for the proposed treatment workload. These findings can contribute to the safer delivery of radiation therapy for patients and personnel. There are further options to study to evaluate all surrounding walls of the new bunker.

KEYWORDS

LINAC bunker, Shielding calculation, Photon beam, slab thickness.

CONTRACT

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