

Evaluation of radiation shielding for developing compact RT room

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The procurement of large-scale piping quantities for marine projects is increasing; however, the efficiency of the process is limited due to potential safety issues such as current radiographic inspection, industrial safety management/surveillance, and others. Among the ideas to address this issue, the compact RT (Radiation Therapy) room improves the efficiency of the shipbuilding radiographic testing process through efficient non-destructive testing (NDT). However, in the development process of the compact RT room that handles radioactive materials, ensuring radiological safety is essential and must be taken into consideration. In this study, a radiation shielding assessment was conducted to analyze the radiation exposure of workers in the compact RT room. Using MCNP simulation, the three-dimensional structure of the handling facility and the developed product was implemented, and shielding calculations and dose assessments were carried out. Additionally, variance reduction techniques and radiation dose mapping were performed through MCNPX 2.7. The analyzed dose values significantly exceeded the target dose values due to the influence of primary Compton scatter radiation. Furthermore, despite conservative adjustments to the collimator's structure, significant dose values were calculated. Ultimately, these results show that the need for additional structural arrangements to reduce scattering effects is required for the development of a safe and optimized compact RT room.