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Sandwich Technology in Radiation-Shielded Structures

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The construction company of Forster Ingenieurgesellschaft mbH has developed in cooperation with the University Erlangen-Nuremberg a process for the erection of radiation-shielded structures utilizing precast concrete components. About 50 bunkers were constructed using this sandwich technology during last three years. The core of the buildings is the filling material in-between the outer and inner double wall precast components.

Attenuation capability was calculated by Monte Carlo simulations and is validated for X-rays, protons and carbon ions by measurement, each with a variety of energies.

For high workload and intense neutron fluencies a waste layer can be prefixed at the wall in front to neutron sources. Depending on neutron fluence the waste layer may be replaced by a period of one year or less, protecting the remaining construction.

Dismantling of the complete construction is an easy going way because of small precasted walls (30-40 cm thickness) and loose gravel as filling material. Separation of the material can easily be done and rational decided after activity measurement. There is no need for diamond wire saw but an enormous reduction of accrued liabilities and radioactive waste.

Two German regulations are based on our data (PAS 1078, Jan. 2008 for proton therapy installations and DIN 6847-2 Sept. 2008 for Linacs in medical use).

Simulations, measurements, filling materials and examples of constructions will be presented.

Summary

Sandwich technology in radiation protection buildings earns increasing interest and turns out to be a cost reduced alternative to conventional buildings made of reinforced concrete. Convincing is not only the cost reduction but also the reduction of erection time to less than a half of usual, no need for dry out time, and lack of shrinkage cracking. Using the physical data of new filling materials and compositions with higher densities and atomic numbers respectively high hydrogen content for neutron moderation enables the constructor to reduce wall dimensions in relation to conventional buildings made of concrete only.

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