13. CASK SIZE AND WEIGHT REDUCTION THROUGH THE USE OF DEPLETED URANIUM DIOXIDE-CONCRETE MATERIAL

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Newly developed depleted uranium (DU) composite materials enable fabrication of spent nuclear fuel (SNF) transport and storage casks that are smaller and lighter in weight than casks made with conventional materials. One such material is DU dioxide (DUO2)-concrete, so-called DUCRETE^{TM}. This paper examines the radiation shielding efficiency of DUCRETE as compared with that of a conventional concrete cask that holds 32 pressurized-water-reactor SNF assemblies. In this analysis, conventional concrete shielding material is replaced with DUCRETE. The thickness of the DUCRETE shielding is adjusted to give the same radiation surface dose, 200 mrem/h (2 mSv/hr), as the conventional concrete cask. It was found that the concrete shielding thickness decreased from 71 to 20 cm and that the cask radial cross-section shielding area was reduced ~50 %. The weight was reduced ~21 %, from 154 to ~127 tons. Should one choose to add an extra outer ring of SNF assemblies, the number of such assemblies would increase from 32 to 52. In this case, the outside cask diameter would still decrease, from 169 to 137 cm. However, the weight would increase somewhat from 156 to 177 tons. Neutron cask surface dose is only ~10 % of the gamma dose. These reduced sizes and weights will significantly influence the design of next-generation SNF casks.