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5.0 SHIELDING EVALUATION

The radiation from low enriched uranium in fresh fuel assemblies that affects external dose includes alpha, beta, and gamma radiation. Because of the relatively short range of alpha particles in dense matter, alpha radiation poses little external dose hazard. The most energetic alphas produced by naturally occurring radionuclides will not penetrate the packaging materials.

Several uranium radioactive decay products are beta emitters. A primary radionuclide of concern is protactinium-234 in its metastable state (^{234m}Pa), a daughter of ^{238}U which produces a very high energy beta particle that can travel up to 20 feet in air. Significant beta radiation is also emitted from ^{234}Th (also a daughter of ^{238}U) and ^{231}Th (a daughter of ^{235}U). Typically, these are shielded with ½ inch of plastic, and therefore will be shielded by the packaging materials.

Storage of large quantities of uranium can create low-level gamma radiation fields (less than 0.05 mSv/hr [5 mrem/hr]). In addition to gamma emissions from the uranium decay chains (^{238}U and ^{235}U), recycled fuel materials introduced back into the enrichment process will result in higher gamma radiation fields because of ^{228}Th, a gamma-emitting daughter of ^{232}U with a relatively short half-life (1.9 yr).

The packaging materials of the Traveller effectively limit radiation levels on the external surface of the package. Under conditions of transport normally incident to transportation, the radiation level does not exceed 2 mSv/hour (200 mrem/hour) at any point on the external surface of the package.

5.1 APPENDICES

5.1.1 References

None.