

## Material Limits Adjusted by a Modified Airborne Release Fraction

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A revision to safety analysis report (SAR) for a Category 3 depleted uranium facility was required to meet current methodologies and isotope content. The previous approved SAR permitted an inventory of depleted uranium that exceeded the Category 2 threshold values in the material storage warehouses, using an accident analysis methodology for final hazard categorization. The use of a modified airborne release fraction (ARF), from the default values in DOE Standard 1027, allows for a technically valid method of maintaining a Category 3 designation even though the facility inventory exceeds the Category 2 threshold. A new inventory control system was also required, since a single limit value was replaced by the summation of several values, each based on material form and/or packaging.

The ARF values in DOE Standard 1027 are provided for solids, powders and liquids regardless of form or containerization. The ARF for all of the constituents of depleted uranium is 0.001. The ARF, if used without regard for material form and containerization, would indicate potential releases in excess of those predicted in the previous SAR. The DOE ID Notice 420.A1 suggests that the ARF may be modified based on factors such as form in arriving at a facility's final hazard category. Depleted uranium metal is considered a combustible metal. However, research has shown that in bulk form the material is essentially non-combustible. The key variable is the specific surface area ( $S_A$ ), which relates material dimension to bulk weight in square-centimeters per gram. An engineering analysis was performed to determine an alternate ARF when material had a low  $S_A$ . For example, it was determined that an alternate ARF of 0.0005 could be used for materials with a  $S_A$  of  $< 0.3$ , and 0.0001 for a  $S_A$  of 0.015. The engineering analysis and the DOE ID Notice also provided for an additional factor of 2 decrease in the ARF when using metal containers to package non-combustible material. This applies to depleted uranium with a  $S_A < 0.3$ . The decreased ARF for a particular material form and packaging results in an inversely proportional change in the Category 2 threshold value used for that component of the total inventory. The facility has significant quantities of material in six combinations of  $S_A$  and packaging. Material limits were developed for each of these combinations. A "sum-of-the-fractions" methodology was established to assure the facility would maintain an inventory in each facility segment less than the Category 2 threshold. Certain facility segments were determined to require a checkbook type transaction for each change of the inventory.

The analysis described above was incorporated in a revision to the SAR. It replaced the previous hazard analysis method approved in the early 1990's. A material Limiting Condition for Operation was developed and implemented as described above. To assure compliance, personnel were trained in the method of calculating the current fraction of

the limit and to perform “what-if” determinations for proposed additions. The resulting material limits did not impact the current operational needs of the facility.

Other Category 3 facilities, or proposed Category 3 facilities, may learn from this methodology to appropriately categorize their facilities using the material inventory, form and containerization. This methodology is complementary to facility segmentation to determine material at risk.

