Generating Criticality Input for HAs and SARs at Los Alamos

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It is commonly accepted that an identified scenario leading to a criticality accident is one that will be eliminated by design. In reality, however, there are always scenarios that are judged to be so unlikely that they are dismissed; sometimes the adjective “incredible” is applied. Thus, for individual operations with significant quantities of fissile material, one must first come to a conclusion as to the credibility of a criticality accident. At this same juncture, considerations such as the costs of a criticality alarm system and it’s routine maintenance, emergency evacuation drills and procedures, special training, etc. must be weighed against the cost of additional controls that would be judged to drive the accident likelihood into the incredible range. This decision point is also being encountered in a reverse sense throughout the DOE as facilities are being cleaned out and fissile inventories are shrinking.

There are three main fissile material handling facilities at Los Alamos. Only one of these has a criticality accident alarm system and thus has an identified design basis criticality accident. The other two facilities have operations for which the criticality accident likelihood has been judged, and documented, to be sufficiently remote that an alarm system would not reduce risk, but on the contrary would increase it. All three SARs, however, describe many common features of the Laboratory’s criticality program in each respective Chapter 6. The differences in Chapters 1 and 3 revolve around the discussion of the supporting documentation, including many Has, which in two cases address the issue of a criticality alarm not contributing to risk reduction. The third SAR, for the plutonium facility, includes highlights from the supporting documentation that justify and identify a design basis criticality accident.

Derivation of the magnitude of the source term for the design basis criticality accident is straightforward based on experimental data. No computer calculations are required nor would they be even defensible based on the difficulty in benchmarking such codes. While there are historical papers, which address potential source term magnitudes and even recent handbooks such as DOE-HDBK-3010-94, it is strongly recommended that the available experimental data be the basis for a value when at all practical.