Contract No:

This document was prepared in conjunction with work accomplished under Contract No. DE-AC09-08SR22470 with the U.S. Department of Energy.

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SRNL-STI-2012-00340

Onsite Transportation Authorization Challenges at the Savannah River Site

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Abstract

Prior to 2008, transfers of radioactive material within the Savannah River Site (SRS) boundary, referred to as onsite transfers, were authorized by Transportation Safety Basis (TSB) documents that only required approval by the SRS contractor. This practice was in accordance with the existing SRS Transportation Safety Document (TSD). In 2008 the Department of Energy Savannah River Field Office (DOE-SR) requested that the SRS TSD be revised to include a DOE-SR review and approval for all Transportation Safety Basis (TSB) documents. As a result, the primary SRS contractor embarked on a multi-year campaign to consolidate old or generate new TSB documents and obtain DOE-SR approval for each. This paper focuses on challenges incurred during the rewriting or writing of and obtaining DOE-SR approval of all Savannah River Site Onsite Transportation Safety Basis documents.

Introduction

Onsite Transportation activities are listed specifically in Title 10, Code of Federal Regulations, Part 830 (10 CFR 830), *Nuclear Safety Management*, Appendix A to Subpart B, Table 2, Item 9 which lists Safe Harbors for transportation activities. Safe Harbors for transportation activities of 10 CFR 830, Appendix A, Table 2, require both a Safety Analysis Report for Packaging (SARP) and TSD. DOE Order 460.1C, *Packaging and Transportation Safety*, establishes packaging and transportation requirements to ensure the safety of offsite shipments and onsite transfers of hazardous material. The Order specifies that onsite transfers either be in accordance with the DOT Hazardous Material Regulations (HMR) [49 CFR Part 100-185], or be justified through demonstration of safety equivalence to meet the intent of the HMR. The Order and the associated Guide, DOE G 460.1-1, *Implementation Guide for Use with DOE O 460.1A, Packaging and Transportation Safety*, stipulate that the equivalence can be established through a combination of packaging and other factors, such as communications and control measures. The Guide further allows for a graded approach, in which materials representing a greater hazard are subject to greater containment, increased communications, and more stringent control requirements.

Equivalence may be demonstrated through an evaluation of packaging performance that shows requirements are met deterministically. In some cases, a deterministic approach is not possible and the demonstration of equivalence will use a risk-based methodology. The SRS transportation program defines a transfer as the onsite transport of hazardous materials external

to the boundary of a facility Documented Safety Analysis (DSA). An onsite transfer stays within the fenced-in and guarded boundaries of SRS and does not cross or travel along public access roads and travels directly between the boundaries defined in the transferring and receipt facilities DSAs.

At SRS, equivalent safety for onsite transfers is documented in a TSB (referred to as Onsite Safety Assessments (OSA) and Non-Routine Transfers). TSBs are used to address deviation(s) from the packaging requirements (e.g. unauthorized contents, expired maintenance, modified packaging closure). Primarily TSBs are used for transferring Type B quantities of material in packaging designed for only Type A quantities or less. The TSBs along with the TSD at SRS satisfy the requirements of 10 CFR 830.

Discussion

Background

The version of SRS contractor approved TSB documents that existed prior to 2008 were developed using a methodology established around 2000. The methodologies employed consisted either of a risk based or a deterministic approach. The method that was used depended on the contents that were to be transferred and the type of container selected. Risk based TSBs assumed some release of content during an onsite transportation accident. Any release of the contents was determined to be within the allowed site limits at the time – 5 rem at the site boundary, although it should be noted that there has never been a release of radioactive contents during onsite transfers at the SRS. The risk based TSBs applied a graded approach to package survivability during an accident depending on certification of the package or structural robustness. In other words, an ordinary metal box was not credited for as much survivability as a DOT Specification 7A Type A 55 gallon drum. Deterministic TSBs were based on package performance. Often times a Type B Safety Analysis Report for Packaging (SARP) or other equivalent packaging test documentation was used as the basis. Deterministic TSBs typically do not involve a release of contents.

The SRS contractor program was modeled after the DOE Packaging Certification program from 10CFR71 *Packaging and Transportation of Radioactive Material*. Because of site production missions, numerous TSB documents were developed to support specific content, packaging, and campaigns. As a result multiple independent documents sometimes existed for the same container (packaging). Although the methodology was maintained with each document, the structure and style varied because of various factors such as different authors and certain facility demands.

A large fleet of packages was authorized by the SRS contractor TSB documents. Although some packages were retired during the multiyear campaign to obtain DOE-SR approval, the fleet continues to be varying and large. The SRS packaging fleet includes:

- Packaging with active DOE and/or DOT certifications, such as industrial packaging (IP), Type A packaging, and Type B packaging which were/are used in accordance with their certificate of compliance.
- Packaging with active DOE and/or DOT certifications, such as industrial packaging (IP), Type A packaging, and Type B packaging which were/are used with deviations from their certificate of compliance.
- Packaging with previous DOE and/or DOT certifications
- Packaging that were never certified by DOE and/or DOT
- Packaging that were based on SRS specific designs

In 2008 when the primary SRS contractor began the multiyear campaign to obtain DOE-SR approval for the TSD and each TSB, a review of every document's purpose and usefulness was conducted. During the rewrite campaign the contractor-only approved documents remained in place until September 2011 in order to allow a reasonable, phased approval process. It was acknowledged there were no serious technical issues associated with the contractor only approved documents. Once DOE-SR approved a TSB, facilities had 60 days to implement the DOE-SR approved version.

An additional benefit to rewriting every TSB was that it allowed the SRS primary contractor to take a "big picture" look at all the TSBs that existed. With the DOE-SR review and the required annual update reviews, it was imperative that the number of maintained TSBs be minimized. The first step was to cancel the TSBs that did not support a current site mission or future mission. Next the focus was to consolidate TSBs involving similar containers into one document when business needs allowed.

The DOE-SR review demanded a need for a standardized TSB format and analysis approach that satisfied both the DOE-SR expectations and the SRS primary contractor's operational objectives. The revised DOE-SR approved TSD maintains a similar methodology as the contractor only approved version. TSBs are still binned into either risked based or deterministic categories.

Discussion of Challenges

The first challenge encountered with the DOE-SR review was that DOE-SR did not accept the graded approach applied to containers for damage ratios during accidents described in risk based TSBs. The contractor-only TSBs assumed a lower damage ratio for certified or structurally robust packagings and a higher damage ratio for uncertified containers. For the DOE-SR-approved risk-based TSBs, the five factor formula from DOE-HDBK-3010-94 , *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, was utilized to determine the source term of radioactive material that could be released into the atmosphere based on site and public receptor limits. In the five factor formula a conservative damage ratio of 1.0 is used for all packaging regardless of its robustness. Thus no credit is taken

for the packaging during an accident which means that the authorized contents are limited to the amount of material that does not exceed the site release criteria specified in the DOE-SR approved TSD (5 rem at the site boundary and 100 rem at 100 meters within the site boundary). Therefore, in a risked based TSB the entire contents of the package are subject to being released since no credit is taken for the package during an accident.

Another challenge involved the approval of a well-known, well-used package and was the first deterministic TSBs submitted to DOE-SR. The package submitted was the DOT Specification 6M. The first version of the 6M TSB was written based on the specifications in 49 CFR 100-185 (2003). However, as of October 1, 2008 the 6M was decertified by DOT. Because it had been decertified and the DOE-SR reviewer did not accept the limits from the DOT specification, the SRS primary contractor had to develop independent criticality analysis for the 6M and use a package testing report from Sandia National Laboratory to resolve DOE-SR review questions rather than rely on the 49 CFR 100-185 (2003) specifications which were being removed from the regulations.

The American Recovery and Reinvestment Act (ARRA) funding allowed SRS to remediate significant quantities of low level waste (LLW) and transuranic (TRU) waste so it could be shipped offsite for disposal. Transferring this waste to and from remediation facilities required numerous revisions to the waste transfer TSBs as new contents were identified or as new content analysis became available. Another challenge thus existed to approve the large portion of the material that was above what the risked based waste DOE-SR approved TSBs authorized. Working with DOE-SR, the primary contractor developed a plan to utilize the controls from the waste storage facility DSA to transfer the waste around the site. In essence the waste TSBs expanded the facility DSA for the duration of the waste transfer.

Prior to 2008 a contractor only TSB could be developed and approved within a few weeks assuming minimal analysis was required. With the addition of DOE-SR review six weeks (minimum) had to be allocated for review time and formal document transmittal between DOE-SR and the SRS primary contractor. Comments from the DOE-SR review are transmitted to the SRS primary contractor and must be resolved, which potentially adds more time to the process. The added time for review and comment resolution was a major change for site facility personnel that were accustomed to having approved TSBs within two to eight weeks of a request. With more awareness of the DOE-SR review time, facilities have adjusted to avoid impacts.

Another challenge that was addressed during the DOE-SR approval cycle involved the issue of shielded packaging used to transfer radioactive material with a high radiation dose onsite. In a risked based TSB the entire contents of the packaging are subject to being released since no credit is taken for the packaging during an accident. The release of high radiation dose material packaging contents could result in a direct shine radiation hazard to the collocated worker(s).

During the DOE-SR review of a TSB the adequacy of the sites radiological program to protect personnel was questioned for a release of high radiation dose material from a shielded packaging. After much discussion between DOE-SR and the contractor, a direct shine methodology was developed to standardize how risked based TSBs should address contents transferred in shielded packaging.

Conclusion

The DOE-SR approved TSBs allow the onsite transfer, between SRS facilities, of radioactive material including waste material, production material, samples, and contaminated equipment. All TSB documents needed to support SRS missions were written and submitted to DOE-SR prior to September 2011. Although one TSB remains to be approved by DOE-SR, the primary contractor is working with DOE-SR to have it approved soon. The multi-year campaign to obtain DOE-SR approval of each TSB has resulted in a reduced number of TSBs to be maintained while maintaining significant flexibility for site facilities in transfering radioactive material. In addition, the DOE-SR approval of TSBs has resulted in the onsite transportation program at SRS being elevated in awareness of all employees whether directly involved in the transportation or not. Transportation activities at the SRS continue to be performed safely and in full compliance with the applicable DOE and DOT standards and regulations.