

## **Teaching Old Packaging New Tricks – 12593**

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### **ABSTRACT**

Waste disposition campaigns have been an industry and government focus area since the mid-1970s. With increased focus on this issue, and a lot of hard work, most waste packaging and transportation issues have been addressed. The material has been successfully shipped and dispositioned. DOE has successfully de-inventoried materials from multiple sites to meet material consolidation, footprint reduction, nonproliferation, and regulatory obligations with cost savings from reduced maintenance and regulatory compliance. There has been a wide range of certified shipping packagings for the transportation of hazardous materials to meet most of the waste needs. The remaining materials are problematic, generally low volume, and do not meet the certified content of the existing inventory of packaging. Designing, testing and certifying new packaging designs can be a long and expensive process and for small volumes of material it is cost prohibitive. One very cost effective option is to lease and use a certified packaging to overpack waste containers. There are many robust certified packagings available with the capability to envelope the waste content. The capability to use inner containers, inside the current fleet of certified casks or packaging, to address specific content problems of additional shielding (e.g., U233) or containment (e.g., sodium bonded nuclear material) has successfully expanded the capability for timely cost effective shipment of unique contents. This option has been used successfully in the NAC-LWT, T-3 and other packagings.

### **INTRODUCTION**

Waste campaigns are an integral part of any active facility and a vital part when dealing with legacy material disposition. Challenging waste streams have been retrieved, treated, packaged and shipped in literally hundreds of campaigns across the United States. Some wastes have had multiple shipments under varying regulations over the years. Due to experience and innovation waste shipment, in the vast majority of cases, has become a routine part of facility operations. This overall success has left facilities and sites with remaining materials, generally low volume, not meeting the certified content of existing available packaging. Designing, testing, and certifying completely new packaging designs can be a long and expensive process. For small volumes of material this choice is cost prohibitive.

The first option is both cost effective and schedule sensitive by leasing currently certified packaging to package the waste containers. There are many robust certified packagings available with the capability to envelope the waste content. Some of these packagings have current licenses capable of bounding the waste container of material. These shipments are really a matter of the procurement process and content certification.

At slightly higher cost, and increased schedule, is the capability to do an addendum or amendment to a packaging to address the specific waste material for shipment. This requires an application to be prepared and submitted to the regulator for review. The application must address how all 10 CFR 71 requirements [1] are met with this proposed content in the package.

The third option is to use inner containers, inside of current casks or packaging, to address specific content problems of additional shielding (e.g., U233) or containment (e.g., sodium bonded nuclear waste). This approach has expanded the capability for timely cost effective shipment of unique contents. This option has been used successfully in the NAC-LWT, T-3 and other packagings.

The final option is to design, test, and certify a modification of an existing design (e.g., increase shielding or length) or a completely new design. When the US Department of Transportation 6M specification package lost its certification this process was used.

## **DISCUSSION**

### **Find and Ship**

Determining if a package or cask is currently suitable for the content is the first task. RAMPAC, the Department of Energy's Website for Information on Radioactive Material Packaging, [http://rampac.energy.gov/RAMPAC\\_Home.htm](http://rampac.energy.gov/RAMPAC_Home.htm) is an excellent resource.

The website lists most active certificates ([http://rampac.energy.gov/certificates/certificate\\_retrieval\\_page.htm](http://rampac.energy.gov/certificates/certificate_retrieval_page.htm)) and provides guidance on the use of DOE, NRC and DOT certificates (<http://rampac.energy.gov/GuidanceRequirements-NRC-DOT.htm>). If additional assistance is needed in locating a suitable packaging for a problematic content contact the Packaging Certification Program or the Savannah River National Lab Packaging Technology.

### **Find, Assess and Ship**

When there is no Certificate of Compliance (CoC) for the content to be shipped but there are packagings with the required critical dimensions and features (e.g., shielding) the next option is to assess if an addendum or amendment is technically feasible. This requires a screening of the content against 10 CFR 71 [1] and the specific capabilities of the current packaging. An application to the regulator (e.g., NRC or DOE) is required to be prepared and submitted. The regulator will conduct an independent review to determine if all requirements are met. This required review will add time and cost to the schedule. At the completion of the process a new CoC will be issued for the shipment of the new content. The 10-160B (see Fig 1.) is an example of a cask capable of holding large volumes of waste loaded directly into the cask or in smaller waste containers then loaded into the cask.



Fig 1. 10-160B has a large cavity with current NRC and DOE Certificates

### **Find, Enhance, Assess and Ship**

If a current packaging cannot meet the requirements needed to ship in compliance but has the payload and dimensions needed for the desired content there is still hope for a cost and schedule effective solution. There is the potential to use inner containers or waste packaging, inside of current licensed casks or packaging, to address specific content problems of additional shielding (e.g., U233) or containment (e.g., sodium bonded nuclear waste). This approach can even be used on certified packagings not being capable of being modified, due to their regulatory bases, since the inner features are considered contents. This approach greatly expands the use of older packaging and has proven very useful in current packaging. The initial process is identical to the previous options. Since there are engineered features, not already credited in the base packaging, to be designed or adapted the schedule and cost can be higher than the first two options. The regulator will have to conduct an independent review to determine if the inner containers to the packaging meet the requirements of 10 CFR 71[1]. This review of additional features can add even more time and cost to the schedule.

Fortunately this process has been used successfully in at least two shipping casks. The T-3 (see Fig 2.) and the NAC- Legal Weight Truck have used inner containers to address the shipment of sodium bonded material. The additional container was required by the 10 CFR 71 [1] regulation of analysis of a flooded primary containment. While the T-3 currently has limited availability and use the NAC-LWT has current NRC and DOE CoCs with a fleet of eight casks capable of payloads up to 2.5 kW and 150mm of lead shielding. This cask has an inner cavity of approximately 4600x340mm limiting the size of the waste to be shipped.



Fig 2. The T-3, with an inner container, being used to ship Fast Flux Test Facility sodium bonded fuel.

Smaller wastes, sources and samples have been licensed and shipped in the 9977 (see Fig 3.) using lead, tungsten and high density polyethylene inserts to address specific content concerns. These contents are normally much smaller in size and often require additional shielding for shipment.

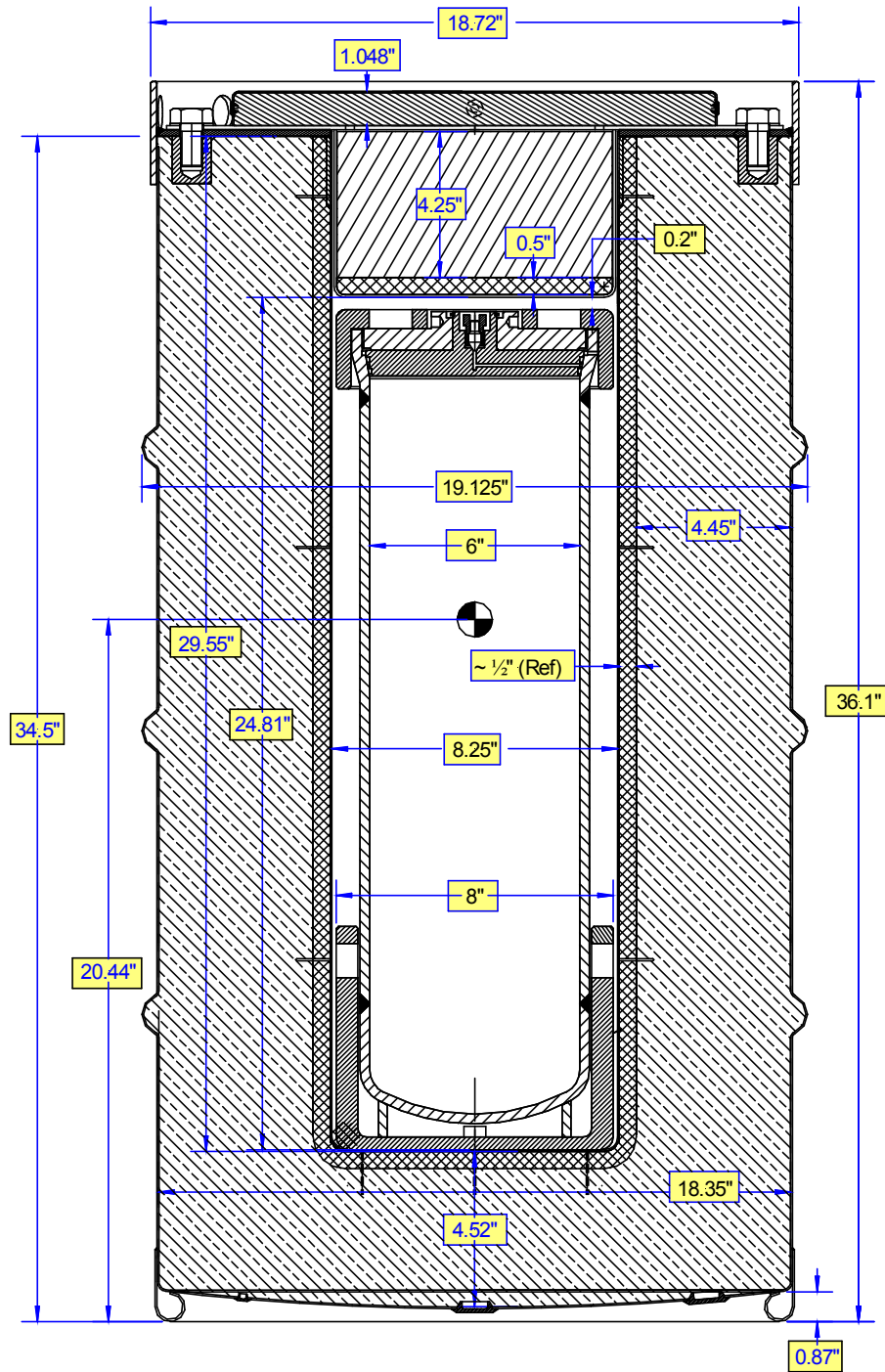


Fig 3. 9977 Packaging Dimensions

### **Design, Test, Assess and Ship**

The final option is to modify an existing design or develop a new one to ship the desired content. This requires packaging design and verification. Verification can be accomplished by comparison, analysis or testing to meet the requirements of 10 CFR 71[1]. A Safety Analysis Report (SAR) for NRC or a Safety Analysis Report for Packaging (SARP) will need to be prepared and submitted to the regulator. This process is a minimum of 12 months with 24 months being a reasonable duration. Guidance and a flowchart for DOE applications are available on RAMPAC ([http://rampac.energy.gov/DOE-Requirements/Packaging\\_Flowchart.pdf](http://rampac.energy.gov/DOE-Requirements/Packaging_Flowchart.pdf)).

### **CONCLUSIONS**

There are a wide range of certified shipping packagings for the transportation of hazardous materials to meet most of the waste needs. The remaining materials are problematic, generally low volume, and do not readily meet the certified content of the existing inventory of packaging. Designing, testing and certifying new packaging designs can be a long and expensive process and for small volumes of material it is not practical. One very cost effective option is to lease and use a certified packaging to overpack waste containers. There are many robust certified packagings available with the capability to envelope the waste content with amendments or addendums. The proven capability to use inner containers, inside of current casks or packaging, to address specific content problems of additional shielding (e.g., U233) or containment (e.g., sodium bonded nuclear material) has successfully expanded the timely and cost effective shipment of unique contents.

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## **REFERENCES**

1. Code of Federal Regulations, Title 10, Energy, Part 71, Packaging and Transportation of Radioactive Material, 10 CFR 71.