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Modification of a Handling Device for Use on Drum-Style Shipping Packages

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ABSTRACT

The Pantex Plant developed a device for the partial removal of the containment vessel from a Model 9977 Shipping Package in order to operate the package without needing electrical power or having to utilize an external lifting mechanism. This device attaches to the top of the 9977 Package and allows two individuals to fully operate the package (open, load/unload, close). This device was modified to function on the 9975 Shipping Package for remote operations. There is a potential that this device can be modified to work on many other drum-style shipping packages. This paper discusses the design of the device as well as the modifications for use on the 9975 Shipping Package and will focus on potential modifications for use on other packages.

DESIGN

The Pantex plant in Amarillo, TX uses the 9977 package for material shipments. One of the concerns at Pantex was introducing new tools and materials into their loading and unloading areas that required large areas for operation as they are space-limited. So, in order to alleviate the space concerns, Pantex designed a lifting device, shown in Figure 1, that attaches to the 9977 drum and has a boom for lifting the containment vessel out of the drum liner. The device also has a clamp mechanism for holding the CV, suspended, allowing for opening, loading, and closing of the CV. The lifting device can be used on other packages as well with the use of adapter plates. An adapter plate was designed to attach the lifting device to the 9975 Shipping Package. The lifting mechanism for the device is a screw housed within the vertical section of the device that when turned raises and lowers the CV. (PATRAM 2013 #514)

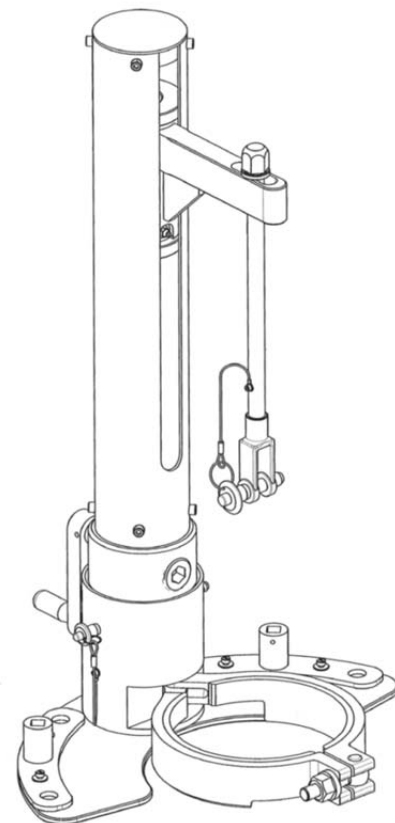


Figure 1

OPERATION OF THE DEVICE

The operation of the lifting device is quite simple. Once it is attached to a drum the boom is lowered into place in order to pick up the CV using approved rigging tools. Figure 2 shows the lifting device attached to a 9975 utilizing the adapter plate.



Figure 2

Once the CV is attached to the boom it is raised and tightened within the clamp on the device (also seen in Figure 2). The rigging is removed and the boom is then rotated 90° in order to allow for loading/unloading of the CV. In the case of the 9975, the lid on the outer CV, called the Secondary Containment Vessel (SCV) is only slightly loosened and then the boom is rotated back into place, the rigging is reattached, and the SCV is lowered. For the 9977 the CV lid is completely removed and loading/unloading can take place. For the 9975, once the SCV has been lowered back into the drum, the SCV lid is removed and the rigging is attached to the top of the Primary Containment Vessel (PCV). The PCV is raised up to the clamp and using adapters the clamp holds the PCV in place (Figure 3). The PCV lid is then removed and the loading/unloading can take place (Figure 4). Once the PCV is loaded, a post load leakage rate test is performed on the CV while it is still in position. After a successful test, the steps are reversed and the PCV is lowered back into the drum, the SCV is raised, a leakage rate test is

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performed on the SCV, the SCV is lowered, and the lifting device is removed from the drum.
(PATRAM 2013 #514)

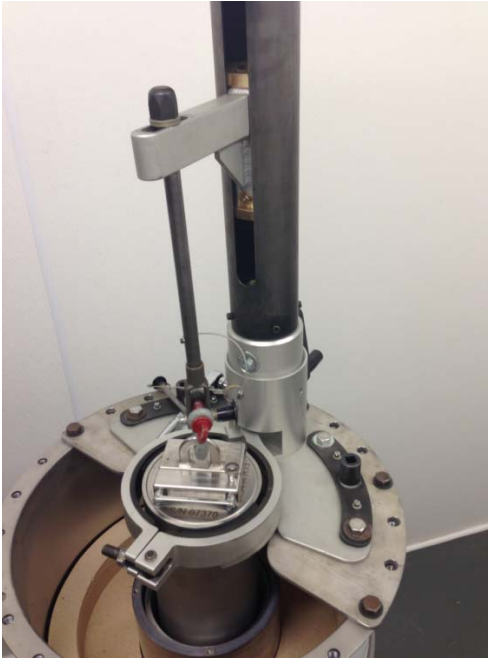


Figure 3



Figure 4

POTENTIAL FOR USE ON OTHER PACKAGES

This device was easily adapted for use on the 9975 shipping package. However, as shown in previous figures, use on the 9975 required a significant amount of additional hardware to allow for stable and secure operations. Thus, a device has been designed modifying the original part by increasing the throw on the screw thread allowing use on the 9975 without additional hardware. The modified design is shown as Figure 5.

Although this change requires a new lifting device to be made, the cost of such a device is minimal compared to the costs of a system utilizing electrically powered lifters. Additionally, the only parts modified in this design were the screw, the housing for the screw, the boom, and the grapple (not shown in Figure 5).

Since there are not many parts that are changed as a result of this modification, it would be quite simple to change the design for other drum-style packages as other drum style packages are in use throughout the DOE complex and in other places world-wide.

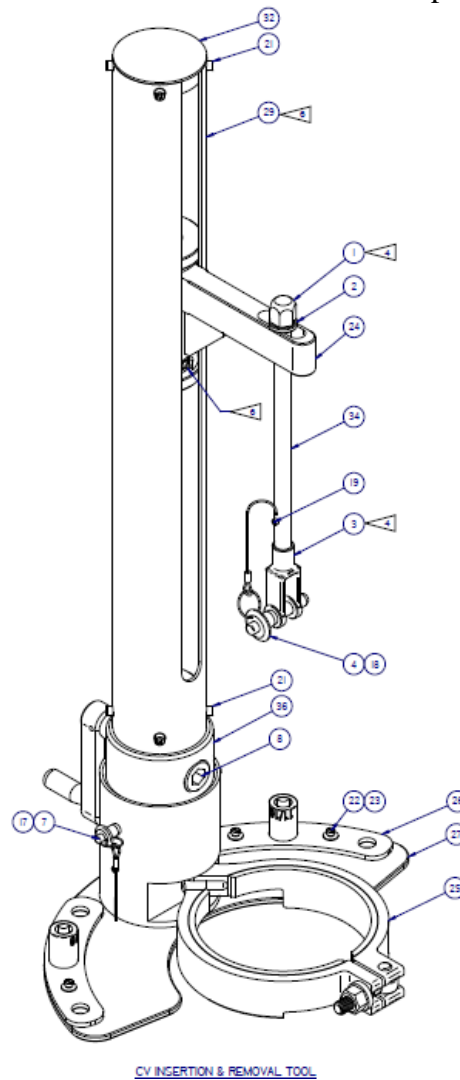


Figure 5

6M Drums

For instance, the former US-DOT specification package, the 6M, is still used in some locations as an “onsite only” package. The 6M internal cavity resembles that of the 9975 and the 9977. This type of lifting device could be modified to lift the 6M internal vessel, called a 2R, up into the grip on the lifting device. At that point the 2R could be attached within the device, opened, and then loaded/unloaded. Doing this would not require any changes to the device itself, but rather another type of adapter plate could be created utilizing a reinforced partial lid for a 6M drum. A schematic of the 6M drum is shown as Figure 6.

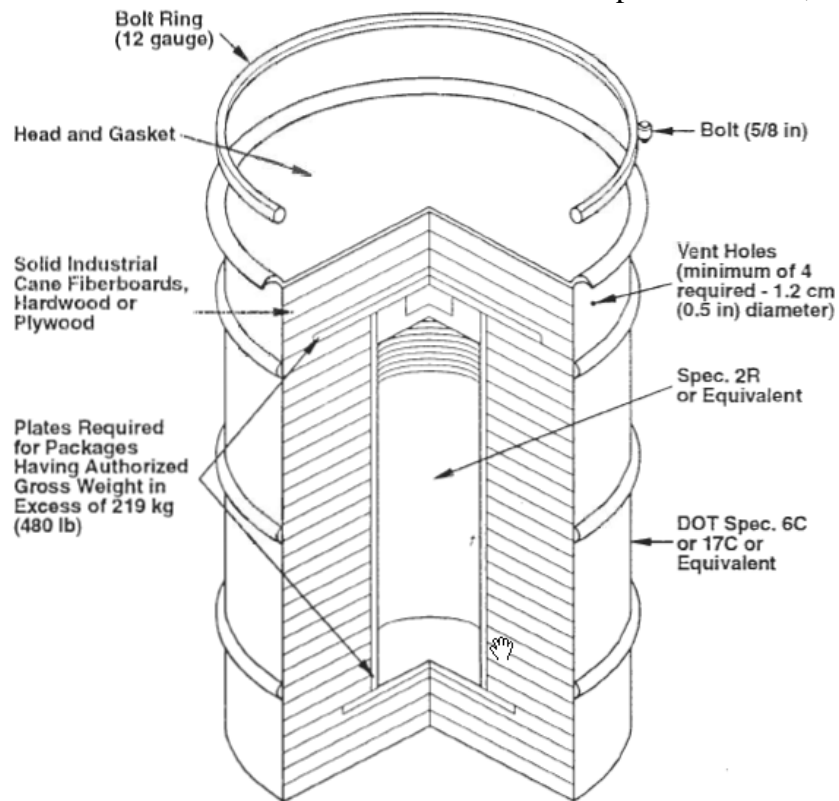


Figure 6 DOT Specification 6M Packaging

ES-3100

The ES-3100 is a drum-style shipping package used primarily for the shipment of uranium within the DOE complex. This drum has a similar lid design to that of the 9977. The cavity within the ES-3100 is deeper than that of the 9977 and thus the longer throw on the modified lifting device would allow for an attachment to be placed onto the containment vessel and then lifted out of the drum cavity. Although the depth of the ES-3100 allows for the attachment of the grapple onto the containment vessel, the bolt holes on the lid have a different pattern than those on the 9977. Thus another adapter plate could be designed to allow use the device on the ES-3100. A schematic of an ES-3100 Shipping Package is shown as Figure 7.

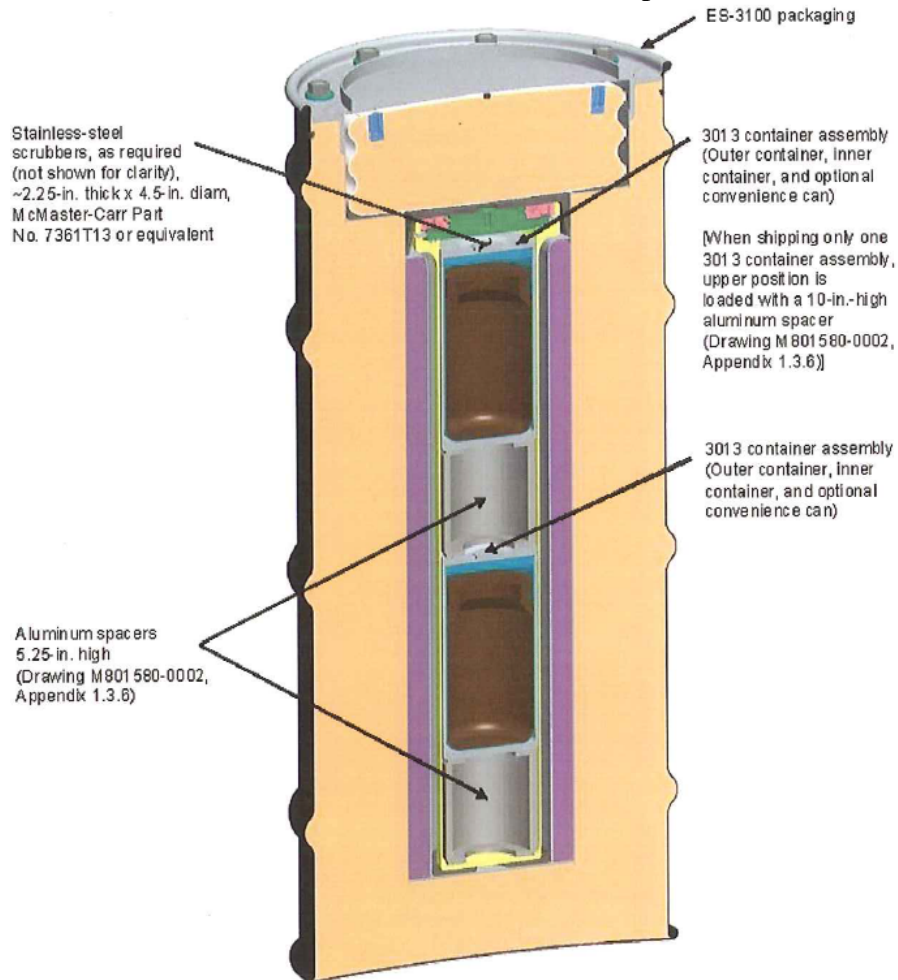


Figure 7 – ES-3100 Shipping Package

9978

The 9978 is a very similar drum to the 9977; thus applications for use of the lifting device on the 9978 would not require much modification at all. In fact, the modified design with the increased throw will allow for use on the 9978 without any other modifications.

CONCLUSIONS AND RECOMMENDATIONS

The Pantex design for this containment vessel lifting device is very utilitarian. It allows for easy modification, and, if modifications are not desirable, additional hardware may be able to be added to allow for the operation of the device on shipping packages other than the 9977. As mentioned, various other shipping packages could take advantage of this device by modifying the device, designing a new adapter plate, or both, if necessary, and then using the lifting device for normal operations or in applications where other lifting options are not available.