

## DEVELOPMENT OF A TEN DRUM OVERPACK AS AN AUTHORIZED TRUPACT-II PAYLOAD CONTAINER FOR USE AT THE WASTE ISOLATION PILOT PLANT\*

Phillip C. Gregory and J. Carlos Lopez  
Westinghouse Electric Corporation  
Carlsbad, NM 88220

Robert Spooner  
U.S. Department of Energy  
Carlsbad, NM 88220

### ABSTRACT

The Ten Drum Overpack (TDOP) is a multi purpose container intended for use in transuranic Package Transporter II (TRUPACT-II) for the transport of transuranic wastes. The TDOP will support the Bin Scale Test Program for the Waste Isolation Pilot Plant (WIPP) underground. The latest Nuclear Regulatory Commission Certificate of Compliance for TRUPACT-II, #9218 Revision 4, approved the use of the TDOP as an overpack for shipments in TRUPACT-II. The TDOP, upon completion of its design and testing, will be qualified as a Department of Transportation 7A Type A container and will provide the capability to handle and ship bulk articles in support of the WIPP mission that would otherwise require size reduction. This paper discusses the aspects of the aforementioned applications and provides a status on the design and testing of the TDOP.

### BACKGROUND

The Waste Isolation Pilot Plant (WIPP) was authorized by the Congress of the United States in 1980 (Public Law 96-164) in response to the national need to dispose of transuranic (TRU) waste from the production of U.S. Department of Defense weapons. The WIPP, located 26 miles east of Carlsbad, New Mexico, is a research and development facility operated for the U.S. Department of Energy (DOE) to demonstrate the safe and permanent disposal of TRU waste.

One major element of the WIPP program is demonstrating safe transportation of TRU wastes from ten DOE facilities located across the United States to the WIPP repository. The WIPP will soon embark on a Test Phase, to develop models to assess the suitability of the repository for long term disposal of TRU wastes. These tests include placing TRU waste into instrumented bins that have been specially prepared for tests to be conducted in the WIPP underground. Well-characterized TRU wastes will be transferred from 55-gallon drums to test bins that will be placed in standard waste boxes (SWBs) and shipped to the WIPP by the TRansUranic PACKage Transporter (TRUPACT-II).

The TRUPACT-II is a Type B packaging, certified by the Nuclear Regulatory Commission (NRC) as meeting the requirements of Title 10 of the Code of Federal Regulations (10 CFR), Part 71, for the safe transport of TRU wastes. The waste for the bin tests will be prepared for shipment at the Idaho National Engineering Laboratory and the Rocky Flats Plant. Upon arrival at the WIPP, these bins will be fitted with a special, instrumented lid and moved to the underground, where testing will be conducted.

The WIPP Land Withdrawal Act (Public Law 102-579), signed into law by President Bush in October 1992, marks a major milestone for the WIPP because it defines the conditions necessary to begin the test program. One of the requirements of the Land Withdrawal Act is the demonstrated

capability to retrieve radioactive materials from the WIPP, if necessary. Should retrieval be required, the WIPP will need a payload container that can serve as an overpack for the bins/SWBs or drums as needed. The Ten Drum Overpack (TDOP), see Fig. 1, has been recently approved by the NRC as a TRUPACT-II payload container for this purpose.

The TDOP was initially conceived as a payload container for loading items that are too large to fit into a 55-gallon drum or SWB, for subsequent shipment in TRUPACT-II. A secondary use of the TDOP was as an overpack for damaged or corroded 55-gallon drums and/or SWBs. During the operational readiness review of the WIPP during 1991, the need for an overpack container was identified for the SWBs in the underground. If an SWB containing a bin of test waste developed a leak due to a puncture, corrosion, or damage, a method of overpacking the failed container is necessary to control the potential contamination; also, if waste has to be retrieved, it will be necessary to either remove all the salt from the surface of all payload containers retrieved from the WIPP underground, or to overpack the retrieved payload containers into a clean overpack container to prevent potential corrosion of the stainless steel containment vessels in the TRUPACT-II. Due to operational and safety considerations and uncertainties about disposal of cleaning materials, the decision was made to overpack all retrieved payload containers. The TDOP was selected for the overpack container because it is large enough to overpack an SWB and could be authorized as a payload container for the TRUPACT-II.

### REQUIREMENTS

The TDOP had to be operationally compatible with the TRUPACT-II and fit inside the TRUPACT-II inner containment vessel (ICV) with close tolerances. No feature of the TDOP design, weight, construction, or materials could restrict the performance of the TRUPACT-II. The TDOP is also required to be a U.S. Department of Transportation

\* Work supported by the U.S. Department of Energy under DOE Contract No. DE-ACO4-86AL31950 DOE/WIPP 92-022C

## DOT CERTIFICATION TESTING

As currently implemented, the description and requirements of tests used for qualifying containers as DOT 7A Type A packages as given in 49 CFR, Part 178.350, are as follows:

**Water Spray** - The water spray test simulates exposure to rainfall of approximately two inches per hour. This test must precede each of the other tests, which include a compression test, a penetration test, and a free-drop test. The time interval between the water spray test and the compression test is to be such that the water has soaked in to the maximum extent. The time interval can be reduced to two hours if the spray is applied from four different directions simultaneously.

**Compression** - The compression test lasts a period of 24 hours minimum. The load is equivalent to five times the weight of the package or 265 pounds per square foot multiplied by the vertically projected area of the package, whichever is greater.

**Penetration** - For the penetration test the package is placed on a rigid, flat, horizontal, and immobile surface. A bar, 1.25 inches in diameter with a rounded tip and weighing 13.2 pounds, is dropped in a vertical position so that the rounded end impacts the center of the weakest part of the package, attacking the containment system. The bar cannot be deformed from the impact. The height of the fall is measured from the lowest part of the bar to the upper surface of the target.

**Free drop** - The drop test calls for a fall onto a rigid, flat surface. The package is oriented such that the fall will cause maximum damage to it. The height of the drop is measured from the lowest part of the package to the upper surface of the target.

Pass or fail criteria are established prior to the testing and recorded. Test packages must satisfy all test requirements, with evidence that the integrity of the package is maintained throughout the entire testing cycle. In the summer of 1990, the preliminary design of the TDOP was tested to DOT 7A Type A specifications. The test sequence was conducted at the Hanford Reservation under the direction and supervision of test engineers from Westinghouse Hanford Company, Richland, Washington. The preliminary design failed the drop test due to a tear on the side, and one of the lid screws was sheared.

From test reports and observations, it was concluded that the lid-container interface was not sufficiently rigid. The TDOP performed well during the puncture test, with no release of waste contents or apparent breaks in the skin of the package. A series of engineering evaluations were performed to assess the failure mode of the package and possible enhancements to the design. The assessment suggested that increasing the wall thickness from one-eighth inch to three-sixteenth inch and stiffening the bolted connection at the lid should prove adequate to pass the tests. A revised prototype will be fabricated, and testing resumed in the near future.

## NRC APPROVAL AND AUTHORIZED CONTENTS

An application to amend the C of C to add the TDOP as an authorized payload container was reviewed by the NRC, and a new C of C was issued to allow fourteen 55-gallon drums, two SWBs, or a TDOP as permissible payload containers. No additional TRUPACT-II Content Codes are required for the TDOP. The TRUPACT-II SARP provides a discussion that concludes any waste form that is acceptable for a

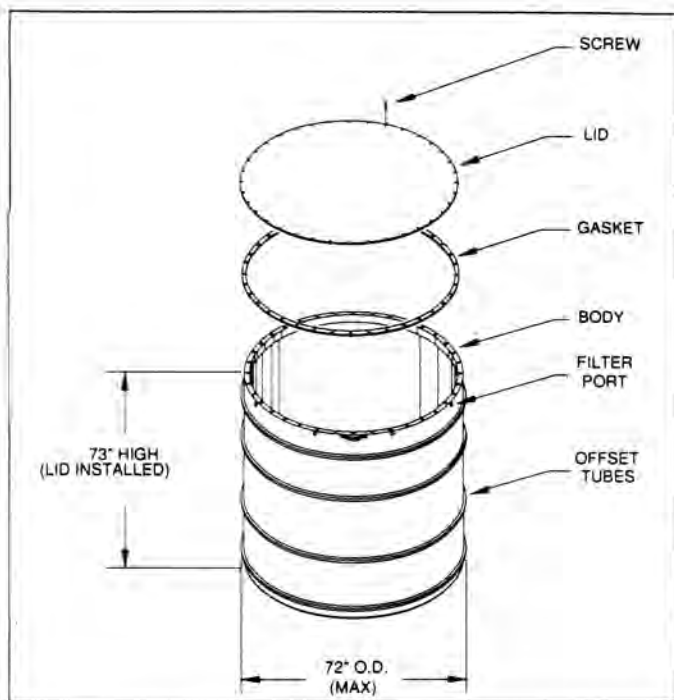


Fig. 1. Ten drum overpack.

(DOT) Specification 7A Type A container to meet operational and safety requirements of the WIPP Waste Acceptance Criteria. The TRUPACT-II Certificate of Compliance (C of C) does not specifically require DOT 7A Type A containers because it was demonstrated by full-scale certification tests that the TRUPACT-II does not rely on a payload container to maintain the integrity of the containment boundary and remain leaktight during the hypothetical accident conditions of transport described in 10 CFR, Part 71. TRUPACT-II certification testing is described in detail in the Safety Analysis Report for Packaging (SARP).

Other less impacting criteria were also considered. The TDOP should have some degree of compatibility with the emplacement process at the WIPP. The need to maneuver and handle the TDOP in the WIPP underground would necessitate restrictions on size, weight, and handling capabilities. These, however, were deemed to be needs which could be technically addressed without any adverse impact to the WIPP surface or underground operations.

## DESIGN AND FABRICATION

The TDOP is shaped like a right circular cylinder, approximately six feet high by six feet in diameter. Its total internal volume is approximately 169 cubic feet, and it can weigh up to 7,265 pounds when fully loaded. The design is based on the exterior dimensions of fourteen 55-gallon drums or two SWBs. The TDOP will hold ten 55-gallon drums or one SWB turned on its side. The TDOP is a vented package, requiring a minimum of nine carbon composite filters. The TDOP is constructed of carbon steel sheet with full penetration welded joints at the sides and bottom and a bolted top lid as its closure.

TRUPACT-II, is acceptable to be overpacked into a TDOP without further analysis or certification. Since the TDOP is approximately the same size as the interior of a TRUPACT-II, but holds only one SWB or ten 55-gallon drums, as compared to two SWBs or fourteen 55-gallon drums for a TRUPACT-II, the TDOP will always contain less waste than the maximum allowable in a TRUPACT-II.

#### CONCLUSIONS

The WIPP has pursued development of the TDOP because of its potential need to overpack SWBs should retrieval from the underground testing be required. The TDOP meets the immediate need for an overpack that may be used in the TRUPACT-II and offers the potential for directly loading large bulky waste with minimum size reduction.

#### REFERENCES

WIPP Brochure, Westinghouse Electric Corporation, Waste Isolation Division for the U.S. Department of Energy, February 1993

First Responders Radiological Transportation Emergencies Course Manual, Westinghouse Electric Corporation, Waste Isolation Division for the U.S. Department of Energy, July 1990

WHC-EP-0558, Test and Evaluation Document for DOT Specification 7A Type A Packaging, Westinghouse Hanford Company for the U.S. Department of Energy, June 1992

TRUPACT-II Certificate of Compliance Nr. 9218, U.S. Nuclear Regulatory Commission, November 1992