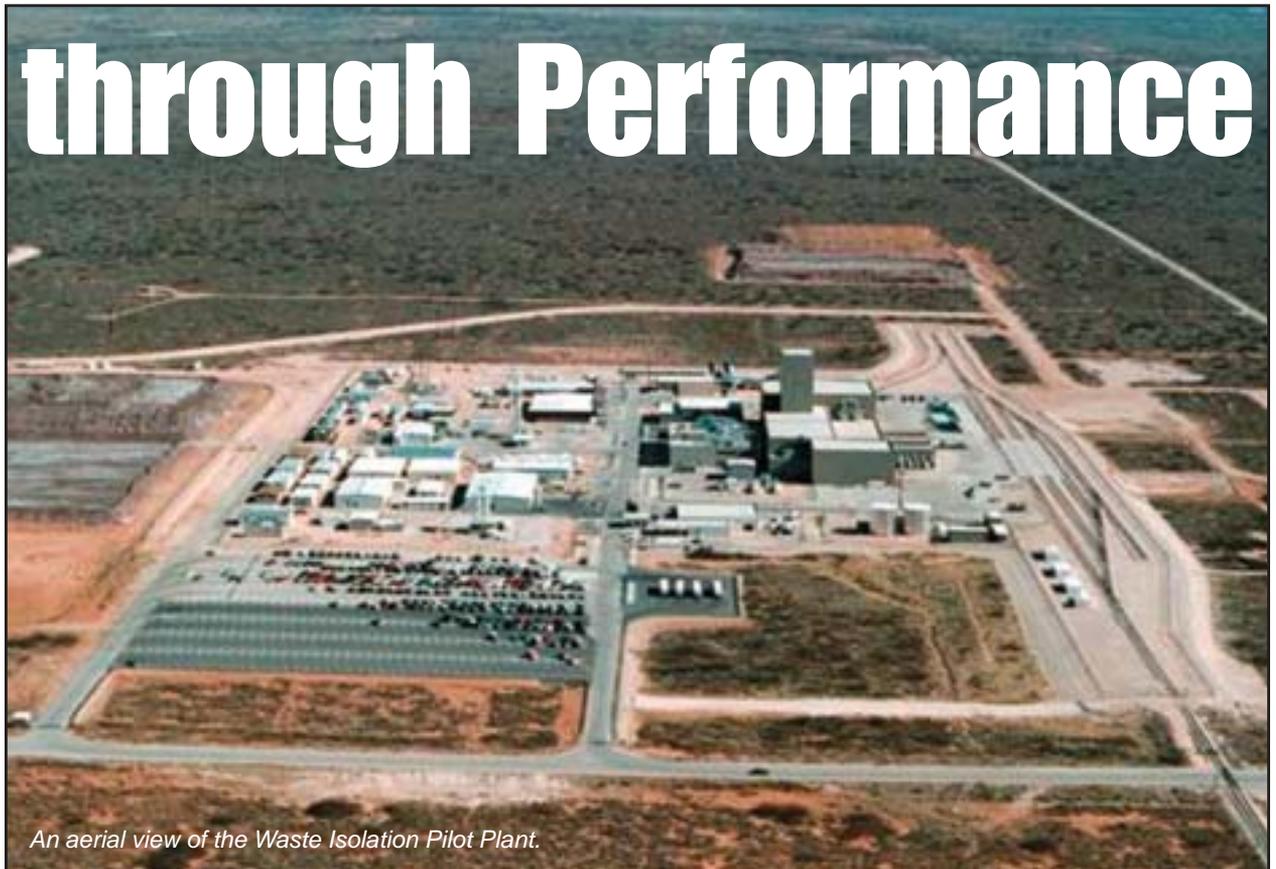


Demonstrating Safety

through Performance



An aerial view of the Waste Isolation Pilot Plant.

WIPP's Model Transportation System

By Jessica L. Hogue

Transportation of nuclear waste has made a lot of headlines lately, begging the question, "How is the federal government doing in this area?" The answer is, quite well, thank you very much. Here, we explore what many consider a model program, the Waste Isolation Pilot Plant (WIPP) Transportation System.

The WIPP, a cornerstone of the U.S. Department of Energy's cleanup effort, is the nation's first repository for permanent disposal of defense-generated transuranic (TRU) radioactive waste generated as a result of research and production of nuclear weapons. TRU waste consists of such items as clothing, tools, rags, and other laboratory materials that came in contact with radioactive elements, mostly plutonium. Some of the waste contains hazardous constituents, such as solvents and paint, and is referred to as TRU "mixed" waste.

In the 1950s, the National Academy of Sciences (NAS) identified salt as a good geologic medium for the permanent isolation and disposal of such wastes. WIPP surface facilities, located 26 miles east of Carlsbad, rest atop a

2000-foot-thick salt formation. Nearly half a mile below, engineers have carved out disposal rooms the size of a football field in the 250-million-year-old salt bed.

On March 26, 1999, WIPP received its first shipment of transuranic waste from Los Alamos National Laboratory (LANL) in northern New Mexico. Since then, more than 36 000 drums and waste boxes have been safely transported and disposed of underground at the facility.

WIPP currently accepts TRU waste from five DOE facilities: the Hanford Reservation, at Richland, Wash.; the Idaho National Engineering and Environmental Laboratory, near Idaho Falls, Idaho; the Savannah River Site, in Aiken, S.C.; LANL, in Los Alamos, N.M.; and the Rocky Flats Environmental Technology Site, near Golden, Colo. In addition, WIPP will receive small quantities of waste from other storage sites nationwide.

Based on current census figures, removal of TRU waste from temporary storage facilities will reduce potential risk of exposure to more than 70 million people living within a 50-mile radius of storage facilities. Congress authorized WIPP to ultimately dispose of 6.2 million ft³ of TRU waste.

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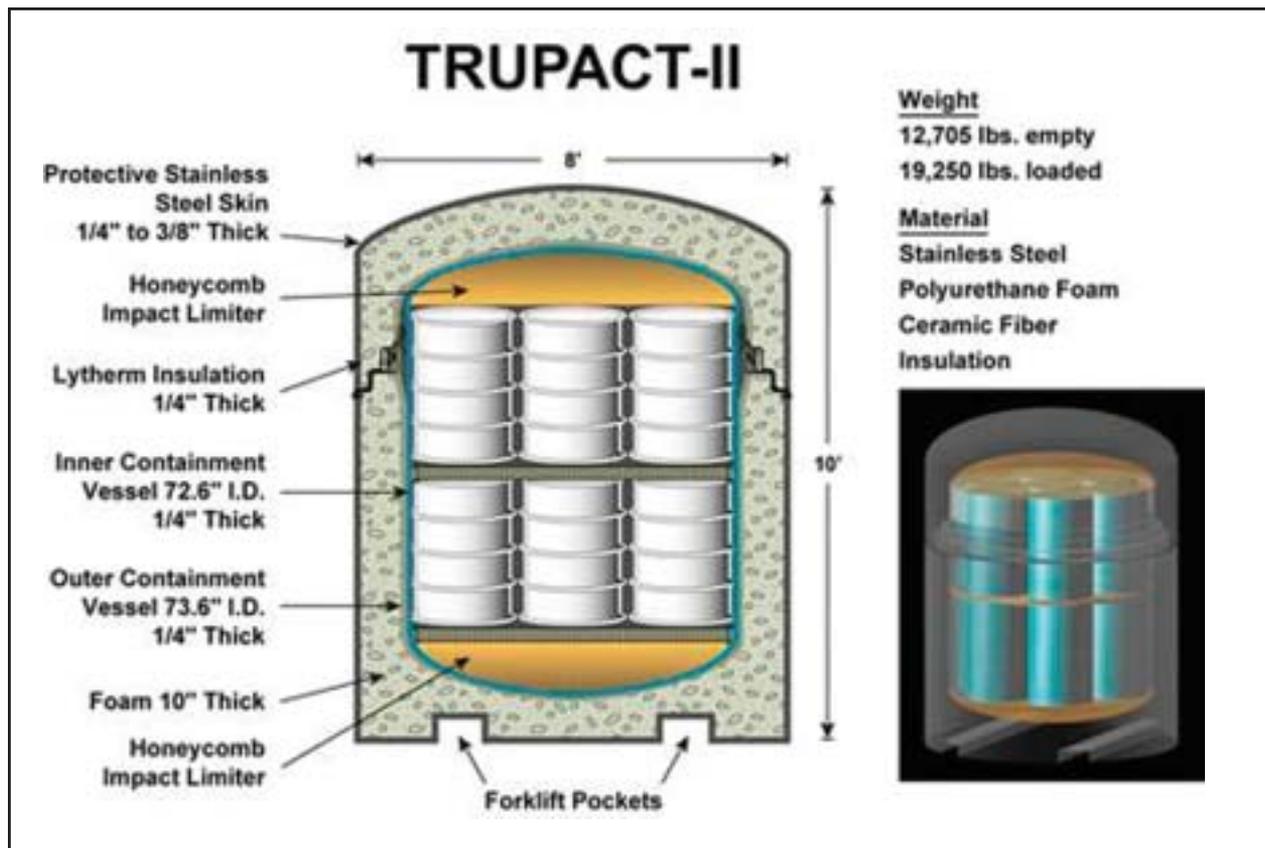
THE PACKAGE

Before WIPP's opening, critics of the project asserted that transporting radioactive waste across the country would be unsafe. WIPP transportation engineers, on the other hand, were confident that the rugged transportation packages used to deliver the waste containers to WIPP would remain leak-tight even under accident conditions.

The specially designed packages, called TRUPACT-IIs, are 10-ft-high domed cylinders, 8 ft in diameter. Much like a thermos, the package's main components are two stainless steel containment vessels, one inside the other. The inner containment vessel is surrounded by 10 inches of polyurethane foam and 1/2 in. of ceramic fiber for thermal insulation. A



Waste emplaced in underground disposal rooms at WIPP.



TRUPACT-II schematic diagram.

stainless steel shell covers the entire TRUPACT-II, serving as an additional protective layer to absorb the impact in the event of an accident.

The TRUPACT-II container underwent extensive testing before certification by the U.S. Nuclear Regulatory Commission. Prototypes were subjected to a series of tests to ensure leak-tightness during the worst conceivable highway accident. Impact testing focused on the container's most vulnerable areas.

During the test sequence, containers were first dropped onto a 25-ft thick concrete surface covered with an 8-in. steel plate to force the container to absorb full impact. The same containers were then repeatedly dropped from a height of 40 in.



Drop test.

Monitoring Room at WIPP monitor shipments 24 hours a day. The vehicle's position is transmitted to a satellite receiving station and relayed to the TRANSCOM control center where shipment information is displayed on computer-generated maps.

If a truck deviates from designated routes or stops moving without explanation, control center operators contact drivers to identify and resolve problems. Drivers and law enforcement personnel communicate with one another through TRANSCOM's central operator or a facility op-



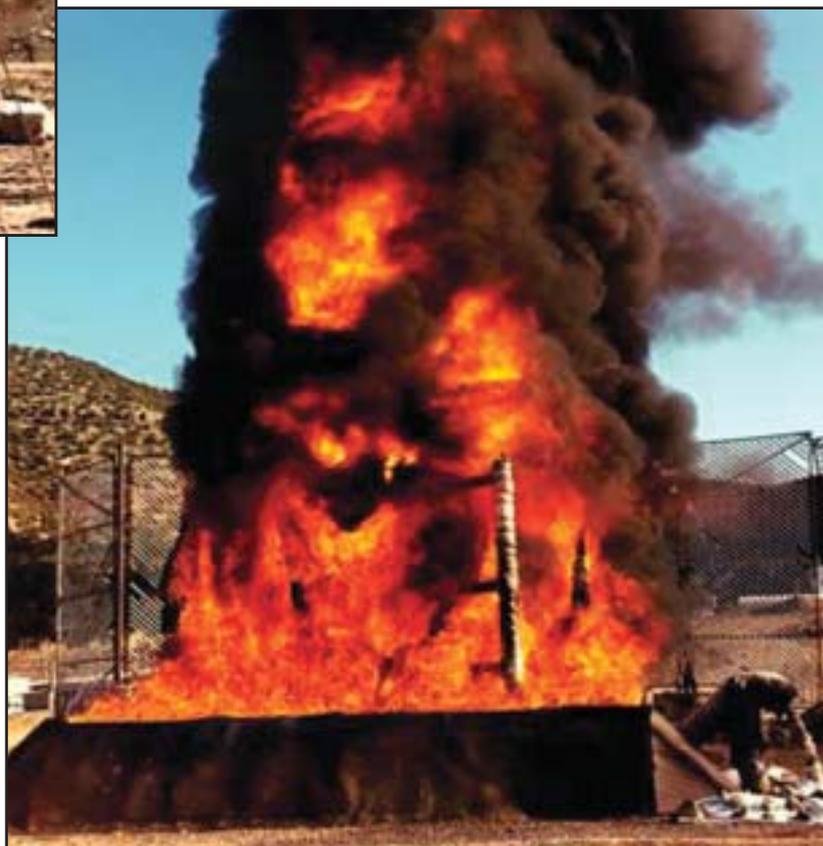
Puncture test.

onto an 8-in.-high steel post, 6 in. in diameter. The spike pierced the outer skin of the vessel in some of the drops but never penetrated the inner or outer containment vessels.

Each battered TRUPACT-II was then engulfed in a 1475°F jet-fuel fire for a minimum of one-half hour. The tests proved conclusively that the TRUPACT-II containers would remain leak-tight and safe under extraordinary circumstances. WIPP now has 67 TRUPACT-IIs in its fleet, at a cost of approximately \$410 000 each.

TRUCKS AND DRIVERS

WIPP trucks are tracked by two satellites and equipped with a transportation tracking and communication system (TRANSCOM). Both the control center in Albuquerque and the Central



Burn test.

erator at the Central Monitoring Room at WIPP. Operators and other federal, state, and tribal officials can access a database that contains shipment-specific scheduling, routing, payload, and emergency response information.

Ultimately, the safety of the WIPP Transportation System rests with the people who move the TRUPACT-II's. WIPP driver candidates are carefully screened, qualified, and trained before picking up their first waste shipment. The driver must be at least 25 years old and have driven 325 000 miles in the last five years or 100 000 miles per year in two of the last five years in a commercial tractor-trailer over-the-road operation. A clean driving record is required, and drivers may not have a chargeable accident or moving violation in a commercial motor vehicle within five years.

Drivers receive instruction in the use of radiation detection instruments, adverse weather and safe parking protocols, first responder, and incident command training and use of tracking system and communication equipment. While en route, drivers are required to stop every 150 miles or three hours to inspect the tractor-trailer.

SAFETY RECORD

Safety, not time, is the principle criterion for shipments of TRU waste. Route schedules are flexible to ensure safety during poor weather or highway conditions. Drivers operate in pairs to allow one to rest while the other drives. Each driver is required to have adequate rest between driving periods.

The WIPP Transportation System has had two insignificant incidents. In August of 2002, a WIPP truck



Crosscut of drums showing TRU waste.

near Carlsbad was hit from the rear by a pickup truck driven by a drunken driver. The pickup driver received minor injuries; neither WIPP driver was injured. State police immediately responded to the accident and blocked off the area until inspectors arrived from the New Mexico Motor Transportation Division. Inspectors noted damage to the left rear outer tire of the transport trailer, which was repaired, and the truck proceeded to its destination.

The following month, a WIPP truck driver became ill and attempted to pull to the side of the road but blacked out before the truck came to a stop. The truck traveled nearly one-fifth of a mile through a level field, woke the driver's partner in the sleeper, and rolled to a stop. No one was injured, and state police found only minor damage to the tractor.

In both cases, the WIPP Transportation System functioned as designed. Response and recovery were immediate, precautionary measures were instantaneous, the waste containers remained leak-tight, and the public's health and safety were protected.

WIPP drivers have logged more than four million miles since they began operating in support of public exhibits, training exercises, training for Commercial Vehicle Safety Alliance inspectors, and cleanup of the nation's TRU waste. The NAS said the "WIPP Transportation System is the safest employed for any hazardous waste in the United States." With nearly 1400 shipments under its belt in three years, the WIPP Transportation System is demonstrating safety through performance. ■



WIPP truck on highway.

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