An Evaluation of Department Of Transportation Specification Packages*

J. E. Ratledge and R. R. Rawl

Oak Ridge National Laboratory*
Oak Ridge, Tennessee 37831-6495

ABSTRACT

Specification packages are broad families of package designs developed and authorized by the U.S. Department of Transportation (DOT) and the Nuclear Regulatory Commission (NRC) for transport of certain Type B and fissile radioactive materials, with each specification containing a number of designs of various sizes. The specification package designs have remained essentially unchanged in a changing regulatory environment. Changes to package designs or authorized contents under the DOT system can be accomplished by rule making action, but there has been little updating of the designs over the years. Many of the individual package designs are no longer supported by reasonably current safety analyses. Since the publication of these specifications, there have been changes in regulatory requirements and improvements in methods of testing and analysis. Additionally, contemplated revisions to the DOT and NRC regulations to bring design requirements into accord with IAEA Safety Series No. 6, 1985 Edition would eliminate fissile classes and require resistance to a crush test for small Type B packages meeting certain criteria.

The NRC has requested that the Oak Ridge National Laboratory (ORNL) staff review the safety documentation of the specification packages to determine the possible need for further testing and analysis, modifications to the designs, and, perhaps, elimination of any designs for which there is insufficient demonstration of compliance with current and proposed requirements. This paper will present a summary of the technical data and information concerning the use of the packages that has been received to date.

BACKGROUND

During the late 1960s and early 1970s, the DOT specification package system was implemented to serve as a useful and equivalent alternative to the approval systems of the Nuclear Regulatory Commission (NRC) and Bureau of Explosives for Type B and fissile radioactive material package designs. When a package design was used by a large number of organizations, the package design was added to the DOT regulations as a specification package that was authorized for use by any shipper. In the mid-1970s, NRC implemented its present system, which issues package approvals in the form of Certificates of Compliance (CoCs). Licensees who have an NRC-approved quality assurance (QA) program and satisfy certain other specified conditions are authorized to use the specification package designs.

The specification package designs have remained essentially unchanged for 20 years. Changes to package designs or authorized contents under the DOT system can only be accomplished by

---

*Research sponsored by the Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission under Interagency Agreement 188681158L with the Oak Ridge National Laboratory, managed by Martin Marietta Energy Systems, Inc., for the U.S. Department of Energy under contract DE-AC05-84OR21400.

a rule making action; consequently, there has been little updating of the designs over the years. Some efforts have been made by DOE contractors to update the safety analyses for frequently used specification packages, but these have not been submitted to DOT to initiate rule making.

Since the publication of these specifications, there have been changes in regulatory requirements and improvements in methods of testing and analysis. Additionally, contemplated revisions to the DOT and NRC regulations to bring design requirements into accord with IAEA Safety Series No. 6, 1985 Edition would eliminate fissile classes and require resistance to a crush test for small packages meeting certain criteria. Because of these regulatory changes, NRC and DOT have undertaken a review of the safety evaluations for specification packages. The review will enable them to determine the need for further testing and analysis, possible revisions to the specifications, and perhaps elimination of any specification packages for which there is insufficient demonstration of compliance with current and proposed requirements.

While the NRC and DOT transportation regulations have evolved over the years, the DOT specification package designs have remained largely unchanged. Questions have been raised as to whether these designs meet the current and proposed regulations. In order to enable NRC and DOT to develop a regulatory analysis that will support appropriate action regarding the specification packages, a study is being performed to compile all available design, testing, and analysis information on these packages. This information will be evaluated to determine whether the package designs meet current regulatory requirements (10 CFR Part 71) as they are presently applied to NRC-certified package designs. The study will enable NRC and DOT to make an informed decision on whether to retain, modify, or withdraw the existing regulatory provisions for the use of specification packages.

Alternatives will be identified to minimize the impact of regulatory action on the transportation of radioactive materials. These alternatives could include upgrading of selected package designs, development by industry of updated safety analyses for specific packages, and selective removal of packages. Public notice that this project is ongoing is an important method of ensuring that all pertinent information is considered so that the most reasonable alternatives can be developed. This study is expected to be completed in late summer 1993.

OBJECTIVE OF PROJECT

In order for NRC and DOT to develop a regulatory analysis that will lead to appropriate regulatory action regarding the specification packages, a study is under way to (1) gather pertinent facts and data, (2) analyze the facts and data, (3) identify possible alternative actions, (4) evaluate the alternatives, and (5) identify any clearly preferred alternative. The DOT specification packages included in the study are 2R, 6M, 6L, 6J[1], 17H[1], 20WC, 21WC, 20PF, and 21PF. Sketches of most of these specification packages are shown in the Figures 1-9.

To accomplish the objective, it is necessary to collect all available information about prior efforts to resolve specification package-related issues. Information needed includes both technical data (design, testing, analyses, etc.) and use data (extent to which the packages are actually used). The technical data are being reviewed and evaluated to determine if each package design is:

[1]The 6J and 17H are used as components in authorized packaging configurations for Type A fissile materials.

1. acceptable as is, with adequate documentation and an acceptable Safety Analysis Report for Packaging (SARP);
2. acceptable, with adequate documentation, but which must be pulled together into an acceptable SARP;
3. missing some analyses and/or tests that must be performed to support an acceptable SARP; or
4. marginal or inadequate in design and unlikely to meet requirements.

The study was initiated in May 1991 and is attempting to identify all users of specification packages by reviewing DOT records for approvals of the use of specification packages for international shipments and by reviewing NRC records of users of approved packages similar to specification packages. Data are being gathered from the users on approximate numbers and types of shipments of radioactive materials made in the specification packages. An attempt is being made to advise the public of this project by making presentations at national and international meetings as a method of acquiring information.

Shippers have been encouraged to participate in this project by providing technical and use information so that the full economic impact of alternatives can be developed and considered. Anyone who can provide technical or use information or the sources for this information is encouraged to do so in order to ensure that the best available documentation will be used to evaluate the adequacy of the designs and identify viable alternative courses of regulatory action. The specification packages having the most significant uses will have their designs and available safety analyses evaluated relative to current NRC, DOT, and international regulations.

RESULTS

Based on the technical and use data received to date, it appears that only the specifications 6M, 20WC, and 21PF have significant amounts of documentation which could be used to develop a current SARP. Very little data have been recovered to support the determination of the adequacy of the other specification packages. The technical data recovered to date resulted from searches of a few DOE contractors' records and a review of DOT, DOE, and NRC records in Washington, DC. Only two reports have been located that address all safety necessary areas (containment, shielding, thermal, and criticality), one prepared by Sandia National Laboratory on the 6M package and one by Martin Marietta Energy Systems on the 21PF package. We expect to receive additional information regarding the use of specification packages from users. The final results will be in the report issued to NRC.

Alternatives will be included as to a possible upgrading of selected package designs, development by industry of updated safety analyses for specific packages, and selective removal of packages. Attendees are encouraged to provide any technical or use data from their records that could contribute to the final evaluation of the specification packages to Oak Ridge National Laboratory, Transportation Technologies Group, Post Office Box 2008, MS-6495, 105 Mitchell Road, Oak Ridge, TN 37831-6495, Attention Joe E. Ratledge.

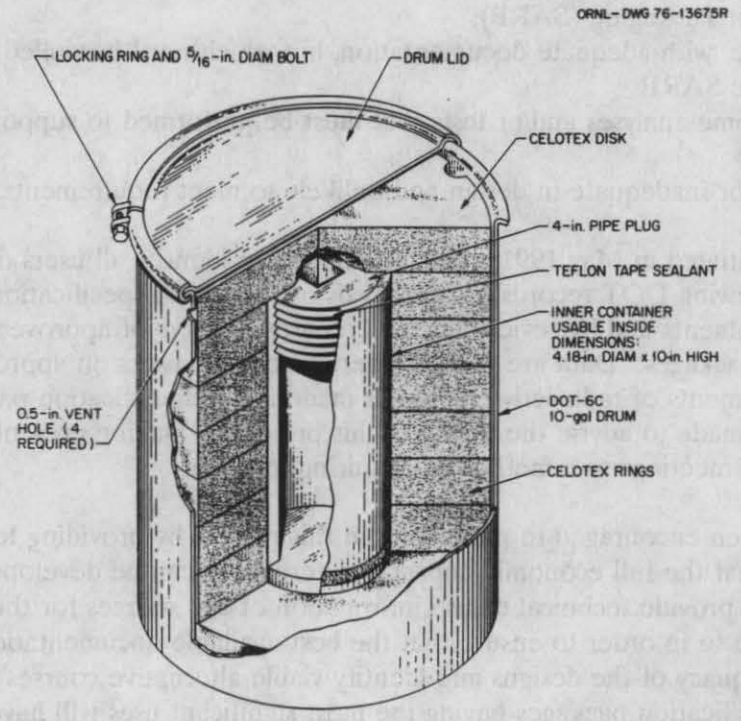

Fig. 1. Typical assembly detail, 10-gal-size DOT-6M; weight = 60 lb, Type B Fissile.

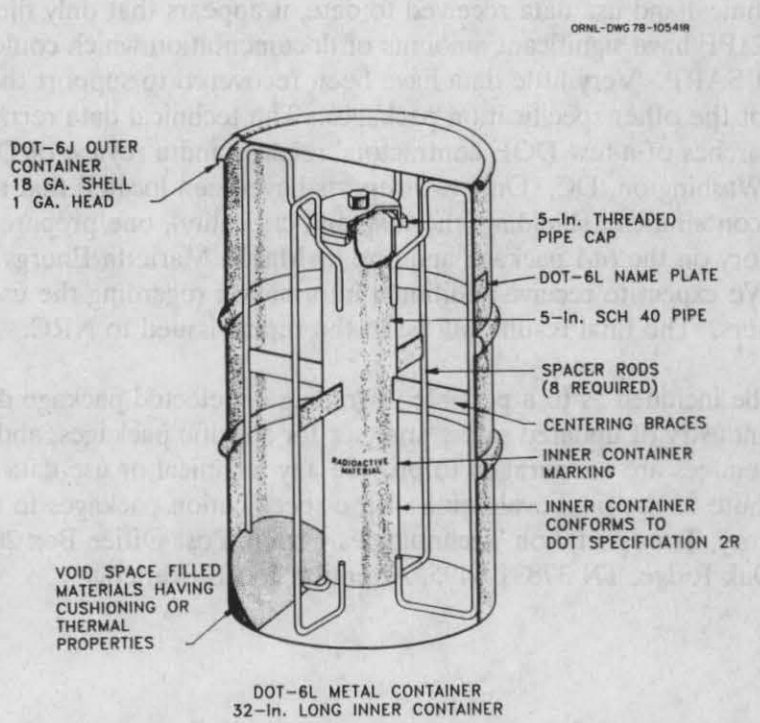

Fig. 2. DOT-6L metal container, 32-in.-long inner container.

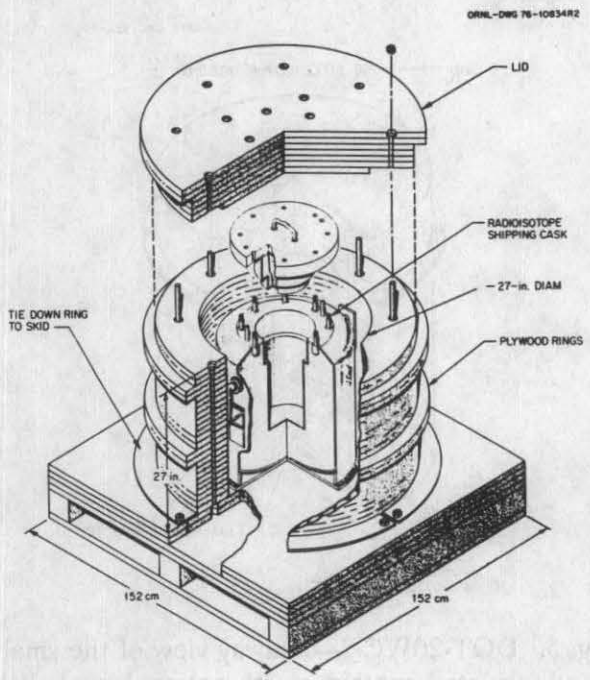

Fig. 3. DOT-20WC-5—special form package; weight = 4000 lb.

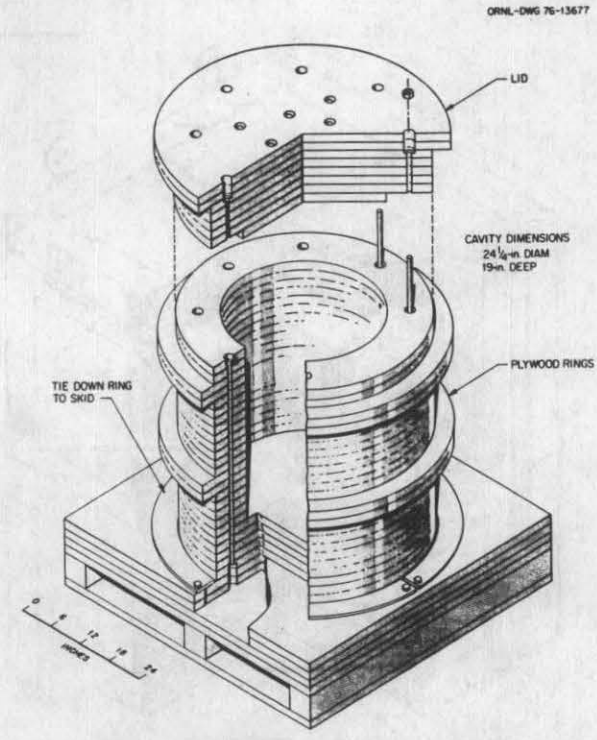

Fig. 4. DOT-20WC-4—fire shield.

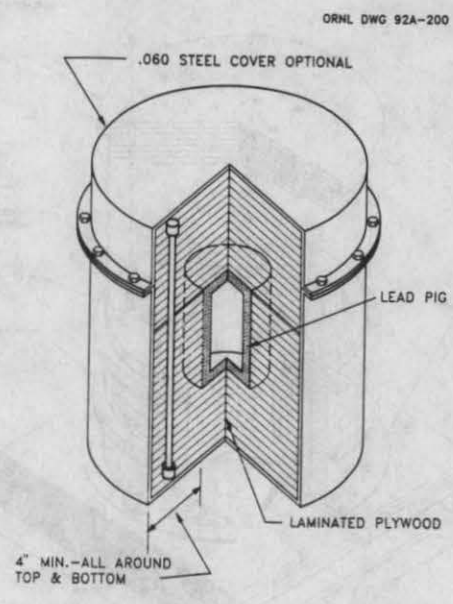

Fig. 5. DOT-20WC-2—cutaway view of the small wood-insulated container with optional steel shell.

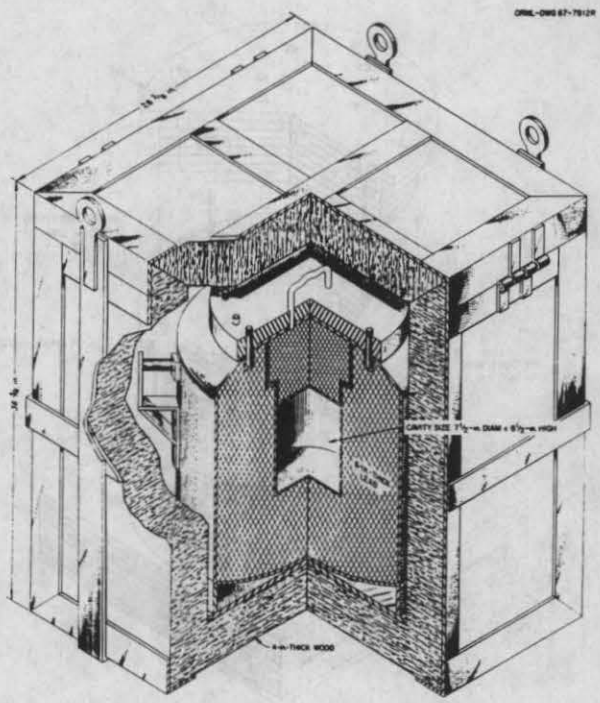

Fig. 6. Radioisotope shipping container with fire and impact shield (Type B, DOT-21WC; weight = 4500 lb).

ORNL DWG 92-201

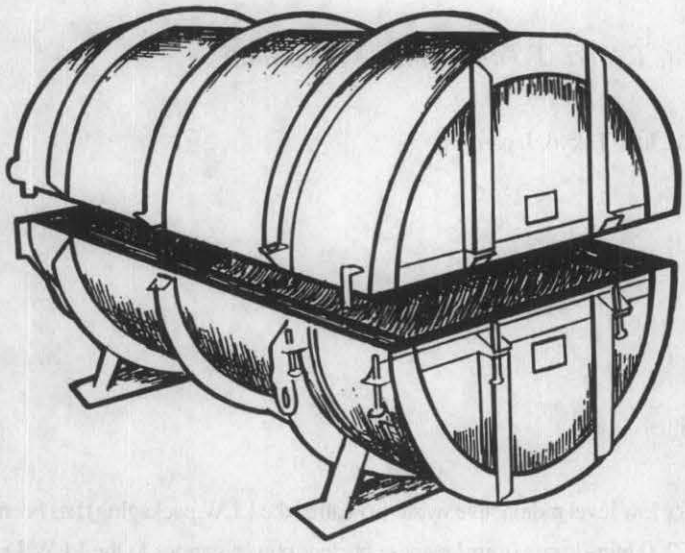

Fig. 7. DOT-21PF-1 overpack.