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**Certification of Packagings:
Compliance with DOT Specification
7A Packaging Requirements**

Don A. Edling

October 8, 1976

Monsanto

MOUND LABORATORY

Miamisburg, Ohio
operated by

MONSANTO RESEARCH CORPORATION

a subsidiary of Monsanto Company

for the

**UNITED STATES ENERGY RESEARCH
AND DEVELOPMENT ADMINISTRATION**

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ABSTRACT

A study was conducted by Mound Laboratory for the Division of Waste Management and Transportation, United States Energy Research and Development Administration, to determine which of the packagings currently listed in CFR 49 §173.395 a.1-5, and used by ERDA contractors, meet the Specification 7A requirements (CFR 49 §173.350).

Hazardous Materials Regulations Board Notice of Proposed Rule Making; DOT No. HM-111, Notice No. 73-7, stated that the present listing of various authorized DOT specifications in §173.394 and §173.395 (Type A containers) of ICC Tariff No. 27 would be deleted. Instead, complete reliance would be placed on the use of DOT 7A, Type A general packaging specification. In addition, each user of a Specification 7A package would be required to document and maintain on file for one year, after latest shipments, a written record of his determination of compliance with the DOT Specification 7A performance requirements for the specific package design.

The purpose of this study was to have one ERDA contractor 1) compile a list of specification packagings, proposed by ERDA contractors, for shipping Type A quantities of radioactive material; 2) analyze these packages for conformance to Specification 7A requirements; and 3) document and publish the results for use by ERDA and industry.

This was done and documented (meeting the documentation and compliance determination of DOT HM-111) and the containers described can be used without further ado, as long as the conditions specified in the report are met. This then eliminates the need for costly and time-consuming duplication of testing/analysis efforts by many different users.

All the specification packagings listed in CFR 49 §173.395a.1-5 that were tested were shown to meet the Specification 7A criteria; however, in many cases qualifications were placed on their use. Forty-nine specification packagings were tested and shown to meet the DOT Specification 7A performance requirements and since there were several styles of some specific packagings, this amounts to greater than 80 packagings having been tested/analyzed and the results documented and published.

The extensive testing generally indicated a high degree of containment integrity in the packagings tested and the documentation discussed is a valuable tool for shippers of Type A quantities of radioactive materials. However, the specifications, qualifications, and restrictions for each packaging are not open to interpretation. If a package is used with different dimensions, which exceed the authorized gross weight, etc., it must be tested/analyzed individually for compliance.

INTRODUCTION

On October 25, 1973, the Hazardous Materials Regulations Board published extensive proposals (Docket No. HM-111), to amend the Department of Hazardous Materials regulations relating to radioactive material (38 FR 29483). Among other proposed changes having an impact on shippers of radioactive materials was a change requiring:

§173.394 Radioactive material in special form.

(a) In addition to the applicable requirements of §§173.24 and 173.393, a Type A* quantity of special form radioactive material must be packaged as follows:

(1) Specification 7A (§173.350 of this subchapter) Type A general packaging. Each shipper of a Specification 7A packaging must maintain on file for at least one year after the latest shipment, and be prepared to provide the Department, a complete certification and supporting safety analysis demonstrating that the construction methods, packaging design, and materials of construction are in compliance with the specification. This requirement is effective December 31, 1975.

* (1) "Type A quantity" and "Type B quantity" radioactive materials means a quantity the aggregate radioactivity of which does not exceed that specified as follows:

Transport group (see §173.389(h))	Type A quantity (in curies)	Type B quantity (in curies)
I	0.001	20
II	0.05	20
III	3	200
IV	20	200
V	20	5,000
VI and VII	1,000	50,000
Special form	20 ¹	5,000

¹ Except that for Californium-252 the Type A quantity limit for special form is 2 curies.

§173.395 Radioactive Material in Normal Form

(a) In addition to the applicable requirements of §§173.24 and 173.393, a Type A quantity of normal form radioactive material must be packaged as follows:

(1) Specification 7A (§173.350 of this subchapter) Type A general packaging. Each shipper of a specification 7A packaging must maintain on file for at least one year after the latest shipment, and be prepared to provide the Department, a complete certification and supporting safety analysis demonstrating that the construction methods, packaging design, and materials of construction are in compliance with the specification. This requirement is effective December 31, 1975.

This impact translates simply into: For one who wants to ship Type A quantities of radioactive material, existing regulations require turning to CFR49 §173.395a.1-5 (Spec. 6B, 6C, 17H, 17C metal drums, 15A, 15B, 19A, 19B wooden boxes, 12B fiberboard boxes, etc.), using one of these packages and, as long as other appropriate requirements were met, shipping the package.

The proposed regulations would:

(1) Delete the "blanket" authorization to use the previously mentioned package (§173.395a.(1-5)) for Type A quantities of radioactive materials and delete the actual listing of packages.

(2) Place instead complete reliance on the use of DOT-7A, Type A general packaging specification (§173.350).

(3) In addition, require each user of a Spec. 7A package to document and maintain on file for one year after latest shipment a written record of his determination of compliance with DOT Spec. 7A performance requirement.

On December 31, 1974, a revised HM-111 was published in the Federal Register (39 FR 45238). Although the major portions of HM-111 became effective on March 31, 1975, it was recognized by the Board that a transition period would be required to effectively implement the Spec. 7A requirement. A period of one

year was provided; that is, the revisions to \$173.394 and 173.395 would become effective December 31, 1975.

It was immediately apparent that if a coordinated effort was not implemented within the Energy Research and Development Agency (ERDA)*, a tremendous duplication of testing and analyses effort would result. Many sites used similar containers (Spec. 17C & 17H steel drums, 15A, 19A, 19B wooden boxes, etc.) and if not coordinated, each site would be testing and documenting similar containers and results. Hence, ERDA's Division of Waste Management and Transportation funded a study by Mound Laboratory, Monsanto Research Corporation, Miamisburg, Ohio. The purpose of this study was to have one ERDA contractor: 1) compile a list of specification packagings, proposed by ERDA contractors, for shipping Type A quantities of radioactive material, 2) analyze these packages for conformance to Specification 7A requirements, and (3) document and publish the study results for use by all ERDA contractors and private industry.

This study was divided into two phases. Phase I provided a report on those packages which could be shown, based on existing test data and engineering analyses, to conform to DOT Specification 7A packaging requirements.

The mode of achievement for Phase I is briefly described below:

Communications

(1) A questionnaire was sent to designated contractor and ERDA area office sources as a mechanism for compiling the information required concerning proposed Spec. 7A packaging. The questionnaire also requested any test and engineering analyses data available. A copy of the questionnaire and mailing list are included in Appendix I.

(2) The Packaging Development Section of Monsanto Company was commissioned to survey container manufacturers, package testing laboratories, and potential

*At that time the Atomic Energy Commission (AEC).

large volume shippers of radioactive materials to determine if data were available. A list of these sources is given in Appendix II.

(3) In a further effort to assemble test and engineering analyses data, major package testing laboratories, container manufacturers, and volume shippers such as radiopharmaceutical shippers were contacted. These potential sources were contacted initially by telephone, and a questionnaire was sent to those expressing willingness to participate. A list of these sources is given in Appendix III.

(4) Other government agencies were also contacted in the search for all available information.

An extensive literature search was conducted to seek out existing test data and engineering analyses already performed on containers and indicated compliance with DOT Spec. 7A packaging requirements.

From the replies to the questionnaires, the following list of containers were determined to be used by ERDA contractors:

<u>Type A Packages</u>	<u>Number of Users</u>

1. Metal Drums

Spec. 5B (178.82)	3 (55 gal)
Spec. 5D (178.84)	-
Spec. 6A (178.97)	-
Spec. 6B (178.98)	2 (30 gal)
Spec. 6C (178.99)	1 (55 gal)
	1 (30 gal)
	1 (10 gal)
	1 (5 gal)
Spec. 6J (178.100)	1 (55 gal)
	1 (30 gal)
	1 (10 gal)
Spec. 6K (178.101)	-
Spec. 6L (178.103)	6
Spec. 6M (178.104)	11
Spec. 17C (178.115)	4 (55 gal)
	1 (30 gal)
	3 (5 gal)
Spec. 17H (178.118)	11 (55 gal)
	3 (30 gal)
Spec. 42B (178.107)	1
Spec. 42C (179.108)	-

<u>Type A Packages</u>	<u>Number of Users</u>
2. Fiber Drums	
Spec. 21C (178.224)	5
3. Wooden Boxes	
Spec. 14. (178.165)	-
Spec. 15A (178.168)	10
Spec. 15B (178.169)	4
Spec. 15C (178.170)	-
Spec. 15D (178.171)	-
Spec. 19A (178.190)	11
Spec. 19B (178.191)	12
4. Fiberboard Boxes	
Any Spec. 12 Series (178.205 to 178.212)	1 (12A) 12 (12B)
(200 lb test minimum)	
Spec. 23F (178.214)	-
Spec. 23H (178.219)	-
5. Cylinders	
Any Spec. 3 Series	2 (3A, 3AA)
Any Spec. 4 Series (178.47 to 178.58)	-
6. Spec. 55 (178.25)	9
7. Spec. 7A (178.350)	

NOTE: 17 packages were listed as being used by ERDA contractors under the Spec. 7A classification.

1) Cylinders for UF ₆ (five sizes)	1
2) Strong Wooden Boxes	1
3) Steel Boxes	3
4) Fiberboard Boxes	2
5) Steel Drums	3
6) Benelex Box (neutron sources)	1
7) Concrete Vaults	1

From the results of the various communications efforts and literature search, test data already available were compiled and analyzed for conformance to DOT Spec. 7A requirements. The packages listed below were shown to meet the requirements subject to the qualifications, specifications, requirements, etc., described in the individual container data packets given in the Phase II

Summary Report. (1)

<u>Container Type</u>	<u>DOT Specification</u>
1) Steel Cylinder (UF ₆) (five styles)	Spec. 7A
2) Brookhaven's Concrete Vaults	Spec. 7A
3) Argonne's Steel Box	Spec. 7A
4) ORNL's 7A Package	Spec. 7A
5) Battelle Columbus Steel Box	Spec. 7A
6) Wooden Box	Spec. 19B-150 (one size 20 x 20 x 20 in.) (NOTE: Comments in Phase II Summary Report)
7) Metal Drum	Spec. 6M
8) Metal Drum	Spec. 6L (55 gal)
9) Metal Drum	Spec. 42B (55 gal)
10) Metal Drum	Spec. 6J (55 gal)
11) Metal Drum	Spec. 17C (55 gal)
12) Metal Drum	Spec. 17H (55 gal)

The objectives of Phase II were:

(1) Identification of packages from Phase I for which available information was not adequate for certification.

(2) Identification of specific test/engineering analysis data required.

(3) Generation/procurement of these data.

(4) Documentation of study results for use by all ERDA contractors and private industry.

These objectives were accomplished, and two documents (1,2) were published.

This paper will just highlight the Spec. 7A requirements, since they are readily available in CFR 49 Part 100 to Part 199 and are also presented in the Phase II Summary Report.

The specification is given below:

Subpart K - Specifications for General Packagings

§178.350 Specification 7A; General Packaging, Type A.

§178.350-1 General Requirements

(a) Each packaging must meet all applicable requirements of §178.24 of this chapter.

§178.350-2

(a) Each packaging must be so designed and constructed that it meets the standards for Type A packaging (see §173.398(b) of this chapter).

§178.350-3 Marking

(a) Marking on the outside of each packaging as follows: "USA DOT 7A Type A" and "Radio-active Material,"

(b) Marking to conform with §173.24 of this chapter.

Basically this study was concerned with the performance of the test packaging when subjected to the tests specified in CFR 49.

§173.398 Special Tests

(b) Standards for Type A packaging:

(1) Type A packaging must be so designed and constructed that, if it were subject to the environmental and test conditions prescribed in this paragraph:

(i) There would be no release of radio-active material from the package.

(ii) The effectiveness of the packaging would not be substantially reduced; and

(iii) There would be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package.

(2) Environmental conditions:

(i) Heat - Direct sunlight, at an ambient temperature of 130°F in still air.

(ii) Cold - An ambient temperature of -40°F in still air and shade.

(iii) Reduced pressure - Ambient atmospheric pressure of 0.5 atmosphere (absolute) (7.3 psia).

(iv) Vibration - Vibration normally incident to transportation.

(3) Test conditions - The packaging shall be subject to all of the following tests unless specifically exempted therefrom, and also to the consecutive application of at least two of the following tests from which it is not specifically exempted:

(i) Water spray - A water spray heavy enough to keep the entire exposed surface of the package except the bottom continuously wet during a period of 30 minutes. Packages for which the outer layer consists entirely of metal, wood, ceramic, or plastic, or combinations thereof, are exempt from the water spray test.

(ii) Free drop - Between 1 1/2 to 2 1/2 hours after the conclusion of the water spray test, a free drop through a distance of 4 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

(iii) Corner drop - A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all Fissile Class II packagings.

(iv) Penetration - Impact of the hemispherical end of a vertical steel cylinder 1 1/4 inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.

(v) Compression - For packages not more than 10,000 pounds in weight, a compressive load equal to either five times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of 24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

The relationship of this study to other packaging requirements (e.g., no dimension less than 4 in., shielding,

pyrophoric materials) is discussed in the Phase II Summary Report.

TEST RESULTS AND DISCUSSION

The test facilities used in this study are shown in Figures 1 and 2.

FIGURE 1 - The 50-ft drop tower has a capacity of 5000 lb.

FIGURE 2 - The hoist is used for placing compressive loads on packagings.

In addition, the Laboratory has an elaborate Fire Test facility, which is shown in Figure 3. The Laboratory has

the capability to do the full spectrum of tests required on all radioactive packagings, up to and including large quantities.

The Type A study basically concerned assessing or actually determining the effects that the conditions and tests given in CFR 49 §173.398(b) would have on the specification packagings. The two standards which could be assessed by our study were:

- (1) "... no release of radioactive material from the package:" and
- (2) "The effectiveness of the packaging would not be substantially reduced."

The third standard:

- (3) "There would be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package."

remains the responsibility of the shipper to assure compliance.

Each of the specification packagings tested were subjected to all the tests given in CFR 49 §173.398(b) unless specifically exempted therefrom. The packagings were also subjected to the consecutive application of at least two of the tests from which they were not specifically exempted.

FIGURE 3 - Shipping containers are subjected to fire tests in this facility.

Several questions arose concerning the application and implementation of the Standards For Type A Packaging. The first of these was, "Is there an order or sequence of test applications specified?" The answer to this was determined to be "No." (3) The next question was, "Do all the tests have to be conducted on the same packaging?" The answer to this was also "No" (4) with two qualifications. One qualification is that if the Water Spray Test is required, it must be followed (within 1 1/2 - 2 1/2 hr) by the Free Drop (4 ft) Test. The other qualification is that one packaging must receive the consecutive application of at least two (any two or more, unless the Water Spray Test is required) of the tests from which it is not specifically exempt. The final question was more difficult to answer. "What constitutes a failure?"

FIGURE 4 - Results of the penetration test on a 19A-400 wooden box constructed of 1/4 in. plywood (walls). The bar readily penetrated the 1/4 in. plywood.

Does Figure 4 illustrate a failure? This is not necessarily a failure; however, it is difficult to technically categorize this test as a "Pass." To reach an answer, one considers two things.

(1) The standards of evaluation, "What must be achieved to categorize the package performance as passing?"

(a) §173.398(b)(1)(i)"...no release of radioactive material from the package."

(b) §172.398(b)(1)(ii)"... effectiveness of packaging ... not substantially reduced,"

and

(2) Require one or more containment vessels within the box.

Obviously if this were to be used for shipping bulk (powder, ore, etc.) radioactive materials, and no significant containment other than the box were to be used, the answer would be "Fail." However, if one or more additional containment vessels were to be used and either or both met the requirements:

(1) The inner vessel(s) would not be breached or have its effectiveness significantly reduced by the penetrating bar.

NOTE: It has to be assumed unless action taken as in (2) below that the most effective/damaging contact is made.

(2) It must be demonstrated that the bar cannot physically contact the inner vessel or have a detrimental effect on the containment integrity of the inner vessel [e.g., packaging materials used to protect/cushion the vessel(s)].

If either or both of these two items can be demonstrated, the fact that penetration of the outer packaging (Figure 4) was achieved is not reason for a "Failure" classification.

This approach is both reasonable and supported by basic documented philosophy concerning packaging test evaluations.(3) This same approach was used throughout the entire Type A study and used in evaluating the performance of packagings after all the tests: Water Spray, Free Drop, Corner Drop, Penetration, and Compression. Other examples of packaging performance, some requiring qualification, are shown in Figures 5 through 21.

In the Free Drop test of the package shown in Figure 5 there was a bending, indent of the closure ring, but no loss of contents or significant reduction in packaging effectiveness. The conclusion: An unqualified pass for the Free Drop (4 ft) test.

The package shown in Figure 7 was damaged as expected in a 30-ft drop. The bottom was split and the impacted end was considerably dislocated. As is shown in Figure 8, there was no release of liquid from the

FIGURE 5 - Results of a Spec. 17H 30-gal-
lon steel drum (open head) having been
dropped 4 ft. (Free Drop) onto the bolt
portion of the closure ring.

FIGURE 6 - Packaging tested for shipping
liquids. Note the Spec. 15A wooden box
with two pipe nipples.

FIGURE 7 - Results of the 30-ft drop test
(required for liquids - §173.393(g)(1)) on
the packaging shown in Figure 6.

inner containment vessel (the pipe nipple);
the liquid was actually contained within
the plastic vial, within the pipe nipple.
The conclusion: An unqualified pass for
the 30-ft drop test.

The packaging, shown in Figure 9, was
damaged in the Free Drop (4 ft); however,
the liquid was contained, even within the
plastic vials, as shown in Figure 8.

FIGURE 8 - One of the inner vials of
liquid after removal of the absorbent
material which completely surrounded it
within the pipe nipple.

NOTE: The same set of pipe nipples
were used in all the tests and opened
only after completion of all the tests.

The conclusion: An unqualified pass for
the Free Drop (4 ft).

The purpose of these figures, the follow-
ing figures, and the discussion is to
attempt to develop some consistency in the

FIGURE 9 - Results of the Free Drop (4 ft) on a similar box. The end of the box was split and one side separated from the end.

FIGURE 10 - Results of the Free Drop test on a wood box containing a lead shielded cavity. (For details see MLM-2228, Supplement No. 1, p. 29).

FIGURE 11 - Inner container after all the tests had been conducted on the package shown. There was no loss of contents (sand) and no significant reduction in packaging effectiveness.

FIGURE 12 - Results of the Free Drop on a 12B-65 Fiberboard box (MLM-2228, Supplement No. 1, p. 5) with dimensions of 24-1/2 x 12-1/2 x 24-1/2 in.

analysis of Type A packaging test results. The final decision many times is a matter of educated, technical judgment; however, there are many steps which can be taken to promote consistency within ERDA and industry. One of these is communication and discussion of results as attempted in this paper. The next few figures (Figures 10 through 21) do not typify by any means the effects the tests had on packagings. However, they do provide some insight into

the basis for the Pass/Fail/Qualification decisions which had to be made.

The package shown in Figure 10 was severely affected, wood splinters broken off, the aluminum cover plate askew, etc.; however, as shown in Figure 11, the smaller inner container of sand (content simulant) was not affected. There was no release of contents and as can be apparent only to one trying to open the package after all

FIGURE 13 - Compression load of 600 lb applied.

FIGURE 14 - Fiberboard box and weight after 24-hr test.

FIGURE 15 - Effect of 600 lb compressive load on fiberboard box.

FIGURE 16 - Construction and contents of Spec. 19A-400 wooden box.

tests were completed (a very difficult job), the effectiveness of the packaging was not significantly reduced.

The conclusion: Pass for all the tests. Certified as a Spec. 7A, per MLM-2228 (Supplement No. 1) p. 29.

After the Free Drop test, a minor opening resulted (shown in Figure 12) in the impacted edge. This and one or two other similar openings resulted in the qualification imposed that an "...inner packaging(s) capable of withstanding the 4 ft drop test... are used..."(2)

The conclusion: A qualified pass to the Free Drop (4 ft) test.

Figures 13, 14, and 15 show a 600 lb compressive load which was applied to a Spec. 12B fiberboard box* for 24 hr, the load and box after 24 hr, and the box after the weight was removed. The dimensions of the box were 14-1/2 in. (width) x 17-1/2 in. (Height) x 28-1/2 in. (length).

*Reference 2, p. 6.

The 600-lb compressive load shown in Figure 13 was a compromise between the two methods for determining total compressive load required (5 x gross weight or 2 lb/in.² x top surface area); however, even the 600 lb did compress the package considerably (Figures 14 and 15). The effect of this compression on the inner container would have to be considered by the shipper, which the qualification stated.*

The conclusion: A qualified pass for the Compression Test.

You may be wondering - "well what constitutes a failure?" One could add enough qualifications to almost any packaging to make it meet the Spec. 7A requirements. Again, a judgment is involved. Shown in Figures 16 and 17 is a package which was not deemed to meet the requirement "... effectiveness of the packaging would not be substantially reduced."

Figure 16 shows the construction and the contents of a Spec. 19A-400 wooden box with three-way corners prior to nailing the lid in place. The void spaces of the box were filled with vermiculite prior to sealing. Figure 17 shows the results of the Free Drop (4 ft) test on this box. The construction was 1/4 in. plywood and pine cleats. The impact was on a corner and the box opened severely. The only thing really holding it together was the chain used in the drop.

*Reference 2, p. 7.

FIGURE 17 - Results of Free Drop test on wooden box, Spec. 19A-400.

The conclusion: Fail

One could at this point make an argument that if there was a strong inner container (e.g., pipe nipple or steel box) within the box, the criteria "...effectiveness of the packaging would not be substantially reduced" could still be technically met (from a containment standpoint) and a "Pass" could be concluded. This seemed to be going too far and this packaging and packaging that behaved in a similar manner were not pursued with respect to attempting to justify a "Pass" conclusion. Typical examples are given in Figures 18 through 21.

Figure 18 shows a Spec. 21C-115 (10-gal) fiberboard drum after the Free Drop (4 ft) test which was preceded by the Water Spray test. The gross weight was 115 lb and the drum opened severely.

The conclusion: Fail

Figure 19 shows a Spec. 15A wooden box (1/2 in. white pine construction) after the Free Drop (4 ft) test. Contents were lead bricks (gross weight 31-1/2 lb) and vermiculite. The packagings literally split down the middle. (4 in. width x 4 in. height x 16 in. length).

The conclusion: Fail

Figure 20 shows a Spec. 19A-400 wooden box after the Free Drop (4 ft) test. The box 12 (width) x 12 (height) x 48 in.

FIGURE 18 - Effect of Free Drop test on fiberboard drum.

FIGURE 19 - Spec. 15A wooden box after Free Drop test.

(length) was constructed of 3/4 in. plywood and pine cleats and all closures were nailed. The contents were lead bricks and vermiculite (gross weight of 400 lb). The end of the box was totally pushed out.

The conclusion: Fail

NOTE: This box was retested with a gross weight of 250 lb and passed all tests. (Reference 1, p. 65)

Figure 21 shows a Spec. 15A-80 lb (Style 1) wooden box of 3/4 in. plywood with nailed closure. The top was definitely opened following the Free Drop (4 ft) test.

The conclusion: Fail

NOTE: A similar box was retested with 43 lb gross weight and determined to pass all tests. (Reference 1, p. 29)

It is worth noting that there are no steel drums shown as not meeting any of the Test Conditions. In all cases, the steel drums tested (5 to 55 gal) performed very well with respect to meeting the Spec. 7A performance criteria.

It should become apparent that in many cases the tests conducted in this study and the analyses are only the first step in assuring that a package complies with the Spec. 7A performance criteria. The shipper still has the responsibility to comply with the "Authorized Contents," "Dimensions," "Description of Container," "Specification and Restrictions," etc.,

FIGURE 20 - Failure of Spec. 19A-400 wooden box after Free Drop test.

given in References 1 and 2 and all other applicable regulations. It would have been nice to be able to test the entire packaging, by this I mean both the inner and outer packagings, and determine the entire packaging met the Spec. 7A performance requirements. This is impractical; the wide variety of inner packagings used and proposed for use throughout ERDA alone would have required a tripling or more of the effort that went into this study. Time and manpower available simply did not allow this intensive a study. Also, considering the fluid state of packaging, whether such a definitive study would be warranted is questionable.

FIGURE 21 - Failure of Spec. 15A-80 wooden box.

The format used in presenting these data is similar to that used in the document, "Directory of Packagings for Transportation of Radioactive Materials," Wash-1279, October, 1973, Division of Waste Management and Transportation, USAEC. It consists of a sketch with pertinent features and dimensions and seven (7) sections:

- (1) Common name,
- (2) Authorized contents,
- (3) Dimensions,
- (4) Description of container,
- (5) Specifications and restrictions,
- (6) Test results and,
- (7) For additional information contact.

It should be stated again for emphasis that all conditions stated in the Phase II Summary Reports must be met in order to use the document as the "Certification" required.

During this study more than 100 packagings were tested and more than 400 individual tests were conducted. Generally a high degree of containment integrity was demonstrated by the packagings tested.

One final item to consider is the regulatory change (HM-111) concerning Type A quantities of liquid radioactive materials. Previously when shipping liquid radioactive materials, one had a choice of using packaging which would contain the liquid within the inner/primary container after the 30-ft drop or using twice the quantity of absorbent required to capture the liquid should it be released from the primary container. With the new regulations, one must meet the 30-ft drop requirement and also meet one of two additional requirements.

(1) Twice the absorbent present to capture the liquid should it be released

or

(2) that a secondary containment vessel be permitted, enclosing the primary inner liquid-containing vessel so as to provide overall containment (under normal conditions of transport) of the liquid, assuming the failure of the innermost vessel.

Five packagings are listed (1) as having been shown to meet these requirements. One cannot assume that the other packagings listed in Reference 1 will contain liquids under normal conditions of transport [CFR 49 §173.398(b)]. These tests would have to be conducted, certified, and documented by the shipper.

SUMMARY

The referenced documents (1,2) should be valuable to shippers of Type A quantities of radioactive materials. The packagings described may be used as described without further testing and the "document" used as the certification and documentation on file. The criteria, qualifications, and restrictions are not open to interpretation, extrapolation, etc. It is impossible for any one study to maintain its usefulness for any length of time in such a fluid area as packaging of radioactive materials. Even since this study was completed, much testing has been conducted, considerable testing is currently being done, and a wealth of information will be generated. There is a need to continue compiling this information and building a document which truly meets the many varied needs of shippers and keeps up with the state-of-the-art. A proposal for such a continuation is currently being evaluated by ERDA's Division of Environmental Control Technology.

There is a need to promote standardization in packaging construction techniques, materials used, and evaluation of test results. The wooden box specifications are extremely difficult to follow: 15A, 15B, 19A, and 19B. The boxes submitted by many contractors and having the "same" specification varied in many aspects.

One final thought which I want to pursue is the possibility of inner containers being established which can be shown to meet Spec. 7A performance requirements by themselves. With such a listing, assuming these would be cheap, practical, and possibly even reusable, one could place this Spec. 7A inner packaging in an outer packaging and have a packaging which surely would meet Spec. 7A requirements. It is proposed that this outer packaging would be one of the previously listed Spec. packagings (CFR 49 §173.39) or equivalent. A proposal to investigate this approach has also been submitted to ERDA/ECT.

REFERENCES

1) D. A. Edling and J. F. Griffin, Certification of ERDA Contractors' Packaging With Respect to Compliance With DOT Specification 7A Performance Requirements - Phase II Summary Report, MLM-2228 (June 13, 1975), 143 pp.

2) D. A. Edling and J. F. Griffin, Certification of ERDA Contractors' Packaging With Respect to Compliance With DOT Specification 7A Performance Requirements - Phase II Summary Report, (Supplement No. 1), MLM-2228 (April 15, 1976), 42 pp.

3) A. Fairbairn and T. C. George, "Sequence and Pyramiding of Tests," in The Safe Transport of Radioactive Materials, R. Gibson (ed.), Pergamon Press, 1966, p. 92.

4) op. cit., p. 89 and p. 92.

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APPENDIX I

Monsanto

MOUND LABORATORY

Operated for the U. S. Atomic Energy Commission

MONSANTO RESEARCH CORPORATION

P. O. Box 32

Miamisburg, Ohio 45342

Phone: (513) 868-7444

April 18, 1974

Distribution:

Mound Laboratory has been authorized by the Division of Waste Management and Transportation to conduct a study, "Certification of AEC Contractors' Packaging with Respect to Compliance with DOT Specification 7A Performance Requirements."

As a result of the TWX (Enclosure 2) your names were provided as primary site/AEC contacts for the purpose of compiling the basic information required to complete this study.

This study is a result of an expected regulatory change (DOT No. HM-111) which would delete the present listing of various authorized DOT specifications in Paragraphs 173.394 and 173.395 (Type A Containers) of Tariff No. 27 and would require each shipper of Type "A" quantities of radioactive material to test/analyze, certify and document that his package met the DOT Spec 7A performance requirements. Considering the wide variety and volumes of such shipments and a great similarity in many of the packages, it is expected that without a coordination of effort among AEC contractors, a wasteful duplication of testing/analysis, documentation effort would result.

The purpose of this study is to identify packages of Type "A" quantities of radioactive materials proposed for shipment by AEC contractors, analyze these packages with respect to test/analyses data already available and to identify those packages which can be shown to meet Spec 7A performance criteria. Compliance with the new regulations (HM-111) is expected to be required approximately 7-1-75, so one should think in terms of what packages will be shipped. Information on number and types of packages used last year, if it is not to continue, will not benefit the study; however, test/analyses data on these packages should probably be included. These packages would then be described in a report and could be used without further ado, as long as the conditions specified in the report are met, thus

Distribution

- 2 -

April 18, 1974

eliminating time-consuming and wasteful testing/analyses efforts by each of the users. The number of packages certified for use as Spec. 7A will be largely dependent on the quantity and quality of the test/analyses data with which we have to work. I am sure a vast quantity of information exists; however, first it must be found. I am asking you to help provide the best and most information possible.

Enclosed are: 1) Excerpts from Form 189C which will provide a good insight into the objectives of the study, proposed time frame and the proposed mechanism for conducting the study, 2) TWX from Dr. Frank K. Pittman, Director, Division of Waste Management and Transportation to Managers, Field Offices, providing supplemental information and 3) Data sheet (with instructions) which you are requested to complete and return to me.

As noted in the Form 189C, the time frame for completion of this study is limited and your cooperation in providing the requested information to me by May 20, 1974, would be greatly appreciated. As you can understand, asking all the "right" questions to insure total coverage of desired information is difficult. Therefore, I ask that if the attached sheets do not cover your packaging problems, test/analyses results, etc., that you provide this additional information.

I will routinely inform you of the status and results of the study as it progresses.

If there are any questions, please call me [513-866-7509 FTS or 513-866-7444 (Ext. 7509) Commercial] or James A Sisler, AEC/HQ (301-973-5261 FTS).

Yours very truly,

D. A. Edling
D. A. Edling

DAE:aw
Enclosures

INSTRUCTIONS FOR COMPLETING SECTION I DATA SHEETS

USE AND TEST/ENGINEERING ANALYSES DATA

Section I

- Column 1: Indicate if use of containers, as listed in paras. 173.395 of DOT Tariff No. 27, is anticipated in the future for shipping radioactive materials.
- Column 2: Indicate the approximate number of shipments made and/or packages used, if the two numbers are different (some of these containers are not specified as "single trip").
- Column 3: Indicate if test/analyses have been conducted on any of the packaging listed which would be applicable to this study.
- Column 4: Indicate if one of the containers is used, but is modified prior to use or purchased with modifications. Describe in detail the modification and the reason for the modification in Section II.
- Column 5: Indicate if test/analyses have been conducted on previously mentioned modified packaging.
- Column 6: Indicate if drawings/sketches of modified packaging are enclosed, available or not available. I encourage the submission of drawings, if possible. If testing/analyses and/or drawing preparation is in progress for either unmodified or modified packaging, please indicate when this information will be available.

Item 7, Section I on Spec 7A packaging proposed for use should be self-explanatory. These packages should be described in detail in Section II and again I encourage the submission of drawings where possible, and if applicable information is currently being generated, please indicate the type of information and the target date for completion.

DATA SHEETS

Section I

USE AND TEST/ENGINEERING ANALYSIS DATA

Type A Packaging
As Given in Para.
173.395, Tariff
No. 27

	Column 1 To Be Used As Listed in 173.395 (Check one)		Column 2 Number of Shipments/ Packages	Column 3 Test/Analysis of Packaging Conducted		Column 4 Used with Modification (described in Section II)	Column 5 Test/Analysis on Modifica- tions, describe in Section II		Column 6 Drawings (Check one) En- closed		Avail- able (when)	Not Avail- able
	Yes	No		Yes	No.	Yes	Yes	No				
1. Metal Drums												
Spec. 5B (178.82)												
Spec. 5D (178.84)												
Spec. 6A (178.97)												
Spec. 6B (178.98)												
Spec. 6C (178.99)												
Spec. 6J (178.100)												
Spec. 6K (178.101)												
Spec. 6L (178.103)												

DATA SHEETSSection IUSE AND TEST/ENGINEERING ANALYSIS DATA

Type A Packaging As Given in Para. 173.395, Tariff No. 27	<u>Column 1</u> To Be Used As Listed in 173.395 (Check one) Yes No		<u>Column 2</u> Number of Shipments/ Packages	<u>Column 3</u> Test/Analysis of Packaging Conducted Yes No		<u>Column 4</u> Used with Modification (described in Section II) Yes	<u>Column 5</u> Test/Analysis on Modifica- tions, describe in Section II Yes No		<u>Column 6</u> Drawings (Check one) En- Avail- closed able (when)		Not Avail- able
Spec. 6M (178.104)											
Spec. 17C (178.107)											
Spec. 17H (178.108)											
Spec. 42B (178.115)											
Spec. 42C (170.118)											
2. Fiber Drums											
Spec. 21C (178.224)											

DATA SHEETS

Section I

USE AND TEST/ENGINEERING ANALYSIS DATA

Type A Packaging
As Given in Para.
173.395, Tariff
No. 27

	<u>Column 1</u> To Be Used As Listed in 173.395 (Check one)		<u>Column 2</u> Number of Shipments/ Packages	<u>Column 3</u> Test/Analysis of Packaging Conducted		<u>Column 4</u> Used with Modification (described in Section II)	<u>Column 5</u> Test/Analysis on Modifica- tions, describe in Section II		<u>Column 6</u> Drawings (Check one) En- closed Avail- able (when) Not Avail- able		
	Yes	No		Yes	No	Yes	Yes	No			
3. Wooden Boxes											
Spec. 14 (178.165)											
Spec. 15A (178.168)											
Spec. 15B (178.169)											
Spec. 15C (178.170)											
Spec. 15D (178.171)											
Spec. 19A (178.190)											
Spec. 19B (178.191)											

DATA SHEETSSection IUSE AND TEST/ENGINEERING ANALYSIS DATA

Type A Packaging As Given in Para. 173.395, Tariff No. 27	<u>Column 1</u> To Be Used As Listed in 173.395 (Check one)		<u>Column 2</u>	<u>Column 3</u>		<u>Column 4</u>	<u>Column 5</u>		<u>Column 6</u>		
	Yes	No	Number of Shipments/ Packages	Test/Analysis of Packaging Conducted	No.	Used with Modification (described in Section II) Yes	Test/Analysis on Modifica- tions, describe in Section II Yes	No	En- closed	Avail- able (when)	Not Avail- able
4. Fiberboard Boxes											
Any Spec. 12 Series (178.205 through 178.212)											
(200 lb. test minimum)											
(If "Yes" indicate actual spec. number(s) below check.)											
Spec. 23F (178.214)											
Spec. 23H (178.219)											

DATA SHEETS

Section I

USE AND TEST/ENGINEERING ANALYSIS DATA

Type A Packaging
As Given in Para.
173.395, Tariff
No. 27

Type A Packaging As Given in Para. 173.395, Tariff No. 27	<u>Column 1</u> To Be Used As Listed in 173.395 (Check one)		<u>Column 2</u> Number of Shipments/ Packages	<u>Column 3</u> Test/Analysis of Packaging Conducted		<u>Column 4</u> Used with Modification (described in Section II)	<u>Column 5</u> Test/Analysis on Modifica- tions, describe in Section II		<u>Column 6</u> Drawings (Check one)		
	Yes	No		Yes	No.	Yes	Yes	No	En- closed	Avail- able (when)	Not Avail- able
5. Cylinders											
Any Spec. 3 Series (178.36 thru 178.44)											
(If "Yes" indicate actual spec. number(s) below check.)											
Any Spec. 4 Series (178.47 thru 178.58)											
(If "yes" indicate actual spec. number(s) below check.)											
6. Spec. 55 (178.250)											

DATA SHEETS

USE AND TEST/ENGINEERING ANALYSES DATA

SECTION I

Type A Packaging As Given in Para. 173.395, Tariff No. 27	Briefly Describe Type of Packaging	Number of Shipments Per Year	Testing/Engineering Analysis Performed (check one)		Test/Analysis Data (check one)		
			Yes	No	En- cld.	Avail- able	Not Avbl
7. Spec. 7A (178.350) 1. 2. 3.							

INSTRUCTIONS FOR COMPLETING SECTION II DATA SHEETS

- (1) Specification of Container
  - (2) Description of Packaging
  - (3) Contents of Packaging
  - (4) Normal Conditions of Transport
  - (5) Additional Information Requested
  - (6) Comments
- Examples

Section II

Blank data forms, for duplication as needed, are enclosed. Typical information requested, for each of the six categories above, is described below. This information should be provided for each packaging anticipated for use as indicated in Section I.

- (1) DOT Specification _____ (e.g., 17-H, 19-A, Spec. 7A, etc.).

- (2) Description of Packaging*

Gross weight, materials of construction, materials used as neutron absorbers or moderators, external dimensions and cavity size, internal and external structure, receptacles, valves, sampling ports, structural or mechanical means of heat dissipation, outer and inner protrusions, lifting and tie-down devices, amount of shielding, pressure relief systems, closures, and means of containment. If a Type A packaging, as listed in 173.395, has been modified, provide details and drawings, if necessary, of the modification, the reason the modification(s) was/were required, and test analysis data if available supporting modified packaging meeting "conditions normally incident to transportation" (Para. 173.398 (b)).

- (3) Contents of Packaging

Quantity of isotope, maximum amounts of radioactivity, chemical and physical forms, material density, criticality safety considerations, maximum decay heat, maximum pressure build-up in inner container, leak tests, and any other loading restriction and limitations (e.g., special form containment used/required, etc.)

*Details provided in Part 178 of Tariff 27 need not be repeated here.

(4) Normal Conditions of Transport*

Results of any tests, engineering analyses, reports (published and unpublished) on any of the listed Type A packaging or Spec. 7A packaging which have been conducted by you, by other shippers, by manufacturers, by testing laboratories, etc. If you know of such data but don't have the results, please provide a literature reference or name of a contact where further information could be pursued.

*Paragraph 173.398 (b) of Tariff No. 27:

(b) Standards for Type A packaging:

(1) Type A packaging must be so designed and constructed that, if it were subject to the environmental and test conditions prescribed in this paragraph:

- (i) There would be no release of radioactive material from the package;
- (ii) The effectiveness of the packaging would not be substantially reduced; and
- (iii) There would be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package.

(2) Environmental conditions:

- (i) Heat. Direct sunlight at an ambient temperature of 130° F. in still air.
- (ii) Cold. An ambient temperature of -40° F. in still air and shade.
- (iii) Reduced pressure. Ambient atmospheric pressure of 0.5 atmosphere (absolute) (7.3 p.s.i.a.)
- (iv) Vibration. Vibration normally incident to transportation.

(3) Test conditions: The packaging shall be subject to all of the following tests unless specifically exempted therefrom, and also to the consecutive application of at least two of the following tests from which it is not specifically exempted:

- (i) Water spray. A water spray heavy enough to keep the entire exposed surface of the package except the bottom continuously wet during a period of 30 minutes. Packages for which the outer layer consists entirely of metal, wood, ceramic, or plastic, or combinations thereof, are exempt from the water spray test.
- (ii) Free drop. Between 1-1/2 to 2-1/2 hours after the conclusion of the water spray test, a free drop through a distance of 4 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.
- (iii) Corner drop. A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all Fissile Class II packagings.
- (iv) Penetration. Impact of the hemispherical end of a vertical steel cylinder 1-1/4 inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.
- (v) Compression. For packages not more than 10,000 pounds in weight, a compressive load equal to either five times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of 24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

(5) Additional Information Requested

- Number of each Type A packages/Spec. 7A packages in inventory.
- Cost of packaging.
- Current suppliers and alternates.
- Other potential sources of information (e.g., ANSI Standards - Manufactory Chemists Association, etc.)
- Expected lifetime (number of shipments, non-reusable, etc.) of packaging.

(6) Comments

Any comments you might have concerning the approach proposed, special problems envisioned, areas of importance not covered by data sheets, etc.

SECTION II DATA PACKETS

For each packaging used, as indicated in Section I, please provide the following information:

(1) DOT Specification _____.

(2) Description of Packaging*

* Details provided in Part 178, DOT Tariff No. 27, need not be repeated here. If same as spec. given in Part 178, write "SAME".

(3) Contents of Packaging

(4) Normal Conditions of Transport

(5) Additional Information Requested

(6) Comments

EXAMPLES

The first step in analyzing the information received from the prime contacts will be developing categories of packages used. These packages may not be exactly identical from a packaging or content standpoint; however, the packages within a category will be similar from a standpoint of expected package performance under Condition Normal to Transport.

Definitions: *

Package means packaging and its radioactive contents.

Packaging means one or more receptacles and wrappers and their contents, excluding fissile material and other radioactive material, but including absorbent material, spacing structures, thermal insulation, radiation shielding, devices for cooling and for absorbing mechanical shock, external fittings, neutron moderators, nonfissile neutron absorbers, and other supplementary equipment.

First Example:

Sites X and Y use 17-H metal drums to ship contaminated, solid residue from Waste Disposal facilities. This residue is contained in 5 mil polyethylene liners. Sites A and B ship contaminated residue from destruction of concrete and brick walls in 17-H drums with a 10 mil polyethylene liner. Sites M and N ship contaminated soil with no liner. These shipments and other similar packages identified by other sites would be placed in one category for purposes of packaging analysis, assuming weight and other pertinent content characteristics were generally the same.

Then a literature search would be conducted for a 17-H metal drum containing 400 lbs. of sand, soil, etc., that had been dropped 4 ft., tested for penetration, compression, etc. If examples of the subject 17-H drum passing all such tests can be found, then this package would be certified for use as Spec. 7A under the specified conditions (e.g., content, weight, etc.).

Second Example:

Sites: R&S ship Type A quantities of Pu-238 and Po-210 in sealed No. 10 metal cans inside a 1 ft. X 1 ft. X 1 ft. 19-A wooden box. The inner container is centered by surrounding vermiculite. Sites K&L ship Type A quantities of Co-60 and Ra-226 in essentially the same package; with the additional requirement of 1/2" of lead shielding surrounding the radioactive material inside the can. Sites W&Z ship radiopharmaceuticals in a similar package; however, the material surrounding the inner container is small styrofoam chips and a No. 12 metal can is used.

Again, these and other similar packages would be placed in one category for purposes of analysis.

The purpose of these examples is to attempt to help you determine, what does Edling deed as for data submitted. If you use a 17-C metal drum and a thin poly-bag liner to ship five different categories of radioactive material (from normal laboratory paper waste to dismantled concrete walls); on one Section II data packet, identify the packaging as DOT Spec. 17-C, describe the package, and provide details of contents, describing in required detail all five general categories of materials shipped. I don't mean differentiating between laboratory paper waste and laboratory plastic waste; however, I do mean differentiate between paper waste, liquids absorbed on solid material, bulky equipment (e.g. motors, pumps, presses), waste disposal residues mixed with concrete, etc. Again, on one Section II data packet give the packaging and divide the contents in similar categories and describe these in the one data packet.

In the same sense, if a 10-gallon metal drum with a similar inner metal container is used to ship fifteen different radioisotopes, use one data packet for the one packaging and adequately describe the contents.

ATU2283 RHEGGINO199 0951730-UUUU--RHEGDAO

ZNR UUUUUU

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R 051730Z MAR 74

FM USAEC FRANK K PITTMAN WASHDC

TO RHEGALO/USAEC H C DONNELLY ALBUQ NMEX

RHEGSMN/USAEC E A YOUNGBERG GRAND JUNCTION COLO

RHEGNVO/USAEC M E GATES LAS VEGAS NEVADA

RHECSFO/USAEC D E REARDON SAN OAKLAND CALIF

RHEGORO/USAEC R J HART OAK RIDGE TENN

RHECIDO/USAEC R G BRADLEY IDAHO FALLS IDAHO

RHEGRLO/USAEC A G FREMLING RICHLAND WASH

RHEGSRR/USAEC N STETSON N AUGUSTA SC

RHEGILL/USAEC J P JEWETT BAO ARGONNE ILL

INFO RHEGDAO/USAEC E V SPRINGER MIAMISBURG OHIO

AF

BT

UNCLASSIFIED//N O N W D/NARR

SUBJECT: COMPLIANCE WITH PROPOSED NEW DOT REQUIREMENT FOR TYPE
A PACKAGE CERTIFICATIONS.

THE DOT HAS PROPOSED IN HM-111, NOTICE NO. 73-7, THAT USE OF ALL
SPECIFICATION PACKAGINGS FOR TYPE A QUANTITIES OF RADIOACTIVE
MATERIALS, EXCEPT SPEC. 7A, WILL NO LONGER BE ALLOWED. FURTHER,

PRIORITY ATTENTION REQUIRED

Note Due Reply Date of 4-10-74

AGE 2 RUEGGTNO199 UNCLASSIFIED/N O N W D/NARE
ACH USER OF SPEC. 7A, PACKAGINGS WOULD BE REQUIRED TO DOCUMENT
AND MAINTAIN ON FILE A RECORD OF HIS DETERMINATION OF COMPLIANCE
WITH THE DOT SPEC. 7A PERFORMANCE REQUIREMENTS FOR THE SPECIFIC
PACKAGE DESIGN. DOT HAS AGREED INFORMALLY TO DELAY IMPOSING THIS
REQUIREMENT FOR SEVERAL MONTHS UNTIL AEC CAN PREPARE SUCH DOCUMEN-
TATION ON CURRENTLY USED SPEC. 7A PACKAGINGS. CONSEQUENTLY, WMT
HAS AUTHORIZED MOUND LABORATORY TO UNDERTAKE A STUDY TO DETERMINE
AND CERTIFY WHICH PACKAGES, NOW USED OR PROPOSED FOR USE IN THE
IMMEDIATE FUTURE BY AEC CONTRACTORS IN SHIPPING TYPE A QUANTITIES,
MEET THE SPEC. 7A PERFORMANCE REQUIREMENTS. PARA.
THE PURPOSE OF THE STUDY IS TO HAVE ONE AEC CONTRACTOR: (1) COMPILE
A LIST OF PACKAGES, USED AND PROPOSED BY ALL AEC CONTRACTORS, FOR
SHIPPING TYPE A QUANTITIES OF RADIOACTIVE MATERIAL; (2) ANALYZE
THESE PACKAGES FOR CONFORMANCE TO DOT SPECIFICATION 7A PACKAGING
REQUIREMENTS, AND (3) DOCUMENT THE RESULTS OF THE STUDY FOR USE BY
ALL AEC CONTRACTORS AND PRIVATE INDUSTRY. THIS IS EXPECTED TO
ELIMINATE THE NEED FOR REDUNDANT TESTING/ANALYSIS OF MANY SIMILAR
PACKAGES BY AEC CONTRACTORS. PARA.
CURRENT PLANS CALL FOR RELIANCE TO A GREAT EXTENT ON TESTING AND
ANALYSIS OF TYPE A PACKAGES ALREADY COMPLETED AND DOCUMENTED BY

P

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3 RHEGGTWO199 UNCLASSIFIED//N O N W D/MARR
AEC CONTRACTORS AND PRIVATE INDUSTRY. THUS, THE EMPHASIS WILL BE
ON COMPILING AND ANALYZING EXISTING DATA RATHER THAN ACTUAL TESTING
OF PACKAGES. PARA.
MOUND LABORATORY HAS BEEN ASSIGNED THE RESPONSIBILITY FOR CONDUCTING
THIS STUDY AND COMPILING THE REPORT. THE PROJECT LEADER AT MOUND
WILL BE MR. DON A. EDLING. QUESTIONS CONCERNING THIS STUDY SHOULD
BE DIRECTED TO MR. EDLING (513-866-7444, EXTENSION 7509 OR 3134)
OR MR. J. A. SISLER, AEC/MO (301-973-5361). PLEASE PROVIDE MR. EDLING
WITH THE NAMES OF FIELD OFFICE AND CONTRACTOR CONTACTS FOR INFORMAL
LIAISON IN DATA COLLECTION, REPORT PREPARATION, AND ASSOCIATED
PROBLEMS. A DETAILED QUESTIONNAIRE WILL THEN BE TRANSMITTED TO
THESE CONTACTS BY MR. EDLING. TYPICAL OF THE INFORMATION WHICH WILL
BE REQUESTED IS: (1) DETAILS OF PACKAGES NOW BEING USED AND THOSE
EXPECTED TO BE SHIPPED AS SPECIFICATION 7A PACKAGES; (2) TYPES AND
CHARACTERISTICS OF CONTENTS (E. G., WEIGHT, HEAT GENERATION, SOLIDS,
LIQUIDS, GASES, WASTE, PRODUCT, ETC.); (3) LISTING OF TEST/ANALYSIS
DATA ON TYPE A PACKAGES GENERATED AT THEIR RESPECTIVE SITES; (4) OTHER
SOURCES OF APPLICABLE INFORMATION ON TEST/ANALYSIS DATA, AND; (5) ANY
OTHER COMMENTS ON SPECIFICATION 7A PACKAGING. PARA.
IN ORDER TO MEET THE DEADLINE FOR COMPLETING THIS STUDY, A DUE DATE

PAGE 4 RHGGTNO199 UNCLASSIFIED/N O N W D/NARP
F APRIL 10, 1974, MUST BE OBSERVED FOR INITIAL FIELD OFFICE
SUBMISSION. THE NAMES OF CONTACTS AND ALL SUBSEQUENT INFORMATION
SHOULD BE SENT TO: MOUND LABORATORY, P.O. BOX 32, MIAMISBURG OHIO
45342. END:REF:WMT:JAS

BT

#0199

NNNN

Letter and enclosures re: "Certification of AEC Contractors' Packaging with Respect to Compliance with DOT Specification 7A Performance Requirements" sent to the following contacts:

Mr. Frank Adcock, Principal Engr.
Product Definition
Dow Chemical, USA
Rocky Flats Division
P. O. Box 888
Golden, Colorado 80401
FTS: 303-494-2285

Mr. E. L. Barraclough
U. S. A. E. C./ALO
Operations Safety Division
P. O. Box 5400
Albuquerque, New Mexico 87115
FTS: 505-264-7276

Mr. J. D. Berger
Oak Ridge Assoc. Univ.
P. O. Box 117
Oak Ridge, Tenn. 37830
615-483-8411 (Ext. 333)

Mr. C. E. Block
National Lead Company of Ohio
P. O. Box 39158
Cincinnati, Ohio 45239
513-738-8230

Mr. R. L. Chandler
U. S. A. E. C.
Savannah River Operations Office
P. O. Box A
Aiken, South Carolina 28901
FTS: 803-642-2291

Mr. Steve Chin
Lawrence Livermore Laboratory
P. O. Box 808
Livermore, California 94550
FTS: 415-447-8531 (1100)

Mr. John L. Cochran
M.I.T.
138 Albany Street
Cambridge, Mass. 02139
FTS: 617-223-2100
Comm: 617-253-3803

Mr. Paul Colsmann
Associated Universities, Inc.
Brookhaven National Laboratory
Upton, New York 11973
516-345-4058

Mr. L. B. Colton
HEDL
P. O. Box 1970
Richland, WA 99352
509-942-3742

Mr. William Crismon, Jr.
OS & Fire Protection
U. S. A. E. C.
Los Alamos Area Office
Los Alamos, New Mexico 87544
FTS: 505-667-5288

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ARHCO
P. O. Box 250
Richland, WA 99352
509-942-7164

Mr. T. E. Dabrowski
UNI
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Richland, WA 99352
509-942-1355

Mr. Roland G. Damm
Special Materials Division
Argonne National Laboratory
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Argonne, Illinois 60439
312-739-3795

Mr. Robert I. Elder
Safety Division
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Chicago Operations Office
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Argonne, Illinois 60439
312-739-2087

Mr. Stephen W. Farkas
Operational Safety Division
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401
208-526-1366

Mr. Homer Faust
Battelle Columbus Laboratory
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614-201-247

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National Accelerator Laboratory
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Batavia, Illinois 60510
312-840-3461

Mr. R. F. Garrison
U. S. A. E. C.
P. O. Box 550
Richland, WA 99352
509-942-6731

Mr. Richard N. Glover
Quality Assurance & Safety
U. S. A. E. C.
Rocky Flats Area Office
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APPENDIX II

EXERPTS FROM
TYPE A PACKAGE STUDY

Monsanto Company
Corporate Distribution Department
Packaging Development Section

June 28, 1974

Prepared by: K. E. Smith
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Approved by: F. J. Kusiak
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EXERPTS FROM
TYPE A PACKAGE STUDY

PURPOSE:

The Department of Transportation, Office of Hazardous Materials, has proposed a rule change to Title 49 under Docket HM 111 as published in the Federal Register dated October 25, 1973. This proposal would eliminate the use of those DOT specification containers listed in the current DOT Regulations for radioactive materials. Instead, the proposal would substitute any container which would pass the DOT performance test criteria for Type A quantity packaging.

SCOPE:

The Packaging Development Section, Corporate Distribution Department, Monsanto Company was requested to assist Mound Laboratory of Monsanto Research Corporation, a subsidiary of Monsanto Company, in the search for data indicating that the prescribed tests had been performed on the DOT specification containers currently listed. The Packaging Development Section, under Mound Laboratory Purchase Order Number 93185-12, was commissioned to survey container manufacturers to determine if data were available.

PROCEDURE:

A list of the major container manufacturers was prepared. Based upon the Section's knowledge of these manufacturers and their research and development facilities, the list was culled to achieve maximum, potential results.

From alternate sources of information available to the Section, the list was expanded to include package testing laboratories and potential large volume shippers of radioactive materials.

Due to the timing limitation on this study, all potential sources were contacted by telephone.

RESULTS:

Generally, there has been little or no testing of radioactive material packages according to the requirements specified in the DOT Regulations. Only four shippers indicated that past or present test data might be available (company administration approval would be required for the release of such data). Only one packaging testing laboratory acknowledged having completed some testing. All other sources contacted reported "no tests performed" for clients or "we assume that the listed containers pass the tests and as such are authorized under the current Regulations."

CONTACTS:

1. New England Nuclear: Boston, Mass.
No data available.
2. Mallinckrodt Chemical: St. Louis, Missouri
Out of the business - no data available.
3. Gaynes Testing Laboratory: Chicago, Illinois.
A corrugated box (polystyrene foam insert to protect vials) was recently tested. Would require the permission of clients for release of information. Also tested a metal drum (for an AEC Utah based waste disposal company) under Test No. 17339.
4. Amersham/Searle: Chicago, Illinois
A 4½" dia. x 10" long tube was tested. Currently some other new packages are being developed. Promises to send any available data.
5. Compressed Gas Association: New York, New York
No test data.
6. International Chemical & Nuclear: Irvine, California
His company has performed the prescribed tests, mostly during the mid-sixties, with results on file. It is believed that the cost of retrieving this data and the labor involved would not be beneficial at this time.

7. Package Research Laboratories: Rockaway, New Jersey
There has been no testing of packages for qualification as Type A at this testing laboratory.
8. Container Corporation of America: Chicago, Illinois
CCA has not done any testing of corrugated boxes for radioactive material shipments.
9. Container Laboratories: Chicago, Illinois
This testing laboratory has had no requests to test packages for radioactive materials.
10. Container Testing Laboratories: New York, New York
No requests for testing of radioactive material packages have been received.
11. Inland Steel Co: Chicago, Illinois
Inland has no test data on metal drums used for radioactive materials. He indicated that a standard DOT 17H would not withstand a drop test from heights greater than 6 feet when filled with liquids.
12. Winthrop Laboratories: Rensselaer, New York
Had no radioactive materials for packaging.
13. Claro Laboratories: South Bend, Indiana
No radioactive material package testing has been performed.

14. Abbott Pharmaceuticals: Chicago, Illinois
Testing of packages had been accomplished several years ago. As new products are developed, packages are being reevaluated as time permits. Some testing is in progress for the more critical packaging. Future contact for approval to release data is Mr. Tom Curda at 668-5059.
15. Container Research Corporation: Leni, Penn.
No testing involved.
16. Pharmaseal Labs: Glendale, California
Do not ship radioactive pharmaceuticals.
17. Travenol Lab: Los Angeles, California
Packages have not been tested.
18. Continental Can Co.: Chicago, Illinois
There would be no reason whereby fiber drums could not be used for radioactive material. CCC will perform the tests to verify this statement. There might be a need to use a waterproof adhesive in Standard Leverpak or Fiberpak construction. Results of the testing will be sent to the Section and relayed to Mound Laboratory.

APPENDIX III

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