



ENGINEERING SERVICES

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ATL Lab No. 3-09042-85

Date: July 18, 1985

DOT SPEC. 7A TESTS

(49CFR Part 173)

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Requested by: Michael Growburg

Tested by: J. R. Franklin and M. Sherrod, ATL Representatives

1. Introduction:

Part 173 of Title 49 of the Code of Federal Regulations, contains the regulations governing the requirements imposed on shippers concerning shipping and packaging of poisonous and radioactive materials. Paragraphs 173.463 to 173.466 prescribe the tests for integrity of packaging and shielding.

2. Common Name of Container:

Metal "Ammo" Box with Internal Packing

3. Authorized Contents:

Type A quantities of liquid radiopharmaceuticals, packaged in 3/4 in. thick foam plastic. Contents are limited to 3 cc capacity syringes with end caps placed inside plastic lead lined pigs with screw-on lids.

4. Description of Containers and Inner Packaging:

The container tested was a Department of Defense steel ammunition box. The dimensions are as follows:

5.5 in. wide by 11.125 in. long by 7 in. high

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The lid hinged at one end and was closed by a clasp at the other end. A plastic seal was used to indicate tempering. A metal handle on the lid folded flat. A rubber gasket in the lid sealed the box.

The "ammo" box was lined on the top and sides with foam rubber, 3/4 in. thick. The bottom was lined with foam rubber, 3 in. thick.

The inner containment system consisted of six (6) 3cc syringes with end caps, containing colored water to simulate a liquid radiopharmaceutical, and placed inside of plastic, lead-lined pigs separated by a rubber/plastic washer. The plastic pig had a screw-on lid.

5. Tests Performed:

a. A 2 in. per hour water spray test was applied simultaneously to four sides of each box for a period of one hour. Immediately after the water spray test was completed the boxes were subjected to the following tests:

b. Free Drop Test

The free drop test consisted of a fall from a height of 4 ft to a flat horizontal surface of such mass and rigidity that any increase in its resistance to displacement or deformation upon impact by the specimen would not significantly increase the damage to the specimen.

c. Compression Test

The box was subjected to a compressive load of 225 lbs per sq ft for 24 hours.

d. Penetration Test

The box was placed on a flat rigid horizontal surface (concrete floor) while the test was performed. A 1.25 in. diameter steel bar with a hemispherical end, weighing 13.2 lbs, was dropped on to the center of the weakest part of the box, so that, if it penetrated far enough, it will hit the containment system. The drop height to the upper surface of the box was 3.3 ft.



6. Results of Tests:

a. Water Spray

The box passed. There was neither loss of contents nor loss of integrity of the outer package. No moisture penetrated the container.

b. Free Drop Test

The box passed. There was distortion of the box, however, there was no loss of contents or damage to them.

c. Compression Test

The box passed with no loss of or damage to its contents.

d. Penetration Test

The box passed. However, the box was indented to a depth of 1.50 in. without loss of or damage to the contents.

7. Additional Tests Performed:

40 CFR 173.393 (g) requires additional tests when shipping Type A quantities of liquids. These requirements are:

a. The package must be adequate to prevent loss or dispersal of the radioactive contents from the inner containment vessel if the package were subjected to a 30 ft drop test, and

b. the packaging must be adequate to prevent loss or dispersal of the radioactive contents from the inner containment vessel if the package is subjected to the specified penetration test, except that the distance of the fall shall be 5.5 ft.

c. Results of Tests:

(1) 30 ft Drop Test:

Box passed. The box lid separated from the box and the pigs were scattered over a sizeable area. The upper edge of the box was deformed, and one plastic pig was cracked. However, the syringes were not damaged. The end caps remained in place and there was no loss of liquid from them.



(2) Penetration Test:

Box passed. There was a 1 1/4 in. indentation at the point of impact but there was no damage to the contents and there was no loss of liquid from the syringes. The box lid remained in place.

8. Conditions:

- a. Only plastic syringes are permitted and end caps must be used.
- b. Only screw-on lid type lead lined syringe carriers are permitted.

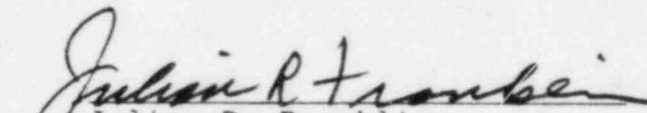
9. Improvements:

Use of a belt or strap will insure that the contents (pigs) remain in the box.

10. Certification Statement:

Based upon the test results contained in this report, I believe that the ammunition box tested meets the DOT Spec 7A requirements when packaged as reported herein.

Reviewed by:


Julian R. Franklin
Project Engineer
July 19, 1985


J. Patrick Callahan, P.E.
Technical Director

JRF/cc

Attachments

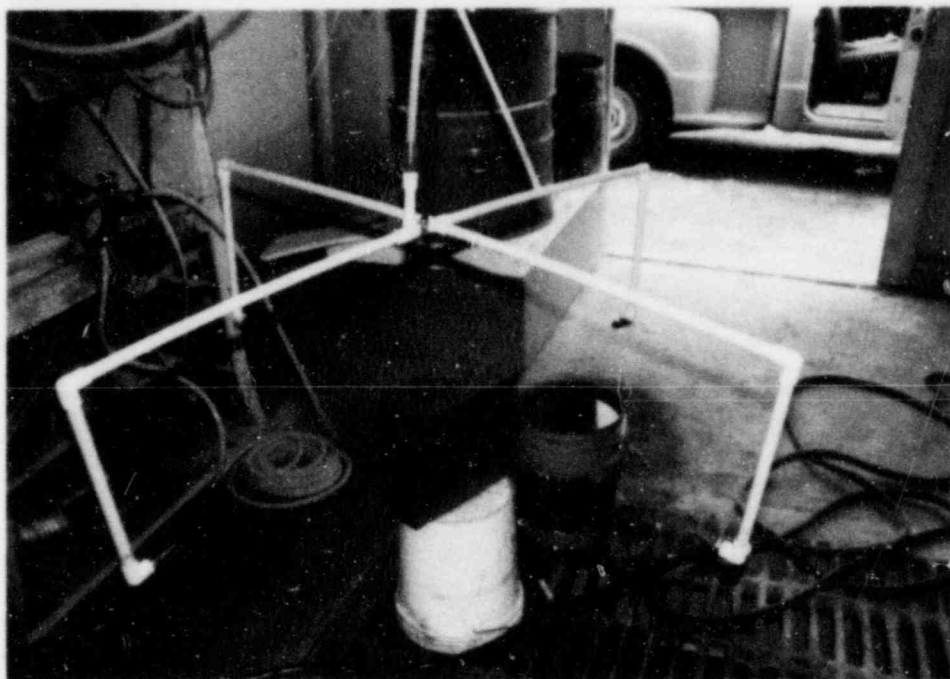


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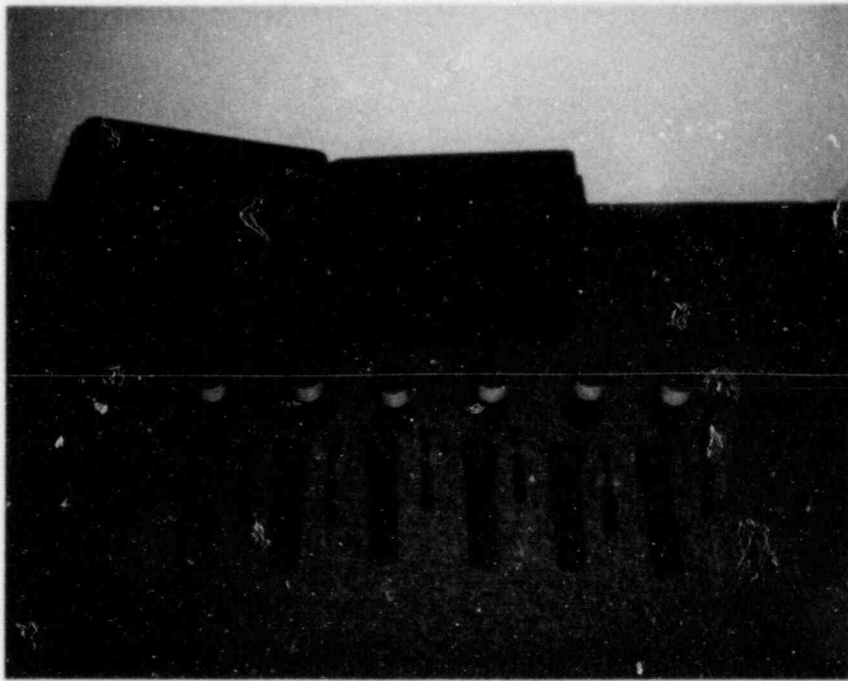
Adjustment of Spray Test Apparatus





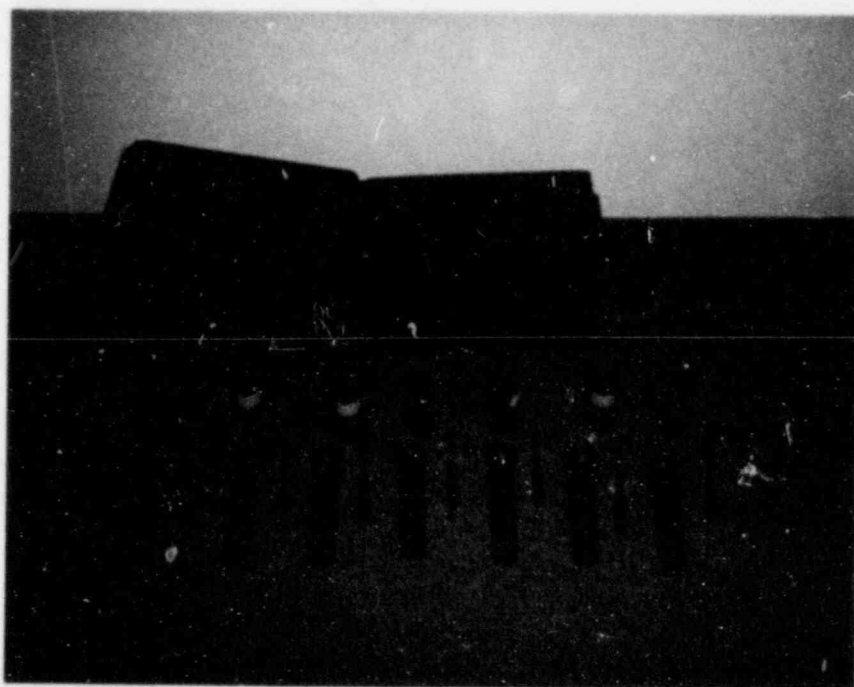
Spray Test in Progress





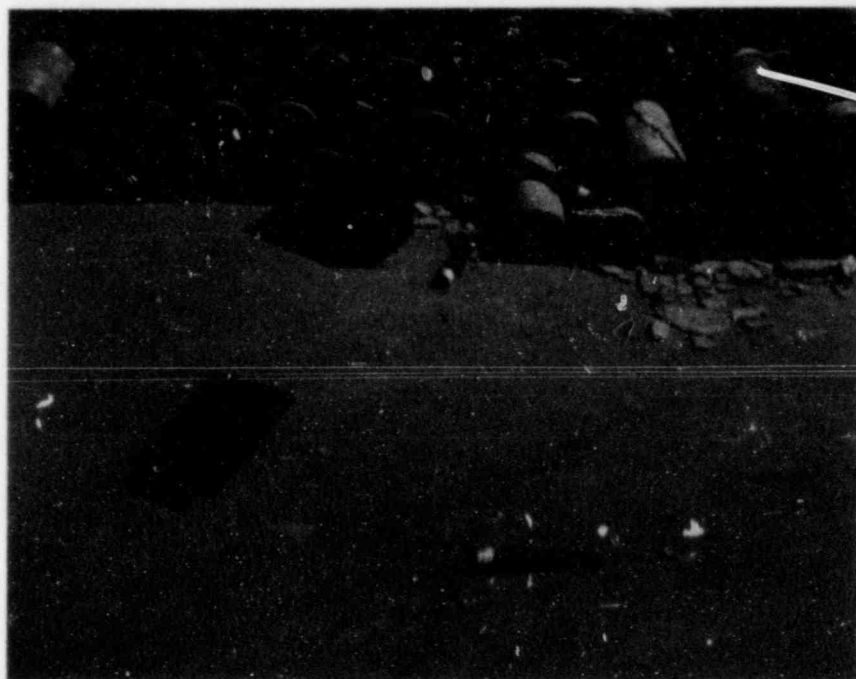
Iso-Diagnostics "Ammo" box and contents
prior to 30 foot Drop Test





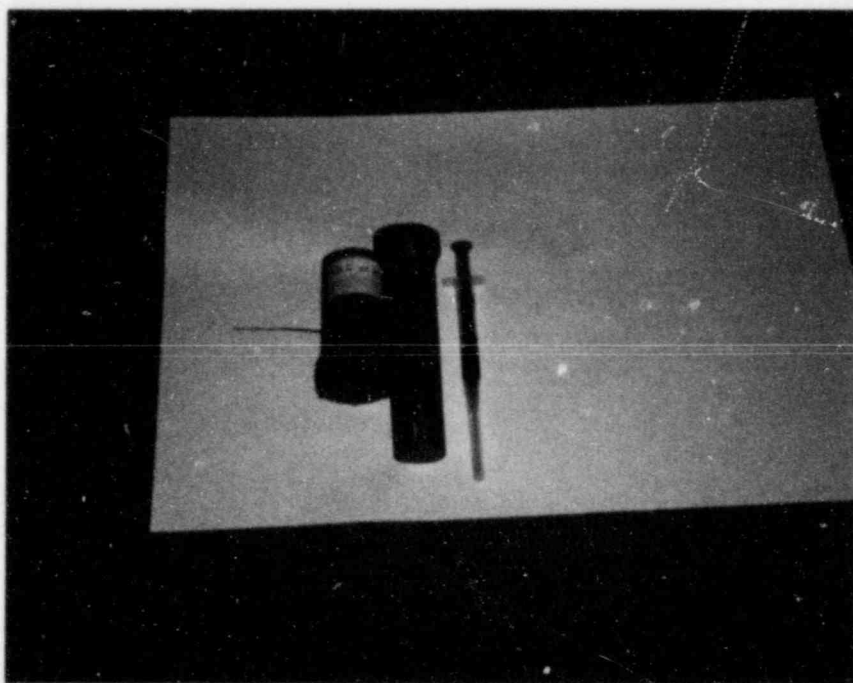
Iso-Diagnostics "Ammo" box #2 and
contents prior to Penetration Test





Iso-Diagnostics "Ammo" box #2 and
contents immediately following 30 ft Drop Test





Iso-Diagnostics plastic syringe with end cap
in place and plastic pig with lead pipe
after 30 ft Drop Test

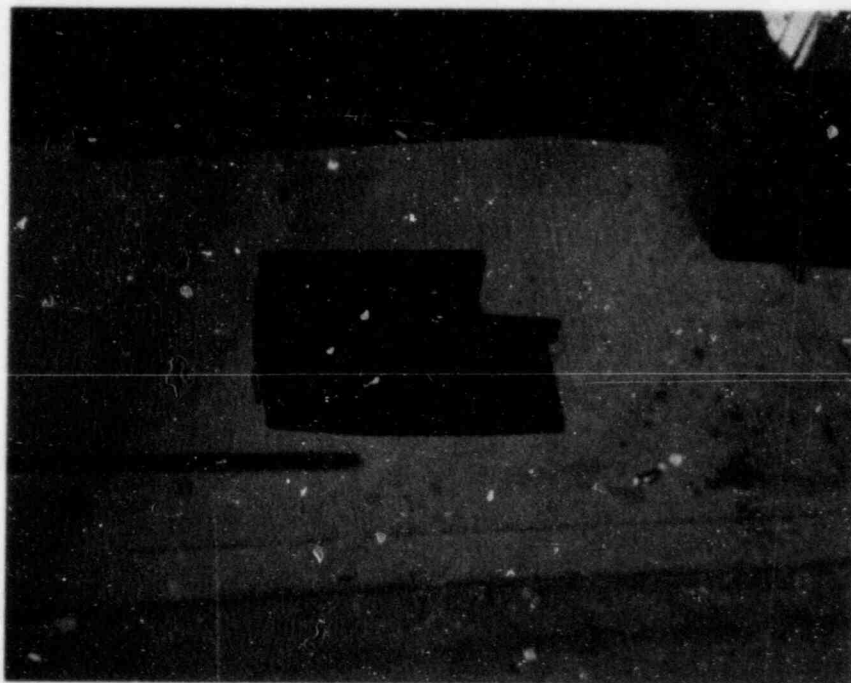
(Note crack in screwed end cap)





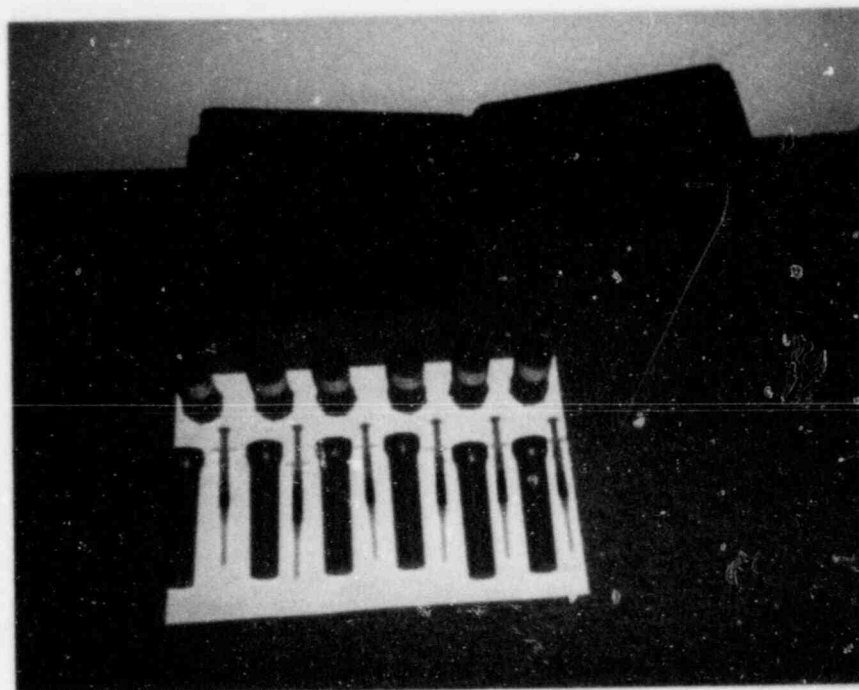
Iso-Diagnostics "ammo" box, detached lid and
contents after 30 ft Drop Test





Iso-Diagnostics "ammo" box immediately after
Penetration Test, with contents in box





Iso-Diagnostics "ammo" box with lid open showing contents