Humboldt Scientific, Inc.

Type A Transit Case HS-200681 Certification

Drawing Number: 15508-2 attachments 1 & 2. This Configuration is HS-200681 type A transit case with Interior partitions of Medium Density Hexene Copolymer Polyethylene.

Model: HS-200681 31.0 inches x 14.5 inches x 19.0 inches (78.75 cm x 36.83 cm x 48.26 cm) is constructed from 0.188 inch (0.5 cm) Medium Density Hexene Copolymer Polyethylene. The case is further described as a rotational molded case and contains other components such as plated steel brackets, plated steel hinges, plated steel draw latches, steel catch cord, and an internal silicon gasket for weather protection. The empty weight is 31lb. (14 kg) and for testing purposes the maximum weight is 90lb. (41kg).

Packaging Description: Package in accordance with Humboldt transit case closure procedure (HPCP-001) attached. The interior partitions of Medium Density Hexene Copolymer Polyethylene are used to separate the various tools and equipment. These items include the nuclear density/moisture gauge containing solid sources radioactive material, reference standard, scraper plate, drill rod, rod extractor, hammer, canvas tool bag, and documentation packet. The case is sealed with zip tie and red security zip tie or with a padlock in the catch eyes on the front of the case.

This is to certify that the shipping container described above was tested and complies with requirements and specification as set forth in the following references:

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1. Title 49 CFR U.S. Department of Transportation Regulations (DOT), 2017, Section §173.410 (General Design Requirements).

2. Title 49 CFR U.S. Department of Transportation Regulations (DOT), 2017, Section §173.412 (Additional Design Requirements for Type A Packages).

3. Title 49 CFR U.S. Department of Transportation Regulations (DOT), 2017, Sections §173.461-§173.465 (Compliance and Testing).

4. Title 49 CFR U.S. Department of Transportation Regulations (DOT), 2017, Sections §178.608 (Vibration Standard).

Authorized Signature:  Date:10/23/2017

A copy of these closure instructions must be retained and be available for inspection upon request for 365 days after offering the package for transport in accordance with 49 CFR 178.2(c)(1)(ii).

DOT Type A Package Test Report

Package Model: HS-200681 – For Transit Case with Tools
Drawing Number: 15508-2 Rev.:G
Approved by Test Engineer: Harold Clark
Test Report Review Date: 08/25/2017

Test performed:

173.465(b)	Water Spray Test of 2inch/hr. (5cm/hr.) for one hour prior to conducting each of the following tests.
173.465(c)	(8) Free Drop on each corner from a height of 4 ft. (1.2m).
173.465(d)	Stacking test of 680 lbs. (309.1 kg) for 24 hours.
173.465(e)	(4) Penetration tests of a 13.2 lbs. (6kg bar), 1.25in. (3.2 cm) diameter dropped from a height of 3.3 ft. (1.0 m).

Description of Tests Performed:

Packaging Specimen Description:

The packaging specimen contain two separate radionuclides, one for moisture determination and one for density. For the moisture determination, a doubly encapsulated stainless steel fast neutron source of Americium-241:Beryllium (Am-241 :Be) USA/0632/S-96, Rev 9 or CZ/1009/S-96, Rev 2. Density measurements are accomplished by use of a Cesium-137 (Cs-137) doubly-encapsulated sealed stainless steel gamma photon source USA/0634/S-96, Rev 4 or USA/0356/S-96, Rev 13.

The Cs-137 source is contained within a 440C stainless steel "source rod" which has been machined out at one end to receive a stainless-steel source cup. The source cup has been machined to receive the sealed source and a spring to ensure the source remains stationary within the rod. The source cup is threaded into the source rod and is held in place via a threaded stainless steel plug which has had a high-temperature epoxy applied to the threads. The plug is tightened to the appropriate torque setting and allowed to cure for 24 hours before additional manipulation. Afterwards, a handle is attached to the source rod and secured using a tamper resistant set screw. Immediate shielding for the Cs-137 source is provided by a 3.4" high, 2.25" diameter cylindrical tungsten shield. The 5001 can be equipped with either an 8" or a 12" source rod. The overall dimensions of the gauge are as follows: 15.75 inch L x 8.66 inch W x 18.00 inch H (with 8 inch source rod) or 21.60 inch H (with 12 inch source rod).

The immediate shielding for the Am-241:Be source. is provided by a 0.55" diameter cylindrical lead source cup. The source cup is placed into a cylindrical aluminum source holder, which is attached inside the base of the gauge. A lead cap (0.55" diameter) is placed atop the source cup and threaded plug which has had a high temperature epoxy applied to the threads is also used to secure this source.

DOT Type A Package Test Report

within the source holder. A "Caution -Radioactive Materials" label is applied over the plug (Drawing Number: HS-200171 attachment 3). The gauge handle locked in the safe position with a padlock and then placed in the transit case. The interior of the case has pre-formed compartments for the placement of the gauge, reference standard block and gauge accessories. Items may be loaded in any order.

Labels attached to two opposite sides of the case:
RADIOACTIVE Yellow II with 0.2 Transport Index
RQ: RADIOACTIVE MATERIAL, SPECIAL FORM, 7, UN3332
and a CARGO ONLY label
Marking attached to one side of the case:
USA DOT 7A TYPE A
Humboldt Scientific Name and address
Serial No.

An outer cosmetic fiberboard container may be employed with the same labels plus an additional notice that the inner container meets the applicable specifications.

The case is designed for multiple use provided the hinges, latches and lock are intact and the labels Markings are readable.

A maximum weight of 90 pounds was tested.

The package tests and results documentation in Humboldt test procedures numbers are (HPTP-001 through HPTP-04) and test results numbers are (HPTR-001 through HPTR-004).

Leak Test Methods: Per 49 CFR 173.413 (j), the tests used must show that the packaging will prevent--(1) Loss or dispersal of radioactive contents; and (2) A significant increase in the radiation levels recorded or calculated at the external surfaces for the condition before the test. The test methods are outlined below:

1. The background and package dose was measured prior to the test to establish the net dose measurement of the package. After each test, the external radiation measurement of the package is recorded.
2. After each test, leak tightness of the sealed capsule was verified by the wet wipe test method described in Humboldt WIPE TEST PROCEDURE. In this test, the external surfaces of the package are thoroughly wiped with a filter paper moistened with a liquid. The activity of the swab is measured. If the detected activity was less than 0.005 uCi, the sealed source is considered leak-free.

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The test results are as follows:

Water Spray Test: The water spray must precede each test or test sequence when conducting Type A packaging tests. The package was exposed to water spray from four directions simultaneously for one hour. Containers were used as rain gauges to verify adequate flow, which exceeded the requirement of 2 inches/hour. The package was fully soaked. The package remained intact. No other change or damage was observed. Integrity was verified by the leak tests as described above and results passed.

Free Drop Test: The free drop test must be within a two-hour interval following the spray test. The specimen was dropped as to ensure maximum damage to the safety features and/or containment. The package was dropped onto a target from a height of 4 feet (1.2 m) on each corner. The package was scuffed at the edges with only superficial damage. The edges were slightly deformed. No other change or damage was observed. Integrity was verified by the leak tests as described above and results passed.

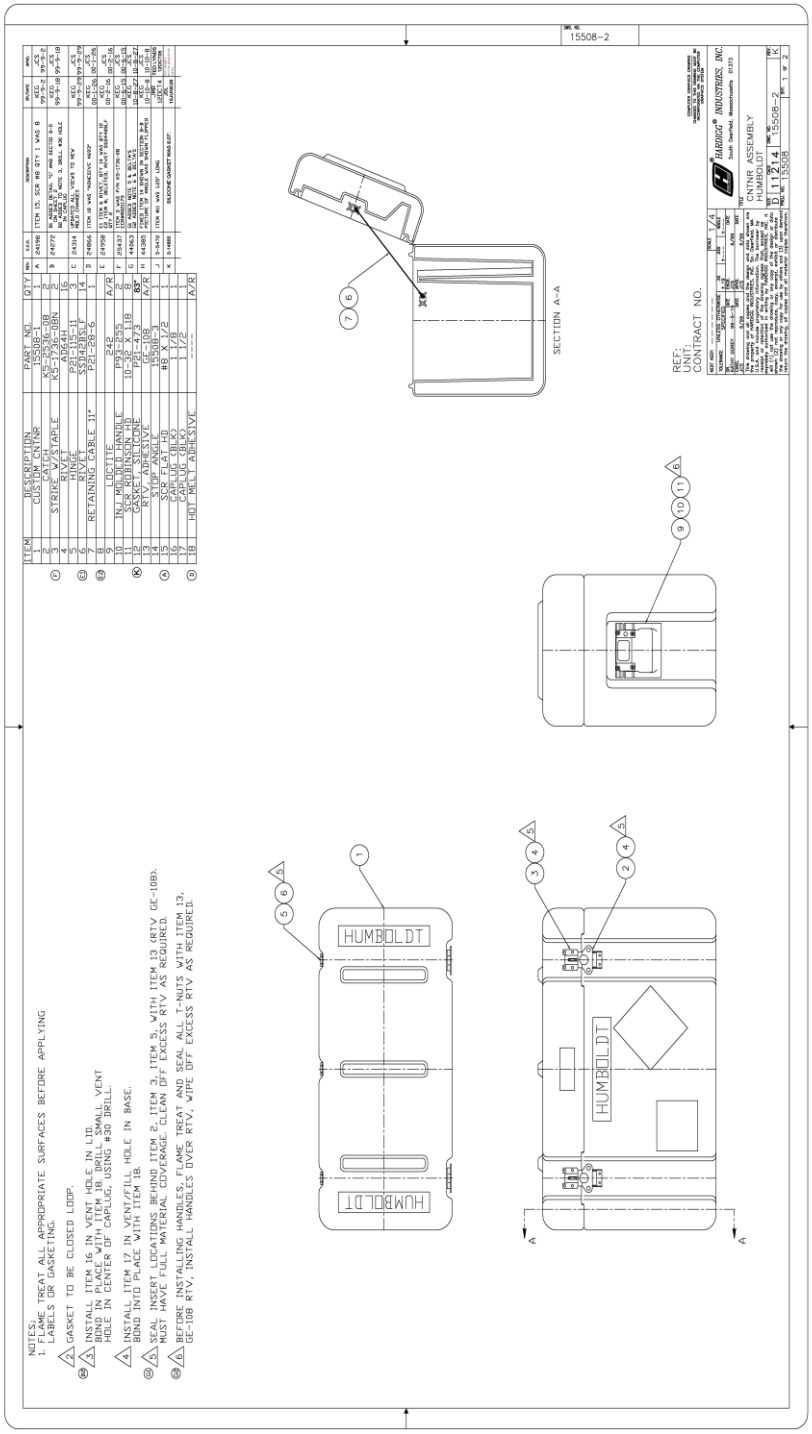
Penetration Test: The penetration test must be within a two-hour interval following the water spray test. The package specimen was placed on a rigid, flat, horizontal surface which would not move while the test is being performed. A bar of 1.25 inches (3.2 cm) in diameter with a hemispherical end and a mass of 6 kg was directed to fall with its longitudinal axis vertical, onto the center of the weakest part of the package from 1 m (3.3 feet). The penetration test resulted in a dimple in the surface matching the end of the bar can be seen. The package remained intact and sealed. No other change or damage was observed. Integrity and leak tightness were verified by the leak test method described above and results passed.

Stacking Test: The stacking test must be within a two-hour interval following the water spray test. The packaging specimen was subjected to a compressive load of five times its mass for a minimum of 24 hours. The comprehensive load was applied uniformly to top side of the specimen. The results of the stacking test were barely visible. Integrity and leak tightness were verified by the leak test method described above and results passed.

Conclusion:

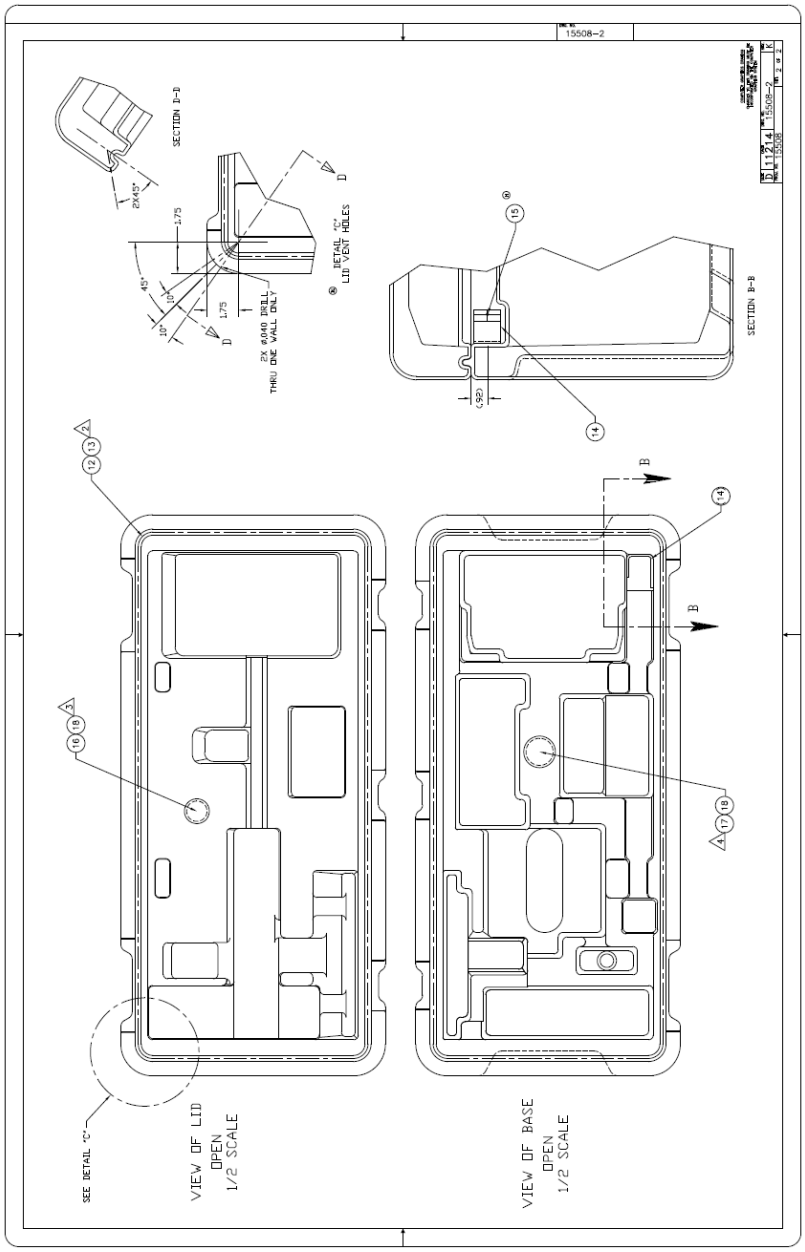
The package passed the water spray, free drop, penetration, and stacking tests as defined in 49 CFR 173.465 and the test criteria outlined in 49 CFR 173.412 (j). Based upon the results obtained, Model HS-200681 meets the USA DOT Type A packaging requirements.

DOT Type A Package Test Report



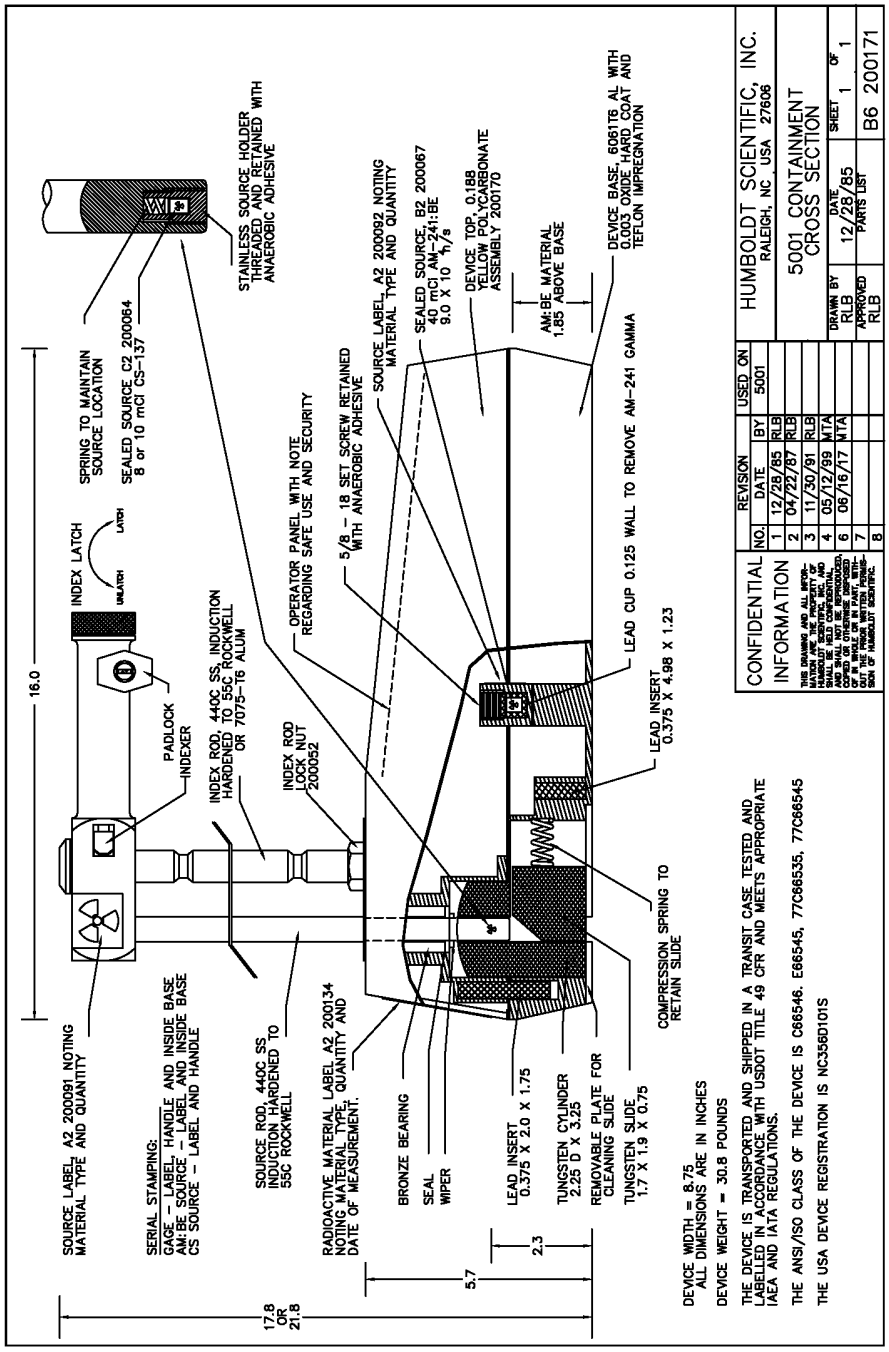
Attachment 1

DOT Type A Package Test Report



Attachment 2

DOT Type A Package Test Report



Attachment 3

HS-200681 5001 SERIES TRANSIT CASE CLOSURE INSTRUCTIONS

Humboldt Scientific, Inc. has prepared the following closure instructions in accordance with 49 CFR 178.2 (c). This document also provides information specifying the types and dimensions of the closures, including gaskets and the components needed to ensure that the packaging is capable of successfully passing the applicable performance tests.

1. Visually inspect the transit case and its contents for the following:
    a. Divergence from specifications or drawings.
    b. Defects in construction.
    c. Corrosion or other deterioration.
    d. Distortion of features.

    Note: If the case is older and well used, it is important to check the seal in the lid and the draw latches which hold the lid closed to ensure they are in good condition. A new case is shown in Figure 1.

Figure 1 – Transit Case HS-200681

2. Before the gauge can be installed into the case, the radioactive source which is extended from the gauge during normal usage must be fully retracted into the gauge. The source is located at the lower end of the source rod (See Figure 2).

Figure 2 -Extended Source Rod into the material under test

3. To retract the source rod with the radioactive source, squeeze the handle trigger on the handle of the gauge and lift the handle until it locks in the top position (See Figures 3 & 4).

Figure 3 - Squeezing the Handle

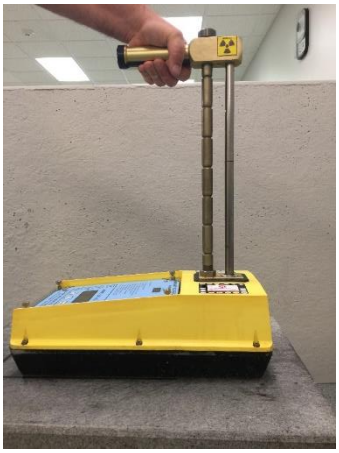


Figure 4 - Handle at Top Position

4. Secure the handle by installing the padlock through the hole in the handle trigger and close the padlock (See figure 5).

Figure 5 - Installing the Padlock

5. Begin loading the standard contents into the transit case. The items to be loaded include a nuclear Moisture/Density gauge, scraper plate, hammer, drill rod, reference standard block, drill rod extractor, tool bag, and gauge documentation packet. The items may be loaded in any order, but the items shown in this procedure will be shown starting with the Moisture/Density gauge. Figure 6 shows the gauge being loaded into the case.

Figure 6 – Installing Gauge

6. Add the documentation packet (Figure 7).

Figure 7 – Installing Documentation Packet

7. Add the reference standard block (Figure 8).

Figure 8 – Installing Reference Standard Block

8. Add the scraper plate (Figure 9).

Figure 9 – Installing Scraper Plate

9. Add the hammer (Figure 10).

Figure 10– Installing Hammer

10. Add the tool bag (Figure 11).

Figure 11 – Installing Tool Bag

11. Add the drill rod (Figure 12).

Figure 12 – Installing Drill Rod

12. Add the drill rod extractor (Figure 13).

Figure 13 – Installing Drill Rod Extractor

Figure 14 – Loaded Case

13. Close the lid of the case (Figure 15).

Figure 15 – Lid Closed, Not Latched

14. Raise the lower portion of the draw latch, located at the front on the bottom half of the case, up so that the hook end of the draw latch can be hooked onto the catch located on the front of the lid (Figure 16). If the hook on the draw latch does not go above the catch, it may be necessary to turn the butterfly handle counterclockwise to raise the hook higher.

Figure 16 – Raised Draw Latch

15. Rotate the butterfly handle clockwise until it pulls the lid closed (Figure 17).

Figure 17 – Lid Pulled Closed

16. Fold the butterfly handle downward and parallel to the front of the case (Figure 18).

Figure 18 – Butterfly Handle Folded Down

17. A gauge user will complete the case closure by using a padlock, or other locking device, through one or both holes in the catch eyes on the front of the case (Figure 19).

Figure 19 – Padlock Installed

18. When Humboldt Scientific, Inc. ships a nuclear Moisture/Density gauge, the natural colored zip tie is routed through the catch eye in both draw latches and through the holes in both butterfly handles (Figure 20). A tamper resistant security seal is also routed through the catch eye of both draw latches (Figure 21).

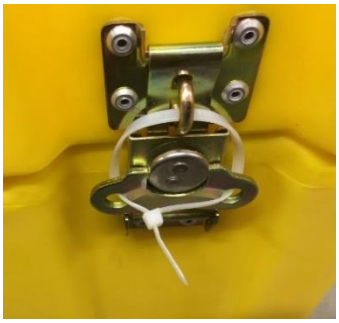


Figure 20 – Zip Tie Attached

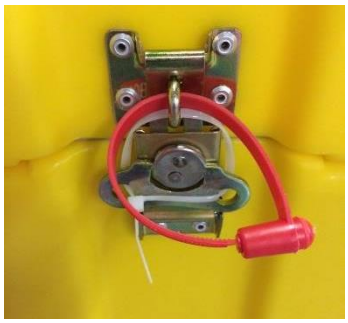


Figure 21 – Tamper Resistant Security Seal Installed

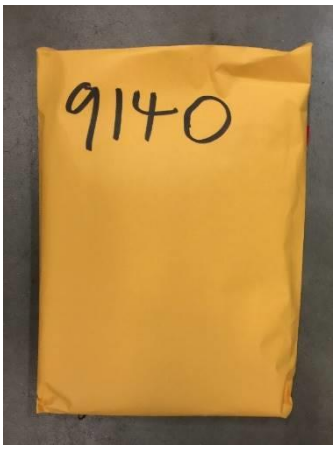
Transit Case Contents

Nuclear Moisture/Density Gauge

Reference Standard Block

Drill Rod Extractor

Hammer



Documentation Packet

Scraper Plate

Tool Bag

Drill Rod