

HUMBOLDT SCIENTIFIC, INC. TRANSPORTATION GUIDE FOR PORTABLE NUCLEAR GAUGES

SEPTEMBER 2022



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TRANSPORTATION GUIDE

INTRODUCTION

This guide has been prepared to assist Humboldt Scientific (Humboldt) nuclear gauge users with shipping and transporting portable nuclear gauges in the U.S. and complying with U.S. Department of Transportation (DOT) hazardous material (Hazmat) regulations and International Air Transport Association (IATA) Dangerous Goods Regulations. While Humboldt will attempt to keep this guide current, transportation regulations may change at any time and Humboldt does not guarantee the completeness and accuracy of the information contained herein. Responsibility for compliance with all transportation requirements, including specific state regulations, lies with those persons who prepare, ship, and transport nuclear gauges.

APPLICABLE REGULATIONS

The U.S. Department Of Transportation (U.S. DOT) regulations are contained in Title 49 of the Code of Federal Regulations, Parts 100-185 (49 CFR 100-185), which can be viewed online at the U.S. DOT hazmat web site: <u>http://www.phmsa.dot.gov/hazmat/regs</u>. Transportation of Licensed Material requires compliance with U. S. DOT regulations in 49 CFR. The major areas the U.S. DOT regulations that are most relevant for transportation of typical portable gauges that are shipped as Radioactive Yellow II labeling and Type A packaging are found in Appendix A.

IATA Dangerous Goods Regulations may be purchased from the IATA online store at: <u>http://www.iata.org</u>. The U.S. DOT HAZMAT regulations apply to all U.S. domestic shipments by all modes of transport, while IATA regulations apply to all shipments by air, both international and domestic. When shipping a nuclear gauge by Federal Express, the gauge must be prepared in accordance with IATA regulations for shipment by air.

The focus of this guide is on preparing nuclear gauges for shipment via common carriers and on transporting gauges as a private carrier. A company that owns a nuclear gauge and transports it to and from job sites is considered a private carrier. Private carriers generally own the goods (nuclear gauge) being transported and the transportation of the goods is incidental to their regular business. Common and contract carriers, on the other hand, are "for hire" carriers whose primary business is transportation of goods for others.

The major requirements that apply to shipping a gauge via common carrier or transporting a gauge as private carrier include:

- A current copy of the International Atomic Energy Agency (IAEA) Certificate of Competent Authority (special form certificate) for each source in the gauge must be on file.
- The gauge must be in a TYPE A package and a copy of the TYPE A package testing results must be on file.
- The package must be properly marked, labeled, sealed, and inspected prior to each shipment.
- The package must be properly loaded and secured in the vehicle.
- Properly completed shipping papers (Bill of Lading) must be in the transport vehicle and within reach of and readily accessible to the driver.
- Ensure that shipping papers contain proper entries (e.g., shipping name, hazard class, identification number (United Nations (UN) number), total quantity, package type, nuclide, reportable quantities,

radioactive material, physical and chemical form, activity, category of label, Transport Index (TI), shipper's name, certification and signature, emergency response phone number, cargo aircraft only label (if applicable)).

- An Emergency Response Information document must be in the transport vehicle with the shipping papers and immediately accessible to the driver.
- An emergency response phone number must be manned continuously while the gauge is in transit. Note that this service is provided free of charge by Humboldt.
- Ensure that the field user has the following available for inspection: copy of the radioactive material license, copy of individuals' authorization from the RSO, copy of gauge operator's manual, copy of radiation safety plan, copy of the current leak test, Bill of Lading (shipping paper), and an approved transit case.
- A certificate of training must be on file for each hazmat employee involved in the shipment, essentially any individual involved in packaging, preparing shipping papers, or transporting a nuclear gauge (training classes are offered by Humboldt).

TRAINING REQUIREMENTS

Hazmat training is required for employees that transport portable nuclear gauges. Initial and recurrent training must be given to all employees who transport portable gauges per the requirements of Subpart H, "Training," of 49 CFR Part 172. The licensee shall maintain transportation shipping records in accordance with the requirements of Subpart C, "Shipping Papers," of 49 CFR Part 172, including the proper shipping name, hazard class (7), United Nations (U.N.) identification number, the name of the shipper, and the name and activity of each radionuclide.

The regulations define a *hazmat employee* as a person (including a self-employed person) who is employed by a hazmat employer and who:

- Loads, unloads, or handles hazmat (e.g., a nuclear gauge containing hazardous materials);
- Tests, reconditions, repairs, modifies, marks, or otherwise represents packaging's as qualified for use in the transportation of hazmat;
- Prepares hazmat for transportation;
- Is responsible for safety of transporting hazmat; or
- Operates a vehicle used to transport hazardous materials.

Hazmat employees must train and test, certify, and develop and retain records of current training for each hazmat employee (during the period of employment and 90 days thereafter). Initial hazmat training must be completed within 90 days of employment or change in job function. Before completing training, an employee may only perform hazmat functions under the direct supervision of a properly trained and knowledgeable hazmat employee. Hazmat refresher training is required at least once every three years per U.S. DOT hazardous material rules. IATA requires refresher training every two years.

Hazmat employee training must include the following:

- General awareness/familiarization training
- Function-specific training

- Safety training
- Security awareness training
- In-depth security training

Training records must include:

- Hazmat employee's name;
- Completion date of most recent training;
- Training Materials (copy, description, or location);
- Name and address of hazmat trainer; and
- Certification that the hazmat employee has been trained and tested.

To assist you in meeting these training requirements, Humboldt offers both initial and hazmat refresher training courses, including testing and certification. For further information about Humboldt training opportunities, please visit the Humboldt website at http://www.humboldtscientific.com/classes.html.

CERTIFICATE OF COMPETENT AUTHORITY

The sealed sources in Humboldt gauges meet the U.S. DOT requirements for classification as Special Form Radioactive Material. Special Form materials are designed and constructed to maintain their physical integrity and prevent radioactive contamination even under severe accident conditions. The testing requirements that "special form" materials must meet are described in 49 CFR 173.469. Sources meeting these requirements are issued a Certificate of Competent Authority by the International Atomic Energy Agency (IAEA).

A shipper must keep a copy of the IAEA Certificate of Competent Authority (also known as Special Form Certificate) for at least one year after the latest shipment of special form radioactive material [49 CFR 173.476(a)]. An example of a special form certificate is shown in Appendix B. Please note that these certificates have expiration dates. You must have a current copy in your possession before you can legally ship special form radioactive materials. If shipping a gauge by air, a copy of the special form certificate must be included with the shipment.

Current copies of the certificates can be downloaded from the Humboldt web site at <u>http://www.humboldtscientific.com/resources.html</u>. When requesting a special form certificate, please provide your gauge model number and serial number or the special form certificate number.

TYPE A PACKAGES – TESTING, MARKING AND LABELING

The type, form, and quantity of radioactive material in all Humboldt portable nuclear gauges requires the use of Type A packaging during transportation. The Humboldt shipping cases meet all Type A package standards described in 49 CFR 173.410 and 49 CFR 173.412. Each shipper of a (Specification 7A) Type A package must maintain on file for at least one year after the latest shipment, documentation of the Type A package testing methods and results. This documentation is provided in Appendix C for two Humboldt shipping cases that have been, and are currently used.

49 CFR requires that shipments of quantities of hazardous materials above certain levels be reported to the EPA in the event of an accident. For the radioactive materials in the gauge per 49 CFR 172.101, Appendix A, Table 2, these "Reportable Quantities" are:

Cs-137 1,000 mCi

Am-241 10 mCi

Activity levels in Humboldt gauges of 10 mCi of Cs-137 is not a reportable quantity, but 40 mCi of Am-241/Be is. For a reportable quantity, RQ must be included either before or after the description. RQ may also replace the X in the HM column of the shipping paper. The shipping name label on the package must include the RQ (see label on page 7).

U.S. DOT requires the name and address of the shipper and consignee to be marked on the package, except when the package is transported by highway only and will not be transferred from one motor carrier to another. Therefore, when transporting a gauge to and from a job site by highway, name and address marking is not required. However, if a gauge is transported by a common carrier, name and address marking is required. [49 CFR 172.301(d)]

For transport by air, IATA requires the full name and address of the shipper and the consignee to be shown on the same side of the package and near the proper shipping name marking.

| RADIOACTIVE | Dose rate at package surface | Transport Index |
|-------------|--------------------------------|-----------------|
| WHITE I | =<0.5 mrem/hr | NA |
| YELLOW II | >0.5 mrem/hr to =<50.0 mrem/hr | =<1.0 |
| YELLOW III | >50.0 mrem/hr | =<10.0 |

A radioactive label must be selected from the following:

The Humboldt gauge instruction manual will include a radiation profile drawing showing dose rate measurement on the surface and at one meter. All Humboldt gauges fall under the RADIOACTIVE YELLOW II category. RADIOACTIVE YELLOW II labels must be placed on two opposite surfaces. The source activity and Transport Index entered should agree with the manufacture's published data.

The Transport Index (TI) is an indicator to the vehicle operator the degree of control required. It is actually the dose rate in mrem/hr at one meter from the package. Since it is intended to be used by non-technical personnel, it is expressed as a dimensionless number rounded up to the nearest 1/10th. For multiple package shipments, the driver limits the vehicle total TI to 50. Package(s) with a TI of 1.0 or less should not be closer to passengers than one foot. All Humboldt gauges have a TI value of 0.2 and this value is included on the label below.

The package must be marked with the following labels and markings:



USA DOT 7A TYPE A Radioactive material Type a package Special form UN 3332 RQ

Humboldt Scientific, Inc. 2525 Atlantic Ave., Raleigh, NC 27604 USA 919.833.3190

RADIOACTIVE YELLOW II labels (see above) must be placed on two opposite surfaces. The source activity and Transport Index entered should agree with the manufacture's published data. A label (see above) containing the words Radioactive Material, Type A Package, Special Form, UN3332, and RQ must be placed on at least one side of the package.



A Cargo Aircraft Only label (see above) is required only if shipping by Air. This label must be installed within 6 inches of each of the two RADIOACTIVE YELLOW II labels.



A marking (see above) must include gauge manufacturer's name, complete address, and gauge serial numbers with letters sized at 1/2 inch.

INSPECTING PACKAGES BEFORE SHIPPING

The shipper must inspect each shipping case before each shipment to ensure it is in unimpaired physical condition, except for superficial marks, and that each closure device (hinge, hasp, latch, etc.) is properly installed and operational, secured, and free of defects. The shipper must also ensure that contamination and external radiation levels are within allowable limits and that external radiation levels are consistent with the Transport Index shown on the radioactive labels on the package. If the gauge is in undamaged condition, this requirement may be met by visual inspection of the gauge. However, if the gauge has been damaged, radiation measurements should be made with a survey instrument and a leak test performed on the sealed sources prior to shipping or transporting the gauge. Ensure that all latches are securely closed on the package.

Appendix D provides a shipping checklist that Humboldt currently uses.

SHIPPING PAPER – BILL OF LADING

A gauge shipment must be accompanied by a shipping paper, or Bill of Lading (Appendix E), and include the following information:

- Name of Shipper
- Description, RQ
- Contents and activity (in parentheses)
- Label Category
- Transport Index
- Package Type
- Certification/Signature: Note: This is not required for a private carrier if the shipment is not to be transferred to another party. It is easiest to include it, just in case.
- Emergency Contact: Note: A telephone number which must be monitored at all times the shipment is in transit and answerable by a person knowledgeable of the hazardous material being shipped and has comprehensive emergency response information, or has immediate access to a person with such knowledge. For normal daytime work this can be the organization's phone number with instructions to notify the RSO. When shipping the gauge for service, the service centers will normally supply a 24-hour number.

When transporting hazmat by motor vehicle, the driver must ensure that the shipping papers are readily available to, and recognizable by, authorities in the event of an accident or inspection. When the driver is at the vehicle's controls, the shipping paper must be within immediate reach while the driver is restrained by the lap belt. The paper must be either readily visible to a person entering the driver's compartment (e.g., on the seat next to the driver) or in a holder which is mounted to the inside of the door on the driver's side of the vehicle. When the driver is not at the controls of the vehicle, the shipping papers must be on the driver's seat or in a holder which is mounted to the inside of the driver's side of the vehicle.

EMERGENCY RESPONSE INFORMATION

An emergency response information sheet must accompany the shipment of a nuclear gauge. This document must be in the transport vehicle and immediately accessible to the driver during transportation on a public highway. An example of the Humboldt emergency response information sheet is shown in Appendix F.

A 24-hour emergency response telephone number must be provided on the shipping paper. This number must be manned continuously, while the gauge is in transit, by someone who is knowledgeable of the hazards and characteristics of the hazardous material being shipped, has comprehensive emergency response and accident mitigation information for that material, or has immediate access to a person who possesses such knowledge and information. Humboldt utilizes the services of INFOTRAC which has an emergency response number of 800-535-5053 that Humboldt gauge owners may use. However, if this number is used on shipping papers, the shipper must place its company's name immediately before, after, above, or below the emergency response phone number. Both the emergency phone number and company's name must be printed in a prominent, readily identifiable, and clearly visible manner that allows the information to be easily and quickly found (e.g., highlighted, larger font, or different color text).

DRIVER RESPONSIBILITIES

| <u>Inspection</u> | The gauge and package should be checked prior to each shipment. This should include the integrity of the package; case, hinge, hasps, and that all required labels and marking are installed, readable, not faded, and the gauge and package are locked. |
|-----------------------|---|
| Braced | The package should be braced in the vehicle to prevent movement during transportation or a reasonable accident. This can be accomplished by brackets, chain, wire rope, or cord. |
| Safe | The package should not be in the passenger compartment. The preferred locations are the rear of a pickup, rear of a van, or trunk of a sedan. |
| <u>Secure</u> | The package should be, chained, or wire roped and locked to the bed of a pickup or locked in the freight area of a van, or locked in the trunk of a sedan, to prevent theft. |
| Driving | Drive in a friendly, low profile manner. E.g. minimum lane changes, and park in the outer area of a public parking lot. |
| <u>Shipping Paper</u> | The driver should have within view and within reach (normally on the seat adjacent to the driver) the shipping paper, and the emergency response information sheet. Also, if a driver leaves a vehicle, the shipping paper must be left on the driver's seat or in a pocket on the driver's door. |

COMMERCIAL SHIPMENTS

The previously defined requirements for private carriage transportation apply with the following changes/additions:

Label - Consignor/consignee. An address label must be on the package.

Lock or Seal - The package must incorporate a seal that if broken will show improper entry.

Additional requirements depend upon the mode of commercial transportation; truck, air-domestic, and air-international.

Domestic Shipment By Truck

Shipping Paper

The shipping paper will be a Bill of Lading supplied by the carrier and properly filled out by the shipper. If more than the gauge will be shipped, the hazardous material must be listed first. The pre-printed Bill of Lading from the trucking company includes the certification. See Appendix E for a sample Bill of Lading.

Driver

The driver may keep the shipping papers in a pocket on the driver's door.

Domestic Shipment By Air

In the USA, shipment of the radioactive material in the gauge is not allowed on passenger carrying aircraft. This is not a problem since Federal Express, a cargo only airline, can transport the gauge anywhere in the USA overnight. While it is a domestic shipment, Federal Express has opted to follow the requirements of the International Air Transport Association (IATA) rather than 49 CFR. This requires some changes and additional information.

Shipping Paper

Federal Express has a special combination document that is both an Air Waybill and a Declaration of Dangerous Goods (DG) Document. The DG document has specific places for the shipping information. It includes certification.

The words "Cargo Aircraft Only" must appear on the Air Waybill.

The source activity on the DG document must be stated in units of Becquerels, instead of, or in addition to the units of Curies.

370 MBq (10 mCi) 1.48 GBq (40 mCi)

The size of the package on the DG document must be stated in metric units.

Pay careful attention to details of completing the form. Any minor error, like leaving the title off of the signer will be cause for rejection of the shipment. The carrier is not allowed to make corrections. You will be required to go to the terminal.

HUMBOLDT SHIPPING ASSISTANCE

Humboldt provides detailed instructions on shipping gauges at <u>http://www.humboldtscientific.com/services-shipping.html</u>. Appendix G provides these instructions.

Download the Humboldt RMA form from the Humboldt website and fill it out completely. This form should then be printed and packed with your gauge during shipment (see Appendix H). http://www.humboldtscientific.com/download/pdf/RMA-FORM.pdf

View Shipper's Declaration of Dangerous Goods under 7000 (see Appendix I). - <u>Shipper's Declaration for</u> Dangerous Goods Form (for Humboldt gauges with serial numbers under 7000) (Download)

View Shipper's Declaration of Dangerous Goods beginning with 7000 and above (see Appendix I). -Shipper's Declaration for Dangerous Goods Form (for Humboldt gauges with serial numbers beginning with 7000 and above) (Download)

RECORD KEEPING REQUIREMENTS

The following is a summary of the record keeping requirements applicable to shippers of Humboldt portable nuclear gauges.

| Record | |
|--|---|
| Hazmat employee training records including: Employee name Training completion date Description, copy, or the location of the training materials used Name and address of the person providing the training Certification that the hazmat employee has been trained and tested | A record of current training, inclusive of the preceding three years, in accordance with this section shall be created and retained by each hazmat employer for as long as that employee is employed by that employee and for 90 days thereafter. [49 CFR 172.704(d)]. |
| IAEA Certificate of Competent Authority for special form radioactive material | 1 year after the latest shipment [49 CFR 173.476(a)] |
| Type A package testing methods and results – See Appendix J, Transit Case Certifications | 2 years after the latest shipment [49 CFR 173.415(a)] |
| Shipping papers | 2 years after date of shipment [49 CFR 172.201(e)] |
| Package closure instructions provided by the package manufacturer – See Appendix K, Package Closure Instructions | 365 days after the package is offered for shipment [49 CFR 178.2(c)(1)(ii)] |

GAUGE SECURITY

The U.S Nuclear Regulatory Commission has created security requirements (10 CFR 30.34(i)) that apply whenever gauges are not under control and constant surveillance, including (1) storage on vehicles, (2) storage at temporary facilities, (e.g., residence, hotel, job site trailer), and (3) storage at permanent facilities. The objective of security requirements is to reduce the opportunity for unauthorized removal and/or theft by providing a delay and deterrent mechanism.

At all times, licensees are required to maintain control and constant surveillance of the portable gauge when it is in use and, at a minimum, use two independent physical controls to secure the portable gauge from unauthorized removal while it is in storage. The physical controls used should be designed and constructed of materials suitable for securing the portable gauge from unauthorized removal, and both physical controls must be defeated in order for the portable gauge to be removed. The construction and design of the physical controls should be such that they will deter theft by requiring a more determined effort to remove the portable gauge. The security procedures should ensure that the two physical barriers chosen, increase the deterrence value over that of a single barrier, and that the two physical barriers would make unauthorized removal of the portable gauge more difficult. Various security scenarios are suggested in the latest version of NUGEG-1556, Vol. 1, Program-Specific Guidance About Portable Gauge Licenses. Selected information from this document is provided in Appendix L. Please note that the various State Departments of Transportation and Radiation Protection Agencies may have specific security requirements different than those described in this report. Gauge users should comply with any of these state requirements.

Appendix A

Transportation Regulations

Appendix A

<u>49 CFR Part 172</u>, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans."

- (1) Table of Hazardous Materials and Special Provisions (<u>Subpart B</u>)
 - purpose and use of hazardous materials (<u>49 CFR 172.101</u>)
 - list of hazardous substances and reportable quantities (<u>49 CFR 172.101</u> <u>Appendix A, Table 2</u>)
- (2) Shipping Papers (<u>Subpart C</u>)
 - preparation and retention of shipping papers (<u>49 CFR 172.201</u>)
 - description of hazardous material on shipping papers (<u>49 CFR 172.202</u>)
 - additional description requirements (<u>49 CFR 172.203</u>)
 - shipper's certification (<u>49 CFR 172.204</u>)
- (3) Package Markings (<u>Subpart D</u>)
 - general marking requirements for non-bulk packaging's (<u>49 CFR 172.301</u>)
 - prohibited marking (<u>49 CFR 172.303</u>)
 - marking requirements (49 CFR 172.304)
 - Class 7 (radioactive) materials (<u>49 CFR 172.310</u>)
 - hazardous substances in non-bulk packaging's (49 CFR 172.324)
- (4) Package Labeling (<u>Subpart E</u>)
 - general labeling requirements (<u>49 CFR 172.400</u>)
 - prohibited labeling (<u>49 CFR 172.401</u>)
 - Class 7 (radioactive) material (<u>49 CFR 172.403</u>)
 - placement of labels (<u>49 CFR 172.406</u>)
 - label specifications (<u>49 CFR 172.407</u>)
 - RADIOACTIVE WHITE I label (<u>49 CFR 172.436</u>)
 - RADIOACTIVE YELLOW II label (49 CFR 172.438)
 - RADIOACTIVE YELLOW III label (49 CFR 172.440)
- (5) Placarding of Vehicles (<u>Subpart F</u>)
 - applicability of placarding requirements (<u>49 CFR 172.500</u>)
 - prohibited and permissive placarding (<u>49 CFR 172.502</u>)
 - general placarding requirements (<u>49 CFR 172.504</u>)
 - providing and affixing placards: highway (<u>49 CFR 172.506</u>)
 - visibility and display of placards (<u>49 CFR 172.516</u>)
 - general specifications for placards (49 CFR 172.519)
 - RADIOACTIVE placard (<u>49 CFR 172.556</u>)
- (6) Emergency Response Information (<u>Subpart G</u>)
 - applicability and general requirements (<u>49 CFR 172.600</u>)
 - emergency response information (49 CFR 172.602)
 - emergency response telephone number (<u>49 CFR 172.604</u>)
- (7) Training (<u>Subpart H</u>)
 - applicability and responsibility for training and testing (<u>49 CFR 172.702</u>)
 - training requirements (<u>49 CFR 172.704</u>)

<u>49 CFR Part 173</u>, "Shippers—General Requirements for Shipments and Packaging's," Class 7 (Radioactive) Materials (Subpart I)

- definitions (<u>49 CFR 173.403</u>)
- general design requirements (<u>49 CFR 173.410</u>)
- additional design requirements for Type A packages (<u>49 CFR 173.412</u>)
- authorized Type A packages (<u>49 CFR 173.415</u>)
- requirements for determining basic radionuclide values, and for listing of radionuclides on shipping papers and labels (<u>49 CFR 173.433</u>)
- table of A1 and A2 values for radionuclides (<u>49 CFR 173.435</u>)
- radiation level limitations and exclusive use provisions (<u>49 CFR 173.441</u>)
- quality control requirements prior to each shipment of Class 7 (radioactive) materials (<u>49 CFR 173.475</u>)
- approval of special form Class 7 (radioactive) materials (<u>49 CFR 173.476</u>)

49 CFR Part 177, "Carriage by Public Highway"

- (1) General Information and Regulations (<u>Subpart A</u>)
 - driver training (<u>49 CFR 177.816</u>)
 - shipping papers (<u>49 CFR 177.817</u>)
- (2) Loading and Unloading (<u>Subpart B</u>)
 - general requirements (packages secured in a motor vehicle (<u>49 CFR 177.834(a))</u>
 - Class 7 (radioactive) material (<u>49 CFR 177.842</u>)

Appendix B

IAEA Certificate of Competent Authority



East Building, PHH-23 1200 New Jersey Ave, SE Washington, D.C. 20590

U.S. Department of Transportation

IAEA CERTIFICATE OF COMPETENT AUTHORITY SPECIAL FORM RADIOACTIVE MATERIALS

Pipeline and CERTIFICATE USA/0634/S-96, REVISION 6 Hazardous Materials Safety Administration

This certifies that the source described has been demonstrated to meet the regulatory requirements for special form radioactive material as prescribed in the regulations of the International Atomic Energy Agency¹ and the United States of America² for the transport of radioactive material.

- <u>Source Identification</u> QSA Global, Inc. Model X.8 (Manufactured on or after September 23, 1981).
- 2. <u>Source Description</u> Cylindrical double encapsulation made of stainless steel and tungsten inert gas or laser seal welded. Approximate exterior dimensions are 6.1 mm (0.24 in.) in diameter and 8.3 mm (0.33 in.) in length. Minimum wall thickness of the outer encapsulation is 0.4 mm (0.02 in.). Construction shall be in accordance with attached AEA Technology QSA, Inc. Drawing No. RBA62011, Rev. C.
- 3. <u>Radioactive Contents</u> No more than either 37.0 GBq (1.0 Ci) of Cesium-137, or 740.0 MBq (20.0 mCi) of Radium-226, or 740.0 MBq (20.0 mCi) of Barium-133. The Cs-137 is in the form of a cesium silicate in a glass matrix or a sulfate as ceramic ion exchange pellets. The Ra-226 is in the form of a low solubility radium sulfate powder. The Ba-133 is in the form of barium silicate as a glass bead or a ceramic pellet.

¹ "Regulations for the Safe Transport of Radioactive Material, 2012 Edition, No. SSR-6" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

² Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

CERTIFICATE USA/0634/S-96, REVISION 6

- 4. <u>Management System Activities</u> Records of Management System activities required by Paragraph 306 of the IAEA regulations shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the requirements of Subpart H of 10 CFR 71.
- 5. <u>Expiration Date</u> This certificate expires on July 31, 2027. Previous editions which have not reached their expiration date may continue to be used.

This certificate is issued in accordance with paragraph(s) 804 of the IAEA Regulations and Section 173.476 of Title 49 of the Code of Federal Regulations, in response to the July 5, 2022 petition by QSA Global, Inc., Burlington, MA, and in consideration of other information on file in this Office.

Certified By:

July 25, 2022 (DATE)

William Schoonover Associate Administrator for Hazardous Materials Safety

Revision 6 - Issued to extend the expiration date.







U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

CERTIFICATE NUMBER: USA/0634/S-96

ORIGINAL REGISTRANT(S):

QSA Global, Inc. 40 North Avenue Burlington, MA, 01803 USA

Department of Energy U.S. Department of Energy 1000 Independence Ave, SW EM-60 Washington, DC, 20585 USA

Schlumberger 300 Schlumberger Drive MD-121 Sugar Land, TX, 77478 USA

U.S. Geologic Survey Idaho Water Science Center, U.S. Geological Survey Department of Interior 1955 N Fremont MS 4131 Idaho Falls, ID, 83415 USA

U.S. Army Corps of Engineers USACE Huntsville Center - Environmental and Munitions Center of Expert 721 19th St. Denver, CO, 80202 USA



East Building, PHH-23 1200 New Jersey Ave, SE Washington, D.C. 20590

U.S. Department of Transportation

IAEA CERTIFICATE OF COMPETENT AUTHORITY SPECIAL FORM RADIOACTIVE MATERIALS

Pipeline and
Hazardous Materials
Safety AdministrationCERTIFICATE USA/0632/S-96, REVISION 10

This certifies that the sources described have been demonstrated to meet the regulatory requirements for special form radioactive material as prescribed in the regulations of the International Atomic Energy Agency¹ and the United States of America² for the transport of radioactive material.

- 1. <u>Source Identification</u> QSA Global, Inc. Model Nos. AX1, X.1, and X.1/2 (All models manufactured on or after May 17, 1977).
- 2. <u>Source Description</u> Cylindrical double encapsulations made of stainless steel and tungsten inert gas or laser seal welded. Approximate outer dimensions of all models are 7.9 mm (0.31 in.) in diameter and 10.15 mm (0.4 in.) in length. Construction shall be in accordance with attached QSA Global, Inc. Drawing No. RBA10880, Rev. F.
- 3. <u>Radioactive Contents</u> No more than either 3.7 GBq (100.0 mCi) of Americium-241 or 13.0 GBq (351.0 mCi) of Californium-252. The Am-241 is in oxide form and mixed with beryllium powder and pressed into a solid pellet. The Cf-252 is in the form of an oxide pressed into a pellet, a metal wire, or an oxide solid ceramic.
- 4. <u>Management System Activities</u> Records of Management System activities required by Paragraph 306 of the IAEA regulations shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the requirements of Subpart H of 10 CFR 71.

¹ "Regulations for the Safe Transport of Radioactive Material, 2012 Edition, No. SSR-6" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

² Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

CERTIFICATE USA/0632/S-96, REVISION 10

5. <u>Expiration Date</u> - This certificate expires on June 30, 2027. Previous editions which have not reached their expiration date may continue to be used.

This certificate is issued in accordance with paragraph(s) 804 of the IAEA Regulations and Section 173.476 of Title 49 of the Code of Federal Regulations, in response to the May 2, 2022 petition by QSA Global, Inc., Burlington, MA, and in consideration of other information on file in this Office.

Certified By:

June 09, 2022 (DATE)

William Schoonover Associate Administrator for Hazardous Materials Safety

Revision 10 - Issued to extend the expiration date.





U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

CERTIFICATE NUMBER: USA/0632/S-96

ORIGINAL REGISTRANT(S):

QSA Global, Inc. 40 North Avenue Burlington, MA, 01803 USA

U.S. Geologic Survey Idaho Water Science Center, U.S. Geological Survey Department of Interior 1955 N Fremont MS 4131 Idaho Falls, ID, 83415 USA

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| B(ACTIVE DIAMETER) | 0.118[3.00] | 0.118[3.00] | | | | | | |
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U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

CERTIFICATE NUMBER: USA/0356/S-96

ORIGINAL REGISTRANT(S):

Eckert & Ziegler Isotope Products 24937 Avenue Tibbitts Valencia, CA, 91355 USA

J.L. Shepherd & Associates 1010 Arroyo Ave. San Fernando, CA, 91340-1822 USA

Halliburton 3000 North Sam Houston Parkway, East Houston, TX, 77032 USA

Stuart Hunt & Associates Ltd 5949 Ambler Drive Mississauga, Ontario, L4W 2K2 Canada

Tru-Tec Services, Inc. 11005 West Fairmont Parkway La Porte, TX, 77571 USA

Troxler Electronic Laboratories P.O. Box 12057 3008 Cornwallis Road Research Triangle Park, NC, 27709 USA

U.S. Geologic Survey Idaho Water Science Center, U.S. Geological Survey Department of Interior 1955 N Fremont MS 4131 Idaho Falls, ID, 83415 USA Appendix C

Prototype Testing

Appendix C

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:

- 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, Section §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).

Package Model:HS-200681 – For Transit Case with ToolsDrawing Number:15508-2Rev.:GApproved by Test Engineer:Harold ClarkTest Report Review Date:08/25/2017

Test performed:

| 173.465(b) | Water Spray Test of 2 inch/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) <u>USA/0632/S-96</u>, <u>Rev 9</u> or <u>CZ/1009/S-96</u>, <u>Rev 2</u>. Density measurements are accomplished by use of a Cesium-137 (Cs-137) doubly-encapsulated sealed stainless-steel gamma photon source <u>USA/0634/S-96</u>, <u>Rev 4</u> or <u>USA/0356/S-96</u>, <u>Rev 13</u>.

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 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, Inc. 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).

<u>Leak Test Methods</u>: 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.

The test results are as follows:

<u>Water Spray Test:</u> 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.

<u>Free Drop Test:</u> 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.

<u>Penetration Test:</u> 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.

<u>Stacking Test:</u> 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.

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Attachment 1



Attachment 2



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



Drill Rod Extractor



Reference Standard Block



Hammer



Documentation



Scraper Plate



Drill Rod



Tool Bag

Humboldt Scientific, Inc.

Type A Transit Case HS-200554 Certification

Drawing Numbers: 19D50572000 attachments 1 & HS-200554 attachment 2. This Configuration is HS-200554 type A transit case with Interior partitions of High Density Polyethylene.

Model: HS-200554 26.0 inches x 14.0 inches x 19.25 inches (66.04 cm x 35.56 cm x 48.90 cm) is constructed from 0.188 inch (0.5 cm) High Density Polyethylene (HDPE). 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 27lb. (12.3 kg) and for testing purposes the maximum weight is 70lb. (31.8 kg).

Packaging Description: Package in accordance with Humboldt transit case closure procedure (HPCP-002) attached. The interior partitions of High Density 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, 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 side 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:

- 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, Section §178.608 (Vibration Standard).

Authorized Signature:

Care .

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).

Package Model:HS-200554 – For Transit Case with ToolsDrawing Numbers:19D50572000Rev.:H & HS-200554Approved by Test Engineer:Harold ClarkTest 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 | | |
|------------|---|--|--|
| | 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) <u>USA/0632/S-96, Rev 9</u> or <u>CZ/1009/S-96, Rev 2</u>. Density measurements are accomplished by use of a Cesium-137 (Cs-137) doubly-encapsulated sealed stainless-steel gamma photon source <u>USA/0634/S-96, Rev 4</u> or <u>USA/0356/S-96, Rev 13</u>.

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 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 documentation. 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 Package 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 70 pounds was tested.

The package tests and results documentation in Humboldt test procedures numbers are (HPTP-005 through HPTP-008) and test results numbers are (HPTR-005 through HPTR-008).

<u>Leak Test Methods</u>: 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.

The test results are as follows:

<u>Water Spray Test:</u> 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.

<u>Free Drop Test:</u> 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.

<u>Penetration Test:</u> 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.

<u>Stacking Test:</u> 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-200554 meets the USA DOT Type A packaging requirements.



Attachment 1



Attachment 2



Attachment 3

HS-200554 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.

- 3. 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 typical case is shown in Figure 1 and Figure 2.



Figure 1 – Transit Case HS-200554 Interior



Figure 2 – Transit Case HS-200554 Exterior

4. 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 (Figure 3).



Figure 3 - Extended Source Rod into the material under test

5. 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 (Figure 4 & Figure 5).



Figure 4 - Squeezing the Handle



Figure 5 - Handle at Top Position

6. Secure the handle by installing the padlock through the hole in the handle trigger and close the padlock (Figure 6).



Figure 6 - Installing the Padlock

7. Begin loading the standard contents into the transit case. The items to be loaded include a nuclear moisture/density gauge, reference standard block, 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.

8. Add the gauge (Figure 7).



Figure 7 – Installing Gauge

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



Figure 8 – Installing Reference Standard Block

10. Add the documentation packet (Figure 9).





Figure 10 – Loaded Case

10. Close the lid of the case (Figure 11).



Figure 11 – Lid Closed, Not Latched



Figure 9 – Installing Documentation Packet

11. 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 12). 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 12 – Raised Draw Latch

12. Rotate the butterfly handle clockwise until it pulls the lid closed and fold the butterfly handle downward and parallel in front of the case (Figure 13).



Figure 13 – Lid Pulled Closed

13. A gauge user will complete the case closure by using a padlock, or other locking device, through one or both holes in the padlock eyes on the ends of the case (Figure 14).



Figure 14 – Case Locked with Padlock through Padlock Eyes

14. When Humboldt Scientific, Inc. ships a Moisture/Density gauge, the natural colored zip tie is routed through one of the padlock eyes on the ends of the case (Figure 15). Also, Humboldt routes a tamper resistant security seal through the natural colored zip tie (Figure 16).



Figure 15 – Zip Tie Attached to Padlock Eyes on the Ends of the Case



Figure 16 – Tamper Resistant Security Seal Routed Through Zip Tie

Appendix: Transit Case Contents



Figure 17 – Nuclear Moisture/Density Gauge



Figure 18 – Reference Standard Block



Figure 19 - Documentation Packet

Appendix D

Shipping Checklist for Hazardous Material

Appendix D

HUMBOLDT GAUGES SHIPPING CHECKLIST FOR HAZARDOUS MATERIAL

| This form is to be completed and initialed for all shipments involv. Contents: HS 5001 ser: | ing the radioactive materials contained in the HS-5001. |
|---|--|
| A. Gauge: | and A Look Text Lobel on Course |
| 1. Source rod locked of zip tie on nancie to prevent source exposu | rre 4. Leak Test Label on Gauge |
| 2. Visual check that sliding shield is closed. | 5. Calibration Label on Gauge |
| 3. Verify Transport Index using detection Instrument. | 6. Power turned off |
| B. Transit Container: | |
| 1. Yellow II transit labels on two opposite sides. | 3. Cargo only label, two opposite sides. |
| 2. RQ Label (red/white) two opposite sides. | 4. SN – serial number label includes address. |
| 5. If case not locked, Security Seal (sticker) across lid and base or | case banded SECURITY SEAL SN: |
| C. # 1 Documents-Inside case (envelope) | C. # 2 External Shipping Documents |
| 1. Gauge Operating Manual (applies to New gauges only). | 1. Bill of Lading and Emergency Response Sheet. |
| 2. Sealed Source Certificate (applies to New gauges only). | 2. Shippers Declaration for Dangerous Goods (AIR). |
| 3. Transit Case Certificate (applies to ALL gauge shipments) | 3. Certificates of Approval |
| 4. Case Closure Instructions (applies to ALL gauge shipments) _ | (USA 632-S & USA 634-S) (AIR) OR (USA 356-S & CZ/1009/S-96) (AIR) |
| 5. Emergency Response Sheet (applies to ALL gauge shipments | s) |
| 6. Certificates of Approval (USA 632-S & USA 634-S) OR (USA | 356-S & CZ/1009/S-96) |
| D. Outer cardboard container if used: 1. Proper transit labels same as 1, 2, & 3 of Transit Container labels | els above. |
| 2. Security seal across box flaps at both ends. (applies to new gat | uges only) |
| 3. Overpack and Inner package compliance label. (applies to new Note: All labels must be undamaged and no part covered with sea | y gauges only) ling tape or other shipping labels. |
| E. Restricted Country (10 CFR 110.29): Yes No If YE Embargoed Country (10 CFR 110.28): Yes No If YE | S, one shipment is limited to maximum of 22 HS-5001gauges. S, specific Export License (10 CFR 110.31) # |
| Customer Name: | State: Lic#: |
| If export, note country as alternate: | |
| Carrier Name: | |
| Waybill number: | |
| Tracking (Pro) number if used: | |
| Date of shipment: Pac | cker initials: |

Appendix E

Bill of Lading

Appendix E

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| HAZ-MAT 800-5 | EMERGENCY 535-5053 | CONT | ACT NUMBER CONTRACT NUMB 93326 | ER | OFFERERS | NAME/CONTRACT HOLD | ER'S NAME | | |
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| Note 1 - Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding: | | | | | | | | | |
| accordin | g to the appli | cable | regulations of the Department of Transportation. | CARRIER | | | | | _ |
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* Mark with an "X" to designate Hazardous Material as defined in Title 49 of the Code of Rederal Regulations, and insert Shipper's Haz-Mat Emergency Phone No.

Appendix F

Emergency Response Information

Appendix F



EMERGENCY RESPONSE INFORMATION

Humboldt Scientific, Inc. produces and ships material testing equipment, which may contain small amounts of radioactive material. These materials are "Special Form" as defined by the US Department of Transportation, Hazardous Materials Branch, and IATA regulations.

The radioactive materials may be cesium-137 and/or americium-24l:be. They are securely installed in the equipment and are shielded to maintain a Transport Index of 0.2 or less. The material description is:

"RQ Radioactive Material, Type A Package, Special Form, 7, UN3332". The equipment and transport case are tested to US DOT 7 A Type A specifications as described in CFR Title 49 part 173.465.

IMMEDIATE HAZARDS TO HEALTH

The material represents no immediate hazard to health unless ingested. Long term exposure to the unshielded sources (outside of the equipment shielding) should be limited to less than 350 hours at a distance of one meter. The dose rate at one meter is approximately 3.5 mrem/h. If the shielding is intact the dose rate at one meter is 0.2 mrem/h and exposure time should be limited to less than 6000 hours. The above exposure times are based on 1/4 of the maximum dose for radiation workers but, as with any use of a source of ionizing radiation, the exposure times should be limited to the minimum necessary to evaluate damage.

RISKS OF FIRE OR EXPLOSION

Temperatures above 600°C may melt the aluminum holding the shielding in place and extended temperatures above 1350°C may melt the encapsulation materials. If the latter condition has existed, precautions to prevent inhalation, skin contamination or ingestion must be taken. If burning of the transit case and melting of the aluminum parts is observed this condition may exist.

IMMEDIATE PRECAUTIONS TO BE TAKEN

Secure an area of approximately a 15-foot (5 meters) radius surrounding the site containing the instrument or debris and limit access to trained personnel until an evaluation of the risk can be determined.

Do not move or remove the damaged instrument or debris until it is determined that no contamination is present in the vicinity. Appropriate emergency response individuals/organizations such as the licensee's Radiation Safety Officer or contracted emergency response services should be contacted for assistance immediately. The appropriate State regulatory agencies or NRC should also be notified as soon as possible.

ACCIDENT HISTORY

While these instruments have been destroyed by accidents and fire, there have been no known instances where contamination and damage to health has occurred. Humboldt Scientific, Inc. is available at all times to offer assistance in the event of transportation accident.

EMERGENCY RESPONSE PHONE: 1-800-535-5053 OR52-323-3500 FOR EMERGENCY USE ONLY

HUMBOLDT SCIENTIFIC, INC., 2525 Atlantic Ave., Raleigh, NC USA 27604

Appendix G

Nuclear Gauge Shipping Instructions

Appendix G





Leak Test

Rental

Disposal

Shipping

How to ship your nuclear gauge to Humboldt

HUMBOLDT SHIP ASSIST

If you need assistance with your shipping or would like Humboldt to handle it for you, just contact us at: 1.800.537.4183.

Damaged Gauge Shipping:

To ship a damaged gauge to us for repair or disposal, you must first obtain prior approval. **To do this call us at 1.800.537.4183.** We will require that you send us photos, as well as a leak test, which has been performed on the gauge after the damage was inflicted.

To begin, you will need to pack your gauge into its shipping case. Be sure to lock the source rod in the "safe" position. Include the gauge and its reference block only. Do not send tools and other items with your shipment. You will want to lock the gauge and its shipping case.

If you are shipping a Humboldt gauge and case with the original locks you do not need to send the keys for the locks. However, if you have changed locks, aren't sure if you changed locks or are sending another manufacturer's gauge, place the keys in an envelope and attach them securely to the shipping case.

A Tamper Evident Security Seal may also be used to seal the shipping case per USDOT regulations. Also, be aware that damaged cases with holes or cracks other than superficial marks will not be permitted for shipping.

Also, be aware you will need a current, valid leak test for the gauge before shipping the gauge. Be sure to correctly indicate a valid leak test is available on the Humboldt RMA

You will need to confirm that Yellow II labels, indicating exactly what is in the case, are on the front and rear of the shipping case, as required by regulations. In addition to the Yellow II labels, you will also need an orange and black Cargo Aircraft Only (Do Not Load in Passenger Aircraft) label attached to the front and rear of the case.

Properly labled shipping case

form



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Download the Humboldt RMA form from our website and fill it out completely. This form should then be printed and packed with your gauge during shipment.

🔁 RMA Form (Download)

To ship your gauge by freight carrier, download a Bill of Lading form from our website and fill it out completely. This form should be attached to the outside of shipping case during shipment. We use R&L as our shipper and have provided their form in .pdf format for your use. This form has our shipping information filled in, you just need to complete the form with your information and use the drop down menus to auto fill-in the shipment information. See FedEX Shipping Instructions below for shipping by FedEX

Nuclear Gauge Shipping Instructions - Humboldt Scientific

🔁 Bill of Lading (Download)



To populate the correct HazMat Shipping information for the gauge(s) you are shipping, select the gauge type from the drop down menu located in the Description of Articles Box.

If you are shipping multiple gauges, use a separate form for each type of gauge. You can ship multiple gauges of the same model on a single form, but different model gauges must be on a separate form. The form will automatically calculate the total weight of multiple gauges.

The form will fill out the Transport Index number based on your gauge type choice.

If there are multiple documents, fill in the page numbers at the top right of the forms.

To schedule a pick up, contact R&L at 1.800.543.5589, or visit their website at



http://www.rlcarriers.com. All shipping costs will appear on your final invoice.

Print TWO (2) copies of each BOL needed and sign on the "Signature of Consignor" line and next to "Shipper" at the bottom left-hand side of the page.

Give ONE set of the BOL to the R&L Carriers driver, and keep ONE set of the BOL for your records.

FedEX Shipping Instructions



See Sections 💶 and 🙎 above and follow the instructions on how to prepare and pack your gauge for shipment, as well as downloading a Humboldt RMA form and filling it out

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Humboldt Shipper's Declaration for Dangerous Goods



Federal Express Wavbill

Completely fill out a Federal Express Waybill and Shipper's Declaration for Dangerous Goods Form. On the waybill, be sure to check "YES" under the heading "Does the shipment contain dangerouse goods?"; and check "Cargo Aircraft Only". Please note that FedEx requires that all DG Forms be typed. Waybills can be generated online or

downloaded from the Fedex website: http://www.fedex.com, they can also be acquired from the Fedex driver.

🔁 Shipper's Declaration for Dangerous Goods Form (for Humboldt gauges with serial numbers under 7000) (Download)

A shipper's Declaration for Dangerous Goods Form (for Humboldt gauges with serial numbers beginning with 7000 and above) (Download)

On the forms above the areas shaded in gray need to be provided by the shipper. Please be sure to read the Disclaimer & Instructions prior to using these forms to ensure that all required information is provided correctly.

Emergency Response Phone number and contact name must be included on the DG document as to who to notify in case of emergency during shipment.

🔁 View Emergency Response Information (Download)



Forms are in PDF format. These forms may be used for shipments made via FedEx or any other air carrier that accepts radioactive shipments.

Print 4 copies of the Dangerous Goods Form.

Note: A color printer is needed to print these forms properly. The red marks on either side of the form MUST appear in red or the carrier will not accept the form.

Contact FedEx at 1.800.GO.FEDEX to schedule a pick up. If you did not already fill out a waybill or do not have one, you can request a waybill from the driver and complete the form as explained above.

An Emergency Response Sheet must accompany the FedEx Shipper's Declaration for Dangerous Goods form.

Use Quick Response

To contact a sales representative, call 1.800.537.4183 or



Humboldt Scientific, Inc. | 2525 Atlantic Ave., Raleigh, NC 27604 USA Toll Free: 800.537.4183 | Phone: 919.833.3190 | Fax: 919.833.5283 | Email Appendix H

Return Materials Authorization Form (RMA)



Return Materials Authorization Form (RMA)

Please fill out completely, sign and return this form with your Nuclear Gauge

| Section 1: License Information | | | |
|--|---|--|--|
| Licensee Name: | License #: | | |
| Expiration Date: | License issued by: Date: | | |
| Certified by: | | | |
| Section 2: Customer Information | | | |
| Contact Name: | PO#: | | |
| Phone: | | | |
| Ship to: | | | |
| Section 3: Shipping | | | |
| To Humboldt: COD Prepaid Motor Freight 1 1 Day 2 Day 3 Day 0 | Return To Customer: COD Prepaid Motor Freight 1 Day 2 Day 3 Day Other: | | |
| Section 4: Gauge Information | Frequency of Calibration 12 24 Months | | |
| Gauge Serial Number: | (RMA should be filled out for each Gauge) | | |
| Last Leak Test Date: | (per your license requirement) | | |
| Services Needed: ISO 17025 Calibration Leak Test Repair Cleaning/Lubrication/Seals Replace/Electronic Check | Lease Return Disposal | | |
| List Repairs Needed or Detail of Problem | | | |
| Form Completed by: | Date: | | |

HUMBOLDT SCIENTIFIC, INC., 2525 Atlantic Ave., Raleigh, NC USA 27604

Appendix I

Shipper's Declaration for Dangerous Goods Form

| Shipper's Declaration for Dangerous Goods Form (for humbor | at gauges with serial numbers under 7000) (Provide at least three copies to the arritre) | | |
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| | Page 1 of 1 Pages | | |
| | Shipper's Reference Number | | |
| | | | |
| Consignee HUMBODLT SCIENTIFIC. INC | Testing Equipment for Construction Materials | | |
| 2525 ATLANTIC AVE. | | | |
| RALEIGH, NC 27604 | HUMBOLDT | | |
| USA | NUCLEAR GAUGES | | |
| Two completed and signed copies of this Declaration must be handed to the operator | WARNING | | |
| TRANSPORT DETAILS | Failure to comply in all respects with the applicable | | |
| This shipment is within the limitations prescribed for: (delete non applicable) | Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. | | |
| PASSENCER CARGO AIX XAXGO AIRCRAFT ONLY | | | |
| Airport of Destination: | Shipment type: (delete non-applicable) | | |
| NATURE AND QUANTITY OF DANGEROUS GOOD | DS | | |
| UN Number or Identification Number, Proper Shippin | ng name, Class or Division (subsidiary risk), Packing | | |
| Group (if required), and all other required information | n. | | |
| UN3332, RADIOACTIVE MATERIAL Cs-137 0.37 GBq / Am-241 1.48 GE ALL PACKED IN ONE TYPE A PACK II-YELLOW, TI = 0.2 Dims 79 x 37 x SPECIAL FORM CERTIFICATE ATTA USA/0634/S-96 USA/0632/S·96 Pkg. #1 | , TYPE A PACKAGE, SPECIAL FORM, 7, RQ 3q (AGE 49 cm ACHED | | |
| | | | |
| ICAO /IATA USED Emergency response sheet attached to Dangerous Good Declaration. | | | |
| 24 Hour Emergency Telephone Number | | | |
| I hereby declare that the contents of this consignment a accurately described above by the proper shipping nam- classified, packaged, marked and labelled/placarded, and respects in proper condition for transport according to a International and National Governmental Regulations. I d all of the applicable air transport requirements have bee | re fully and Name/Title of Signatory e, and are Place and Date applicable Signature n met. Signature | | |
| I FOR RADIOACTIVE MATERIAL SHIPMENT ACCEPTABLE FOR PASSENGER AIRCRAFT, THE SHIPMENT CONTAINS RADIOACTIVE MATERIAL INTENDED FOR USE IN OR INCIDENT TO RESEARCH, MEDICAL DIAGNOSIS, OR TREATMENT. | | | |

| Shipper's Declaration for | Dangerous Goods | Form (for Humboldt gauges with serial numbers beginning with 7000 and al | ove) (Provide at least three copies to the airline) |
|---------------------------|-----------------|--|---|
|---------------------------|-----------------|--|---|

| Shipper's Declaration for Danger | ous Goods Form (for Humboldt gauge | es with serial numbers beginning with 7000 and above) (Provide at least three copies to the airline | | |
|---|---|---|--|--|
| Shipper | | Air Wavbill No. | | |
| | | Page 1 of 1 Pages | | |
| | | Page of Pages | | |
| | | Shipper's Reference Number | | |
| Consignee HUMBODLT SCIENT | IFIC, INC | Testing Equipment for Construction Materials | | |
| 2525 ATLANTIC AV | /E. | | | |
| RALEIGH, NC 27604 USA | | | | |
| USA | | NUCLEAR GAUGES | | |
| Two completed and signed cop be handed to the operator | bies of this Declaration must | WARNING | | |
| TRANSPORT DETAILS | | Failure to comply in all respects with the applicable | | |
| This shipment is within the limitations prescribed for: (delete non applicable) | | Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. | | |
| PASSENGER CARGO ANA XAXGO AIRCRAFT AIRCRAFT ONLY | | | | |
| Airport of Destination: | | | | |
| | | | | |
| UN Number or Identificati Group (if required), and a UN3332, RAI Cs-137 0.37 ALL PACKED II-YELLOW, T SPECIAL FOI USA/0356/S- CZ/1009/S·9 Pkg. #1 | on Number, Proper Shipp Il other required informatic GBq / Am-241 1.48 G IN ONE TYPE A PAC I = 0.2 Dims 79 x 37 x RM CERTIFICATE ATT 96 6 | I, TYPE A PACKAGE, SPECIAL FORM, 7, RQ Bq KAGE (49 cm ACHED | | |
| | THIS SHIPMENT MAY E | BE CARRIED ON PASSENGER AIRCRAFT OUTSIDE U.S. JURISDICTION | | |
| ICAO /IAIA USED | ICAO /IATA USED Emergency response sheet attached to Dangerous Good Declaration. | | | |
| 24 Hour Emergency Telepho | one Number | | | |
| I hereby declare that the c accurately described abov classified, packaged, marl respects in proper conditi International and National all of the applicable air tra | contents of this consignment a ve by the proper shipping nam ked and labelled/placarded, ar on for transport according to Governmental Regulations. I nsport requirements have bee | are fully and ne, and are nd are in all applicable declare that en met. Name/Title of Signatory Signature (see warning above) | | |
| FOR RADIOACTIVE MATERIAL S | SHIPMENT ACCEPTABLE FOR PA IDENT TO RESEARCH, MEDICAL | SSENGER AIRCRAFT, THE SHIPMENT CONTAINS RADIOACTIVE MATERIAL DIAGNOSIS, OR TREATMENT. | | |

Appendix J

Transit Case Certification

Appendix J

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:

- 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, Section §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).

Humboldt Scientific, Inc.

Type A Transit Case HS-200554 Certification

Drawing Numbers: 19D50572000 attachments 1 & HS-200554 attachment 2. This Configuration is HS-200554 type A transit case with Interior partitions of High Density Polyethylene.

Model: HS-200554 26.0 inches x 14.0 inches x 19.25 inches (66.04 cm x 35.56 cm x 48.90 cm) is constructed from 0.188 inch (0.5 cm) High Density Polyethylene (HDPE). 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 27lb. (12.3 kg) and for testing purposes the maximum weight is 70lb. (31.8 kg).

Packaging Description: Package in accordance with Humboldt transit case closure procedure (HPCP-002) attached. The interior partitions of High Density 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, 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 side 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:

- 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, Section §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).

Appendix K

Package Closure Instructions
Appendix K

HS-200681 5001 SERIES TRANSIT CASE CLOSURE INSTRUCTIONS

- 1. Retract the source rod upward in the safe/shielding position. Install the padlock through the hole in the handle trigger and lock.
- 2. Visually inspect the transit case and its contents as shown below.



3. Loading the standard contents into 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



- 4. Close the lid of the case.
- 5. Fastening of the draw latches.
 - A picture of the draw latch mechanism is shown below.



6. Place the draw latch into the catch as shown below.

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. 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. Ensure the draw latch is securely in the catch by turning the butterfly handle clockwise then folding downward.



Note the four parts: butterfly handle, catch, catch eye and draw latch.

- 7. Rotate the butterfly handle clockwise and fold it downward to secure the draw latch to the catch. The catch eye should protrude through the latch as shown below.
- 8. Complete the case closure by using a padlock or other locking device through one or both holes in the padlock eyes on the front of the case. Gauge users may choose other locking devices.



Contact Humboldt Scientific, Inc. for complete closure instructions at <u>hsi@humboldtmfg.com</u>

HS-200554 5001 SERIES TRANSIT CASE CLOSURE INSTRUCTIONS

- 1. Retract the source rod upward in the safe/shielding position. Install the padlock through the hole in the handle trigger and lock.
- 2. Visually inspect the transit case and its contents as shown below.



3. Loading the standard contents into the transit case.

The interior of the case has pre-formed compartments for the placement of the gauge, reference standard block, and gauge accessories.



- 4. Close the lid of the case.
- 5. Fastening of the draw latches.
 - A picture of the draw latch mechanism is shown below.



6. Place the draw latch into the catch as shown

below. 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. If the hook on the draw latch does not go above the catch, it may be necessary to turn the butterfly handle counter- clockwise to raise the hook higher. Ensure the draw latch is securely in the catch by turning the butterfly handle clockwise then folding downward.



Note the three parts: butterfly handle, catch, and draw latch.

7. Complete the case closure by using a padlock or other locking device through one or both holes in the padlock eyes on the ends of the case. Gauge users may choose other locking devices.



Contact Humboldt Scientific, Inc. for complete closure instructions at hist@humboldtmfg.com

Appendix L

Gauge Security

Appendix L

From: NUGEG-1556, Vol. 1, Program-Specific Guidance About Portable Gauge Licenses.

Information to Consider when Developing Security Procedures

Different licensees have developed various methods of complying with 10 CFR 30.34(i) requirements. The following information provides guidance to assist the licensee in developing security procedures.

NRC regulations require a portable gauge licensee to use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal whenever the portable gauge is not under the control and constant surveillance of the licensee. See 10 CFR 30.34(i).

Note: "Control and maintain constant surveillance" of portable gauges means being immediately present or in close proximity to the portable gauge so as to be able to prevent unauthorized removal of the portable gauge. The objective of security requirements is to reduce the opportunity for unauthorized removal and/or theft by providing a delay and deterrent mechanism.

The security requirements of 10 CFR 30.34(i) apply whenever gauges are not under control and constant surveillance, including (1) storage on vehicles, (2) storage at temporary facilities (e.g., residence, hotel, job site trailer), and (3) storage at permanent facilities. At all times, licensees are required to maintain control and constant surveillance of the portable gauge when it is in use and, at a minimum, use two independent physical controls to secure the portable gauge from unauthorized removal while it is in storage. The physical controls used should be designed and constructed of materials suitable for securing the portable gauge from unauthorized removal, and both physical controls must be defeated in order for the portable gauge to be removed. The construction and design of the physical controls should be such that they will deter theft by requiring a more determined effort to remove the portable gauge. The security procedures should ensure that the two physical barriers chosen increase the deterrence value over that of a single barrier, and that the two physical barriers would make unauthorized removal of the portable gauge more difficult.

For example, using two chains may not be the most effective means of control. To provide adequate security, licensees are encouraged to use combinations of physical controls. 10 CFR 30.34(i) requires that each portable gauge licensee shall use a minimum of two independent physical controls. For example, if two chains are used, each chain and lock combination should be physically robust enough to provide both a deterrence and a reasonable delay mechanism. When two chains or cables are used, the second chain or cable should be substantially more robust and more difficult to cut than the first chain or cable.

If possible, the licensee should consider storing its portable gauges inside a locked facility or other non-portable structure overnight, instead of storing them in a vehicle.

As long as the licensee maintains constant control and surveillance while transporting the portable gauges, the licensee need only comply with the DOT requirements for transportation (e.g., placarding, labeling, shipping papers, blocking and bracing). However, if the licensee leaves the vehicle and portable gauge unattended (e.g., while visiting a gas station, restaurant, store), the portable gauge must be secured by two independent controls as required by 10 CFR 30.34(i).

While transporting a portable gauge, a licensee should not modify the transportation case if it is being used as the Type A container for transporting the device. This includes, but is not limited

to, drilling holes to mount the case to the vehicle or to mount brackets or other devices used for securing the case to the vehicle. In the event the package is modified, the modified package must be reevaluated by any of the methods described in 49 CFR 178.350, "Specification 7A; General Packaging, Type A," or 49 CFR 173.461(a). The reevaluation must be documented and maintained on file in accordance with DOT regulations.

Physical controls may include, but are not limited to, a metal chain with a lock, a steel cable with a lock, a secured enclosure, a locked tool box, a locked camper, a locked trailer, a locked trunk of a car, inside a locked vehicle, a locked shelter, a secured fenced-in area, a locked garage, a locked non-portable cabinet, a locked room, or a secured building. To assist licensees, the list below provides some common examples of the use of two independent physical controls.

Securing a Portable Gauge at a Licensed Facility

Long-term storage of a portable gauge is usually at a permanent facility listed in the license or license application. Routine storage of a portable gauge in a vehicle or at temporary or permanent residential quarters is usually reviewed by the NRC and may be authorized during the licensing process. In accordance with NRC security regulations, when a portable gauge is stored at a licensed facility, the licensee would be specifically required to use a minimum of two independent physical controls to secure the gauge.

The following are examples of how two independent physical controls can be used to secure a portable gauge when it is stored at a licensed facility:

- (1) The portable gauge or transportation case containing the portable gauge is stored inside a locked storage shed within a secured outdoor area, such as a fenced parking area with a locked gate.
- (2) The portable gauge or transportation case containing the portable gauge is stored in a room with a locked door within a secured building, access to which the licensee controls by lock and key or by a security guard.
- (3) The portable gauge or transportation case containing the portable gauge is stored inside a locked, non-portable cabinet inside a room with a locked door, if the building is not secured.
- (4) The portable gauge or transportation case containing the portable gauge is stored in a separate secured area inside a secured mini-warehouse or storage facility.
- (5) The portable gauge or transportation case containing the portable gauge is physically secured to the inside structure of a secured mini-warehouse or storage facility.

Securing a Portable Gauge in a Vehicle

The regulations in 10 CFR Part 71.5, "Transportation of Licensed Material," require that licensees who transport licensed material, or who may offer such material to a carrier for transport, must comply with the applicable DOT requirements that are found in 49 CFR.

Licensees commonly use a chain and a padlock to secure a portable gauge in its transportation case to the open bed of a pickup truck while using the vehicle for storage. Because the transportation case is portable, a theft could occur if the chain is cut and the transportation case with the portable gauge is taken. If a licensee simply loops the chain through the handles of the transportation case, a thief could open the transportation case and take the portable gauge without removing the chain or the case. Because the transportation case is also portable, it must be protected by two independent physical controls if the portable gauge is inside. A lock on the transportation case, or a lock on the portable gauge source rod handle, is not sufficient because both the case and the gauge are portable.

A vehicle may be used for storage; however, the NRC and DOT recommend that this practice only be used for short periods of time, or when a portable gauge is in transit. A portable gauge should only be kept in a vehicle overnight if it is not practicable to provide temporary storage in a permanent structure. When a portable gauge is being stored in a vehicle, the licensee is specifically required to use a minimum of two independent physical controls to secure the portable gauge.

The following are examples of how two independent physical controls approved by the NRC can be used to secure portable gauges in a vehicle:

(1) The locked transportation case containing the portable gauge is physically secured to a vehicle with brackets, and a chain or steel cable (attached to the vehicle) is wrapped around the transportation case such that the case cannot be opened unless the chain or cable is removed. In this example, the locked transportation case would count as one control because the brackets would prevent easy removal of the case. Looping the chain or cable only through the transportation case handle is not acceptable.

(2) The portable gauge or transportation case containing the portable gauge is stored in a box physically attached to a vehicle, and the box is secured with (1) two independent locks, (2) two separate chains or steel cables attached independently to the vehicle in such a manner that the box cannot be opened without the removal of the chains or cables, or (3) one lock and one chain or steel cable is attached to the vehicle in such a manner that the box cannot be opened without the removal of the chains or cables, or (3) one lock and one chain or steel cable is attached to the vehicle in such a manner that the box cannot be opened without the removal of the chain or cable. See the following photo for an example of a box physically attached to a vehicle.



Box physically attached to a vehicle

(3) The portable gauge or transportation case containing the portable gauge is stored in a locked trunk, camper shell, van, or other similar enclosure and is physically secured to the vehicle by a chain or steel cable in such a manner that one would not be able to open the case or remove the portable gauge without removal of the chain or cable.

In addition to the two examples above, there are other ways that licensees may choose to secure their portable gauges.

Securing a Portable Gauge at a Temporary Job Site or at Locations Other than a Licensed Facility

When a job requires storage of a portable gauge at a temporary job site or at a location other than a licensed facility, the licensee should use a permanent structure for storage, if practicable to do so. When storing a portable gauge in temporary or permanent residential quarters, the licensee should limit access by storing the gauge in a separate room away from residents and other members of the public. The licensee must also meet the radiation exposure limits specified in 10 CFR Part 20, "Standards for Protection against Radiation." When a portable gauge is stored at a temporary job site or at a location other than an authorized facility, the licensee is required to use a minimum of two independent physical controls to secure the portable gauge.

The following are examples of how two independent physical controls are used to secure portable gauges at these locations:

- (1) At a temporary job site, the portable gauge or transportation case containing the portable gauge is stored inside a locked building or in a locked non-portable structure (e.g., construction trailer, sea container) and is physically secured by a chain or steel cable to a non-portable structure in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable. A lock on the transportation case or a lock on the portable gauge source rod handle would not be sufficient because the case and the portable gauge are portable.
- (2) The portable gauge or transportation case containing the portable gauge is stored inside a locked room within temporary or permanent residential quarters and is physically secured by a chain or steel cable to a permanent or non-portable structure (e.g., large metal drain pipe, support column) such that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable.
- (3) The portable gauge or transportation case containing the portable gauge is stored in a locked garage and is within a locked vehicle or is physically secured by a chain or steel cable to the vehicle in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable.
- (4) The portable gauge or transportation case containing the portable gauge is stored in a locked garage and is within a locked enclosure or is physically secured by a chain or steel cable to a permanent or non-portable structure in such a manner that an individual would not be able to open the transportation case or remove the portable gauge without removing the chain or cable.