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Ferrovial Agroman
Ave. Ponce de León 1250
San Jose Building Of 901
Santurce, P.R.
Zip-Code. 00907

Ref: Additional Information Concerning Application for a License Amendment, Control 589163

52-31107-01
03037094

Dennis Lawyer
Health Physicist
U.S. Nuclear Regulatory Commission
Division of Nuclear Material Safety
Region I, 2100 Renaissance Boulevard, Suite 100
King of Prussia, PA 19406-2713
610-337-5366
610-337-5269 (F)

Dear Mr. Lawyer,

By means of this its corrections to the document "use, management, and transport of equipment with radioactive sources procedure". The suggests changes have been changes in document.

Any questions or requests please communicate.

Thanks for evefything,

Fernando Cortés C.
OHS Manager
Health and Safety Department
Radiation Safety Officer
Ferrovial Agroman – Puerto Rico
fernandocortes@ferrovial.com

Cell: (787) 223-4627
Phone: (787) 725-5505
Fax (787) 725-5530
Ave. Ponce de León 1250
Suite 901-902
Parada 18, Santurce

San Juan, Puerto Rico, Diciembre 31, 2015

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USE, MANAGEMENT, AND TRANSPORT OF EQUIPMENT WITH RADIOACTIVE SOURCES PROCEDURE

December, 2015
Rev.-2.03

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Internal Control of Documents		
Revision Number	**Date**	**Previous Modifications**
2.03	Diciembre 2015	Rev. 2.02

USE, MANAGEMENT, AND TRANSPORT OF EQUIPMENT WITH RADIOACTIVE SOURCES PROCEDURE

Prepared by: **Safety and Health Manager** **Ferrovial Agroman – Puerto Rico**	**Date**	**Signature**
Fernando Cortés C.	**Decembre, 2015**	
Reviewed by: **Safety and Health Manager** **Ferrovial Agroman – Puerto Rico**	**Date**	**Signature**
Fernando Cortés C.	**Decembre, 2015**	
Approved by: **General Manager** **Ferrovial Agroman – Puerto Rico**	**Date**	**Signature**
Nassin Tactuk D.	**Decembre, 2015**	

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USE, MANAGEMENT, AND TRANSPORT OF EQUIPMENT WITH RADIOACTIVE SOURCES PROCEDURE

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1. PURPOSE

The main objective of this procedure is to assure an appropriate level and controlled protection of the people and the environment while complying with the U.S. Nuclear Regulatory Commission (NRC, www.nrc.gov) requirements, and the OSHA Hazard Communication Standard 29 CFR 1910.1200.

2. SCOPE

The scope is to generate and implement a procedure for adequate operation of the nuclear densimeter during storage, transportation, use, and an emergency plan in case of a radioactive accident.

The current procedure will be a mandatory requirement for all staff (operators) that use the nuclear densometer (use, management and transport of equipment).

3. REFERENCES

3.1 U.S. Nuclear Regulatory Commission (NRC), NUREG-1556, Volume 1
3.2 Volume 1 Errata: Appendix H, "Operating, Emergency, and Security Procedures"
3.2 49 CFR 172, Transportation of Hazardous Materials (DOT)
3.3 Hazard Communication Standard 29 CFR 1910.1200 (OSHA)
3.4 Safety and Occupational Health Program – Ferrovial Agroman in Puerto Rico
- Safety and Occupational Health Policy
- Safety and Occupational Health Program Objectives
- General Responsibilities in Safety and Occupational Health

4. DEFINITIONS

Absorbed dose: The quantity of main interest to the clinician for both beta and gamma sources. It is the quotient of dE by dm, that is, the differential energy absorbed in the differential mass in the medium. The unit of absorbed dose is the gray (Gy), which is 1 joule per kilogram.
Absorbed Dosage (D): Is the fundamental dosimetric magnitude and is defined as:

$$D = \frac{d\varepsilon}{dm}$$

From which **D** is the average energy shared by the ionized radiation to the material in a given volume and dm is the material mass existing in this volume. The energy could average together with respect to any defined volume, being an average dosage as well as the total energy given in a divided volume by the volume mass. The unit of absorbed dosage in the International System is the gray (Gy), where $1Gy = 1\ J.Kg^{-1}$
Accident: Any involuntary event including: an operating error, failure of equipment, or other mishaps, of which actual and potential consequences that could be unknown from a safety and protection point of view.
Activation: Process in which a material becomes radioactive by means of a bombardment of neutrons, protons, or other nuclear particles.

Activity: Deals with an amount of radio nuclides in a determined state of energy during any given time. The A activity, is defined by the following expression:

$$A = \frac{dN}{dt}$$

ALARA (acronym for "as low as is reasonably achievable"): Means making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.

Annual limit on intake (ALI): Means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any individual organ or tissue. (ALI values for intake by ingestion and by inhalation of selected radionuclides are given in Table 1, Columns 1 and 2, of appendix B to §§ 20.1001-20.2401).

Authorized Staff: One who has obtained registration or regulative authorized license to use radioactive source machinery, according to License 52-31107-01, given by the U.S. Nuclear Regulatory Commission (NRC), given on the date of July 29, 2015 (Start) and February 28, 2021 (Expiration).

Calibration: The adjustment, as necessary, of a measuring device such that it responds within the required range and accuracy to known values of input.

Contamination: Presence of radioactive substances within a material or on its surface, on a human body, or any other place that is not desirable, or could be harmful.

Controlled area: At a nuclear facility, an area outside a restricted area but within the site boundary, to which the licensee can limit access for any reason.

Controlled zone: Includes all zones that are or could be necessary measures of protection or specific safety regulations for:

- Controlling normal exposures or preventing the dispersion of contamination in a normal working environment.
- Prevent potential exposure or limit its magnitude.

Corrective Action: When a radiation level is exceeded, and the dose is reduced, according to established procedure, and to avoid a critical situation for the health.

Damage: Is the result or consequence of an operational incident in which the effect is visible, measurable, and tangible in a relatively simple way. Generally, it is an exchange of energies that exceed the capacity limit of the body or structures. It is known as physical damage due to the modification of structural character in which it is characterized. With its presence, an incident is categorized as an "accident".

Densimeter (gauge source): Measuring equipment that obtains the density and humidity of the ground, bases, aggregates, concrete, and asphalt.

Densimeter Accessories: reference block, gradient plate, perforation bar, sledgehammer, extractor, locks, chargers, operation manual.

Dosage: Measurement of radiation received or absorbed by a target.

Dosimeter: Measures the exposure or absorbed dosage or equivalent by the exposed working staff during a determined amount of time.
Dosimetric Calibration: The process whereby the response of a dosimeter or measuring instrument is characterized through comparison with an appropriate standard that is traceable to, and consistent with, a national standard.
Where: dN is the expected value of spontaneous nuclear transformation numbers from that energy state to the time interval dt. The unit of activity in the International System (IS) is Becquerel (Bq), where 1Bq = 1 disintegration/s.
Dosimetric Calibration Laboratory: Organization accreditation by National Voluntary Laboratory Accreditation Program (NAVLAP).
Emergency Plan: In conjunction with all planned operations which should be performed in a way to reduce radiation consequences in case of an accident.
Equivalent Dosage, $H_{T,R}$ is defined as:

$$H_{T,R} = D_{T,R} * W_R$$

Expression in which $D_{T,R}$ is the absorbed dosage due to the radiation type R averaged over an organ or tissue T y W_R is the factor of corresponding radiation deliberation to radiation type R.

When the radiation field forms different types of radiation with different values of W_R, the equivalent dosage is:

$$HT = \sum W_R * D_{T,R\,R}$$

The unit of equivalent dosage is $J.Kg^{-1,\text{known}}$ as Sievert (Sv)

Exposure: Means being exposed to ionizing radiation or to radioactive material.
Geiger Counters (meter): Device or monitor, a visual indicator of the quantity of radiation detected, as opposed to a radiation detector (typically a cheap model) that lacks a numerical visual display of any type in favor of a general alert level. The analogy would be an automobile dashboard indicator, for example, an oil pressure gauge versus an "idiot light". We prefer Geiger counters with meters.
Intervention Level or Limit: Level of avoidable dosage, that when reached a protective or restorative action will be performed during a situation of chronic exposure or during an emergency situation of exposure.
Limit: Value of magnitude, applied in certain activities or specific circumstances, which should not be exceeded.
Protective Action: Intervention with the purpose of avoiding or reducing the risk of chronic exposure or emergency situations to members of the public.
Qualified Expert: Individual who, by virtue of extended certificates for organizations or competent society (recognized or authorized), professional type licenses, or academic titles and experience, is properly recognized as a competent person in a specialty of interest, for example in Medical Physics, Radiation Protection, Occupational Health, Fire Prevention, Quality Guarantee, or any other technical specialty or relevant safety.
Radiation Safety Officer (RSO): The RSO has responsibility for overseeing the radiation safety program and for ensuring that radiation uses conform to Ferrovial Agroman S.A. (Puerto Rico area) policies and applicable government regulations, including the Ferrovial Agroman S.A. Radioactive Materials License (52-31107). The RSO reports to the General Manager of Ferrovial Agroman S.A. in Puerto Rico.

The RSO is empowered to halt any radioactive operations that pose an immediate health and safety danger to the public and/or workers. The RSO has full authority to stop work that does not meet the requirements of the Radioactive Materials License (52-31107).

Radiation source: A radioactive material or byproduct that is specifically manufactured or obtained for the purpose of using the emitted radiation. Such sources are commonly used in teletherapy or industrial radiography; in various types of industrial gauges, irradiators, and gamma knives; and as power sources for batteries (such as those used in spacecraft). These sources usually consist of a known quantity of radioactive material, which is encased in a manmade capsule, sealed between layers of nonradioactive material, or firmly bonded to a nonradioactive substrate to prevent radiation leakage. Other radiation sources include devices such as accelerators and x-ray generators.

Radiation Surveillance: Measurement of exposure, the dosage or the contamination for reason related to the evaluation or the control of exposure to radiation or radioactive substances and interpretation of the results.

Radiation, ionizing: A form of radiation, which includes alpha particles, beta particles, gamma rays, x-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Compared to non-ionizing radiation, such as radio- or microwaves, or visible, infrared, or ultraviolet light, ionizing radiation is considerably more energetic. When ionizing radiation passes through material such as air, water, or living tissue, it deposits enough energy to produce ions by breaking molecular bonds and displace (or remove) electrons from atoms or molecules. This electron displacement may lead to changes in living cells.

Radionuclide of Americium (Am 241: Be): Is a solid source used to measure humidity; it has an activity of 40 mCi and a half-life period of 431 years.

Radionuclide of Cesium (Cs 137): Is a solid source used to measure density; it has an activity of 8mCi and has a half-life of 30 years.

Cesium (chemical symbol Cs) is a soft, flexible, silvery-white metal that becomes liquid near room temperature, but easily bonds with chlorides to create a crystalline powder. The most common radioactive form of cesium is Cs-137. Cs-137 is produced by nuclear fissionHelpfissionThe splitting of an atomic nucleus into at least two other nuclei with the release of a relatively large amount of energy. Fissioning that occurs without any outside cause is called "spontaneous fission." for use in medical devices and gauges. Cs-137 is also one of the byproducts of nuclear fission processes in nuclear reactors and nuclear weapons testing.

Radioactivity: Spontaneous transformation of energy or particles by an atom, as a result of nuclear instability, having to find a more stable structure. The nuclei that transform spontaneously are called radio nuclides.

Radioisotope (Radionuclide): An unstable isotope of an element that decays or disintegrates spontaneously, thereby emitting radiation. Approximately 5,000 natural and artificial radioisotopes have been identified.

Reference Level or Limit: Generic term that indicates levels of Jurisdiction, Intervention, Research, or Registration. These levels can establish any of the determined magnitudes while practicing radiation protection.

Register Level or Limit: Level of dosage, of exposure, or required incorporation by the regulative authority. When this level is reached or exceeded, the dosage values of exposure or incorporation received by the workers should be noted in their records of individual exposure.

Regulatory Authority: The Nuclear Regulatory Commission Agency is an independent regulatory agency that oversees the civilian use of nuclear power in the United States. It licenses and regulates the uses of nuclear energy to protect public health and safety, and the environment. The NRC's prime

responsibility is to ensure that the more than 100 commercial nuclear power plants in the United States conform to its regulations. It also regulates the use of nuclear materials in the diagnosis and treatment of cancer, in sterilizing instruments, in smoke detectors, and in gauges used to detect explosives in luggage at airports.

Research Level or Limit: Value of a magnitude such as effective dosage, the incorporation or contamination by unit of area or of volume that, when reached or exceeded merits an investigation.

Risk: Combination of probability and severity of damage or deterioration of health could cause a dangerous event or exposure.

Sealed Source: Radioactive material that is: a) permanently enclosed a capsule or b) closely wrapped and in solid form. The capsule or sealed source material should be resistant enough in order to maintain tightness in the conditions of use and wear so that the source can be conceived, such as in the case of foreseen mishaps.

Source material means:

(1) Uranium or thorium or any combination of uranium and thorium in any physical or chemical form; or

(2) Ores that contain, by weight, one-twentieth of 1 percent (0.05 percent), or more, of uranium, thorium, or any combination of uranium and thorium. Source material does not include special nuclear material.

Total Effective Dose Equivalent (TEDE): The sum of equivalent effective dosage (for external exposure) and the equivalent of committed effective dosage (for internal exposure).

5. RESPONSIBILITIES

5.1 Construction Director: In his role as group director, he should reinforce the appropriate implementation of this procedure in a systematic way, in accordance with the objectives mentioned in the Safety and Health Policy from Ferrovial Agroman in Puerto Rico.

5.2 Safety and Health Manager: is the person who monitors and evaluates the appropriate application of this procedure, assisting the organization when effective and appropriate implementation deviations take place.

5.3 Construction Manager: In his role of maximum authority in a particular job, he should comply and promote the appropriate implementation of this procedure. The Construction Manager should know this procedure in order to properly apply it to relevant activities, in a way that the job can develop in its different stages of construction.

5.4 Radiation Safety Officer: Is the person who represents the organization before the U.S. Nuclear Regulatory Commission (NRC) agency, in accordance with License 52-31107-01. This person will have a specific function with relation to the radioactive sources, to which indicate:

- Act as a director of the radiation protection program before the organization, being the most responsible in guaranteeing compliance of the radiation protection program.
- Guarantee the compliance of organizational and technical requirements and create resources that optimize radiation protection.
- Officially appoint and communicate with the person in charge of radiation protection; and provide him with the necessary means in order to comply with the program.
- Coordinate any emergency situation in work places and local agencies in Puerto Rico and the U.S. Nuclear Regulatory Commission (NRC).

5.5 Commitments and Responsibilities

The following guidelines will continue to comply with the requirements of the U.S. Nuclear Regulatory Commission (NRC):

- Radiation safety, security, and control of radioactive materials and compliance with regulations
- Completeness and accuracy of the radiation safety records and all information provided to the NRC (10 CFR 30.9, "Completeness and accuracy of information")
- Knowledge about the contents of the license and application
- Compliance with current NRC and U.S. Department of Transportation (DOT) regulations and the licensee's operating, emergency, and security procedures
- Commitment to provide adequate resources (including space, equipment, personnel, time, and, if needed, contractors) to the radiation protection program to ensure that the public and workers are protected from radiation hazards and compliance with regulations is maintained
- Selection and assignment of a qualified individual to serve as the radiation safety officer (RSO) for licensed activities and confirmation that the RSO has independent authority to stop unsafe operations and will be given sufficient time to fulfill radiation safety duties and responsibilities
- Commitment to ensure that radiation workers have adequate training
- Prevention of discrimination of employees engaged in protected activities (10 CFR 30.7, "Employee protection")
- Commitment to provide information to employees about the employee protection and deliberate misconduct provisions in 10 CFR 30.7 and 10 CFR 30.10, "Deliberate misconduct," respectively
- Commitment to obtain NRC's prior written consent before transferring control of the license; and
- Notification of the appropriate NRC regional administrator in writing, immediately following the filing of petition for voluntary or involuntary bankruptcy (10 CFR 30.34(h)).

5.6 Nuclear Densimeter Operator: Are responsible for the Densimeter Operator and in compliance with 49 CFR Part 172.704 and the Nuclear Regulatory Commission (NRC) NUREG - 1556, Volumen 1, and the 29 CFR 1910.1200 from OSHA, be willing to have the following responsibilities:

- Only one Operator will be authorized to use, manage, and/or transport equipment with radioactive sources, when he fulfills the requirements from the U.S. Nuclear Regulatory Commission (NRC), 49 CFR Part 172.704 and the 29 CFR 1910.1200 from OSHA.
- Comply with the procedure order of use, management, and transportation of the equipment with radioactive sources.
- Correctly use the radiation monitoring devices (film badge dosimeter).
- Carry out the radiation monitoring programs in a timely manner.
- When returning equipment with radioactive sources; leaving as well entering storage, the time of entering and exiting should be recorded with the entering and exiting of all equipment with radioactive sources.
- When transporting equipment with radioactive sources in a motorized vehicle, the equipment should be transported inside of a metal box with a sign that indicates its radioactive source.
- Provide all information about their work activities with nuclear gauges.
- Only official authorized motor vehicles will be used by an authorized representative by the company to transport equipment with radioactive sources.
- The motor vehicles that transport cannot be left abandoned if the equipment with radioactive sources is in the motor vehicle. The driver will not leave the vehicle running with the keys left in.

- Precaution will be taken when blocking the work area to prevent robbery of any vehicle, nor taken from where the nuclear densimeter is located (nuclear meter).
- Equipment with radioactive sources should be kept isolated from other people when they are measuring the thickness. There should be four orange reflective cones with a label indicating "Precaution Radioactive Source".
- Comply with the indicated procedure of use, management, and transportation of equipment with radioactive sources for the operation of equipment, be it in the correct way.
- In the case of any emergency in the workplace, it should be communicated to the Designated Radiation Safety Officer.

6. GENERAL REQUIREMENTS

6.1 Source Equipment Description

The type of practice performed with the nuclear densimeters is the determination of the density and humidity in construction materials through two methods:
Retro – transmission or the way of direct transmission, depending on the type of material and the thickness of the corresponding layer. In continuation, the corresponding radiation specifications are presented to the nuclear densimeters.

Table # 1. Radiation specifications of the Nuclear Densimeter

TERM	DESCRIPTION
Gamma Source	Cesium – 137 (8 ± 10% mCi) (0.3 ± 10% GBq)
Neutron Source	Americium – 241: Beryllium (40 ± 10% mCi) (1.48 ±10% GBq)
Source Type	Sealed – special form
Encapsulation of the source	Stainless Steel
Shielding	Tungsten, Lead, and Cadmium
Rate relation of dosage on Surface	34.0 mrem/hour (Model 3430 – M) 27.4 mrem/hour (Model 3430) 20.0 mrem/hour (Model 3440)
Material / bar - source	Stainless steal
Transport crate	DOT 7A, Type A, Yellow II, TI. 0.3
Radiation consequence	External exposure
Radiation Accident	Consequences are limited to the room or laboratory
Evaluation of Risk	Minor degree

IDENTIFICATION OF RADIOACTIVE SOURCE EQUIPMENT

Manufacturer Brand	: TROXLER
Model	: 3430-SURFACE MOISTURE
Cesium 137	: 0.3 ± 10% GBq (8 ± 10% mCi)
Americium 241	: 1.48 ± 10% GBq (40 ± 10% mCi)
Base	: Cast Aluminum
Size (w/o)	: 14.45 x 8.85 x 6.45 inches
Weight (w / handle)	: 23.25 in (591 mm) for 12" rod
Transport Crate	: 29.5 x 14.0 x 17.0 inches
Weight	: 29 lb (13 kg)
Transport Weight	: 86 lb (39 kg)

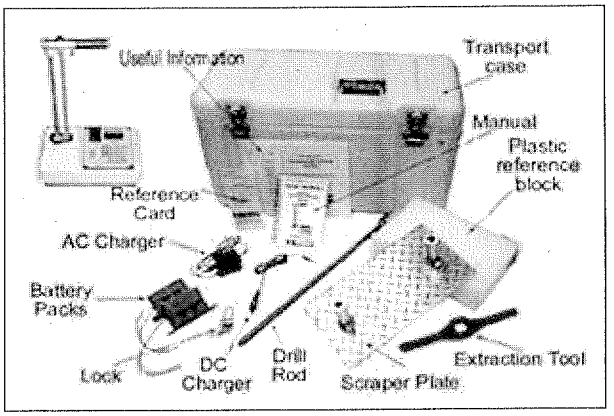


Figure 1: Troxler Nuclear Densimeter 3430

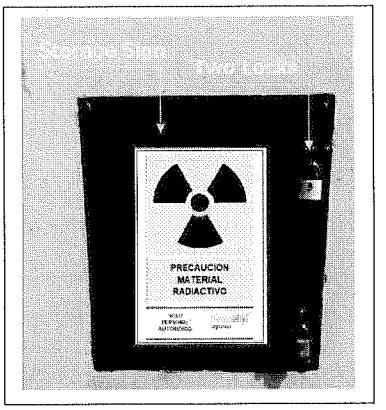


Figure 2: Store Box (Nuclear Gauge)

6.2 Equipment Storage and Control

The equipment with radioactive sources should comply with the requirements from the U.S. Nuclear Regulatory Commission (NRC), according to which indicates:

6.2.1 Storage Zone: Is a controlled zone, where the densimeter is stored while it is not being used. It is a "storage box" in concrete block placed in the project area (see figure 2), safe with two locks and key that only the densimeter operator has access. The "storage box" should be marked, as indicated to inform and give warning of the presence of radioactive material, as shown in figure 2. The following are the storage areas of nuclear gauges:

A. Storage Facility - Temporary Location

- The building shall be rigidly constructed, with adequate fire safety equipment and located in a commercially zoned area (controlled zone).
- The gauge(s) will be stored in a separate room, if possible. If this is not possible, the storage cabinet will be located in a remote area where only occasional personnel use is anticipated. In either case, the area will be kept locked and secured at all times with keys available only to licensed operators. In addition, the gauge's source rod is kept locked when not in use.
- The room cabinet both will be posted with appropriate radiation warning signs.
- The building will be locked and secured during non-working hours. If available, security guards will make rounds to check on above.

- The facility will be inspected by and meet with the approval of the Radiation Safety Officer.
- The facility shall always be subject to inspection for compliance to these requirements.

B. Storage in Vehicle

1. If the gauge is going to be stored overnight in vehicle the following conditions must be met:
   a. Prior to approval by the Radiation Safety Officer will be necessary.
   b. Vehicle must be two locks and display the appropriate radiation warning signs.
   c. Vehicle must be kept at same location as where certified operator is staying. In addition, the vehicle must be parked in a well-lighted area for security reasons.
   d. At no time shall the gauge be taken inside a private residence or other public place overnight.
2. If an accident occurs with vehicle follow conditions under Emergency Procedures.

6.2.2 Control of exiting and returning the densimeter: In function with the operation needs, there should be a record of Exit/Entrance of the Bunker Nuclear Densimeter, according to the Safety and Health Program form, PSSO-F-81-Documentation of Radioactive Sources-Shipping Paper and PSSO-F-82-Documentation of Radioactive Sources in Warehouse-Entrance-Out.

6.3 Transport of Radioactive Equipment

The equipment with radioactive sources should comply with the requirements from the U.S. Nuclear Regulatory Commission (NRC) and 49 CFR 172, Transportation of Hazardous Materials, according to which indicates:

6.3.1 Transport Vehicle: Is an authorized motor vehicle, according to the transit law of Puerto Rico, it should be in good electro mechanic status and belong to Ferrovial Agroman in Puerto Rico.

Transporting the Densimeter in a Motor Vehicle

- Lift the equipment inside its transport crate inside the vehicle.
- Secure the equipment with a chain to the anchorage point on each side of the body in the furthest part of the driver's cabin.
- At all times, you should have the shipping document or "shipper paper" in your work area, according to form PSSO-F-81-Documentation of Radioactive Sources-Shipping Paper.
- The package (packaging and the densimeter), should be placed in the back part of the motorized vehicle (pick up) inside the metal drawer securing it with two locks and tie it with a chain in a way that it will not suffer from strong vibrations and prevent someone from stealing it.
- When the densimeter is transported, attached to this no other hazardous element, such as fuel or any other element in case of an accident should not be transported as it could create a reaction when in contact with the radioactive material.
- The supervised zone should be identified in an area where an operator is working with a motorized vehicle that can transport the densimeter.
- Monitor the dosage rates through the portable radiation measuring device in three sides of the body (right, left, and back) and record the most amount of radiation on the package labels, this will be the rate of transport. The previous with the frequency required by local regulations.
- The motor vehicles that transport a densimeter "may not be abandoned", if the equipment with radioactive sources is in a motor vehicle. The driver (densimeter operator), will not leave the vehicle running with the keys in place, without the motor vehicle being supervised at all times. The keys of the motor vehicle will be isolated to prevent any possible robbery and/or getting

lost.
- Verify that all pertinent documents are taken while transporting such in the case of the "Shipping Paper".
- When arrived to the work zone, the controlled zone should be determined temporarily so that non-authorized staff do not have access and place orange reflective cones as a preventative measure to take caution around the work zone.
- The transporting motor vehicle should have a preventative and corrective maintenance program, whether routine or non-routine maintenance, to comply with the Safety of Motor Vehicle Program.

Note: Reflective cones and safety indications should always be transported during transportation in case of an accident.

6.3.2 Measuring with Radioactive Equipment

Radiation dosage limits are based on the limits specified by the NRC. These limits are established as maximum values, and in all cases, the exposure of the staff should be kept much less than the limits specified in these parts as much as possible. Special effort should be made to maintain the radiation exposure away from an embryo or fetus in least amount possible, during the entire progression of pregnancy as suggested by the National Council of Radiation Protection and Measurements.

The equipment with radioactive sources should comply with the requirements from the U.S. Nuclear Regulatory Commission (NRC) and 49 CFR 172, Transportation of Hazardous Materials, Hazard Communication Standard 29 CFR 1910.1200, and Safety and Occupational Health Program – Ferrovial Agroman in Puerto Rico.

6.4 Exposure Radiation Dose

6.4.1 TEDE, Total Effective Dose Equivalent

a. Restricted Area

Dosage limits for controlled areas: No radiation worker of 18 years of age or more, during any calendar quarter will receive a dosage of more than the following limits:

Table # 2. Dosage for parts of the body

Description of the body part	**Dosage** [mRem]
Total corporal equivalent effective dosage	1250
Sum of the equivalent profound dosage and the equivalent compromised dosage to any individual organ or tissue.	12500
Eye lenses	3750
Superficial dosage of skin and/or extremities	12500

The dosage to the entire body that exceeds the previously mentioned limits is permitted only during a different calendar trimester, the dosage may not exceed 3 Rem verified by the surveillance staff and that the accumulated dosage doesn't go over 5 Rem per year.

a. Dosage limits for minors and members of the public

The maximum exposure of an individual's entire body should be limited to 100 mrem per calendar year. If federal and state laws don't prohibit having minors working in laboratories, different state and federal laws put restrictions on younger minors (14 and 15 years old) that can do it. The current policy only allows those who are at least 18 years old to work in laboratories and only those who are older than 16 years of age can volunteer.

In general, minors (those who are considered underage):

- May not work with radioisotopes.
- Should get in depth safety training before initiating any type of job.
- Should be under strict supervision by someone in a laboratory who is familiarized with the dangers and appropriate operative procedures.

b. Dosage Limit for Staff who are Pregnant

The exposure of radiation to staff who is a pregnant woman will be limited to less than 500 mRem during the progression of the pregnancy. Women who are exposed to radiactive sources should receive orientation over the risks and their rights in case of becoming pregnant. Pregnant woman can indicate whether they are pregnant voluntarily, and can fill out a questionnaire in which it is stated in the appendix of the Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure (http://pbadupws.nrc.gov/docs/ML0037/ML003739505.pdf)

c. Dosage Limits in Restricted Areas

The restricted zones and the individuals exposed who are not workers are limited to 100 mRem of exposure per calendar year.

e. Radiation Limit for Workers

Each film badge dosimeter report will be reviewed to see if any employee has exceeded the limit of dose which is shown in the previous table. If an employee has exceeded the limit, the Radiation Safety Officer will complete an investigation of the root cause of the exposure. High levels of radiation can indicate an inadequate use of the nuclear measurer, incorrect storage of the film badge, or a source of exposure. The Radiation Safety Officer will fill out a report for investigation with connective action (in this case). If necessary, the Radiation Safety Officer will elevate the limits of investigation.

The dosimeter film badge, or a film badge, is a personal dosimeter used to measure the accumulated radiation dosage due to the radiation ionizer.

6.4.2 Control Area (radiation zone)

Work Area: Is a temporarily controlled area, in which the restricted is performed with reflective cones and a warning of radioactivity. It is the place where the density and humidity measurements take place and the zone where it is expected to have more dosage received. The Nuclear Source can only be removed from the transportation capsule at the moment of performing density and humidity readings, if not, they remain inside of their capsule; when completing the daily tasks at the construction site, they should be sent to a storage zone.

The criterion used for selecting and classifying the zones comply with the potential danger that the densimeter could cause in each one of the work area if an accident were to happen or handling the device incorrectly over and over.

To prevent a high dose to the employees and the general public, in each of the work areas restricted, we to ensure that the dose rate measured by Geiger Muller monitor is within the ranges set acceptable health.

6.4.3 Compliance with dose limits for individual members of the public

(a) The licensee shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in § 20.1301.

(b) A licensee shall show compliance with the annual dose limit in § 20.1301 by

(1) Demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit; or

(2) Demonstrating that

(i) The annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in table 2 of appendix B to part 20; and

(ii) If an individual were continuously present in an unrestricted area, the dose from external sources would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in a year.

(c) Upon approval from the Commission, the licensee may adjust the effluent concentration values in appendix B to part 20, table 2, for members of the public, to take into account the actual physical and chemical characteristics of the effluents (e.g., aerosol size distribution, solubility, density, radioactive decay equilibrium, chemical form).

Table # 3. Radiation Dose Limits

Radiation Worker, TEDE	5 Rem or 0.05 Sv.
Any individual organ or tissue	50 Rem or 0.5 Sv.
Eye dose	15 Rem or 0.15 Sv.
Extremities or skin (shallow dose)	50 Rem or 0.5 Sv.
Declared Pregnant Worker *	0.5 Rem or 0.005 Sv.

(*) = During the remainder of the pregnancy (After the declaration)

7. SAFETY AND HEALTH PROCEDURE

7.1 Procedure of handling of the densimeter in each of the zones

The procedure for classifying and marking off the zones, having in mind the distance and rate of dosages that are defined in 6.2.1, according to the safety zone.

The densimeter should remain in the designed and constructed warehouse for that purpose, during the time that surface readings are being performed.

7.2 Storage and Removal of the Densimeter

- Notify the Radiation Safety Officer in the case of any emergency. See item 8. Response in case of an Emergency.
- The densimeter should always be stored inside its container, metal box, or manufacturer package to store it in the Storage Box and inside the metal box transport (including the manufacturer box or package) and in each case, it should be secured with two high resistant locks.
- Mark, monitor and put signs in the new controlled zone.
- The place should be covered and free of humidity, and should be a room independent of the zone where the staff that transports the densimeter can rest.
- The Storage Box should be distanced from any dangerous element, such as fuel or any other element that in the case of an accident could create a reaction to having contact with the radioactive material.
- The keys of the warehouse where the Nuclear Densimeter is stored should be guarded and access to any unauthorized person should be avoided.
- The entrance to the Storage Box should only happen when taking out the densimeter, by the authorized person who transports it.
- The densimeter should be placed in a motor vehicle such as the one indicated in section 7.4 from transporting the nuclear densimeter.

Follow the follow safety rules for removing the densimeter (nuclear meter) in a secure way from place of storage:

- Readings should be taken frequently with a mobile radiation measuring device in all areas of the storage zone (above, left, right, forward, and back).
- Head to the "Storage Box" with the keys to the door and locks of the equipment
- Review the radiation reading on the surface of the access door and if the reading is lower than maximum allowed limit, enter in the bunker to take out the equipment
- Once outside of the bunker place the equipment in the inspection zone or in the transportation zone and take the radiation readings with the mobile monitor in accordance with the established procedures.
- Once the activity is finished, whether inspection or transportation, return the equipment to the Bunker, making sure that the bar of the equipment has been left in a secure place and with its respective locks.
- Keep the Nuclear Source in the "Storage Box", also we install two locks on the door and keep the key in the project office.

Note: The Nuclear Source Operator should always use the personal dosimeter.

Table # 4. Radiation Profile (mrem/hour) Nuclear Densimeter model 3430

POSITION	SURFACE			ONE (1) FOOT (30 CENTIMETERS)			THREE (3) FEET (1 METER)		
	GAMMA	NEUTRON	TOTAL	GAMMA	NEUTRON	TOTAL	GAMMA	NEUTRON	TOTAL
Front Side	13	1.7	14.7	1.1	0.3	1.4	0.3	<0.1	0.3
Backside	26	1.4	27.4	2.5	0.5	3.0	0.4	<0.1	0.4
Left Side	13	0.5	14	0.7	0.25	0.95	0.1	<0.1	0.1
Right Side	12	0.7	13	2.5	0.25	2.75	0.4	<0.1	0.4
Upper Side	19	1.7	20.7	0.6	0.7	1.3	0.15	0.1	0.25
Lower Side	18	6.0	24	0.6	0.9	1.5	0.1	0.1	0.2
Radiation Profile of Nuclear Densimeter model 3430 with transportation box (mrem/h)									
Front Side	10	0.7	10.7	1.2	0.4	1.6	0.25	<0.1	0.25
Backside	7	0.8	7.8	0.8	0.25	1.1	0.1	<0.1	0.1
Left Side	0.3	0.1	0.4	0.1	0.1	0.2	<0.1	<0.1	<0.1
Right Side	5	3	8.0	0.6	0.7	1.3	0.2	0.1	0.3
Upper Side	10	0.4	10.4	0.6	0.3	0.9	0.1	<0.1	0.1
Lower Side	10	0.7	10.7	2	0.2	2.2	0.3	<0.1	0.3

Note: All indicated values in mrem/h, are taken from the Toxler operation manual delivered by the manufacturer.

7.3 Instructions for Inspection of the Densimeter

Once the Densimeter is removed from the storage site, it should be taken to the inspection zone with the equipment inside of the package in order to initiate the taking of radiation readings while it remains inside the package; record them in a way for this purpose. If the readings are within normal limits, proceed to take out the densimeter from its transport package and perform the radiation readings with the equipment outside and on top of the reference block; begin to take the readings with the portable monitor by the sides with the most activity and record these readings; they should be less than 27 mrem/hr in the zones of most activity, in other words close to the bar while keeping a safe position, completely at the top. Once the radiation limits are verified, proceed to perform the standard count above the block or return the equipment in its package to assemble it in one of the authorized transportation vehicles for this purpose.

If the activity to follow is the transportation of the equipment review the next step, rather than perform the verification process with the standard count, in the following way:

- Place the densimeter over the reference block adjusting it over the guides to avoid having air cushions.
- Turn on the equipment and move away at least 15 feet (5 meters) while it charges itself.
- Program the standard count to 4 minutes and once initiated you should move away at least 15 feet (5 meters); the equipment will indicate when it has finished the count so that you do not have to approach it to check.
- Verify the standard count readings DS and HS and test them with the theoretic measurements from Table # 2 from this procedure. In case of an error, the procedure should be repeated and a new count should be initiated. Record the readings obtained in the assigned format for them.
- Once the densimeter is taken out of the transportation box, and ready on top of the reference block the operator should perform the surface count in the six sides of the densimeter (above, below, front, back, right, and left side), through Geiger Muller making special emphasis in the lower base of the equipment since there is where the shutter could get blocked and expectedly present a big discharge, due to not closing the shutter correctly.

If it is in the field to take densities return the equipment again to the transport crate without needing to turn it off, to transport it to different work sites, rather return the equipment back into its box, secure it, and return it to its place of storage.

Note: One has to keep in mind that the equipment always gives off energy, even when turned off.

7.4 Transporting the Densimeter in a Motor Vehicle

- Lift the equipment inside its transport crate inside the vehicle.
- Secure the equipment with a chain to the anchorage point on each side of the body in the furthest part of the driver's cabin.
- At all times, you should have the shipping document or "shipper paper" in your work area, according to form PSSO-F-81-Documentation of Radioactive Sources-Shipping Paper.
- The package (packaging and the densimeter), should be placed in the back part of the motorized vehicle (pick up) inside the metal drawer securing it with two locks and tie it with a chain in a way that it will not suffer from strong vibrations and prevent someone from stealing it.
- When the densimeter is transported, attached to this no other hazardous element, such as fuel or any other element in case of an accident should not be transported as it could create a reaction when in contact with the radioactive material.

- The supervised zone should be identified in an area where an operator is working with a motorized vehicle that can transport the densimeter.
- Monitor the dosage rates through the portable radiation measuring device in three sides of the body (right, left, and back) and record the most amount of radiation on the package labels, this will be the rate of transport. The previous with the frequency required by local regulations.
- The motor vehicles that transport a densimeter "may not be abandoned", if the equipment with radioactive sources is in a motor vehicle. The driver (densimeter operator), will not leave the vehicle running with the keys in place, without the motor vehicle being supervised at all times. The keys of the motor vehicle will be isolated to prevent any possible robbery and/or getting lost.
- Verify that all pertinent documents are taken while transporting such in the case of the "Shipping Paper".
- When arrived to the work zone, the controlled zone should be determined temporarily so that non-authorized staff do not have access and place orange reflective cones as a preventative measure to take caution around the work zone.
- The transporting motor vehicle should have a preventative and corrective maintenance program, whether routine or non-routine maintenance, to comply with the Safety of Motor Vehicle Program.
  Note: Reflective cones and safety indications should always be transported during transportation in case of an accident.

7.5 Occupational Health (Exposure to Radioactive Sources)

7.5.1 Radiation Monitoring Verification measurements should be performed frequently, in different zones, depending on the activities, which guarantee the dosage within the established parameters. These monitoring allow the ability to take immediate action.

Likewise, through the Personnel Dosimeter, the operator's dosage can be controlled when dealing with abnormalities (high dosage), which allows to analyze the causes of such and take corrective action as soon as possible. The Personnel Dosimeter, will be sent to a laboratory approved to measure individual exposure dose.

Personnel dosimeters (badges) are provided to Ferrovial Agroman radiation workers through RSO. Radiation Monitoring badges are issued commensurate with the type of ionizing radiation to which a worker is exposed. Badges are issued to workers who are likely to exceed 10% of the annual occupational dose limits. Workers may work with radioactive material or sources of ionizing radiation and not be issued a monitoring badge.

Radiation badges will be issued based on:

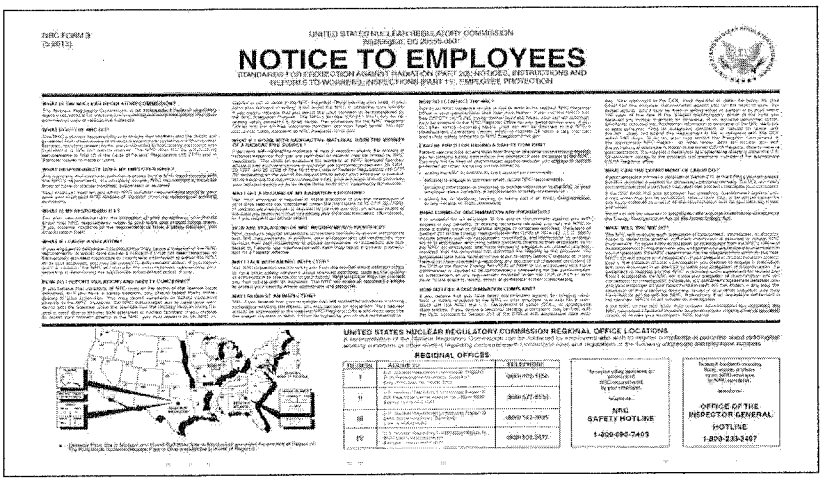
- an analysis of the individual's potential radiation exposure,
- the type of radiation source,
- the nature and duration of exposure, and
- the quantity of radioactive material that will be handled at any one time.

7.5.2 Exposure monitoring

A. Each certified operator is provided with a monitoring film badge which is to be submitted to SRO at Ferrovial Agroman. The Monitoring film badge should be returned every 3 months in exchange for a new one.
B. A record of exposure information is maintained and monitored by the Radiation Safety Officer.
C. Each time that the individual dose exceeds the allowed limit, the Radiation Safety Officer should take measures to comply with the established requirements by the Nuclear Regulatory Commision (NRC).

7.6 Warnings and Precaution Signs

a. The following signs and necessary warnings can be obtained from the radiation safety office. "WARNING TO EMPLOYEES" - NRC and the Health Department of Puerto Rico require that this warning be published in all places where there are radioactive and radiation materials (when these machines are being used). It should be published in areas that contain x-ray or fluoroscopy machines, these levels of radiation are only present when the machine is being operated. Keep in mind that the NRC form is different from the one the Health Department of Puerto Rico uses. That being said, two signs could be necessary in the same place. Apply format 3A from NRC-5-2012.



NOTICE TO EMPLOYEES

UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICE LOCATIONS

REGIONAL OFFICES

NRC SAFETY HOTLINE

OFFICE OF THE INSPECTOR GENERAL HOTLINE

Figure 2. Warning to Employees from the NRC

"Caution- Radioactive Material" - This sign is to be posted in each area where radioactive materials are used or stored.
"Caution - Radiation Area" - This sign is to be posted in a room in which the radiation intensity could range from 2.0 to 100 mRem in any one hour. This is measured at 30 cm from the surface of the source.
"Caution -High Radiation Area" - This sign is to be posted in a room in which the radiation intensity could range from 100 mRem or higher in any one hour. This is measured at 30 cm from the surface of the source. Only authorized personnel should enter these areas and the individual entering the area must wear personnel dosimeter.

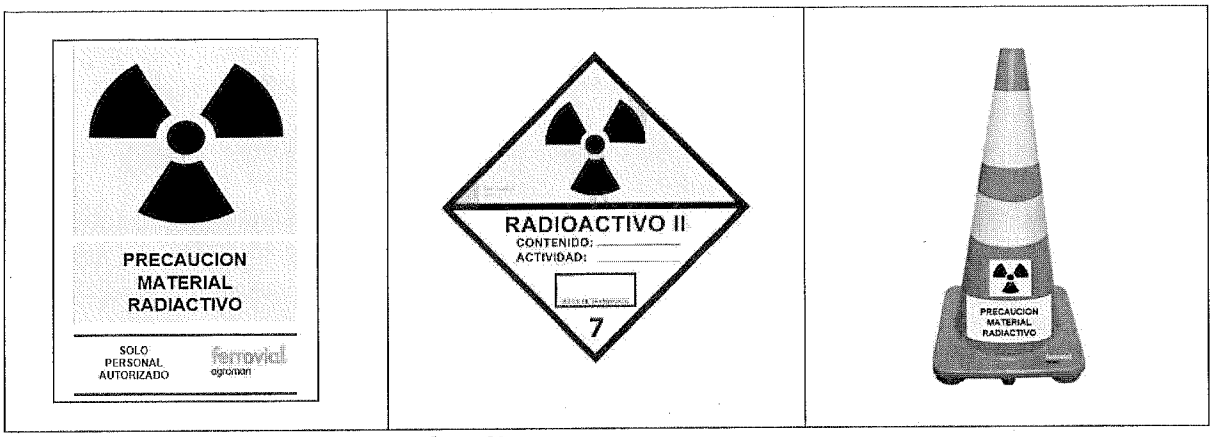


Figure 3. Radioactive Source Safety Signs

The required labels for shipping containers:

- Direction Label
- DOT Label
- ONU Label
- Yellow Label II
- Aerial Cargo Label

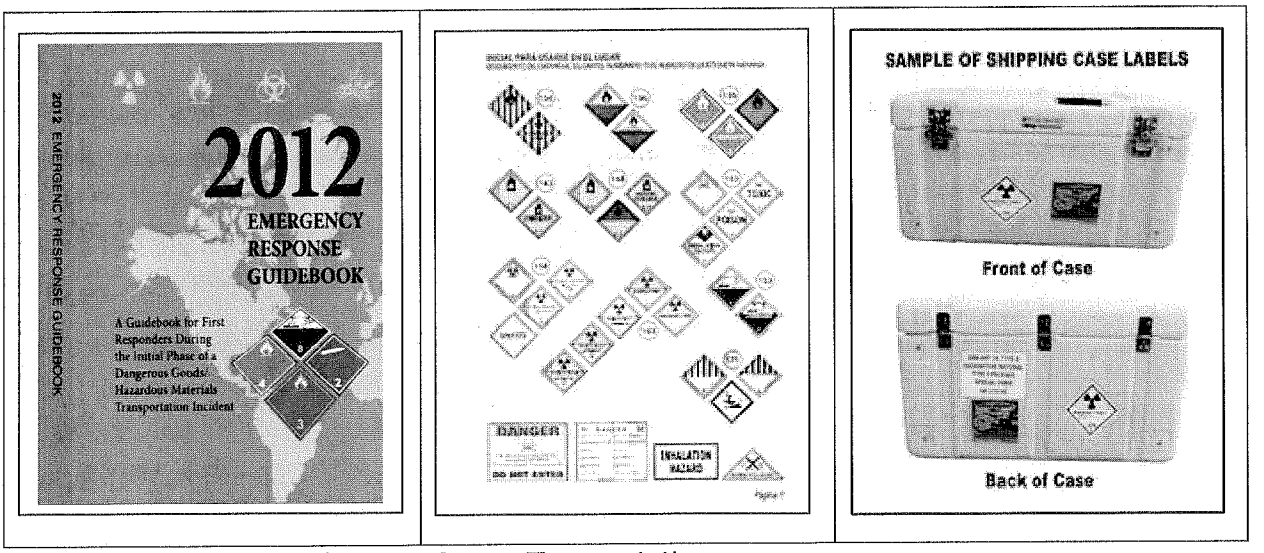


Figure 4. Labels for Radioactive Source Transportation

7.7 Principles of Safe Operation

The radioactive device is an object in which a radioactive source is installed in order to use it in its determined application. It serves to shield from radiation and allow the employee protection from controlled radiation for as long as he desires.

The package for radioactive transport is an object or packaging in which one or more radioactive sources can be transported.

The devises and radioactive transport packages normally contain lead, tungsten, or other dense materials that shield from radiation, in a way in which they are heavy in relation to their size.

In continuation there is a brief Safety Procedure in the case of using radioactive material contained in measuring devices (densimeters or radioactive meters):

- Each Densimeter or Nuclear Meter consists of two sealed radioactive sources that can cause possible damage to people who are exposed and the public in general if there was to be an emergency or incident.
- The authorized operator with license for use and management of the nuclear meter will be watchful of the nuclear meter at all times.
- The authorized operator with license to use and manage the nuclear meter with stay at least 10 to 15 feet or more from the nuclear meter.
- The authorized operator with a license to use and manage the nuclear meter will be sure that a motor vehicle is not of 20 feet or more, unless the vehicles are not started and the drivers/operators are 20 feet or more from the Nuclear Meter.

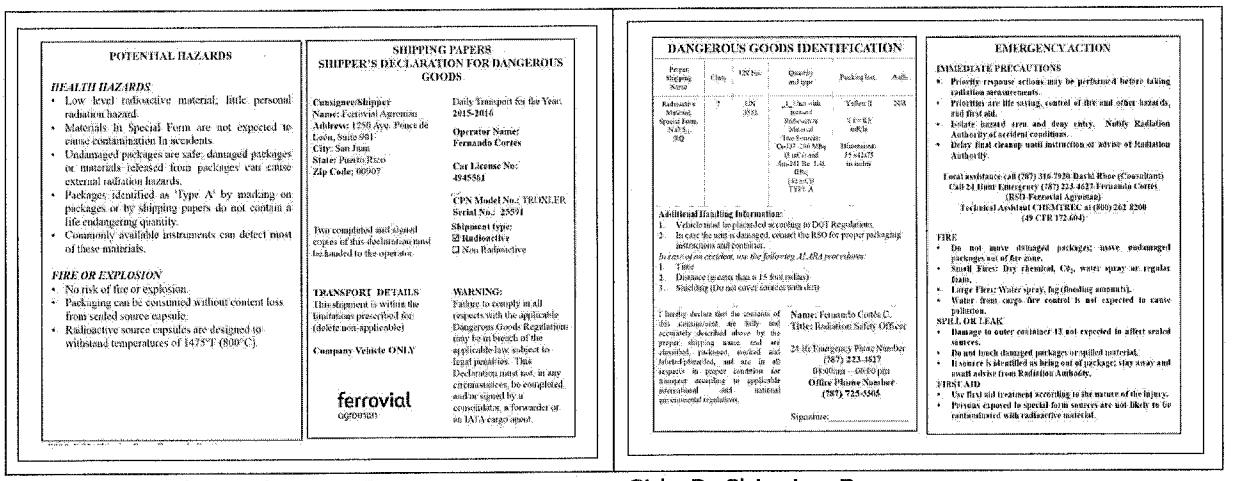


Figure 8. Side A, Shipping Paper Side B, Shipping Paper

7.7.1 Methods for measuring the Density

The "Roadreader" can do measurements of density in construction materials through two means of operation. The operator selects the retro-transmission way or the direct transmission way, depending on the type of material and the thickness of the corresponding layer.

a. Retro-transmission

The way of retro-transmission is fast and non-destructive. The source of gamma emissions and the detectors remain inside the densimeter, placed on the surface of the material to be analyzed. The gamma emissions penetrate the material being evaluated; the emissions are received through quantified detectors. The retro-transmission is mainly used in thin layers, whether asphalt or hydraulic cement slabs.

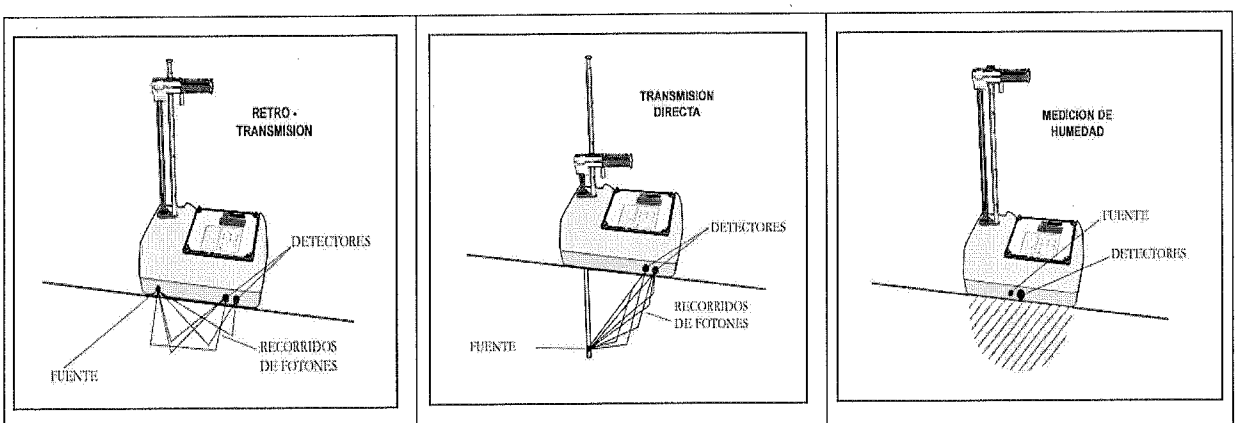
b. Direct Transmission

In this way of operation, the gamma source is positioned to a specific depth, within the layer of material to evaluate, through its insertion of an access hole. The gamma emissions are transmitted through the material, towards the detectors, inside the densimeter. The density of the average emission between the gamma source, and the detectors is determined. This way of operation minimizes the uncertainty caused by rough surfaces and the chemical composition of the material being evaluated, determining a high accuracy in the measurements. The direct transmission is used for evaluations in layers with density by means of thickness, of the ground, aggregates, asphalt layers, and hydraulic cement slabs.

c. Humidity

The measurement of humidity is a non-destructive test; the source of neutrons and the detector remain inside the densimeter, on the material's surface to be analyzed.

Emissions of neutrons, at high speed, are introduced in the layer being evaluated, and are partially detained due to their collisions with hydrogen atoms inside the material. The helium detector in the densimeter, counts the amount of thermalized neutrons (with a diminished speed); that directly correlate with the amount of humidity in the material being evaluated.



Retro-transmission	Direct Transmission	Humidity

Figure 9. Methods for density measurement

8. RESPONSE IN CASE OF EMERGENCY

8.1 Definitions

Just as being used in the current emergency plan, these terms have definitions that are established in continuation:

Accident: Means any event that is not desired (including a functioning error, equipment failure or any other incident), that could (1) take place a dosage higher than the regulated limit at a place or for the public or (2) have consequences or potential consequences that cannot be ignored from the protection or safety point of view (as a real or potential substantial deterioration of the protection or safety level of the installation or the release of radioactive materials in a sufficient amount as to justify the consideration of protection action).

Alert: Means it could cause an event, is in process, or has occurred and could conduct the release of radioactive material, but that it is not expected for the release to require a response by the non-workplace response organizations of emergencies to protect people outside of the incident.

Emergency: Means an event that requires immediate action to lower a threat to the health and safety of the workers and the public, or a threat of damage to the environment.

Evacuation: Means immediate exit of the people of an area to avoid or reduce high level of exposure in a short amount of time.

The Action of Protection: Means an action taken by the members of the public to protect them from radiation from an accident with radioactive material. Protective action could include shelter, evacuation, relocation, control of access, the administration of a radio protective medicine, the decontamination of people, the decontamination of the land or property or the control of food and water.

Place of Work: Means the physical area within the limits of the project, including the area over which the operation activity of equipment with radioactive sources (densimeter) and any restricted area. The limit of work place is the line beyond which does not belong to the perimeter of the landlord or whoever is controlling the project.

Place of Emergency: An event could occur, be in process, or has occurred in which could create a significant release of radioactive material and could require a response from the non-workplace response organizations to protect people outside of the area.

Relocation: Means elimination or, after an emergency has taken place, to continue prohibiting people to go near contaminated areas to avoid dosages of chronic radiation.

Shelter: The use of a structure for protection from the point in the air that contains the radioactive material.

Zone of Emergency Plan: Means a geographic area that surrounds a specific installation so that the special planning and the efforts of preparation can take place to assure the fast and efficient actions of protection can reduce or minimize the impact of the emissions of the radioactive material for the health and safety of the public or the environment.

8.2 Evaluation Dosage and Plan of Emergency

Each type of radioactive source has an amount or dosage in case of an excess of the amount allowed by U.S. Nuclear Regulatory Commission (NRC). The amount of radioactive materials that require the need of an emergency plan to respond to a launch", should contain the following:

a. An evaluation, such as described in 6.4, showing that the projected dosage outside the workplace to a person due to the release of radioactive material to not be over 0.01 Sievert (1 rem) of the total equivalent effective dosage or 0.05 Sievert (5 rem) for the thyroid gland;

or

b. A contingence plan, according to prescribed in 8.4, to respond to any even in which radioactive material could be released from the work place.

8.3 Evaluation of Potential Dosage

In the evaluation of the total equivalent effective dosage in individual accordance with 6.4. The previous will be noticed by the evaluator if:

a. The radioactive material physically separates in a way that only one part could be implicated in alert for the area of the emergency site.
b. All or part of the radioactive material due to the form in which it is stored or contained, is not subject to being released during an alert or area in the place of an emergency.

8.4 First Response when facing an Emergency

If a radiation emergency occurs, where the exposure has involved people, due to damage, or an incident, it will be dealt with in the following manner:

a. The number for an Emergency 9-1-1 will be called
b. Contact the Radiation Safety Officer at (787) 223-4627
c. In the case of an incidence with the Nuclear Meter (without being lost) stay at least 20 feet away from the incident.
d. In case of an incident with losing the Nuclear Meter, only one line of external communication will be kept. .

Place informative warnings in the zone where the densimeter has been lost, informing the community of the risks that exist with the sources. The basic information in case of an emergency can be observed in Table 5, in addition see General Procedure in case of an Emergency, as stated in the Safety and Health Program of Ferrovial Agroman in Puerto Rico:

Table 5. List of Emergency Contacts

Name and Last Name	Job Position	Telephone	Alternative Telephone
Fernando Cortés	Radiation Safety Officer (RSO)	(787) 223.4627	(787) 725.5505
	Nuclear Regulatory Commission (NRC)	(800) 695.7403	
	Center of Emergency Operations	(301) 816-5100	
	Health Departament of Puerto Rico	(787) 274.7815	
	Local Police		
	Firefighter Departament	(787) 761.2330	

8.5 Notification and Coordination with Emergency Response Agency

a. A brief description of the measures, in the case of an alert or zone of place [or general] of emergency, to notify without hesitation to the non-workplace response organizations listed as stated on the contact list in case of an emergency.
b. There will be a brief description of the adopted order to request an efficient coordination by phone and use of the organizations outside of the facilities of the project. This coordination should be capable of increasing the response in a planned situation, including the dispositions for copied safety communication and the ability within 24 hours.

c. The assistance or help in a requested emergency could include, but is not limited to medical treatment of workers in the contaminated area or injured workers.
d. A description or a drawing of the designated places that control and evaluation of an alert or the area of emergency will be completed (in other words, the control center and the control points).
e. The order for notifying and coordinating of key staff of the case, the parts of the facilities, or some equipment that is not available.

8.6 Information that should be communicated

a. A brief description of the information that should be given to the out of work place response organizations, including an agency, in the case of an emergency zone alert.
b. The type of information that should be given, include the declared state of installation, a description of the exact or potential releases of radioactive material, and the names and telephone numbers of designated staff as points of contact, what has been seen affected, and the recommended action of protection.
c. A brief description of the types of information that should be given to the public by staff of the Company and through the non-workplace response organizations.
d. Is the protective action for the public is part of the contingence plan, a description of how the public will be trained in order to perform the action (for example, the elimination and disposition of the contamination).

8.7 NUREG-1556, Volume 1 Errata: Appendix H, Operating, Emergency, and Security Procedures

The company will implemented the regulation concerning Operating, Emergency, and Security Procedures, as indicated NUREG-1556, Volume 1 Errata: Appendix H, "Operating, Emergency, and Security Procedures".

OPERATING PROCEDURES

- If personnel dosimetry is provided:
  - Always wear your assigned National Voluntary Laboratory Accrediation Program (NVAP) approved thermoluminescent dosimeter (TLD), optical stimulated dosimeter (OSL), or film badge when using the portable gauge;
  - Never wear another person's TLD, OSL, or film badge;
  - Never store your TLD, OSL, or film badge near the portable gauge.
- Before removing the portable gauge from its place of storage, ensure that, where applicable, each portable gauge sealed source is in the fully shielded position and that in portable gauges with a movable rod containing'a sealed source, the source rod is locked (e.g., keyed lock, padlock, mechanical control) in the shielded position.
  Place the portable gauge in the transport case and lock the case.
- Use a minimum of two independent physical controls that form tangible barriers tosecure portable gauges from unauthorized removal whenever the portable gauges are not under the licensee's control and constant surveillance (i.e., in storage).
- Guidance regarding this requirement is discussed below in the "Security Procedures" section of this Appendix.

- Sign out the portable gauge in a log book (that remains at the storage location) including the date(s) of use, name(s) of the authorized users who will be responsible for the portable gauge, and the temporary job site(s) where the portable gauge will be used.
- Block and brace the portable gauge to prevent movement during transport and lock the portable gauge in or to the vehicle. Follow all applicable Department of Transportation (DOT) requirements when transporting the portable gauge.
- Use the portable gauge according to the manufacturer's instructions and recommendations.
- Do not touch the unshielded source rod with your fingers, hands, or any part of your body. -
- Do not place hands, fingers, feet, or other body parts in the radiation field from an unshielded source.
- Unless absolutely necessary, do not look under. the portable gauge when the source rod is being lowered into the ground. If you must look under the portable gauge to align the source rod with the hole, follow the manufacturer's procedures to minimize radiation exposure.
- After completing each measurement in which the source is unshielded, immediately return the source to the shielded position.
- Always maintain constant surveillance and immediate control of the portable gauge when it is not in storage. At job sites, do not walk away from the portable gauge when it is left on the ground. Take action necessary to protect the portable gauge and yourself from danger of moving heavy equipment.
- When the portable gauge is not in use at a temporary job site, place the portable gauge in a secured storage location with two independent physical controls.
- Examples of two independent physical controls are: (1) securing the portable gauge in a locked storage facility located in a separate secured area in a warehouse; (2) securing the portable gauge inside a locked van and secured to the vehicle with a steel cable; (3) or storing the portable gauge inside a locked, noriremovable box and further securing the box with a steel cable or chain. If chains or cables are used as a method of providing security, one of the two chains or cables used, should be substantially more robust and more difficult to cut than the other.. Simply having two chains or cables with locks would not satisfy the security rule, unless each chain and lock combination were physically robust enough to provide both a deterrence and a reasonable delay mechanism.
- Always keep unauthorized persons away from the portable gauge.
- Perform routine cleaning and maintenance according to the manufacturer's instructions and recommendations.
- Before transporting the portable gauge, ensure that, where applicable, each portable gauge source is in the fully shielded position. Ensure that in portable gauges with a movable source rod, the source rod is locked in the shielded position (e.g., keyed lock, padlock, mechanical control). Place the portable gauge in the transport case and lock the case. Block and brace the case to prevent movement during transportation. Lock the case in or to the vehicle, preferably in a closed compartment.
- Return the portable gauge to its proper locked storage location at the end of the work shift.
- Log the portable gauge into the daily use log when it is returned to storage.
- If portable gauges are used for measurements with the'unshielded source extended more than 3 feet beneath the surface, use piping, tubing, or other casing material to line the hole from the lowest depth to 12 inches above the surface. If the' piping; tubing, or other casing material cannot extend 12 inches above the surface, cap the hole liner or take other steps to ensure

that the hole is free of debris (and it is unlikely that debris will re-enter the cased hole) so that the unshielded source can move freely (e.g., use a dummy probe to verify that the hole is free of obstructions).

- After making changes affecting the portable gauge storage area (e.g., changing the
- location of portable gauges within the storage area, removing shielding, adding portable gauges, changing the occupancy of adjacent areas, moving the storage area to a new location), reevaluate compliance with public dose limits and ensure proper security of portable gauges.

9. SAFETY AND HEALTH TRAINING

Employees who are exposed to the sources should have a Safety and Health Training every 12 months (once a year), about the safety of radioactive sources.
Employees who are exposed to sources should have a Safety and Health Training every 36 months, about Hazardous Materials Safety (HazCom).
Employees who are exposed to sources should have a Safety and Health Training about the Risks that they will be exposed to, according to the requirements from OSHA / PR OSHA.

10. MAINTENANCE AND CALIBRATION OF INSTRUMENTS AND EQUIPMENT

Aspects to Keep in Mind:

- The equipment for measurement and control (monitor radiation dosimeter), will be calibrated by a qualified and authorized person and verify that the calibration to regular intervals leave a written record. Annual Calibration of the Densimeter (every 12 months) and the leak test or inspection of equipment ("Leak Tests") every 6 months.
- There should always be a cleaning performed on the densimeter use a measurer of the rate of radiation ionizers to check whether the source was left shielded and in good safety conditions.
- Use a personal dosimeter while performing cleaning tasks.
- Perform cleaning of the container or packaging box eliminating any type of filth or humidity.
- Check to make sure the screws are well tightened and verify good status of nuts and springs.
- Confirm that the safety mechanism of the source works well.
- Inform about any failure to your superior immediately, who determines if the competent authority is informed.
- Warehouse, transport, and operation (safety measures)
- Any failure of proper functioning and/or physical conditions of the equipment should be communicated to the Radiation Safety Officer.

11. LEAK TEST

Any source or device that contains more than 100 uCi of radioactive material with a half-life of greater than 30 days shall be tested for contamination and/or leakage at intervals of six months. The counting instrument shall be able to detect the presence of 0.005 uCi of activity on the test sample. If the tests reveal the presence of 0.005 uCi or greater, the source shall be removed from use and either decontaminated or properly disposed. The Radiation Safety Office will conduct such leak test. Any source that is not in use may be placed in a container and sealed with tape. This source does not have to be leaked tested until it is removed from storage or at the end of a ten-year storage period. Once removed from storage the source must first be leak tested before usage. A dose rate of the area will be performed. Any source that is required to be leak tested will be listed in the inventory at the same time the leak tests are performed.

12. PROCUREMENT, RECEIVING RADIOACTIVE MATERIALS, INVENTORY

12.1 Procurement and Inventory Control

All orders for radioactive materials to be purchased shall not be processed until approved by the Radiation Safety Office. All requests should include the following: Vendor, Isotope(s), and Activity. If orders do not have all of the information listed, it will cause a delay upon approval of the radioactive material.

12.2 Receiving Radioactive Materials

1. All packages must be approved by the Radiation Safety Office.
2. In the event that packages are delivered after hours, the following procedures will be followed:
   a. The Authorized User will be responsible for arranging receipt for the package.
   b. If the package is visibly damaged or leaking: the receiving person shall immediately notify the RSO and attempt to detain the carrier until it can be determined that neither the driver nor the vehicle is contaminated. If not, the person accepting the delivery shall obtain the name of the driver, a delivery company or other identifying information required by the RSO.
   c. Isolate the damaged package from further handling.
   d. Keep all personnel away from the immediate vicinity of the package and under no circumstances shall anyone, other than Radiation Safety personnel, attempt to open the package.

12.3 Inventory Control

The Radiation Safety Officer will maintain a database of all radioactive material delivered to and possessed by the facility.
Every 6 months, a thorough inventory is done (this coincides with leak testing schedule) to check gauges for usage and condition.

12.4 Storage

Upon receipt of the package, all material must be stored in authorized area. (see 6.2 Equipment Storage and Control)

12.5 Transfer of Radioactive Material

The Radiation Safety Office must obtain the following information:

- Name and address of recipient
- A copy of the recipient license
- Manufacturer, model, and serial number of nuclear gauge

13. EVALUATIONS AND AUDITS

In the appropriate areas where there is a Nuclear Densimeter stored, Activities or measuring the density of the ground, the employees who are exposed, activities in the field where the public in general is exposed, and in any type of situation that has to do with safety and health in the usage, management, transport of equipment with radioactive sources, the following evaluation activities should be performed:

1. Inspection of Warehouse where the Densimeter will be kept.
2. Zones of Inspection Surveillance, Storage, Transport, and Use of the Densimeter
3. Surveillance and Control of the Personal Dosimeters
4. Inspection of Equipment (Densimeter and Package from the Manufacturer)
5. General Audits of Radiation Safety

(Intentionally left blank)

REGISTER AND CONTROL OF DOCUMENTS

"USE, MANAGEMENT, AND TRANSPORT OF EQUIPMENT WITH RADIOACTIVE SOURCES"

The employee has received this Comprehensive Orientation of Safety and Health, declaring: I certify compliance having received the present internal regulation of the Standard Procedure of the Project, in which contains the Procedure of "Use, Management, and Transport of Equipment with Radioactive Sources" established by Ferrovial Agroman in Puerto Rico for regulatory and internal compliance.

About the received document, I show having received adequate instruction, I respect the materials included, and reiterate my commitment to comply with previously stated instructions while performing the job being commended to me.

In the case of violating these rules of safety practices, I accept my responsibility of receiving a written warning as a disciplinary measure in order to correct or improve my alarming or risky behavior.

Employee Identification	**Name and Last Name – Employee**							
Project								
Position								
Return Date	**Month - MM**			**Day – DD**			**Year - YY**	
			-			-		

The following sections have been included in this document:	**YES**	**NO**	**NA**
Definitions			
Responsibilities			
General Procedures of Radioactive Sources			
Safety and Health Procedures			
Storage, transport, and operation (Safety measures)			
Principles of Safe Operation			
Response in Case of an Emergency			
Required Training			
Inventory Control			
Evaluations and Audits			

Trainer's Signature		**Employee's Signature**	

CONTROL DEL EQUIPO RADIACTIVO (DENSIMETRO NULEAR)

(equipo nuevo, movimiento dentro el proyecto o transportado desde otro lugar)

# Identificación	Manufacturero	Nro. Serie	Fecha Retiro	Ubicación Almacén	Removido Por (Nombre):	Lugar de trabajo (Proyecto)	Fecha Retorno	Retornado por: Operador Certificado
Tag Number	Manufacturer	Serial Number	Date Removed	Storage Location	Removed By (name):	Job Site Location (Project)	Date Returned	Returned by: Operator Certificate

CONTROL DEL EQUIPO RADIACTIVO (DENSIMETRO NULEAR)

(equipo nuevo, movimiento dentro el proyecto o transportado desde otro lugar)

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Tag Number	Manufacturer	Serial Number	Date Removed	Storage Location	Removed By (name):	Job Site Location (Project)	Date Returned	Returned by: Operator Certificate

PROGRAMA DE SEGURIDAD Y SALUD			
ferrovial agroman	**CONTROL DE SALIDA DE DENSIMETRO NUCLEAR DESDE EL ALMACÉN (sólo para casos de transporte fuera del proyecto)**	CODIGO	PSSO-F-81
		EDICION	1.01
		FECHA	5/11/2015
FERROVIAL AGROMAN – PUERTO RICO			

CONTROL DE SALIDAS DEL DENSIMETRO NUCLEAR							
# Identificación	Proyecto	Fecha Despacho	Despachado por	Firma	Ubicación del Equipo	Recibido por (Operador Licenciado)	Firma
Tag Number	Project	Date Dispatched	Dispatched By	Signature	Location Equipment	Received By (Licensed Operator)	Signature

INFORMACION DEL VEHICULO DE MOTOR Y CHOFER			
Remitente (lugar donde sale)		Destinatario (lugar donde se envía)	
Nombre		Nombre	
Dirección		Dirección	
Teléfono		Teléfono	
Contacto		Contacto	
Fecha		Fecha	
CHOFER QUE TRANSPORTA EQUIPO RADIOACTIVO			
Nombre Chofer		Marca Vehículo	
Licencia Chofer		Modelo Vehículo	
Fecha y Firma		Malbete	

NOMBRE Y APELLIDO
PERSONA AUTORIZA TRANSPORTE

FECHA Y FIRMA
PERSONA AUTORIZA TRANSPORTE

POTENTIAL HAZARDS

HEALTH HAZARDS

- Low level radioactive material; little personal radiation hazard.
- Materials In Special Form are not expected to cause contamination In accidents.
- Undamaged packages are safe; damaged packages or materials released from packages can cause external radiation hazards.
- Packages identified as 'Type A' by marking on packages or by shipping papers do not contain a life endangering quantity.
- Commonly available instruments can detect most of these materials.

FIRE OR EXPLOSION

- No risk of fire or explosion.
- Packaging can be consumed without content loss from sealed source capsule.
- Radioactive source capsules are designed to withstand temperatures of 1475'F (8OOC).

SHIPPING PAPERS
SHIPPER'S DECLARATION FOR DANGEROUS GOODS

Consignee/Shipper **Name:** Ferrovial Agroman **Address:** 1250 Ave. Ponce de León, Suite 901 **City**: San Juan **State:** Puerto Rico **Zip Code:** 00907	Daily Transport for the Year: **2015-2016** **Operator Name:** **Fernando Cortés** **Car License No:** **4945561** **CPN Model No.:** TROXLER **Serial No.: 25591**
Two completed and signed copies of this declaration must be handed to the operator.	**Shipment type:** ☑ **Radioactive** ❑ Non Radioactive
TRANSPORT DETAILS This shipment is within the limitations prescribed for: (delete non-applicable) **Company Vehicle ONLY** ferrovial agroman	**WARNING:** Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.

DANGEROUS GOODS IDENTIFICATION

Proper Shipping Name	Class	UN No.	Quantity and type	Packing Inst.	Auth.
Radioactive Material, Special Form, N.O.S., RQ	7	UN 3332	_1_Unit with incased Radioactive Material Two Sources: Cs-137 296 MBq (8 mCi) and Am-241/Be 1.48 GBq (40 mCi) TYPE A	Yellow II T.I = 0.3 mR/hr Dimensions: 35 x42x75 in inches	N/A

Additional Handling Information:

1. Vehicle must be placarded according to DOT Regulations.
2. In case the unit is damaged, contact the RSO for proper packaging instructions and container.

In case of an accident, use the following ALARA procedures:

1. Time
2. Distance (greater than a 15 foot radius)
3. Shielding (Do not cover sources with dirt)

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Name: Fernando Cortés C.
Title: Radiation Safety Officer

24 Hr Emergency Phone Number
(787) 223-4627
08:00am – 06:00 pm
Office Phone Number
(787) 725-5505

Signature:_____

EMERGENCY ACTION

IMMEDIATE PRECAUTIONS

- **Priority response actions may be performed before taking radiation measurements.**
- **Priorities are life saving, control of fire and other hazards, and first aid.**
- **Isolate hazard area and deny entry. Notify Radiation Authority of accident conditions.**
- **Delay final cleanup until instruction or advise of Radiation Authority.**

Local assistance, call (787) 316-7920.
CALL INFOTRAC 24 HOUR EMERGENCY ASSIST NO. (800) 536-5053 first If not available or no answer, call CHEMTREC at (800) 424-9300. (49 CFR 172.604)

FIRE

- **Do not move damaged packages; move undamaged packages out of fire zone.**
- **Small Fires: Dry chemical, C02, water spray or regular foam.**
- **Large Fires: Water spray, fog (flooding amounts).**
- **Water from cargo fire control is not expected to cause pollution.**

SPILL OR LEAK

- **Damage to outer container 13 not expected to affect sealed sources.**
- **Do not touch damaged packages or spilled material.**
- **It source is identified as being out of package; stay away and await advise from Radiation Autho6ty.**

FIRST AID

- **Use first aid treatment according to the nature of the injury.**
- **Persons exposed to special form sources are not likely to be contaminated with radioactive material.**