Bz. 2

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REF:License Amendment Request Docket No.03037094, License No. 52-31107-01

Following the procedure of investigation of the incident from the US NRC, the theft of portable gauge / vehicle occurred on April 28, 2015, we wish to request the amendment of the License 52-31107-01, which includes:

1. Add the revised Operational and Emergency Procedures in which members of Ferrovial Agroman under the License 52-31107-01, pledge to continue these Operational Procedures and Emergency reviewed, and follow the guidelines of the 2005 guide NUREG 1556, Volume 1, Revision 1, Errata.
2. We also send the method of use, handling and transportation equipment with radioactive source in English.

Thank you for your cooperation, I am at your service,

Best regards,

Fernando Cortes C.
EHS Manager and
Radiation Safety Officer
Health and Safety Department
Ferrovial Agroman – Puerto Rico
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San Juan, October 14, 2015

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NMSS/RGNI MATERIALS-002

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

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Internal Control of Documents		
Revision Number	**Date**	**Previous Modifications**
2.01	**April 2015**	**Rev. 2.0**

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

Prepared by: **Safety and Health Manager** **Ferrovial Agroman – Puerto Rico**	**Date**	**Signature**
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Approved by: **General Manager** **Ferrovial Agroman – Puerto Rico**	**Date**	**Signature**
Nassin Tactuk D.	**April, 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. National Regulation 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 that use radio frequency transmitter equipment, or is involved in transporting or storing it.

3. REFERENCES

3.1 U.S. National Regulation Commission (NRC) (NUREG 1556)
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

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.
Protective Action: Intervention with the purpose of avoiding or reducing the risk of chronic exposure or emergency situations to members of the public.
Corrective Action: Action which will be used when the level of determined intervention exceeds in order to reduce the radiation dosage, which if not dealt with, could imply an intervention of a situation of chronic exposure.
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:

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

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.

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

ALARA: (acronym for "as low as reasonably achievable") means to make all the reasonable effort possible to maintain radiation exposure below the dosage limits in this part as coherent practice with the purpose of this activity being performed with a license, keeping in mind the state of technology, the economy of improvement in relation with the benefits of public health and safety, and other social and socioeconomic considerations, and in relation with the use of nuclear energy and the materials with a license in the interest of the public.

Regulating Authority: The authority that has the responsibility of complying with the current radiation material protection and safety regulations. In Puerto Rico, this competency is based on the U.S. National Regulation Commission (NRC), www.nrc.gov.

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. National Regulation Commission (NRC), given on the date of November 21, 2014.

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.

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: Measuring equipment that obtains the density and humidity of the ground, bases, aggregates, concrete, and asphalt.

Dosimeter: Measures the exposure or absorbed dosage or equivalent by the exposed working staff during a determined amount of time.

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

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 $^{-1}$

Equivalent Dosage, $H_{T,R}$ is defined as:

$$H_{T,R} = D_{T,R} \cdot W_R$$

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:

$$HT = \sum_{8} W_R \cdot D_{T,R\,R}$$

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

Qualified Expert: Individual who, by virtue of extended certificates for organs or competent societies, 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.

Exposure: Exposure of people to radiation or radioactive substances, that could be external (radiation sickness caused by sources situated outside the human body), or internal (radiation sickness caused by sources situated inside the human body).

Source: Anything that could cause exposure to radiation, whether it be emitting ionized radiation or releasing radioactive substances or materials. For example, the substances that emit radon are sources that exist in the environment; a unit of sterilization by radiation sickness gamma is an assigned source to the radio diagnostic practice, and a nuclear power plant is the assigned source to the generation of nuclear electric energy practice.

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.

Geiger Muller: Device or monitor that determines the exposure or absorbed dosage rate or equivalent. It is an ionization camera, proportional counter.

Dosimetric Calibration Laboratory: Laboratory in charge of establishing, maintaining, or improving primary or secondary patterns with the purpose of radiation dosimetry.

Limit: Value of magnitude, applied in certain activities or specific circumstances, which should not be exceeded.

Annual Limit of Consumption (ALI, Annual limit on intake): The limit derived from the amount of radioactive material had on an adult worker's body by inhaling or ingestion of one year. ALI is the smallest recommended value of radio nuclide intake given in a year by a reference person. Reference that would give place to an equivalent compromise of effective dosage of 5 rem (0.05 Sv) or an equivalent compromised dosage of 50 rem (0.5 Sv) to any individual organ or tissue.

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.

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.

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.

Competent Person: Is the person capable of identifying foreseen and existing dangers nearby the place of work in and dangerous conditions for the employees, who has the authority to make quick decisions with regards to the corrective measures to eliminate, reduce, or deal with them.

Emergency Plan: In conjunction with all planned operations which should be performed in a way to reduce radiation consequences in case of an accident.

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.

Radio Nuclide of Cesium (Cs 137): Is a solid source used to measure density; it has an activity of 8mCi and a disintegration period of 30 years.

Radio Nuclide 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.

Responsible of Radiation Safety: The person who is technically competent in relation to radiation protection of interest for type of practice give, who is designated by a registered director or trained director in accordance with the training requirements with the 49 CFR Part 172.704 and the U.S. National Regulation Commission (NRC) NUREG 1556.

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

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

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.

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.

Supervised Zone: All zones that are not defined as controlled zones, but in which the conditions of occupational exposure are maintained under surveillance, even though normally these protective measures are not necessary nor are they definite safety regulations.

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 Radioactive Safety Officer: Is the person who represents the organization before the U.S. National Regulation 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. National Regulation Commission (NRC).

5.5 Competent Person Designated for Radiation Safety: Is the responsibility of the person in charge of the radiation protection plan in compliance with the 49 CFR Part 172.704 and the U.S. National Regulation Commission (NRC) NUREG 1556:

- Participate in the implementation of this radiation protection procedure.
- Train the employees about recognizing danger and emergency situations entering or when employees are exposed to radioactive sources.
- Give technical speeches about the characteristics of the densimeter (nature of its sources and characteristics of its emissions) identification of responsibilities in case of accidents.
- Perform safety evaluations of the warehouse where the machinery with radioactive sources (nuclear dosimeter) will be stowed and protected with the objective of complying with the requirements from the U.S. National Regulation Commission (NRC) and the 29 CFR 1910.1200 from OSHA.
- Perform safety evaluations of the management and transportation of the machines with radioactive sources (nuclear dosimeter). With the objective of complying with the requirements from 49 CFR 172, Transportation of Hazardous Materials.
- Coordinate maintenance services, calibration and leak tests for the nuclear densimeter; calibration of radiation monitor; and verification of other required elements from the radiation protection program.
- Go with the radiation safety state inspectors and provide them with any information that they need.
- During radiation events, it should be coordinated for someone to go and supervise the operations if needed.

5.6 Nuclear Densimeter Operator: Are responsible for the Densimeter Operator and in compliance with 49 CFR Part 172.704 and the U.S. National Regulation Commission (NRC) NUREG 1556, 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. National Regulation 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 vigilance devices (film badge dosimeter).
- Carry out the radiation vigilance 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 crate with a sign that indicates its radioactive source.

- Facilitate to the designated competent person for radiation protection all the information such as past, present work activities that are of interest to guarantee safety and protection.
- 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 and/or the Designated Competent Person.

6. GENERAL REQUIREMENTS

6.1 Source 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 steal
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)

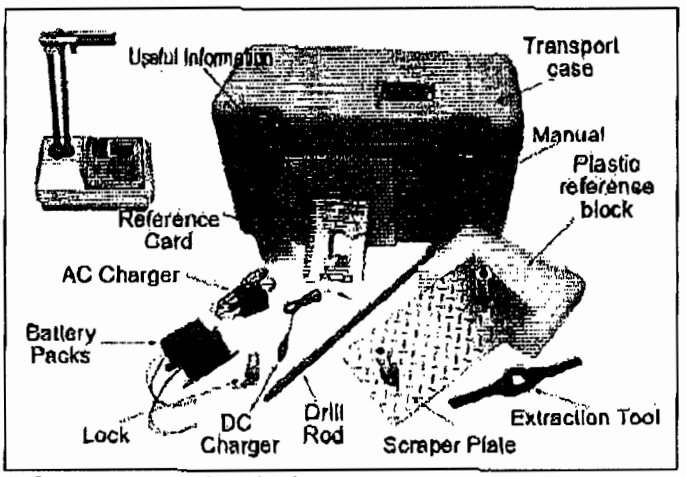

Figure 1. Troxler Nuclear Densimeter 3430

6.2 Equipment Storage and Control

The equipment with radioactive sources should comply with the requirements from the U.S. National Regulation 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 bunker in concrete block placed in the project area, secured with a lock and key that only the densimeter operator has access. The bunker should be marked, as indicated to inform and give warning of the presence of radioactive material, as shown in Figure 1.

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. National Regulation 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.
6.3.2 Supervised Zone: Is defined as a supervised transport zone to a transfer zone of the equipment to the field. The motor vehicle should have protection from where it performs the transport of radioactive equipment which should be transported inside its manufacturer box and secured inside a metal crate in the rear part of the motor vehicle or in the cab of a pickup from the storage zone to the place of work, Isolated from the staff driving the motor vehicle. The nuclear densimeter transport crate should have dual locks that immobilize any kind of movement that might cause damage or robbery of the nuclear densimeter.
Once the equipment has been secured in the cab of the motor vehicle, a measurement should be done with the Geiger Muller to surface level of body to calculate the rate of Transport and record its value on the labels from the box or manufacturer package.

6.4 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. National Regulation 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.

6.4.1 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 trimester 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.

b. 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.

c. Dosage Limit for Staff who are Pregnant

The exposure of radiation to staff who are pregnant that work in restricted zones will be limited to less than 500 mRem during the progression of the pregnancy. The supervisors should train the female staff who at reproductive age to give verbal and written notice to the Radiation Safety Officer when they find out that they are pregnant. In order to assure the compliance of this part, the supervisors should give written notice to the Radiation Safety Officer of all pregnancies.

d. 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

Table 3. Radiation Limits for Workers

Manufacturer of Nuclear Densimeter	Frequency Shift	Research Limits [mRem]
CPN, Troxler, and Humbolt	Once a month	50
	Once every two months	75
	Once every three months	100
Seamens	Once a month	75
	Once every two months	100
	Once every three months	125

Each film badge dosimeter report will be reviewed to see if any employee has exceeded the limit of research 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 limits 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 control the accumulated radiation dosage due to the radiation ionizer.

6.4.2 Radiation Dosage Limits per Zone

Work Zone (Inspection): Is a temporarily controlled zone, in which the delimitation 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 densimeters 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.

Only authorized staff will be allowed to enter this work 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 zones if an accident were to happen or handling the device incorrectly over and over.

In order to prevent a high dosage, the Densimeter Operator and the public, in each of the work zones, a delimitation should be established to guarantee that the rate of dosage measured by the Geiger Muller monitor reaches zero; the same when implementing technical procedures that reduce the time of exposure to as little as possible.

In continuation of Table 4, each type of zone will be placed, the distance of delimitation and the rate of dosage read by the Geiger Muller.

Table 4: Distances of Delimitation Safety

Radiation Zone	Delimitation Distance	Dosage Rate [mSv/hour]
Storage (within the thermometer)	Physical place in concrete and metal door, located in an area where there is not a flow of staff. Reading matter will be on the surface of the access door.	**0,1**
Inspection	Clear zone marked by warnings and marked off with cones with at least 10 ft. (3 meters) distance from the densimeter to the operator.	**0,6**
Transportation	Temporary zone, marked from the package to the cabin on the vehicle at a distance of 10 feet (3 meters).	**0,1**
Work	Controlled zone marked off with warnings of radioactive material and with limited distance of no less than 10 feet (3 meters).	**0,1**

6.5 Limit and Level Measurement

6.5.1 Units of Radiation Dosage

According to 10 CFR 20.1004 de U.S. National Regulation Commission (NRC) with relation to the dosage of radiation:

As used in this part, the units of radiation dosage are:

Gray (Gy) is the unit SI of absorbed dosage. One Gray is the same as an absorbed dosage of 1 Joule / kilogram (100 rads).

Rad is the special unit of absorbed dosage. One Rad is the same as the absorbed dosage of 100 ergs / gram or 0.01 joule / kg (0.01 gray).

Rem is the special unit of any of the expressed amounts in equivalent dosages. The equivalent of dosages in rems is the same as the absorbed dosage in rads multiplied by the quality factor (1 rem = 0.01 Sievert).

Sievert is the unit SI of any of the expressed amounts in equivalent dosages. The equivalent of dosages in Sievert is the same as the absorbed dosages in grey, multiplied by the quality factor (1 Sv = 100 rem).

(b) At the end of this part, the quality factors for absorbed dosage conversion to the equivalent dosage are shown in Table 5, regarding 10 CFR 1004 (b).1.

Table 5: Quality and Equivalences for absorbed dosages

Radiation Type	Quality Factor (Q)	Absorbed dosage equal to an equivalent dosage unit [a]
X-, gamma, or radiation beta	1	1
The particle alfa, multiple charged particles, fragments of fission and heavy particles of unknown charge	20	0.05
Neutrons of Unknown Energy	10	0.1
Protons of High Energy	10	0.1

[a] The absorbed dosage rad equals 1 rem of grey dosage absorbed equals 1 Sievert.

(c) If it is more convenient to measure the rate of fluency of neutrons than to determine the equivalent dosage rate of neutrons in rems per hour or Sievert per hour, as stated in paragraph (b) of this section, 1 rem (0.01 Sv) of neutrons the radiation of unknown energies could, to the effects of the progress in this part, supposedly the result of a total fluency of 25 million neutrons per square centimeter incident over the body. If there is not enough information to estimate the distribution of approximate energy of neutrons, the licensor can use the fluency rate per unit of equivalent dosage or

the value of Q as shown from Table 10 CFR 1004 (b).2 to convert a tissue dosage measured in rads to the equivalent dosage in rems.

As indicated in 10 CFR 20.1301 from the U.S. National Regulation Commission (NRC) with relation to the radiation dosage:

(a) Each licensed director should perform the operations in a way that:

(1) The total equivalent effective dosage to individual members of the public of authorized operation does not exceed 0,1 rem (1 mSv) in a year, excluding the contributions of radiation dosage in depth, any administration that the person has received, of exposure to radiation dosage in depth, in any administration that a person has received, from the exposure of administered individuals of radioactive material and published under 10 CFR 35.75, of voluntary participation in medical research programs, and the disposition of the director licensed in radioactive material in Sanitary Sewage System in accordance with 10 CFR 20.2003 and

(2) The dosage in any area without restriction of external sources, excluding contributions of dosages of administered patients of radioactive material and released in accordance with 10 CFR 35.75, may not exceed more than 0.002 reales (0,02 mili Sievert) in any one hour.

(b) If the licensed director allows members of the public to have access to the controlled zones, the established limits for members of the public continue to apply for the people.

(c) Nevertheless paragraph (a) (1) of this section, a licensor can allow that visitors of an individual who cannot be put freely, in virtue of 10 CFR 35.75, to receive a radiation dosage of more than 0,1 rem (1 mSv) if:

(1) The radiation dosage received may not exceed 0.5 rem (5 mSv); and

(2) The authorized user, according to definition found in 10 CFR Parte 35, has determined that it is appropriate before the visit.

(d) A person with a license or license applicant can request previous authorization from the NRC to operate up to one annual dosage limit for an individual member of the public of 0.5 rem (5 mSv). The director of the license or permit of the applicant should include the following information in this application:

(1) Show the necessity and expected duration of the operations that go beyond the established limit in paragraph (a) of this section;

(2) The license program for evaluation and dosage in 0.5 rem (5 mSv) annual limit control; and

(3) The procedures to follow in order to keep the dosage as low as reasonably and achievably possible.

(e) In addition to the requirements from this part, a director with license subject to rule dispositions of environmental radiation of general application of EPA in 40 CFR part 190 should adjust to the standards.

(f) The commission will be able to impose additional restrictions over the radiation levels in restricted zones and the total amount of the radio nuclides that a licensor can release in the effluents with the purpose of limiting the collective dosage.

Table 6. Radiation Zones vs. Work Zones

RADIATION ZONES	WORK ZONES
Supervised Zones	Storage
	Inspection
Controlled Zones	Transportation
	Work-Project

Table 7. Operational limit vs. Legal reference level

OPERATION ZONES	OPERATIONAL LIMIT	REFERENCE LEVEL
Storage	0.006 mSv	0.012 mSv
Inspection	0.002 mSv	0.004 mSv
Transportation	0.008 mSv	0.016 mSv
Work	0.024 mSv	0.048 mSv
Total	0.040 mSv/day	0.08 mSv / day

6.5.2 Reference Parameters

In order to comply with the established internal limit (200 mrem a year), the parameters of time, distance, monitoring, and shielding will be managed.

Time Parameters: For calculation effects, the operator is exposed to radioactive sources of Cs 137 y Am241: Be for 4 hours a day for 5 days a week during 50 weeks which equals a total of 1000 hours a year.

Distance Parameters: The operation of the densimeters should be done at a distance no less than 1m, which the equivalent dosage will diminish according to the "inverse square law." This parameter can vary in each of the zones.

Monitoring: There should be periodic radioactive activity readings done to the storage zone. These readings should be recorded for future analysis and will be performed weekly.

Shielding: The storage area has an artificial concrete shield; the inspection zone does not have a shield, the transportation zone will contain a shield from the same packaging box such as the chassis vehicle; and this type of shielding will not be in the work zone, in a way in which the absorbed dosage will be diminished by means of other parameters.

Table 8. Dosage Rate according to Distance

Densimeter Model	Dosage Rate to 0.01m		Dosage Rate to 0.2m		Dosage Rate to 1m	
	mRem/h	µSv/h	mRem/h	µSv/h	mRem/h	µSv/h
3430	27	270	0.0675	0.675	0.0027	0.027

Note: These values are obtained by the inverse square law ($H1*d1^2 = H2*d2^2$), where:

H1: Exposure rate to distance d1

H2: Exposure rate to distance d2

d1: Distance of exposure 1

d2: Distance of exposure 2

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 6.1, 6.2 y 6.3 according to the different safety zones.

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, crate, or manufacturer package to store it in the bunker and inside the metal transport crate (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 Bunker 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 Bunker 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 bunker of storage 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 equipment in the "Bunker" place dual-pass on the latch of the door and keep the keys in the project office.

  Note: The Densimeter Operator (in other words the designated or authorized person) should always use the personal dosimeter.

Table 9. 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.

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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

- Life 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 Radiation Vigilance (Occupational Health)

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 personal 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.

7.5.1 Staff Vigilance

Those who operate the densimeters, in each one of the work fronts have dosimetry service that is read monthly. It is a dosimeter with the ability to determine the dosage from Gamma emissions. In the Occupational Surveillance with the exposure of radioactive sources should have the following precaution:

- Know to administer the dosimetry service and coordinate the training about how to use dosimeters.
- Record the measuring results on the Individual Radiation Vigilance form.
- Coordination of blood tests that are performed on laboratory workers every three months and record the results on the Occupational Vigilance form.
- Analyze the results on a monthly basis, compare them with what is expected, and generate conclusions and take actions that are considered pertinent.

7.5.2 Supervised of Zones

Each one of the work zones is monitored in order to guarantee compliance of established operating limits as an internal limit within the company.

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.

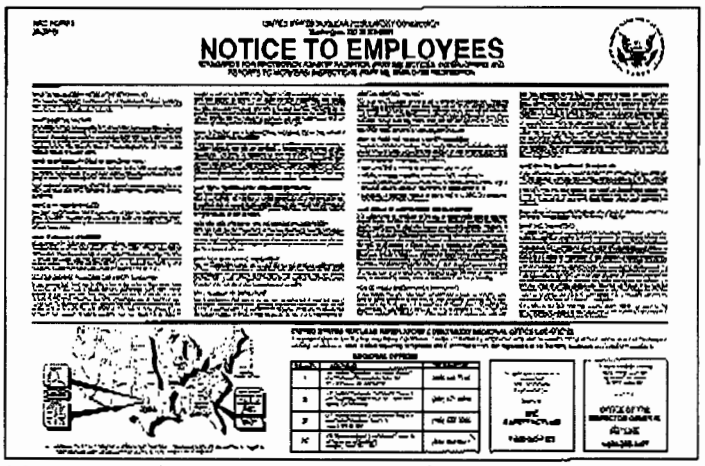


Figure 2. Warning to Employees from the NRC

"RADIOACTIVE MATERIALS WARNING": This sign should be published in each area where radioactive materials are being used or stored.

"WARNING – RADIATION AREA": This sign should be published in a room where the radiation intensity could fluctuate between 2.0 to 100 mRem at any given moment. This is measured at 30 cm from the source surface.

"HIGH RADIATION AREA WARNING": This sign has been written in a room where the radiation intensity could fluctuate between 100 mRem or more at any given time.

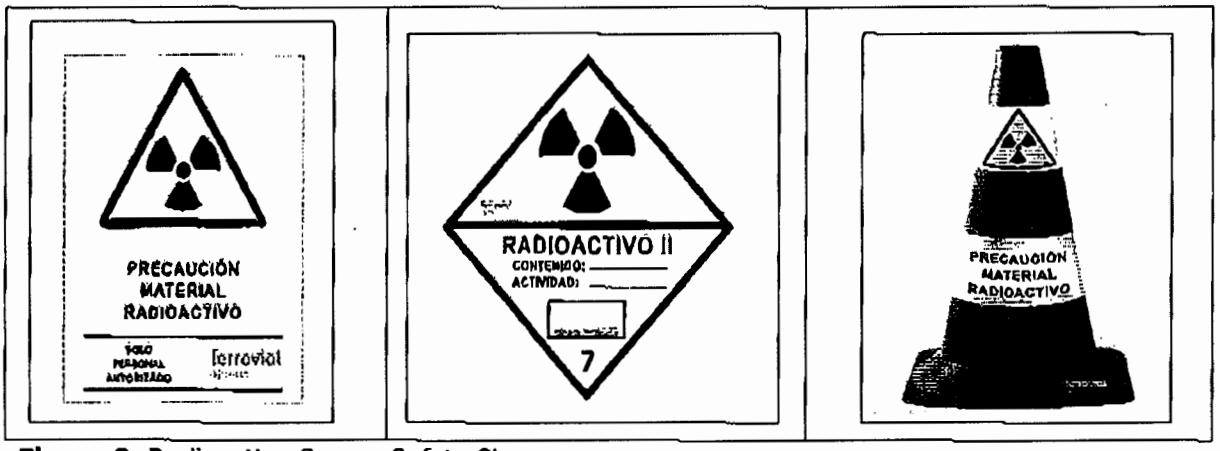


Figure 3. Radioactive Source Safety Signs

The required labels for shipping containers:

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

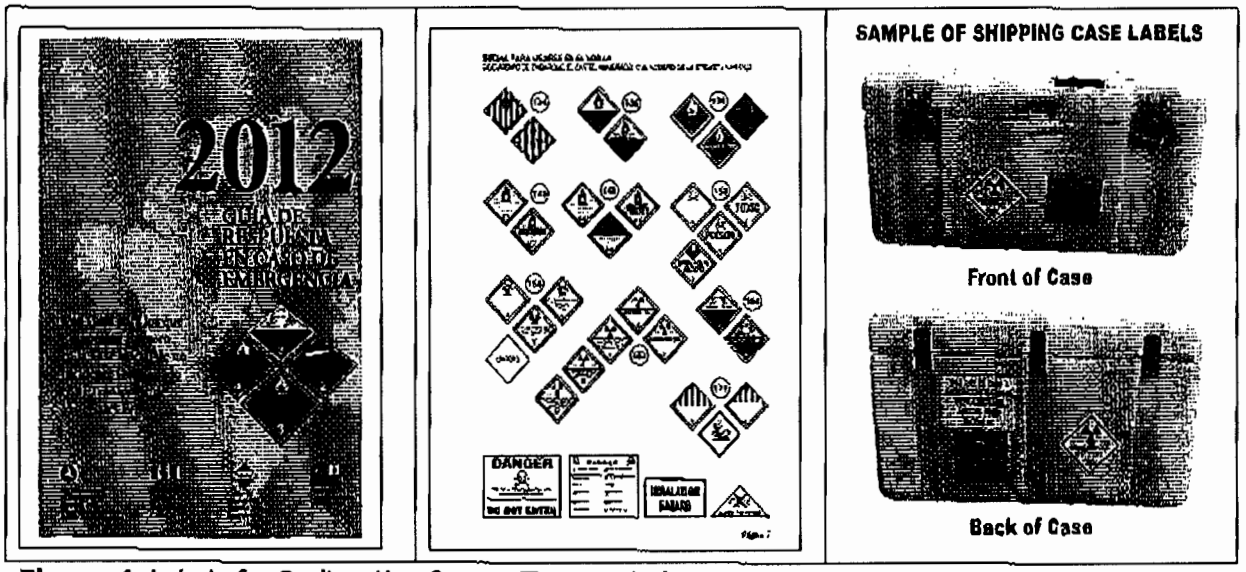


Figure 4. Labels for Radioactive Source Transportation

Measurement of the Dosage Exposure from Radiation for the entire body:

A dosimeter of the entire passive body so that it fluctuates between 0.01 mSv – for the gamma radiation in the Interval of 5 keV - 10 MeV

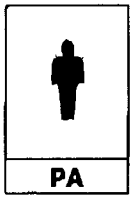
Minimum Detection: 0.01 mSv

Landauer Dosimeter Dimensions
Wide: 50 mm
Tall:45 mm
Thick: 5 mm

Note:
Request a new Dosimeter when it is getting close to the date of expiration or as close to this date as possible.

Use the personal dosimeter with the backside of the body icon. Use the dosimeter ring on one finger of your hand as indicated on the cover of the ring.

Front View



Backside View

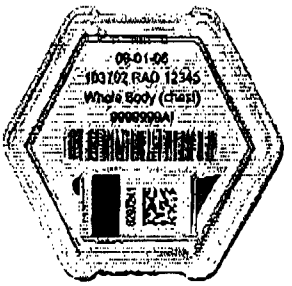


Figure 5. Dosimeter use for the Body
http://www.landauer.co.uk/library_documentation.html

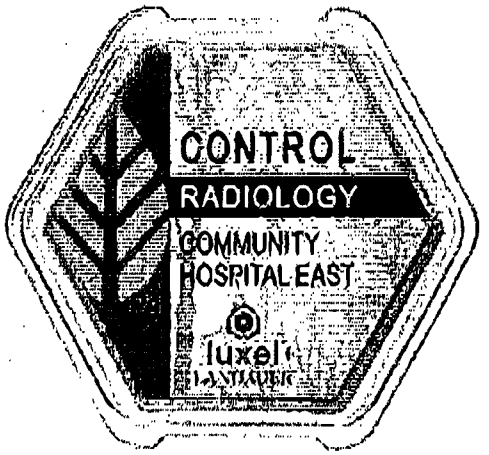
Dosimeter of Control	Front View
A dosimeter separately is known as a Dosimeter of Control which is included with each delivery to monitor the radiation received during the transportation or storage. The exposure of the Dosimeter of Control can be diminished from each individual dosimeter exposure during the delivery from separating the Occupational Dosage from the bottom exposure. The dosimeter of control assigned to a delivery should go with that travelling delivery, as much from and to Laudauer. Do not use the Dosimeter of Control for any other purpose.	

Figure 6. Use of the Dosimeter of Control
http://www.wobook.com/WBnz48H7sn2C-f

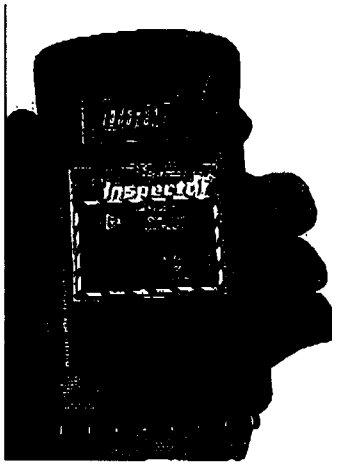
	A Geiger counter is an instrument that allows you to measure the radioactivity of an object or place. It detects particles and ionized radiation. They call this instrument a "counter" due to the fact that each particle that passes through it produces an identical pulse, allowing it to count the partciles (normally in electronic form) but without telling us anything about its identity or energy (except that they should have enough energy to penetrate the walls of the counter). The Van Allen counters were made from fine metal with isolated connections at opposite ends.

Figure 7. Detector of emitted radiations by the Nuclear Densimeter (Geiger counter)

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.

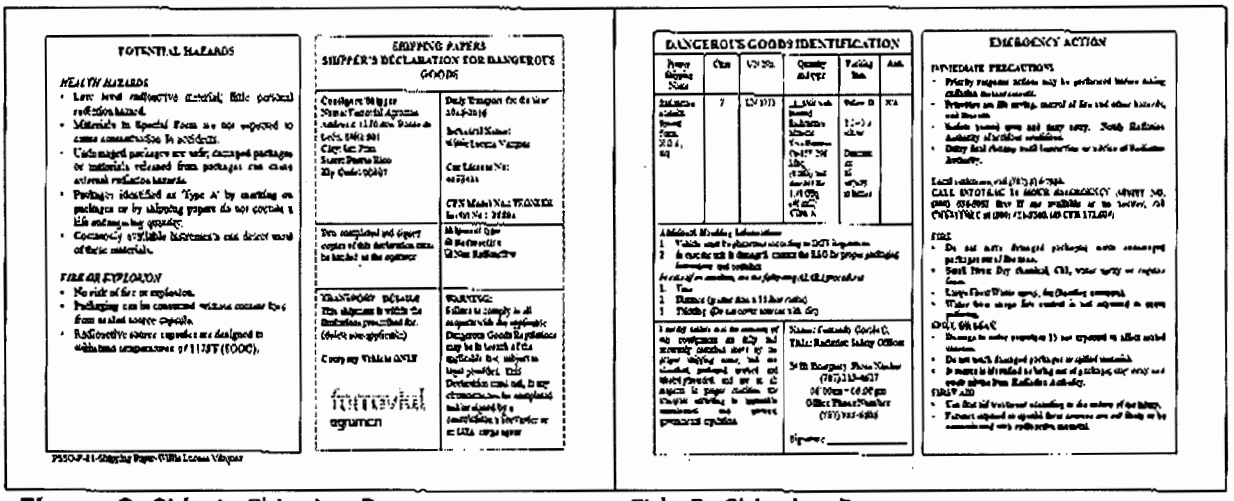


Figure 8. Side A, Shipping Paper Side B, Shipping Paper

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.

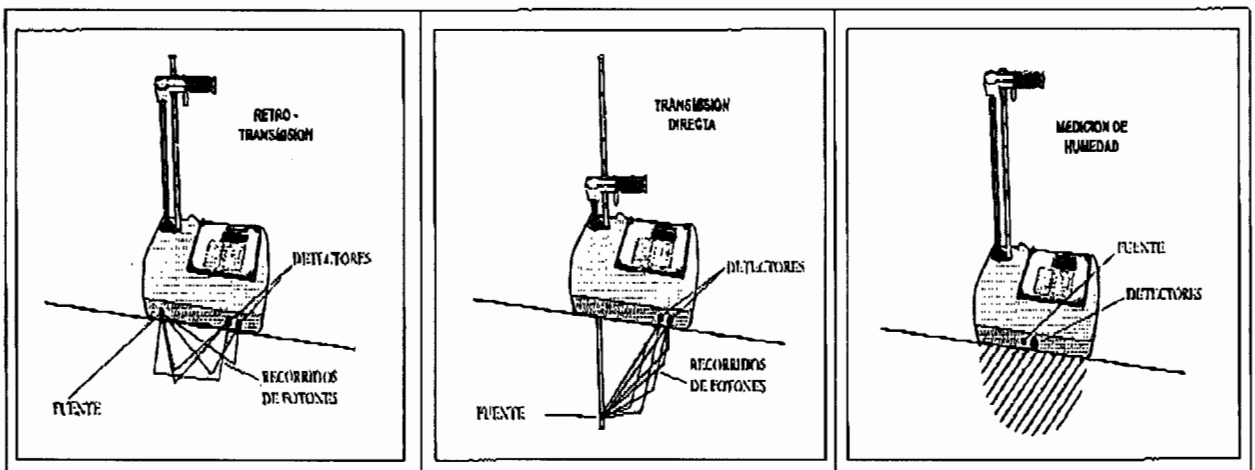
b. Direct Transmission

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. National Regulation 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 10, 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 10. List of Emergency Contacts

Name and Last Name	Job Position	Telephone	Alternative Telephone
Fernando Cortés C.	RSO (Radiation Safety Officer)	(787) 223.4627	(787) 725.5505
	NRC	(800) 695.7403	
	Center of Emergency Operations	(301) 816-5100	
	Health Dept. of PR	(787) 274.7815	
	Local Police		
	Firefighter Dept.	(787) 761.2330	

8.5 Notification, Coordination with non-workplace response organizations

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).

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:

- Calibrate the destined measuring and control equipment (radiation monitor, dosimeter), 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.

10. 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

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			
Evaluations and Audits			

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

This is to acknowledge the receipt of your letter/application dated

10/14/2015, and to inform you that the initial processing which includes an administrative review has been performed.

52-31107-01 (Amendment)

[X] There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

[ ] Please provide to this office within 30 days of your receipt of this card

_____.

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 589163.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader