

	<b>Marathon Los Angeles Refinery Standing Instruction</b>	<b>HSS-302</b>	
	<b>Radiation Protection</b>	<b>Page 1 of 24</b>	
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### 1.0 INTRODUCTION

#### 1.1 Purpose

HSS-302 provides procedures that Marathon and contract employees must utilize when engaged in activities working with or around any radiation sources to keep exposure to radiation As Low as Reasonably Achievable (ALARA).

HSS-302 outlines the regulatory obligations that must be addressed in order to possess and use both radioactive materials and radiation (X-ray) machines.

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**1.2 Scope**

The procedures and information apply to all Marathon employees and contractors.

**2.0 REFERENCES**

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Applicable requirements in the latest edition (or the edition indicated) of the Confined Space Procedure / Standing Instruction and the Isolation , shall be considered an integral part of this Practice. Additional references are listed below. Short titles will be used herein when appropriate.

**2.1 Marathon Procedures and Standards**

- LAR Carson F/S 305, Confined Space
- LAR HSS-008, Control of Hazardous Energy

**2.2 Government Regulations**

- Title 17 California Code of Regulations, Chapter 5, Subchapter 4. Radiation
- Title 8 California Code of Regulations, Group 14, Radiation and Radioactivity
- 10 Code of Federal Regulations, Part 20, Standards for Protection against Radiation
- Radioactive Material License, number 1364-19, California Department of Public Health
- Radioactive Material License, number 0078-19, California Department of Public Health

**3.0 DEFINITIONS**

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The following additional definitions are applicable to this Standard.

**Table 1 Definitions**

<b>Term</b>	<b>Description</b>
Owner	Marathon
Parent Document	The Specification, Practice, or Industry Standard used as the basis for the process being defined.
As low as reasonably achievable (ALARA)	An approach to radiological control or process to manage and control exposures (individual and collective) to the work force and to the general public at levels as low as is reasonable, taking into account social, technical, economic, practical and public policy considerations.
Background radiation	Radiation from cosmic sources; naturally occurring radioactive materials which have not been technologically enhanced, including radon (except as a decay product of source or special nuclear material; consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation; and global fallout as it exists in the environment from the testing of

**Table 1 Definitions**

<b>Term</b>	<b>Description</b>
	nuclear explosive devices. "Background radiation" does not include radiation from materials regulated by the NRC.
General License	A document issued by the Radiologic Health Branch (RHB) to allow a person or organization to acquire, use, or possess a device that utilizes a radioactive material (e.g., a level gauge, an alloy analyzer) through an authorized transfer by the device manufacturer/distributor.
Member of the Public	An individual who is not occupationally exposed to radiation or radioactive material. Refinery employees are considered "members of the public" for the purpose of Radiation regulations.
NORM	"Naturally Occurring Radioactive Material", which may be found in petroleum as it is extracted from the ground. NORM may be present in some scale build-up in pipes or vessels.
Occupationally Exposed Individual	A licensed contractor who handles radioactive material while performing their essential job duties, e.g., radiography. No Marathon employee is classified as "occupationally exposed".
Radiation	Ionizing radiation includes alpha and beta particles, gamma and X-rays and fast neutrons, for purposes of this TRS
Radiation Machine	A device capable of producing radiation when in operation, (e.g., contains an X-ray tube). A radiation machine is NOT a device that produces radiation by use of radioactive material.
Radioactive Material	Includes activated material, sealed and unsealed sources, and material that emits radiation spontaneously. For compliance with Department of Transportation regulations, material with a specific activity greater than 0.002 microcuries per gram. Includes any material, equipment or system component determined to be contaminated or suspected of being contaminated with nuclides undergoing radioactive decay.
Radiologic Health Branch	A division of the California Department of Public Health (CDPH) which regulates the possession and use of radioactive materials (under both specific and general licenses) and radiation (X-ray) machines.
Radiation Protection Program (RPP)	A documented methodology for compliance with regulatory requirements for radiation protection.
Radiation Safety Officer (RSO) and Alternates (ARSO)	Persons, who by a combination of training and experience, have particular knowledge in radiation safety issues, and are therefore designated by Marathon as a resource for concerns and advice on nuclear materials and radiation safety.
Rem	A measure of dose to the body, taking into account that different parts of the body have varying sensitivities to radiation. The maximum permissible dose of radiation to the whole body that a person may receive in a year is 5 rem for occupationally exposed individuals, and 0.1 rem for a member of the public.
Reportable sources of radiation	Include: (1) Machines capable of producing radiation when installed and in operation



**Table 1 Definitions**

<b>Term</b>	<b>Description</b>
	(2) Amounts of radioactive material present in devices designed and manufactured for the purpose of detecting, measuring, gauging, controlling thickness density, level, leakage or qualitative or quantitative chemical composition as specified in the licensing regulations.
Sealed source	Radioactive material that is contained in a sealed capsule that is further sealed between layers of nonradioactive material (i.e., a source housing). The confining barriers prevents dispersion of the radioactive material under normal and most accidental conditions related to use of the source.
Specific License	A document issued by the Radiologic Health Branch (RHB) to allow a person or organization to acquire, use or possess a device that utilizes a radioactive material (e.g., a level gauge) through an authorized transfer by the device manufacturer/distributor. A specific license imposes stricter requirements than a general license.
Wipe Test	An analytical testing method performed to determine whether radioactive material is present on the source housing, which would indicate a leak from the sealed radioactive material source. Wipe tests are performed twice per year.

**4.0 RESPONSIBILITIES**

**4.1 Radiation Safety Officer and Alternates**

- a. Ensure that all applicable LAR licenses are maintained current and accurate.
- b. Ensure that all radiation sources are inspected at a minimum of every six (6) months by either the RSO or the radiation contractor.
- c. Source surveys to assure adequate shielding (by contractor)
- d. Wipe tests to detect possible leakage of the source (by contractor)
- e. Addition of new sources to the inventory
- f. Appropriate notification to applicable agencies
- g. Ensure proper storage and installation of sources (by the RSO)
- h. Isolate radiation as a source of hazardous energy prior to entry into a vessel to which a radiation source is attached (e.g, close and lock shutter)
- i. Re-energize a radiation source (i.e., remove lock and open shutter)
- j. Maintain records and documents related to radiation management program. Provide Operations with the postings required in 4.3 (g).
- k. Review the Radiation Management Program on an annual basis and maintain the annual review summary.



#### **4.2 All Persons**

- a. Completing their annual radiation safety training, and maintaining a general awareness of the location of radioactive materials and radiation (X-ray) machines, and the potential hazards that these materials and equipment can cause if not handled properly.
- b. Notifying the Radiation Safety Officer of the intent to purchase or remove from use (1) a device (e.g., level gauge, density meter, alloy analyzer) that contains a radioactive material or (2) a radiation (X-ray) machine (e.g., X-ray spectrometer, alloy analyzer). The radioactive materials license, general license and radiation (X-ray) machine registration must be kept up-to-date to reflect current inventory. See Appendix D.

#### **4.3 Operations**

(Operators/ Supervisors) are responsible for:

- a. Ensuring a gauge that contains a radioactive material source is included in the equipment isolation plan, as appropriate, per HSS-008 "Control of Hazardous Energy" for general maintenance and turnaround situations. Providing the RSO (or ARSO) with an isolation tag for each source, when isolation of the radioactive material source is required.
- b. Contacting the RSO / ARSO when a radioactive material source in a fixed gauge needs to be isolated and de-energized.
- c. Conducting a job walk with a radiographer to ensure that all points of access (e.g., stairways, ladder cages) into the restricted area have also been barricaded to prevent entry, prior to the initiation of radiographic work (i.e., exposing a radioactive material source).
- d. Ensuring work occurring simultaneously with radiography (SIMOPS) does not occur within the area barricaded for radiography.
- e. Communicating with Operator(s) in an adjacent unit(s) should a barricade established for radiography extend into their operating area(s).
- f. Identifying for radiographers any measurement indicating devices that are known or suspected to be impacted by radiation released during radiography.
- g. Maintaining the posting of signage required under Radiation Safety Regulations, which include:
  - Warning signs that read CAUTION: RADIOACTIVE MATERIALS are posted at locations within operating areas on equipment and pipelines, by the probes and gauges where radioactive materials are used.
  - Warning signs that read CAUTION: X-RAYS are posted in areas where radiation (X-ray) machines are operated.
  - Department of Public Health (CDPH) Form RH-2364, "Notice to Employees" regarding their rights under the California Radiation Control Regulations are posted in locations where reportable sources of radiation are used.



#### **4.4 Quality Assurance Laboratory Personnel**

Technicians and chemists working at the Quality Assurance Laboratory are responsible for:

- a. Ensuring that a radiation machine (i.e., instrument that contains an X-ray tube) is used only by persons specifically trained in its safe handling.
- b. Notifying the Radiation Safety Officer of any changes in the status (e.g., purchase, sale, re-location, removal from service, etc.) of their inventory of radiation machines on a monthly basis.
- c. Following the protocol outlined in Appendix D when purchasing, repairing or disposing of a radiation (X-ray) machine.

#### **4.5 Users of Alloy Analyzers**

Alloy analyzers used for the purpose of positive material identification (PMI) can contain either a radioactive material or a radiation (X-ray) tube. Persons who operate these analyzers are responsible for:

- a. Ensuring that they have been trained in its safe handling. A list of approved users should be forwarded to the RSO for filing. Training records should be forwarded to the Learning and Development Department.
- b. Ensuring that a "Use Log" is maintained for the alloy analyzer.
- c. Ensuring that the alloy analyzers are kept in a secure location when not in use.
- d. Ensuring that, when an alloy analyzer is being transported, the instrument is shut off and are securely packed inside the carrying case and documented to meet DOT regulations when traveling on the public roadway.
- e. Notifying the Radiation Safety Officer of any change in the inventory of their alloy analyzers (e.g., purchase, sale, removal from service, etc.) on a monthly basis.
- f. Following the protocol outlined in Appendix D when purchasing, repairing or disposing of an alloy analyzer.

#### **4.6 Procurement Department Personnel**

The Procurement Department is responsible for:

- a. Instituting and maintaining an internal protocol that helps to ensure the RSO is notified prior to intended purchase of both devices that contain or use radioactive materials and radiation (X-ray) machines. See Appendix D.
- b. Ensuring that the RSO receives a copy of the sales agreement when Marathon owned equipment that contains a radioactive material or radiation (X-ray) machine is bought or sold.

#### **4.7 Radiation Contractors**



Radiation contractors bring and use radioactive sources and/or radiation-producing machines into LAR for use in work contracted by Marathon. The employees of radiation contractors are classified as Radiation Workers.

A radiation contractor is responsible for:

- a. Supplying, upon request of the RSO, pertinent information (e.g., number, type, strength, and location(s)) regarding where a radiation source(s) will be used at LAR.
- b. Submitting or making available a copy of their radiation safety program, Radioactive Materials License, and Emergency Response Plan for review by the RSO, upon request.
- c. Supplying proof of training or certification for each employee coming into LAR, upon request.

## **5.0 PROCEDURE FOR RADIATION SAFETY**

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### **5.1 Sources of Radiation**

- a. All sources of radiation (i.e., radioactive materials or radiation (X-ray) machines) brought into or removed from LAR must be reported to and be accounted for by the Radiation Safety Officer.
- b. Gauges that contain radioactive materials owned by LAR and their location of use are listed in the following Appendices:
  - Appendix A lists the gauges in use at Carson
  - Appendix B lists the gauges in use at Wilmington
  - Appendix C lists the radiation (X-ray) machines in use at both sites
  - Appendix D lists the alloy analyzers in use at both sites
- c. Gauges owned by Marathon Logistics which are in use at Carson are listed in Appendix E.
- d. Radiography cameras used by Inspection contractors are stored in a "double lock" cabinet at the southeast corner of the Traffic Office at Carson.
- e. Gauges that contain radioactive materials are in use at the Ineos Polypropylene site, which is located within the boundaries of the Carson site.
- f. Certain types of "EXIT" signs contain tritium, a radioactive form of hydrogen. The signs have a radiation label attached on one edge.

### **5.2 Licensing and Registration**

- a. The refinery maintains agreements with the State of California that allows for the possession of radiation sources:
  - A radioactive materials license that specifies the type and amount of radioactive material LAR can possess (i.e., "specific license"). Carson and Wilmington each have a specific license.



- A "general license" that allows the possession of devices that are exempt from a "specific license" (i.e., contain a lesser quantity of a radioactive material).
  - A radiation (X-ray) machine registration inventory that specifies the radiation (X-ray) machines LAR possesses.
- b. The licenses and registration are available for review in the Health Department .
- c. Radioactive materials are used under the general supervision of the Radiation Safety Officer (RSO) or designated alternate (ARSO). The RSO and alternates are listed on the radioactive materials license. No other individual may act in the capacity of RSO.

### **5.3 Employee Health and Exposure Limits**

- a. The maximum permissible exposure for a LAR employee (i.e., individual members of the public) shall be 100 millirem (mR) per year. Calculated "worst case" exposure assessments for Operators, Maintenance crafts persons and other individuals who work in units where radiation sources are present are below the 100 millirem (0.1 rem) per year allowable level. The exposure calculation information is kept on file in the Health Department.
- b. LAR employees are considered Members of the Public as no employees are considered occupationally exposed. A Declaration of Pregnancy is not necessary for employees who are or plan to become pregnant.
- c. The exposure dose rate to a LAR employee shall not exceed 2 mR per hour (assuming that an individual may be in the vicinity of radiation sources or radiation-producing devices)
- d. An employee who has a concern about radiation exposure may request a radiation survey at any time by contacting the RSO. The primary goal of LAR radiation safety is to control exposure to a level "as low as reasonably achievable" (ALARA).
- e. A physical inspection of all sources of radiation sources shall be performed at least every 6 months.

The inspection and survey shall be conducted by the RSO, Alternate RSO or licensed Radiation Contractor.

The inspection shall consist of:

- Visual inspection of the source container/cabinet
- Survey using a calibrated radiation detection device
- The survey shall be documented.
- For radioactive material sources, a wipe test (which determines if radiation is leaking from a gauge that holds a radioactive material) shall be conducted by the Radiation Contractor. Wipe test records are kept on file by the Health Group.
- If a leak test results in measurements of 0.005 microcuries or more of removable radioactive material, the Department of Health Services,



Radiologic Health Branch will be notified within 5 days of laboratory report receipt.

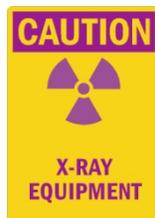
- A "shutter check" to ensure that the shutter will properly close when required will be performed by the Radiation Contractor.
- f. In the case of x-ray analytical equipment, dose measurements shall be measured from any accessible region 5-cm from the outside surface of the generator cabinet.

#### 5.4 Required Posting and Notifications

- a. The following sign (or something similar) shall be posted near or next to a gauge that contains a radioactive material:



- b. In the QA Lab, the following sign (or something similar) shall be located outside of a room that contains x-ray analytical equipment:



- c. The following label shall be located on the x-ray analytical equipment:



- d. A copy of CDPH Form RH-2364, which alerts employees to their rights under the state "Standards for Protection against Radiation", is posted in units where a source of radiation is located.

If a new radiation source is purchased for use in a unit, operating area or location not currently listed, the RSO will provide appropriate signage, labels and a RH-2364 form for posting.

#### 5.5 Isolation of Radiation Sources

In order to protect employees from possible exposure to radiation during times when there is a need for entry into a process vessel (e.g, inspection, testing, turnaround maintenance), the following measures will be followed:

- Prior to a person's entering a vessel (e.g., coke drum, coker heater surge drum, fractionator tower, vacuum tower or precipitator hopper), the RSO, ARSO, or designated licensed radiation contractor will secure the radiation devices by locking the shutter in the closed position. A tag will be applied at or near the shutter to indicate it is in the "CLOSED" position.
- The device will remain in the out-of-service mode until the unit is ready for start-up. At this time, with Operations' approval, the RSO will return the sources to their operating modes.



- Only the RSO, Alternate RSO or a qualified representative designated by the RSO is authorized to open the shutters on radiation sources.
- The RSO/Alternate RSO shall utilize the radiation lockbox when isolating the equipment. Refer to SAF-008 and the FS 800 series for requirements and guidelines for isolation of hazardous energy.

The Laboratory has analytical devices (see Appendix C) that produce X-rays. These devices are either "ON" or "OFF". When "OFF", the device is not producing X-rays. The x-ray machine shall be visually inspected and the surrounding area surveyed every six months by the RSO/ARSO

The PEI Department utilizes portable analytical equipment that are sources of radiation (see Appendices). At each site, this equipment is stored in a locked cabinet accessible only to radiation trained persons. This equipment is surveyed and wipe tested, as applicable, every 6 months.

### **5.6 Purchase, Installation and Removal of Sources of Radiation**

All purchases of equipment that contain sources of radiation must be reviewed with and co-ordinated through the RSO.

- the Radioactive Material License must be amended to reflect the new radioactive material source(s) PRIOR to purchase and subsequent delivery onsite
- the radiation tube registration must be amended within 30 days of receipt, removal or re-location of any radiation (X-ray) machine
- the General License must be amended within 30 days of receipt, removal or re-location of sources of radiation covered under the license.

The Procurement protocol for ensuring compliance with licensing and registration requirements is contained in Appendix F.

Removal (either temporary or permanent) of a source of radiation from its designated location must be coordinated through the RSO.

- a licensed radioactive material source can be permanently removed from LAR only through licensee-to-licensee transfer of ownership, i.e., from LAR to an authorized recipient.
- the RSO must obtain a copy of the recipient's radioactive materials license allowing receipt of the transferred radioactive material prior to shipment.
- Documentation will be kept on file by the RSO. (Note: The information on the licensee's radioactive materials license number is necessary in the required license amendment notification to RHB.)

Disposal of an "EXIT" sign that is labeled as containing a radioactive material must be handled through the RSO.

Only licensed individuals shall perform the installation, relocation, maintenance, repair, replacement, disposal, and initial radiation survey, of sealed sources containing radioactive materials.



Only those persons trained and certified to work on radiation devices and/or radiation-producing machines shall perform maintenance.

Radiation surveys shall be performed after any repair or maintenance of radiation sources or radiation-producing devices.

The sources of radiation must be accounted for during any decommissioning of a process unit or facility. The RSO will have primary responsibility should such an event occur.

### **5.7 Survey (Monitoring) Instruments**

Survey instruments and personal dosimeters to assess exposure to radiation are located within the Industrial Hygiene laboratory at each site. The Ludlum 2241-2 survey meter is also located on the Support Rig that is staged during an emergency response.

Survey meters include:

- Ludlum 3 Beta/Gamma Survey Instrument with a 44-9 Pancake Probe Detector – used for Beta/Gamma contamination
- Ludlum 14C Beta/Gamma Survey Instrument with a 44-6 Survey Probe Detector – used for Beta/Gamma survey
- Ludlum 15 Neutron Counter Survey Instrument with 42-14 and 44-7 Survey Probe detectors– used for Neutron survey
- Fluke Biomedical Pressurized Ion Chamber Survey Meter used for Beta above 1 MeV, Gamma and X-ray above 25 keV
- Victoreen 190 Radiation Meter with GM Probe 489-35 – used for Alpha, Beta, Gamma, and X-ray
- Victoreen 450P Radiation Meter – used for Beta above 1 MeV and Gamma above 25 KeV
- Technical Associates Surface Contamination Meter TBM-3S – used for alpha, beta, and gamma contamination
- Ludlum 2241-2 Radiation Survey Instrument with a 44-2 and 44-9 Probe– used for Alpha, Beta, and Gamma and Gamma-specific contamination

Personal exposure monitoring devices include:

- Arrow-Tech AT-138 Dosimeter with Arrow-Tech DCA Model 909 Charger
- RaeSystems Neutron Rae II PRM-3020

Radiation survey instruments shall be calibrated:

- by an individual licensed or registered to perform such service
- at energies appropriate for the intended use
- at intervals not to exceed manufacturer's recommendations
- after each instrument servicing (other than battery replacement)



Calibration records are kept on file by the Occupational Health Group.

## **6.0 EMERGENCY RESPONSE**

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### **6.1 General Information**

- a. In the event of an emergency involving a source of radiation, notify the Operations Shift Supervisor (OSS) / Unit foreman who will, in turn, notify the RSS / 501. The RSS /501 will notify the RSO / ARSO.
- b. An emergency involving sources of radiation may include, but is not limited to:
  - damage to equipment to which radiation equipment is attached (e.g., fire within or near a coke drum, a vacuum tower)
  - damage to the device which houses the source of radiation (e.g., fire impinges on the device, an earthquake or explosion may cause the device to come loose from the brackets that attach it on a vessel)
  - damage to or loss of a portable source of radiation (e.g., alloy analyzer) as it is being transported (e.g., a vehicle accident)
- c. If a fixed gauge that contains a radioactive material source is damaged or potentially damaged, an appropriate (minimum 15 foot) area around the damaged gauge (and source) will be evacuated and barricaded to restrict entry. The RSO will assess the area for radiation levels prior to allowing re-entry. If warranted, the RSO will arrange to have the damaged gauge (and source) removed and replaced.
- d. If an incident involving a radiographer's equipment that contains a radioactive material source should occur (e.g., malfunction, physical damage) that results in a potential exposure to an individual, a facility representative will inform the RSO immediately. Any CAUTION: RADIATION barricade tape in use at the time of the incident will remain in place or be modified to ensure no person(s) working nearby is potentially exposed to radiation. The facility representative will inform the RSO of actions taken to cover /shield and remove the exposed radioactive material.
- e. If a fixed gauge that contains a radioactive material source owned by Marathon Logistics is damaged or potentially damaged, the procedures outlined above will be followed. In addition, the local Logistics' RSO will be informed.
- f. If at any time it becomes necessary to enter into an area where radiation work is being performed, the Unit Operator will:
  - have the radiographer (1) cease work and (2) secure the radiation source device.
  - pull the permit after the radiographer has confirmed that the source is secure and the area clear.
  - re-issue the permit and notify the radiographer that work may be resumed once the situation /area is clear and acceptable to resume work



- g. If a person walks into a barricaded area while radiography is being conducted, he/she should contact their foreman, who will contact the RSO and the Medical Department. An incident investigation will be conducted. The RSO and radiography contractor's RSO will determine the level of exposure. At minimum, such an occurrence will be classified as an "At-Risk" Health Related Incident (HRI)
- h. If an "EXIT" sign that has a radiation label attached (i.e., contains tritium) is damaged, clean-up should not be attempted. The broken sign should not be touched. The area around the damaged sign should be secured, and the RSO contacted. The RSO will arrange to have the sign properly disposed of by a licensed contractor.
- i. If a fixed gauge source at Ineos is damaged or potentially damaged, the LAR Carson RSO will assist the Ineos RSO, as requested.

## **6.2 Radiation Emergency Response**

The facility Emergency Response Plan will incorporate scenarios where damage to sources of radiation are plausible.

Security will alert the RSO if response to an event that requires radiation monitoring becomes necessary.

The RSO or ARSO will provide notify the RHB in the event of an emergency that results in the release of radiation.

The RSO or ARSO will serve as primary escorts for RHB inspectors or their designates in the event of an inspection or emergency response.

## **7.0 RADIOGRAPHY**

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Radiography is conducted under the supervision of the PEI Department. Radiographers will follow all applicable rules and regulations, including, but not limited to:

- Staffing a minimum of two persons at each field radiography location.
- Ensuring the proper permitting paperwork as been obtained.
- Conducting a job walk with Operations to Prior to exposing a radioactive material source (1) advise the scope of the regulated area and (2) ensure that all points of access (e.g., stairways, ladder cages) into a regulated area have also been barricaded to prevent entry.
- Establishing a regulated area marked with "Caution: Radiation Area" barricade tape, within which the radiography will occur.
- Using two layers of barricade tape to restrict access to the area of work and to all means of access to that area while performing radiography within the boundaries of a process unit.
- Ensuring no work is being conducted overhead or below a radiation regulated area, and that all points of access into the regulated area are barricaded.
- Evacuating persons not cleared to be in the barricaded area
- Establishing radio communications with area Operations.



- Using a flashing red light to warn persons working in the vicinity of the radiography that the radioactive material source is exposed.
- Displaying Radiation warning signs. Signage may include how to contact the radiographer in the event of an emergency.
- Maintaining direct surveillance of the radiographic operation to protect against unauthorized entry into the controlled area. Only the lead radiographer may allow entry to the regulated area.
- Using a survey meter to ensure that the level of radiation exposure at the perimeter of the regulated area does not exceed 2 millirem/hour.
- Conducting radiation exposure monitoring for their employees. Radiographers and radiographers' assistants shall wear a direct reading pocket dosimeter, an alarm ratemeter, and either a film badge or thermoluminescent dosimeter at all times during radiographic operations. Additionally, radiographers will take adequate measures to limit ionizing radiation exposure to themselves and shall maintain exposures to other personnel "As Low As Reasonably Achievable" (ALARA).
- Utilizing collimation and supplemental shielding whenever practical.
- Locking out radiographic equipment when not in use and surveying it for possible leakage. Radiographic exposure devices shall be kept locked at all times except during authorized use or when under the direct surveillance of a radiographer or radiographer trainer.
- Physically securing radiographic exposure devices while being transported.
- Carrying a copy of their Radioactive Material License in their vehicle.
- Notifying the LAR RSO or ARSO of any of the following:
  - Overexposure or potential overexposure of any person in excess of that allowed by regulations
  - Malfunctioning, potentially damaged, stolen or missing exposure device
  - Unauthorized personnel within posted radiation boundaries

If radiographers are working in an area where their radiographic equipment may impact LAR equipment level detectors (e.g., level gauges at the Coker or Vacuum units), they must inform the control board Operator to allow the Operator to place the detector in manual for the duration of the radiography.

**Note:** When radiography is being performed in the North Area of LAR Carson close to Wilmington Avenue and 223<sup>rd</sup> Street, the radiography contractor will send an email to the Customs and Border Patrol office of the Department of Homeland Security as a courtesy notification. Appendix G contains the distribution list for this email notification. The health group will be copied in that email.



**8.0 TRAINING**

The RSO/ARSO shall receive 40 hour initial training and 8 hour refresher training by a certified instructor annually.

All other LAR employees shall receive initial training through the Occupational Health Group, and bi-annual refresher training via computer based module.

**9.0 RECORDKEEPING , REPORTING, AUDITING**

The following documents are kept on file by the Health Group:

- Results of wipe tests, source surveys and inventories
- Copies of the Radioactive Material License and correspondence for license amendments and renewals
- Copies of contractor licenses,
- Copies of general license information
- Copies of radiation (X-ray) machine registration
- Records of training
- Records of calibrations for survey equipment
- Records of receipt, transfer and removal of radiation sources
- Records of Dose Assessment calculations
- Exposure Record
- Records of inspections by the RHB or its designated agencies

The Occupational Health Group will review this program annually to update changes in regulations or work practices. As best practices are for keeping exposures to radiation ALARA, become known, they will be incorporated into this program.

**10.0 CHANGE LOG**

Summary of Changes	Changes Completed by:	Approved by:	Date
<p>FS 935 and SAP 045 have been integrated to create HSS 302. The change to the format is the most noticeable change.</p> <p>A "Contents" table has been added to help direct procedural inquiries more directly to the appropriate section and page.</p> <p>The "Definitions" section has been expanded to include terminology from both SAP-045 and FS 935.</p> <p>Amended Section 5.3 "Employee Health and Exposure Limits" to incorporate references to the Reproductive Health Programs (FS 960 and HSP 698615) while eliminating female specific gender requirements</p> <p>In Section 5.4, included pictorial examples of signage required under Radiation regulations.</p>	John Sullivan	Sharon Callahan	12/23/15



# Radiation Handling

Summary of Changes	Changes Completed by:	Approved by:	Date
<p>In section 7.0 "Radiography", specified that double "Caution: Radiation" barricade tape is mandatory only when radiography is performed within process units.</p> <p>Appendix A lists only the radioactive material sources licensed for use at Carson.</p> <p>Appendix B is now an inventory of radioactive material sources licensed for use at Wilmington.</p> <p>Appendix C now lists the Radiation Machines registered to LAR., and includes an X-ray spectrometer at the QA Laboratory at Wilmington.</p> <p>Appendix D lists the "generally licensed" devices in use at both sites.</p> <p>Appendix E lists the radioactive materials licensed to Marathon Logistics which are physically located within the refinery property (at Carson).</p> <p>Appendix F lists the process for procuring radioactive material sources and radiation machines.</p>			
<p>Amended Appendix B to reflect the currently owned radioactive material sources at Wilmington.</p>	John Sullivan	Sharon Callahan	6/21/2016
<p>Amended Section 5.7 Survey (Monitoring) Equipment to reflect the currently owned equipment at LAR.</p> <p>Amended Appendix A to reflect the currently owned radioactive material sources at Carson.</p> <p>Amended Appendix C to reflect the currently owned radiation machines at Wilmington.</p>	Pearl Lee	Sharon Callahan	5/7/2018
<p>Amended 7.0 radiography to require radiography contractor to notify DHS and the health group when radiography is being conducted in the North Area of LAR Carson close to Wilmington Avenue and 223<sup>rd</sup> Street</p> <p>Added Appendix G for recipients of notification email required in the above change</p>	John Sullivan	Sharon Callahan	5/15/2019

**11.0 APPENDICES****APPENDIX A**

The table below lists: (1) the unit or location where the device containing a licensed radioactive material source is used, (2) the particular radioactive material used in the device, (3) the strength of the radioactive material; and (4) for what purpose the device is used.

<b>Radioactive Material Sources at LAR-Carson</b>				
<b>Marathon-owned fixed gauge sources</b>				
<b>Unit / Location</b>	<b>Number of sources</b>	<b>Usage of source</b>	<b>Radioactive material source</b>	<b>Source strength (milliCuries)</b>
#1 Coker #1 Drum	2	Level gauge	Americium-241/Beryllium	500
#1 Coker #1 Drum	3	Level gauge	Cesium-137	300
#1 Coker #2 Drum	2	Level gauge	Americium-241/Beryllium	500
#1 Coker #2 Drum	3	Level gauge	Cesium-137	300
#1 Coker #3 Drum	2	Level gauge	Americium-241/Beryllium	500
#1 Coker #3 Drum	3	Level gauge	Cesium-137	300
#1 Coker #4 Drum	2	Level gauge	Americium-241/Beryllium	500
#1 Coker #4 Drum	3	Level gauge	Cesium-137	300
#2 Coker #5 Drum	2	Level gauge	Americium-241/Beryllium	500
5 <sup>th</sup> Section Storage	1	Level gauge	Cesium-137	1000
#2 Coker #5 Drum	3	Level gauge	Cesium-137	300
#2 Coker #6 Drum	2	Level gauge	Americium-241/Beryllium	500
#2 Coker #6 Drum	3	Level gauge	Cesium-137	300
FCC Fourth Stage Hopper (RPV 5524)	2	Level gauge	Cesium-137	500
FCC Fract Tower (RPV 2322)	1	Density gauge	Cesium-137	5000
#4 Steam Plant (ESP Hopper deck)	20	Level gauge	Cesium-137	50
51 Vac RW 5967	1	Level gauge	Cesium-137	1600

**APPENDIX B**

The table below lists: (1) the unit or location where the device containing a radioactive material source is used, (2) the particular radioactive material used in the device, (3) the strength of the radioactive material; and (4) for what purpose the device is used.

<b>Radioactive Material Sources at LAR-Wilmington</b> <b>Marathon-owned sources</b>				
<b>Unit / Location</b>	<b>Number of sources</b>	<b>Usage of source</b>	<b>Radioactive material</b>	<b>Source strength (milliCuries)</b>
DCU V-895 (upper)	1	Level gauge	Cesium-137	1000
DCU V-895 (lower)	1	Level gauge	Cesium-137	2000
DCU V-896 (upper)	1	Level gauge	Cesium - 137	1000
DCU V-896 (lower)	1	Level gauge	Cesium-137	2000
DCU V-897 (upper)	1	Level gauge	Cesium-137	1000
DCU V-897 (lower)	1	Level gauge	Cesium-137	2000
DCU V-898 (upper)	1	Level gauge	Cesium-137	1000
DCU V-898 (lower)	1	Level gauge	Cesium-137	2000
DCU V-899 (Vac)	1	Level gauge	Cesium-137	100
DCU V-900 (Fract)	1	Level gauge	Cesium-137	500
DCU 8 in line 1498-0-J113	1	Density gauge	Cesium-137	5
DCU V-901 (heater surge drum)	1	Level gauge	Cesium-137	1000
DCU V-3593 (Vac)	1	Level gauge	Cesium-137	70
FCC Precipitator 3	4	Level gauge	Cesium-137	100
FCC Precipitator 4	4	Level gauge	Cesium-137	100
FCC Precipitator 5	4	Level gauge	Cesium-137	100
FOB Room 149	1	Inspection	Americium-241/ Beryllium	200
BWTU V-2183 (1 <sup>st</sup> stg desalter)	8	Level gauge	Cesium-137	80
BWTU V-2184 (2 <sup>nd</sup> stg desalter)	8	Level gauge	Cesium-137	80

**APPENDIX C**

The table below lists the radiation (X-ray) machines registered to be used at the Los Angeles Refinery. A radiation machine contains an X-ray tube. The table identifies each machine by the location where the machine is set up and used, and the type of machine or its intended use.

The manufacturer's name and model number are provided for identification purposes.

<b>Inventory of Radiation (X-ray) Machines at LAR</b>				
<b>Unit/Shop /Area</b>	<b>Location</b>	<b>Equipment Type</b>	<b>Manufacturer</b>	<b>Model</b>
QA Laboratory	Carson Room 123	X-ray spectrometer	Horiba	SLFA-1800
QA Laboratory	Carson Room 123	X-ray spectrometer	Horiba	SLFA-2800
QA Laboratory	Carson Room 124	X-ray spectrometer	X-ray Optical Systems	Clora Bench Top Analyzer
QA Laboratory	Carson Room 233	Electron Microscope	Hitachi	S-3000N
QA Laboratory	Carson Room 224	X-ray diffraction	Philips (PanAnalytical)	DY-1094
QA Laboratory	Carson Room 201	X-ray spectrometer	X-ray Optical Systems	Clora Bench Top Analyzer
Carson Storehouse	PMI cage	Alloy analyzer	Niton	XL2-800
Watson Cogen Maintenance Shops	Inspection Office	Alloy Analyzer	Niton	XL3T-800
PEI /Inspection	FIT Offices Campus One	Alloy Analyzer	Innov-X	XT-245
QA Laboratory	Wilmington	X-ray Spectrometer	XOS	Sindie+Cl



**APPENDIX D**

The table below is a list of equipment that contains a radioactive material source, and is owned by the Los Angeles Refinery under the terms of a General License.

The table identifies each piece of equipment by the location / owner, where the machine is stored or used, and the type of equipment by its intended use.

The manufacturer's name and model number are provided for identification purposes.

<b>Inventory of Generally Licensed Devices at LAR</b>				
<b>Unit/Shop /Site</b>	<b>Location</b>	<b>Equipment Type</b>	<b>Manufacturer</b>	<b>Model</b>
PEI Carson	FIT Offices Campus One	Alloy Analyzer	Niton	XLp-818W
PEI Carson	FIT Offices Campus One	Alloy Analyzer	Niton	XL3p+
PEI Carson	FIT Offices Campus One	Alloy Analyzer	Niton	XL3p+
PEI Wilmington	FOB Storage Room	Alloy Analyzer	TN Technologies	5020



**APPENDIX E**

These devices listed below are licensed to Marathon Logistics and are located on pipelines running through the Carson site.

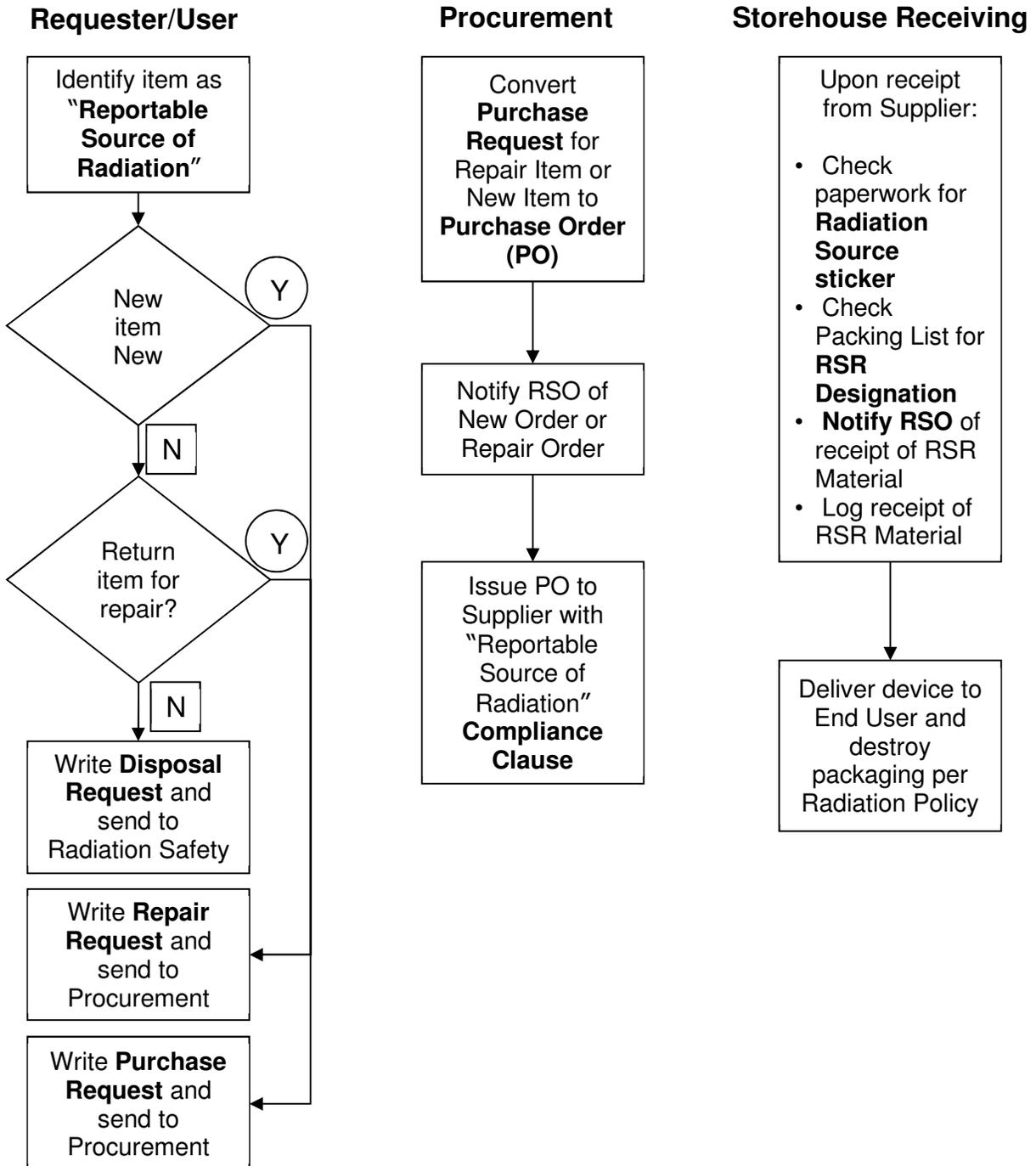
The table lists: (1) the location where the device containing a radioactive source is used, (2) the particular radioactive material used in the device, (3) the strength of the radioactive material; and (4) for what purpose the device is used.

<b>Marathon Logistics owned fixed gauge Sources at LAR Carson</b>				
<b>Unit / Location</b>	<b>Number of sources</b>	<b>Usage of source</b>	<b>Radioactive material source</b>	<b>Source strength (milliCuries)</b>
Line 69 south of #8 Cooling Tower	1	Density gauge	Cesium-137	200
Line 104 south of #8 Cooling Tower	1	Density gauge	Cesium-137	500
Line 64 south of #8 Cooling Tower	1	Density gauge	Cesium-137	500
Line 103 south of #8 Cooling Tower	1	Density gauge	Cesium-137	500
Line 80 northeast of #15 Cooling Tower	1	Density gauge	Cesium-137	500



APPENDIX F

Acquisition of Reportable Sources of Radiation: Roles and Responsibilities





**APPENDIX G**

The following people will be notified whenever radiography is performed in the North Area of the LAR Carson near Wilmington Avenue and 223<sup>rd</sup> Street.

1. [Jo.r.comey@cpb.dhs.gov](mailto:Jo.r.comey@cpb.dhs.gov)
2. [Louis.salem@cpb.dhs.gov](mailto:Louis.salem@cpb.dhs.gov)
3. [Hung.t.ta@cpb.dhs.gov](mailto:Hung.t.ta@cpb.dhs.gov)
4. [Melanie.j.pickel@cpb.dhs.gov](mailto:Melanie.j.pickel@cpb.dhs.gov)