

Engineering Procedure

SAEP-1141

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Radiation Protection
for Industrial Radiography

Document Responsibility: Environmental Protection Department

Saudi Aramco DeskTop Standards

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1 Scope

This procedure covers the minimum requirements for safe use, handling, storage, and transport of ionizing radiation producing equipment and materials used for Industrial Radiography in compliance with the requirements of GI-0150.003 and shall be applicable to all organizations and personnel utilizing ionizing radiation sources on Company property (see definitions) for the purpose of industrial radiography. The requirements contained herein are subject to change based on revisions and clarifications issued by the Regulatory Authority, King Abdulaziz City for Science and Technology (KACST).

For the purposes of this procedure, the title "**Radiation Safety Officer (RSO)**" is herein after referred to as "**Radiation Protection Officer (RPO)**". With regards to this procedure and compliance with National Regulations, the titles, RSO and RPO are identical in all respects including duties, responsibilities and obligations.

2 Conflicts and Deviations

- 2.1 Direct all requests to deviate from this procedure in writing to the Company or Buyer Representative, who shall follow internal company procedure [SAEP-302](#) and forward such requests to the Supervisor of Radiation Protection Unit (RPU) of Environmental Protection Department (EPD).
- 2.2 Any conflicts between this procedure and other Saudi Aramco Engineering Standards (SAES's), Materials System Specifications (SAMSS's), Standard Drawings (SASD's), industry standards, codes, and forms shall be resolved in writing through the Supervisor of Radiation Protection Unit (RPU) of Environmental Protection Department (EPD).

3 ALARA (As Low As Reasonably Achievable)

For the application of ALARA principle (see definitions) the user of this procedure is advised that any unnecessary radiation dose is not acceptable and that it is the responsibility of all those working with or handling sources of radiation to work in a manner that limits exposure to radiation to themselves and to others. Every reasonably achievable means to reduce radiation exposure shall be taken. Under no circumstance is urgency to complete a task justification not to take reasonable measures to reduce radiation dose. The user of this procedure should contact the RPO any time he feels that demands compromise obligation to meet the concepts of ALARA.

4 Contacting Inspection Department Radiation Protection Officer (ID-RPO)

Any individual having information regarding mishandling of radioactive material, violations, safety hazards, etc., is required to contact the ID-RPO (RSO) or Assistant ID-RPO. The ID-RPO can be contacted by calling 03-872-0415 and 03-872-0233.

5 Applicable Documents

5.1 Saudi Aramco References

Saudi Aramco Engineering Procedures

[SAEP-302](#)

*Instructions for Obtaining a Waiver of a
Mandatory Saudi Aramco Engineering
Requirement*

[SAEP-1140](#)

Qualification of Saudi Aramco NDT Personnel

[SAEP-1142](#)

*Qualification of Non-Saudi Aramco NDT
Personnel*

General Instructions

GI-0002.100

Work Permit System

GI-0150.003

Saudi Aramco Ionizing Radiation Protection

Other Documents

KACST

*National Regulations for Radiation Protection
published 1997*

OID-N-RS-01

Emergency Response Procedure

OID-N-RS-02

Radiographic Exposure Device Maintenance

OID-N-RS-03

*Radiation Containment Building Radiation
Monitoring and Alarm System*

OID-N-RS-04

Wipe Test – Radiographic Exposure Device

5.2 Industry Codes and Standards

ANSI CP-189

*Standard for Qualification and Certification of
Nondestructive Testing Personnel*

6 Radiation Risk Assessment

6.1 It is the responsibility of the Inspection Department Radiation Protection Officer (ID-RPO), Assistant RPO, Area RPO or authorized designee to assess the

radiation risk of all exposures of ionizing radiation. For applications of industrial radiography, risks have been minimized by design of equipment and safety requirements contained herein. The principal risk of overexposure is therefore attributable to misuse of equipment, equipment malfunctions and failure to follow safety procedures. A Radiation Risk Assessment shall be prepared for each assignment involving using ionizing radiation. This shall include:

- 6.1.1 Identification of Radiation Source
- 6.1.2 Calculated radiation level at 1 meter and 1 foot from the source
- 6.1.3 Pre-calculated distance required for 7.5 $\mu\text{Sv/hr}$ (0.75 mRem/hr) for an unshielded source.
- 6.1.4 In the event that the assignment involves techniques not normally encountered by the technicians, the technician is to be provided with additional information (verbal or in writing) related to the risks.
- 6.2 On-Site risk assessments are required for radiographic assignments that involve additional risks.
 - 6.2.1 Scaffolding.
 - 6.2.2 Confined space where it is not possible for equipment controls to be placed outside of the enclosure.
 - 6.2.3 Use of high-energy ionizing radiation such as Cobalt-60 or Linear Accelerators.
 - 6.2.4 Locations such as occupied buildings.
 - 6.2.5 Any location or application whereby the Coordinator evaluates as not being a typical routine assignment.

7 Personnel

7.1 Principal Personnel

The Saudi Aramco Inspection Department maintains a tiered organization of personnel either exclusively assigned to Radiation Protection or having a significant portion of their duties and responsibilities related to Radiation Protection. The minimum safety requirement or expectation when you perform RT examination are approved equipments, work permits, survey of the projector, inspection of equipment, set-up test area and constant surveillance or

examination. The duties, responsibilities and where applicable, qualifications of the department's radiation protection personnel are included in Section 21 of this procedure and GI-0150.003. Followings are the main personnel responsible for running the radiation protection program for industrial radiography within Saudi Aramco Inspection Department:

7.1.1 Department Manager

As defined by KACST, the Department Manager is the "Director of Facility" and has the ultimate authority in Department matters dealing with Radiation Protection.

7.1.2 The Inspection Department-Radiation Protection Officer (ID-RPO)

Duties and responsibilities of ID-RPO are defined in GI-0150.003 and Section 21 of this document.

7.1.3 Area Radiation Protection Officer (Area-RPO)

The duties of the RPO mimic those of the RPO at a field level and are defined in GI-0150.003 and Section 21 of this document.

7.1.4 Autonomous Organization ID-RPO and/or area RPO

Autonomous Organizations (Operating facilities) where ionizing radiation producing equipment or radioactive sources is issued to or stored that are provided by the Inspection Department are classified as Users and shall comply with the requirements of GI-0150.003 including reporting and the requirements of this procedure. The ID-RPO retains responsibility and custody of all sources provided to the USER and, as required, performs duties of the ID-RPO as defined in this procedure. The User must designate a point of contact and backup individual as Inspection Unit Designated Representatives. This individual will maintain close coordination with the ID-RPO to assure compliance with this procedure and GI-0150.003. This includes, but is not limited to, completion of daily dosimetry reports, equipment/source utilization logs, verification of the calibration status of instruments, etc. These individuals will report any discrepancies noted to the ID-RPO.

7.1.5 Authorized Personnel (Radiation Workers)

Authorized personnel are those individuals who have been specifically authorized to use, handle, transport or store ionizing radiation producing equipment and radioactive sources. Requirements for these personnel are defined in GI-0150.003 and Section 21 2 of this

document. These individuals shall, at all times, maintain full compliance to the requirements contained herein.

7.2 Personnel Qualifications for Industrial Radiography

The following describes the basic qualification of personnel involved in Industrial Radiography and Radiation Protection personnel. Personnel assigned as Assistant RPO, Area RPO, Assistant Area RPO, and Autonomous Organization Inspection Unit Radiation Protection Officer and/or area RPO are selected by ID-RPO and concurred by RPU/EPD.

7.2.1 Radiographic Technician – In addition to the following qualification requirements, personnel performing radiography shall have completed formal training in Radiation Safety (Radiation Protection) and shall be in possession of a valid "Radiation Protection Permit" defined in paragraph 8.3. Radiation Protection Permit remain the property of Saudi Aramco and must be surrendered to RPU/EPD when the individual will no longer work in the capacity of a Radiographer for the Contractor or upon request by the RPU/EPD, ID-RPO or his designated representative.

7.2.1.1 Trainee – Shall have completed minimum training requirements defined in [SAEP-1140](#) ([SAEP-1142](#) for 3rd party contractor personnel) for Industrial Radiography and work under the direct supervision of a current certified RT Level II technician. All activities by this individual while in training shall be verified directly by the Level II technician including, but not limited to, any connection of associated equipment to the radiographic projector, attachment of the control cable to the source connector and any radiation surveys performed. Assignment of a "Trainee" requires the review and approval of the ID-RPO or designated representative.

7.2.1.2 Level I Radiographic Technician. Shall have completed minimum training and experience requirements defined in [SAEP-1140](#) ([SAEP 1142](#) for 3rd party contractor personnel) for Level I Radiography and work under the direct supervision of a current certified RT Level II technician.

7.2.1.3 Level II Radiographic Technician. Shall have completed minimum training and experience requirements defined in [SAEP-1140](#) ([SAEP 1142](#) for 3rd party contractor personnel) for Level II Radiography. An RT Level II technician must

have a minimum of 3 years field experience to be assigned to work with Trainees and RT Level I technicians.

7.2.2 Radiation Protection Officer (Radiation Safety Officer) – To be qualified as a Radiation Protection Officer, personnel shall as a minimum meet the following:

7.2.2.1 Possession of a current RSO/RPO license issued by King Abdulaziz City for Science and Technology (KACST); and

7.2.2.2 A minimum of 40 hours formal training in Radiation Protection recognized by the regulatory authority; and

7.2.2.3 Qualified radiographer (minimum certification to ASNT or ANSI CP-189 Level II radiographer or approved equivalent) in industrial radiographic operations or ASNT Level III RT certification; and

7.2.2.4 Formal training in the maintenance of radiographic exposure devices utilized for industrial radiography (Note 1); and

Note 1: Maintenance training shall be directly applicable to the approved radiographic exposure device and shall be conducted by an organization approved by the ID-RPO. Wherein the company has more than one RSO/RPO, at least one shall have completed the maintenance training.

7.2.2.5 Formal training in retrieval of sources utilized in industrial radiography (Note 2).

Note 2: Currently recognized source retrieval training includes programs conducted by the Saudi Arabian Section of ASNT, AEA Technologies (USA) and NRPB (UK). Other programs may be considered applicable by the ID-RPO. All registered RSO/RPO personnel shall have completed such training.

7.2.3 Contractor RPO – Contract organizations with personnel working on Saudi Aramco Property shall have in their employment a RPO meeting the requirements defined above and one equally qualified and trained back-up RPO. Wherein the contractor has more than one RPO, a single individual shall be identified as the Company RPO as a single point of contact and accountability.

7.2.4 Contract Organizations providing radiographic services on Saudi Aramco property (other than manpower supply under the Inspection

Department NDT contract) shall have sufficient RPO personnel to enable effective and expedient response to incidents. Such personnel shall be strategically located for a maximum emergency response time of 6 hours. For remote locations where response time will exceed 6 hours, one technician will be appointed at the Site, "in Charge" having sufficient experience to take action under the direction of the RPO to reduce radiation levels pending arrival of recovery personnel. Such circumstances may, at the discretion of the ID-RPO, require the establishment of a formal response plan specific to the location.

7.3 Crew Requirements

Minimum number of personnel for crew requirements shall be as follows:

Equipment/Material	Crew
Gamma Ray with all sources other than Co-60	2 technicians
Gamma Ray using Co-60	4 technicians *
X-Ray ($\leq$ 350 KV)	2 technicians
X-Ray – ($>$ 350 KV)	Min 4 technicians

* At least one member of the radiographic crew using Co-60 shall have authorization for Co-60 on the Radiographer's permit.

8 Permits

8.1 Work Permit

At least one member of a Radiographic crew should be in possession of a valid Work Permit Receiver's card.

Only Hot Work permits shall be used unless all equipment including the Survey Meter is certified intrinsically safe.

Note: Electronic equipment such as Survey Meters, Electronic Dosimeters, etc., are not typically classed as intrinsically safe.

8.2 Radiation Work Permit

A Project Radiation Work Permit issued by the Inspection Department is required for all radiographic work utilizing either x-ray or gamma-ray sources by NDT Service Providers working on Saudi Aramco property. These permits are issued to a contractor on a project basis and valid for 6 months.

NDT Service Providers are required to provide prior notification of all radiography on Saudi Aramco property.

8.3 Radiation Protection Permit (RPP) (previously was called Radiographer's Permit)

Technicians/personnel using, handling, or transporting ionizing radiation producing equipment and radioactive sources used for Nondestructive Testing on Saudi Aramco property shall be in possession of a valid Radiation Protection Permit (Radiographer's permit) for the use and handling of ionizing radiation producing equipment and radioactive sources issued by Saudi Aramco RPU/EPD. Saudi Aramco personnel in possession of a valid RPO license issued by the Government Regulatory Authority, KACST and current ASNT Level III certification are exempted. RPP details are as following:

- 8.3.1 Radiation Protection Permits (Radiographer's Permits) are valid for two years and remain the property of Saudi Aramco and must be surrendered when the individual no longer works in the capacity of a Radiographer or upon request by the ID-RPO or his designated representative.
- 8.3.2 The RPP may be suspended or canceled by an authorized representative of RPU/EPD, the ID-RPO, Assistant ID-RPO, designated representative, Area RPO, or authorized Radiation Protection Assessor for the following reasons:
 - 8.3.2.1 Due to violation of this procedure, the 1997 Government Regulations, the organization's own radiation protection procedure, or actions contrary to accepted normal practice that demonstrate that the individual is a hazard to himself, other radiation workers, or the general public.
 - 8.3.2.2 The individual becomes physically incapable of carrying out the duties and responsibilities of a radiation worker due to debilitating illness or injury.
- 8.3.3 Suspension or cancellation of an individual's RPP will be reported in writing to RPU/EPD. Only RPU/EPD has the authority to concur or reject this suspension or cancellation. Refer to section 18 of this procedure.

8.4 Temporary Radioactive Source Storage Pit Permit

A valid permit for temporary radioactive storage facility (formerly referred to as: "temporary radioactive source storage facilities") issued by the Inspection Department is required for the storage of sealed radioactive material on Saudi Aramco property. The storage pit and contents thereof are subject to inspections

by RPU/EPD, the ID-RPO or designated representative without prior notice. If the storage pits are found in violation of the Contractor's or Saudi Aramco's Radiation Protection procedures, requirements contained herein or Government Regulations, the permit may be suspended or revoked.

9 Radioactive Source Storage Facilities

The design of all radioactive storage facilities (permanent and temporary) must be approved by RPU/EPD. Designs for permanent and temporary storage pits are standardized and have been pre-approved by RPU/EPD (Appendices 8 & 9). The location of permanently installed facilities and temporary storages must be pre-approved by RPU/EPD. When a standardized storage pit is used, the USER must comply without exception to the RPU/EPD pre-approved design. Any temporary or permanent storage pit not meeting the requirements of the standard pre-approved design shall be considered as unique and requires specific approval of RPU/EPD.

Prior inspection and approval by ID-RPO or designated representative is required for all facilities used to store radioactive material provided by the Inspection Department or for Contractor temporary facilities on Company Property. Radiation Warning signs (in Arabic and English) should be displayed on all doors, cover of the pit and fences of all types of the storage facilities

Note: The use of radioactive source storage pits require the provision of handling devices such as rope & hook, chain & hook, or pole & hook to enable personnel insert and remove radiographic exposures devices to avoid potential personal injury.

9.1 Permanent Radioactive Source Storage Facilities for Industrial Radiography

- 9.1.1 Only Saudi Aramco organizations (e.g., Inspection Department NDTU and Operating Organizations) shall be authorized by RPU/EPD to establish permanent radioactive source storage facilities on company property. The location of permanent radioactive source storage facilities should be located in a completely controlled area and within Saudi Aramco facilities and far from populated buildings and areas.
- 9.1.2 ID-RPO shall have the authority to determine suitability of facilities for storage of sealed radioactive material provided the facility design has been approved by RPU/EPD. The use of any storage facility deemed unsuitable for storage of radioactive material shall cease immediately. Any radioactive material contained therein, will be taken to the nearest Inspection Department radioactive material storage facility and held until suitable and approved storage can be established.

- 9.1.3 Radioactive Source Storage Bunker – is a permanent structure designed for both physical security and radiological protection of the radioactive material contained therein and shall be used only for the storage of "Sealed" radioactive sources, containers and associated equipment.
- 9.1.4 Under no circumstance shall combustible material be stored in the bunker. This includes, for example, paper (other than the equipment tracking log and procedures), boxes, rags, solvents, etc...
- 9.1.5 Storage facilities shall be kept locked at all times with limited distribution of Keys. Personnel authorized to issue and receive sealed radioactive sources include the Area RPO or designated representative, and individuals specifically authorized by the ID-RPO. A roster of authorized personnel shall be maintained at the facility. Storage facilities and contents therein are subject to RPU/EPD inspections without prior notice.

9.2 Temporary Radioactive Source Storage Permit (Isotope Storage Pit Permit)
(Utilized by Contractor providing radiographic services on company property.)

- 9.2.1 The Contractor shall maintain a utilization log with format approved by the ID-RPO as part of the review and approval of the Contractor's Radiation Protection Procedure. The log shall be kept at the storage pit and shall show as a minimum provided date, time, and who a source was issued to, where it is located at all times, and when returned and by who.
 - 9.2.2 The Inspection Department reserves the right to withhold issuance of a permit if the contractor has one or more expired permits and the storage pit(s) has not been removed or application for renewal received has not been submitted.
 - 9.2.3 Temporary storage facilities for industrial radiography sealed radioactive sources shall comply with the requirements specified in Appendix 8 of this document. It is the responsibility of the Contract NDT service provider to prepare and submit application for temporary storage facilities they will use on Company property regardless of who the Prime Contractor is.
 - 9.2.4 Permits for temporary storage facilities are issued to the NDT Contractor who will utilize radioactive material on Saudi Aramco property. This Contractor shall be held accountable for all activities involved, conditions, and circumstances associated with the storage
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facility regardless of who installed it. Storage of radioactive material by another contractor in the same storage pit is not permitted unless the initial Contractor who the permit is issued to agrees, in writing, to assume full responsibility in accordance with his procedure and this document.

- 9.2.5 Permits for temporary storage facilities are issued for a period not to exceed 6 months subject to renewal and must be posted along with the approved radiation protection procedure on the surrounding fence.
- 9.2.6 The temporary storage pit shall be removed and the area restored to pre-installation condition on or before expiration of the permit. Removal is the responsibility of the organization the permit is issued to.
- 9.2.7 Temporary storage pit is not permitted if the radius of the distance between the jobsite and base is within 30 km. This distance allows radiographers to travel to a jobsite complete a reasonable amount of work and return safely to their base on the same day. Any project work outside of this radius requires an approved pit to be provided at site for safe overnight source storage and according to the specification shown in Appendix 8.
- 9.2.8 The following actions by the ID-RPO, or the Area RPO or their designated representatives may be taken for radiographic exposure devices found stored on Saudi Aramco property without a valid permit or the facilities deemed unsafe for storage of radioactive material.
 - 9.2.8.1 The contractor shall be required to immediately remove radiographic projectors from the site until an approval for the storage facilities has been received.
 - 9.2.8.2 The storage facilities shall be locked by the RPO, and the contractor allowed access to the radiographic exposure device(s) only for the purpose of removal and transport off site.
 - 9.2.8.3 The contractor shall be required to remove the storage facilities regardless of pending applications for approval and not reinstall until such a time as approval has been received.

9.3 Offshore Storage

- 9.3.1 Offshore storage applies to the storage of ionizing radiation producing equipment and radioactive sources on offshore facilities such as work boats, barges, platforms, etc...
- 9.3.2 Ionizing radiation producing equipment such as X-ray devices that do not contain radioactive material shall be secured in a locked cabinet or room with restricted access.
- 9.3.3 Radioactive material used for Industrial radiography offshore shall be limited to Ir-192. For Se-75 specific approval of the ID-RPO is needed. The maximum activity unless otherwise specifically authorized by the ID-RPO shall not exceed 30 Ci.
- 9.3.4 A locker sufficient in size to accommodate both the radiographic projector and, if required Type "A" or "B" over pack transport container defined under the manufacturer's license, shall be used. The locker shall be secured by welding or bolts such that in the event of a disaster the locker will remain with the facility. The locker will be clearly identified with Yellow/Black stripe painting and display the standard radiation warning sign(s) visible from all approachable directions. Signs shall be attached by bolts or other secure means and are displayed only when the locker contains radioactive material. Signs shall be in both Arabic and English.

10 Equipment and Materials

10.1 Radiation Monitoring Equipment

Radiation Monitoring Equipment refers to that equipment for which each individual must have when handling, storing, working with or transporting ionizing radiation producing sources (gamma-ray and X-ray devices). Radiation monitoring devices are not required for X-ray equipment when securely disconnected from power, with key removed and when such equipment do not include any gamma-ray sources.

Each individual radiation worker shall have in his possession and in use:

- Thermoluminescence Dosimeter (TLD)
 - Electronic Pocket Dosimeter or Alarm Rate Meter (Chirper)
 - Quartz Fiber Direct Read Pocket Dosimeter (May be omitted if an approved Electronic Pocket Dosimeter with dose displayed is in use.
 - Calibrated Survey Meter.
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TLDs, and Electronic Pocket Dosimeters (or Alarm Rate Meters with Quartz Fiber Direct Read Pocket Dosimeter) shall be worn on the trunk of the body (preferably at chest level).

10.1.1 TLD

- 10.1.1.1 Personnel associated with radiation sources as described above must wear an approved personnel dosimeter (Thermoluminescence Dosimeter (TLD)). The TLD shall be worn at chest level and care shall be taken that it is correctly positioned so that the front of the TLD is facing out.
- 10.1.1.2 A TLD shall be assigned to any individual where a potential dose in excess of 10% of the annual limit for radiation workers exists.
- 10.1.1.3 For the purpose of access to facilities or location where radioactive material is stored, in use, or transported, any individual not in possession of a TLD shall be classified as "General Public" with the limits thereof applicable.
- 10.1.1.4 Possession of a TLD shall not be considered as authorization to use, handle, store or transport ionizing radiation producing material and equipment. Authorization is defined in this procedure.
- 10.1.1.5 When not in use, TLD badges shall be stored in a radiation free location of the assigned area office unless other locations or circumstances are specifically authorized.
- 10.1.1.6 Anytime there is reason to believe that the TLD has been exposed to radiation other than normal usage (e.g., accidentally dropped in an exposure area), all work will cease immediately, equipment secured and returned to storage and concerned personal of high exposure are ceased from work. The TLD along with a report detailing the circumstances of the abnormal dose shall be submitted immediately to the ID-RPO and through him to RPU/EPD. The individual will not resume duties associated with radioactive material until cleared to do so by RPU/EPD.

10.1.2 Personal Radiation Alarm – Saudi Aramco Employees and Contractors

Personnel working for Saudi Aramco either as an employee, contract individual seconded to Saudi Aramco under the provisions of a Manpower Supply or equivalent contract, or for a NDT Service Provider (Contract NDT Company) directly hired by Saudi Aramco shall have in their position and use an Electronic Pocket Dosimeters having radiation dose and dose rate alarms, data logging, and displayed radiation dose compatible with the Inspection Department Dose Monitoring System.

10.1.2.1 All Saudi Aramco facilities having approved permanent storage facilities for radioactive materials shall have at least one reader station (Access Control Work Station (ACW)) connected to the Company Intranet Backbone and configured to interface with the Inspection Department Radiation Dose Monitoring System. Refer to the ID-RPO for specification and details.

10.1.2.2 Radiation Workers shall utilize the ACW nearest to his work location at the beginning and end of each work day/shift or as soon as practically possible. If for any reason the individual's Personal Alarming Dosimeter cannot be logged into the ACW, work with radiation sources shall not be permitted unless specifically authorized by the ID-RPO.

10.1.2.3 Each individual shall maintain a daily dosimeter log (appendix 6). The Electronic Pocket Dosimeter shall be used for completion of this form in addition to utilizing of the ACW.

10.1.2.4 Electronic Pocket Dosimeters shall be calibrated at intervals of not greater than one year, when there is reason to suspect the accuracy of the Electronic Pocket Dosimeters or at the request of the ID-RPO or designated representative.

10.1.3 Personal Radiation Alarm – 3rd Party Contractor Personnel

10.1.3.1 Contractor Personnel working on Saudi Aramco property as 3rd Party Technicians shall have as a minimum Rate Alarm Meter Personal Radiation Alarms with a dose rate threshold of 2 mSv/hr (200 mRem) and shall not be adjustable by the individual. It is recommended that personnel be provided with Electronic Pocket Dosimeters as described above.

10.1.3.2 When Rate Alarm Meters are used, individuals shall also have Direct Read Pocket dosimeters having a range of 0 to 2 mSv, 0 to 2000 μ Sv (0 - 200 mRem). Pocket dosimeters must be zeroed at the beginning of each day.

10.1.3.3 Pocket dosimeters shall undergo performance assessment at 12-month intervals in accordance with the manufacturer's recommended procedure. Acceptable dosimeters must read within $\pm 20\%$ of calibration levels. Records of the performance assessment shall be maintained by the User's RPO.

10.1.3.4 Alarming or malfunctioning Personal Radiation Alarms and/or Direct Read Pocket Dosimeters

If an individual's Electronic Pocket Dosimeter displays a dose greater than the investigation level dose (paragraph 11.1.2), produces a continuous alarm or appears to be malfunctioning, or if a Direct Read Pocket Dosimeter is used, the dosimeter is off scale, all production work will cease immediately.

An immediate radiation survey of the area and equipment shall be performed. If the survey indicates a presence of ionizing radiation beyond the index level of a properly stored source, barriers shall be maintained identifying the "Controlled Area". After the survey is completed, the following steps should be followed:

10.1.3.4.1 If the source is in the shielded position or the x-ray machine is off and the Personnel Radiation Alarm and/or pocket dosimeter continues to indicate receipt of a radiation dose, confirm by radiation survey that there is no release of radiation, secure equipment and immediately notify the Area RPO, your immediate supervisor and/or the Radiation Protection Officer. Work is not to resume until the malfunctioning dosimeter has been replaced and the Area Coordinator or RPO has approved resumption of work.

10.1.3.4.2 If the radiation source cannot be shielded, insure access into the area is restricted to

prevent a radiation hazard, and then notify the RPO of the dosimeter and source condition for further instructions.

10.1.3.4.3 Exposed TLD badge(s) will be processed as soon as possible. All personnel associated with the radiation incident shall not be allowed to return to work until the results of the TLD badge evaluation are received and reported to the ID-RPO. RPU/EPD reserves the right to impose further restrictions on authorization to return to work.. Dosimeter (TLD) reports for Contractor technicians shall be submitted to the ID-RPO and forwarded to RPU/EPD as soon as possible. Under no circumstances are Contractor personnel permitted to return to work after having been involved in an incident until submission of their TLD reports.

10.1.3.4.4 If the total reported results of the TLD badge are not in excess of the allowable limits, individuals involved in the radiation incident may return to active work assignments without exceeding the annual limits.

10.1.3.4.5 If the total reported results of the TLD badge are in excess of the allowable limits, individuals involved in the radiation incident will be given non-radiation work assignments until they are released by the ID-RPO or Assistant ID-RPO to return to active radiographic work.

10.1.4 Radiation Survey Meters

Radiation Survey Meters shall be Geiger Mueller type with a measurement range 2 $\mu\text{Sv/hr}$ (0.2 mRem/hr) to at least 10 mSv/hr (1000 mRem/hr). When pulsed X-ray generators are in use, Ion Chamber type survey meters shall, at the discretion of the ID-RPO, be used in lieu of Geiger Mueller Meters.

Radiation Survey Meters used for field radiography shall have an electronic LED or back-lit LCD display unless otherwise specifically

approved by the ID-RPO and shall be provided with a hands-free carrying strap.

- 10.1.4.1 Usage - Each radiographic technician shall have in use a radiation survey Meter during all aspects of use, handling or storing radioactive material, and when x-ray generating equipment is used or at any time such equipment is connected to power and therefore a potential of radiation exposure exists. At least two radiation survey meters shall be in use during the transportation of radioactive material.
- 10.1.4.2 An operational test of the survey meter shall be performed each day prior to the commencement of work. This operational test shall include a "battery check" or in the case of electronic instruments assurance that the low battery warning is not visible. Operators shall, at reasonable intervals throughout the work day compare readings between survey meters to assure that readings are comparatively similar.
- 10.1.4.3 If for any reason, one survey meter is inoperable or considered to be malfunctioning, radiographic operations shall cease immediately and shall not be resumed until the survey meter is replaced.
- 10.1.4.4 In the case where all survey meters are inoperable or considered to be malfunctioning, the area shall be considered as a radiation incident, and the Controlled Area maintained until a working survey meter can be obtained and used to verify the radiation condition.
- 10.1.4.5 All Radiation survey meters issued for use shall have been calibrated within the past six (6) months, or when repairs or adjustments are made. Calibration shall be performed by an approved, independent agency. A calibration label shall be affixed to the instrument showing the calibration agency and date and record of calibration and maintenance maintained.
- 10.1.4.6 Records of survey meters shall be maintained by the USER's RPO.

10.1.5 Radiation Dose Monitoring System

The Inspection Department Radiation Dose Monitoring System provides for an on-line computerized radiation dose monitoring for personnel designated as radiation workers in industrial radiography and other application of radiation sources used for industrial inspection. Refer to OID-N-RS-10 Dose Monitoring System for details.

- 10.1.5.1 Each Company Facility where Industrial Radiography radiation sources are stored shall be equipped with at least one Electronic Alarming Dosimeter reader station connected to the Company Intranet and configured to interface with the Inspection Department Radiation Dose Monitoring System.
- 10.1.5.2 All personnel (employee and contractor) working under the administration and direction of the Company shall be provided with an Electronic Alarming Dosimeter compatible with the Dose Monitoring System.
- 10.1.5.3 In addition to the "Daily Log", personnel shall Log-in their Electronic Alarming Dosimeter ("Enter" as defined by the system) at the beginning of their work shift and log-out ("Exit" as defined by the system) at the end of their work shift for each day of involvement with sources of radiation.
- 10.1.5.4 Any malfunctions of the system, inability of the system to "read" a specific Electronic Alarming Dosimeter", etc. shall be reported immediately to the ID-RPO.

10.2 **Approved Sealed Radioactive Sources**

Sealed Radioactive sources used for Industrial Radiography shall be limited to Ir-192, Se-75 and Co-60 unless otherwise specifically approved by both ID-RPO and RPU/EPD. (**Note:** Cs-137 sources are acceptable as control sources for X-ray pipeline crawlers.)

- 10.2.1 Ir-192, Se-75, Co-60, and Cs-137 shall be of a double encapsulation design, be in compliance with ISO 2919, have Special Form certification issued by the respective country Competent Authority and registered with the International Atomic Energy Agency (IAEA) and/or have a United Nation (UN) registration. Single encapsulation designs with crimped retention or threaded outer capsule, otherwise meeting the requirements of this paragraph, may be used with specific approval by the ID-RPO. Any approval for non-double encapsulated

designs shall not be considered as precedence for subsequent approvals.

- 10.2.2 NDT Service Providers shall contact the ID-RPO or assistant ID-RPO for information on current approved manufactures of sealed radioactive sources.

10.3 Approval of radiation sources for industrial radiography other than Ir-192, Se-75, and Co-60

The approval of these sources (radioactive or equipment producing radiation) shall be obtained from ID-RPO and RPU/EPD. Use of X-ray generators (other than accelerators) does not require specific approval provided they are clearly identified in the Contractor's Radiation protection procedure.

10.4 Radiographic Equipment

10.4.1 Gamma Ray Sources

- 10.4.1.1 Only radioactive sources contained in approved Type B(U) radiographic projectors may be transported, used, and with specific approval, stored on Saudi Aramco property. Approved projectors include **GammaMat SE**, AEA Technologies (Techops, Amersham, Amertest, QSA) 660B, and 880 Delta or Sigma radiographic projectors. The ID-RPO and RPU/EPD together may approve other exposure devices for specific applications.
- 10.4.1.2 NDT Service Providers are hereby advised that at the time of issue of this procedure, use of 660 series radiographic projectors have been phased out. Of the 660 series, only 660B projectors shall be used on Company property and shall be transported in the original manufacturer provided OPL (Over-pack with Lead) container.
- 10.4.1.3 Projectors (radiographic exposure devices), controls, and guide/extension tubes shall be inspected and maintained in accordance with the Operations Inspection Division, NDT Unit procedure OID-N-RS-02 "Radiographic Exposure Device Maintenance".

Note: Controls used for the 660B and 880 Delta or Sigma projectors shall be in compliance with the manufacture's equipment license. Under no circumstances shall controls originally designed for the 660 projector be

used. For identification, these controls have an embossed logo letter "A" on both the control cable connector and the control connector assembly body.

- 10.4.1.4 Complete Service in accordance with the Operations Inspection Division, NDT Unit procedure OID-N-RS-02 "Radiographic Exposure Device Maintenance" shall be performed at intervals not exceeding 12 months or:
 - 10.4.1.4.1 Equipment exposed to harsh conditions which could result in "sluggish" operation of the moving parts or;
 - 10.4.1.4.2 Determined during daily inspections to be functioning improperly such that could lead to unsafe conditions or;
 - 10.4.1.4.3 Determined at the time of Quarterly Inspection to require Complete Service due to physical condition of the equipment or operation of moving parts, or;
 - 10.4.1.4.4 Immediately following a radiation protection incident involving the equipment.
- 10.4.1.5 Only those components manufactured or approved in writing by the original manufacturer for repair or upgrading of equipment shall be used. Use of "used" components is not permitted. At the time of complete inspection, all springs except those for the lock shall be discarded and replaced with new springs, unless otherwise approved by the ID-RPO. Worn or distorted parts shall be replaced.
- 10.4.1.6 Personnel responsible for inspection and servicing of Projectors, controls, and guide/extension tubes shall be specifically trained and qualified for the work.
- 10.4.1.7 All radiographic exposure devices containing depleted Uranium (DU) shall undergo a wipe test for detection of possible removable contamination in accordance with procedure OID-N-04.

10.4.2 X-Ray Equipment

- 10.4.2.1 Use of X-ray generators (other than accelerators) for industrial radiography up to 350 kVa does not require specific type approval. X-ray generators being a source of ionizing radiation require licensing by the Regulatory Authority, KACST and are included in the Inspection Department use license.
- 10.4.2.2 Contractor organizations providing radiography services on company property may, upon submission of the appropriate application permit, use X-ray generators up to but not exceeding 350 kVa without specific type approval. Preference shall be given to omni-directional generators. Orthogonal, forward throw and panoramic generators must have a justified application.
- 10.4.2.3 All protection precautions provided in this procedure shall apply to operations with x-ray generators where applicable. The following items are mandatory when using x-ray generators.
 - 10.4.2.3.1 Personal Radiation Monitoring
 - 10.4.2.3.2 Radiation Survey meters for each crew member (Ion Chamber type survey meter to be used for battery operated pulsed x-ray units)
 - 10.4.2.3.3 Lock-out device (e.g., panel key)
- 10.4.2.4 Radiation survey meters shall be used in the same manner as they are used with radioactive materials. Survey meters shall be used at all times when equipment is connected to power source regardless if x-rays are being generated or not.
- 10.4.2.5 No x-ray unit shall be left unattended. The control shall be locked after each exposure.

11 Dose Limits

The following establishes the maximum personnel dose limits. The limits established below do not imply that reaching dose limits is acceptable. In accordance with ALARA principle it is the responsibility of the individual to reduce the dose level anywhere possible.

Notes:

- 1) *The official documents for reference to radiation dose limits are GI-0150.003 and the KACST regulations.*
- 2) *Any unnecessary radiation dose is unacceptable. Therefore, the limits defined below are the lower limit of "unacceptability". Application of ALARA principle is mandatory.*

11.1 Occupational

11.1.1 Annual Limit

Whole Body: 20 mSv (2 Rem)

Hands, forearms, feet and ankles 500 mSv (50 Rem)

Annual Whole Body limit may be increased to 50 mSv (5 Rem) per year provided the exposure during 5 consecutive years does not exceed 100 mSv (10 Rem).

11.1.2 Investigation Dose Level

11.1.2.1 The User's RPO, Area RPO, or designated representative shall conduct an informal investigation by interview or other appropriate means of any individual's daily dose exceeding 0.5 mSv (50 mRem) or monthly dose exceeding 1 mSv (100 mRem). The affected individual shall be counseled on methods and procedures of dose reduction and a report forwarded to the ID-RPO. The User's RPO shall review such reports and if deemed necessary require further investigation by the ID-RPO, or assign a designee. Reports of Investigation Level dose shall be forwarded to RPU/EPD. If it is determined that the investigation dose level is the result of an incident, the incident shall be reported in accordance with the requirements of section 15 of this procedure.

11.1.2.2 At the discretion of the ID-RPO, individuals having repeated doses in excess of the investigation limit shall be required to:

11.1.2.2.1 Attend additional training, or

11.1.2.2.2 Have limits placed on work activity, or

11.1.2.2.3 Surrender RPP (Radiographer's permit), or

11.1.2.2.4 Any combination of any of the above.

11.2 Non-Occupational (General Public)

Annual Limit

Whole Body: 1 mSv (100 mRem)

The maximum permissible dose limit for Non-Occupational exposures to radiation shall, when required, be determined by calculation taking into consideration utilization factors for the exposure device and occupancy factors. As an alternative, an area TLD may be used and processed at intervals deemed necessary by the ID-RPO to evaluate area radiation dose levels.

Ionizing radiation producing material or equipment shall not be used, stored or transported in any way that could result in levels which, if a non radiation worker were continuously present in the area, would result in a dose in excess of 1 mSv (100 mRem) in one year. In special circumstances, specifically authorized, a higher dose could be permitted provided that the 5 year average does not exceed 1 mSv (100 mRem) per year.

Radiation dose associated with Non-Occupational (General Public) personnel can be determined by calculation or by representative area TLD with results extrapolated over the anticipated duration of exposure.

12 Restricted Access to Radiation Areas

12.1 Controlled Area

12.1.1 Access to the controlled area is restricted to authorized radiation workers only, anytime control of this area cannot be maintained, all work is to cease immediately and shall not be resumed until control is regained. Radiation levels at the Controlled Area boundary shall not exceed a measured 7.5 $\mu\text{Sv/hr}$ (0.75 mRem/hr). Equipment shall be confirmed as secured and the area safe.

12.1.2 When there is insufficient area to permit a boundary extending to a measured 7.5 $\mu\text{Sv/hr}$ (0.75 mRem/hr), the Area RPO, may permit a smaller boundary area provided the calculated average dose in any one hour does not exceed 7.5 μSv (0.75 mRem).

12.2 Supervised (Observed) Area

The Supervised Area is based on an estimated distance where the dose level averaged over one hour will not exceed 2.5 $\mu\text{Sv/hr}$ (0.25 mRem/hr). Though it

is not required to establish a barrier at this limit, it is the responsibility of the radiation worker to maintain observation of this area to assure that workers do not enter the controlled area.

12.3 **Controlled Area Warning Signs and Barrier Tape or Rope**

The Controlled Area must be clearly identified to provide adequate notification to the General Public (Non-radiation workers) of the presence of work involving ionizing radiation by radiation warning signs and barricade with approved radiation warning barrier tape or orange rope with radiation warning pennants.

12.3.1 Warning Signs

A minimum of four (4) free-standing radiation warning signs shall be posted at the Controlled Area boundary so that warning is provided for all approachable directions. In complex locations where equipment and structures can obscure observation of the warning signs, additional signs shall be used so that warning is provided for all directions and point of entry to the controlled area.

When the radiographic exposure device is elevated such as on a platform, in a confined space, or in a ditch, an additional sign shall be placed at the point of entry.

Signs shall have a minimum height of 1 meter. Radiation warning shall be in both Arabic and English languages and have the international radiation trefoil symbol. Signs used in subdued lighting conditions shall be reflective.

12.3.2 Barricade Tape / Rope

Barricade consisting of barrier tape or rope shall be extended for the full perimeter of the Controlled Area. In remote areas where there is a limited or no presence of personnel other than the radiographic crew, such as pipeline work, barrier tape or rope is not required unless even with limited other personnel, such personnel could interfere with the radiographic operations.

Where radiography is being conducted in "multi-story" applications and access to the level (and above or below) where the work is conducted, additional barricades shall be established at each accessible level.

12.3.2.1 Barrier Tape

Barrier tape, if used, shall include wording in Arabic and English languages and the trefoil radiation symbol continually printed long the length of the tape. Tape shall have a yellow background with wording and symbols including stripes, if present, with black print providing a high contrast for easy visibility. Radiation symbol shall be printed in black. Any twisting or rolling of the tape that could impede visibility shall be corrected by repositioning of the tape or replacement.

12.3.2.2 Barrier Rope

Barrier Rope, if used, shall be bright orange in color and shall have approved radiation warning pennants spaced every 3 meters or less.

12.3.2.3 Pennants

If barrier rope is used, Radiation warning Pennants (hanging signs) shall be attached to the rope. Pennants shall have a yellow background with radiation warning printing and the trefoil symbol printed on both sides in black to provide stark contrast. Radiation symbol shall be printed in black.

12.3.3 Controlled Area Lighting

In situations where radiographic operations are conducted at night, floodlights shall be provided to illuminate the Controlled Area to aid observation by the radiographers. In remote areas (e.g., pipelines) where there the area is open and there is either no or limited opportunity of approach by members of the general public, high intensity spotlights can be used.

In subdued lighting conditions, red or yellow flashing warning lights shall be used with the radiation warning signs defined above. Lights shall be attached to or positioned next to the warning signs. It is recommended that strobe flashing lights be used, but in lieu of these, conventional "traffic" flashing lights can be used.

12.3.4 Radiation Survey of Controlled Area

12.3.4.1 A radiation survey shall be conducted as soon as the source is exposed to confirm correct barrier radiation limits. The

radiographer shall keep the area under constant surveillance to protect against unauthorized or accidental entry.

12.3.4.2 The radiographer must complete a radiation survey at each radiographic work location.

12.3.4.3 If any unauthorized person enters the radiation area the source will be retracted and no exposures made until the area is cleared. The area NDT Coordinator shall be verbally notified of the situation and if deemed necessary, the situation shall be considered as an "Incident" requiring investigation.

13 Transportation

13.1 Vehicle Transportation

13.1.1 Vehicles used for the transport of radioactive material used for industrial radiography shall be equipped with a storage compartment designed for that purpose. The storage compartment SHALL be securely affixed to the vehicle by bolts, welding, or industrial cargo straps* to retain the contents in the event of a vehicle accident and shall be equipped with lock(s) to prevent unauthorized removal of the contents or the box. Such compartments shall be subject to inspection by the ID-RPO or designated representative and RPU/EPD.

** Use of industrial cargo straps for radiographic exposure device transport shall be considered as a temporary measure and requires the specific approval of the ID-RPO or assistant ID-RPO.*

13.1.2 Vehicle storage compartment used for industrial radiography exposure device(s) SHALL provide shielding such that the maximum Transport Index does not exceed the requirements of Yellow Label II which is 0.5 mSv/hr (50 mRem/hr) at the surface and 0.01 mSv/hr (1 mRem/hr) at one meter. Further, the dose level at any occupant position or exterior surface of the vehicle shall not exceed 7.5 μ Sv/hr (0.75 mRem/hr). ALARA principle shall be applied to reduce radiation levels in the occupant portion of the vehicle.

13.1.3 Radioactive sources and X-ray generators shall be secured by lock and key to prevent (as reasonable as possible) unauthorized removal.

13.1.4 Exceptions to the foregoing shall be considered on a case-by-case basis with the specific approval of the ID-RPO or his designated representative.

- 13.1.5 Vehicles used for industrial radiography shall be open bed pick-up trucks $\frac{1}{4}$ ton or greater. Transport boxes to be mounted towards the rear of the vehicle farthest from the passenger compartment.
- 13.1.6 Vehicle Placard: According to the KACST (National Radiation Protection Authority) regulation, "Danger Radiation" placards to be posted on three sides of the vehicle (both sides of the vehicle and rear side). Until otherwise notified, Saudi Aramco vehicles are excluded from this instruction and are allowed to continue with its present practice which is to securely affixed the placards to the front and rear of the vehicle transporting radioactive sources. When vehicle is **not** being used for the transport of radioactive materials, the "Danger Radiation" signs affixed on the front and rear of the vehicle ***shall be temporarily removed or be reversed or covered, indicating that there is no radioactive material loaded on the vehicle.***
- 13.1.7 An Emergency Contact information card shall be prominently displayed within the passenger compartment of the vehicle clearly identifying that in the event of an emergency, who is to be contacted. Also, the emergency procedure to be followed should be available in the passenger compartment.
- 13.1.8 Personnel being transported in a vehicle equipped to transport radioactive material including technicians, drivers, helpers, etc., must have received training in radiation protection and be prepared to respond to emergency situations. All personnel must have in use required personal dosimetry and survey instrumentation at all times when radioactive materials are stored or transported in the vehicle.
- 13.1.9 The maximum permissible speed for vehicular transport of radiographic projectors or shipping containers of radioactive sources for radiographic projectors is 90 km/hr or the posted speed limit whichever is less.
- 13.1.10 Two vehicles equally equipped are required for the transport of Cobalt-60 radiographic projectors.
- 13.1.11 Personnel required for transport of radiographic projectors is primarily governed by the number of individuals required to physically transfer the equipment from one vehicle to another. Typically, only one individual is required for the transport (no radiographic assignments) of Ir-192 radiographic projectors. Cobalt-60 projectors typically require 4 individuals to move without the aid of lifting devices. In addition to the two drivers for the vehicles involved in the transport of

Co-60, additional personnel shall be available within a distance having a travel time of not more than one hour to assist in movement of the projector provided transport personnel have radio or mobile phone communications. Otherwise, the minimum number of personnel required for transport of Co-60 is four.

13.2 Air Transportation

- 13.2.1 In the event transportation of radioactive sources is to be by Saudi Aramco fixed or rotary wing aircraft, such material **MUST** be in compliance with the Saudi Aramco Aviation Department General Instructions and further, in compliance with the International Air Transportation Authority (IATA) regulations regarding the transportation of hazardous goods.
- 13.2.2 The shipper is responsible for the preparation of the transportation manifest and the required IATA "Dangerous Goods Declaration" form.
- 13.2.3 The Pilot may, at his discretion, decline to permit the transport of radioactive sources, regardless of regulatory and/or procedural compliance. In the event that this occurs, the ID-RPO may be contacted to assist in arrangements for next available transportation and determine justification for declining the transport. Radioactive material shall be secured at all times.
- 13.2.4 RPO or designated representative should record the specifications (e.g., type, and identification) of the radioactive materials before its transportation and after receiving. Radiation survey to be performed before sending the radioactive package and after receiving it. The survey record to include the radiation level at the surface and transport index. The record of the radiation surveys should be kept with both RPO's located at the shipping and receiving locations. (Sender and receiver).

13.3 Water Transportation

- 13.3.1 Radioactive sources transported by boat must be secured in a Type B transport container having a maximum "Yellow Label-II" transport classification.
- 13.3.2 Transport container shall be secured in such a way that in the event of a disaster the container will remain with the boat. Securing is at the discretion of the boat Captain, load master, or personnel responsible for stowage.

- 13.3.3 A survey shall be conducted such that the maximum radiation dose at occupied areas of the boat will not exceed 7.5 $\mu\text{Sv/hr}$ (0.75 mRem/hr). Additional lead may be added to further reduce radiation levels.

13.4 Bulk Radioactive Source Transport

Bulk Radioactive Source Transport applies to radioactive source shipments from the port of entry to the distribution site and for depleted radioactive material, from the distribution site to the port of export.

- 13.4.1 Transport must be in an approved and licensed Type B Transport Container and shall not exceed the permissible Transport Index dose limits of Yellow Label-III.
- 13.4.2 It is not required that such transport containers be stored in vehicle transport box due to the variety of size and shape of transport containers encountered. However, such containers must be secured in an open bed pick-up truck $\frac{3}{4}$ ton or greater, situated as far from the driver's position as possible. Transport containers must be transported in the approved Transport Box. The design of the Transport Box should be according to the recently approved design by KACST and RPU/EPD as shown in Appendix 12. The Transport Box should be affixed to the vehicle by welding, bolts, wire rope, cargo transport straps, etc. such that the transport box will remain with the vehicle in the event of an accident.
- 13.4.3 Transport containers must be secured within the Transport Box to prevent shifting during transit by ratchet nylon or wire rope shipping straps secured to the truck bed by anchor bolts. Straps must be drawn tight to prevent load shifting during transport and be capable in quantity and type to retain the load in the vehicle in the event of a vehicular accident. Method of securing transport containers is subject to inspection and approval.

14 Protection Of Radioactive Sources

14.1 Storage

- 14.1.1 Equipment producing ionizing radiation and radioactive sources must be secured in approved locked storage. These include Source Storage Bunker, Source Storage Pit (Temporary or Permanent) or in transport containers. Each facility must be specifically approved by the ID-RPO or designated representative in accordance with storage facility approval requirements (see section 9). Unless otherwise specifically

approved by the ID-RPO or designated representative, vehicles shall not be used for the storage of radioactive material. Vehicles with radioactive materials should not be parked in public areas unattended.

- 14.1.2 X-ray equipment shall be stored in secure cabinets; containers or other lockable means that securely restricts access by authorized personnel only. Facilities designed specifically for radiation exposures may be used provided the ability of the equipment to generate ionizing radiation is inhibited by a lock-out key.
- 14.1.3 Personnel accessing storage facilities for Equipment producing ionizing radiation and radioactive sources used for industrial radiography must be in possession of a valid RPP (Radiographer's Permit) and have the required personal dosimetry described in section 10.1. Visitation to storage facilities by non-radiation workers requires that such personnel be in possession of a pocket dosimeter or Personal Radiation alarm, described in paragraph 10.1.2, and accompanied by a qualified radiographic technician in possession of personal dosimetry described in section 10.1. Access requires the approval of the ID-RPO or Assistant ID-RPO and the facilities must be surveyed prior the entrance of non-radiation workers.

14.2 Issue and Receiving

- 14.2.1 The issue and receiving of ionizing radiation producing equipment and material (e.g., radiographic projectors, X-ray machines, etc.) must be logged in the equipment utilization log clearly identifying the responsible radiographic crew (see appendix 7). Unless specifically approved by the ID-RPO, Assistant ID-RPO or Area RPO, on-site transfer of radiographic projectors between crews is not permitted. On-site transfer of equipment other than radiographic projectors may be permitted and is subject to approval by the ID-RPO.
- 14.2.2 In the event on-site transfer of radiographic projectors is permitted, the transfer must be recorded in the source tracking log including the new location of use, the receiving crew names, and name of requester with contact phone number. If the transfer occurs between shifts, the Area RPO must perform and document the required "Daily Inspection" in accordance with ID/OID procedure OID-N-RS-02.

14.3 Index Radiation Level

- 14.3.1 At the time of issue, an index survey of the projector shall be conducted to determine the radiation level at 12" from the right side of

the projector. The resulting value shall be recorded on the Safety Data Check List and used throughout the radiographic assignment to assure that the radioactive material is stored properly in the projector.

- 14.3.2 If the measured radiation level at the index point (12" from the right side of the projector) exceeds the $\pm 20\%$ of the index level at the time of issue, during the radiographic assignment of a projector, all work is to be stopped and the area classified as an Incident until otherwise instructed by the ID-RPO, Area RPO, or appointed representative. All index surveys shall be at the same distance.
- 14.3.3 At the time of return, an index survey of the projector shall be conducted to confirm that the radiation level is within $\pm 20\%$ of the index level at the time of issue.

15 Procedures for Handling Sealed Sources

15.1 General

- 15.1.1 All sealed sources used for industrial radiography by Saudi Aramco radiographic personnel shall be housed in approved; remote operated, or shielded projector type devices. Any available natural shielding shall be utilized and a tungsten collimating device shall be used at all times with the exception of panoramic exposures.
- 15.1.2 When performing radiographic operations a radiation survey shall be made after each exposure to determine that the radiation source has been properly returned to its shielded position. The survey shall continue as the radiographer approaches the projector with readings taken at all sides of the projector to assure proper retraction. A survey of the projector starts from the back (connector end) and proceeds cautiously towards the front along either the left or right side of the projector. The survey of the front of the projector is done by the technician reaching and not moving in front. He will continue moving the survey meter around the projector completing a 360 degree survey of the projector. The technician is required to continue the survey to the end of the guide tube keeping the survey meter with him during any work with the source stop and film. After the physical survey is completed the survey meter shall be kept with the technician.
- 15.1.3 In no case should the levels of radiation for the surveys noted above exceed the following limits:

- 15.1.3.1 When a radioactive source is returned to its shielded position inside the storage camera, the radiation level 15 cm (6 inches) from any surface shall not exceed the limitations set forth by the manufacturer of the equipment.
 - 15.1.3.2 When a radioactive source is in its shielded position inside the radiographic projector, the maximum at any exterior surface, shall not exceed 2 mSv (200 mR) per hour, or shall not exceed 0.1 mSv (10 mR) per hour at 1 meter from any exterior surface.
 - 15.1.4 Radiographic Equipment
 - 15.1.4.1 Each radiographer is responsible for checking his own radiographic equipment (projectors, wind-outs, and extensions) prior to each day's assignment. Daily inspection requirements are defined in procedure OID-N-RS-02.
 - 15.1.4.2 The following are operational steps that should be used when operating radiographic projectors at the beginning of a work assignment:
 - a) Assure the survey meter is operating properly prior to unloading the projector from its storage container.
 - b) When the radiographic projector is in its work location, layout the full length of the wind-out cables keeping them as straight as possible.
 - c) Unlock the radiographic projector and turn the locking device to the connect position, removing the cap, exposing the source pigtail.
 - d) Connect the control cable to the pigtail.
 - e) Connect the wind-out cable to the projector and turn the locking device to the lock position.
 - f) Move the shutter lever to the connect position, attach the front guide tube, and move the shutter lever to the fully open position. For 660B projectors, remove the safety plug from the front of the radiographic projector and connect the guide tube.
 - g) Place the guide tube at the exposure location making sure there are no 90 degrees bends in the tube keeping is as straight as possible.
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- h) When the radiographic projector setup is complete, turn the locking device to "operate".
- i) Prior to the first radiograph, wind out the source to conduct a radiation survey of the area roped off and/or posted, to check that radiation levels at the boundaries are at or below the established limits and adjust position of boundaries as necessary.
- j) At the end of each exposure, rewind the source into the radiographic projector and conduct a physical survey as described in 15.1.2.
- k) When work is completed, and a survey conducted; turn the locking device to the locked position, disconnect the guide tube and close the connector shutter to the fully closed position. For 660B projectors, replace the safety plug.
- l) Turn the locking device to the connect position and disconnect source pigtail, replace the cap, and turn the locking device to its locked position and remove the key (this locks the radiographic projector).

Note: Source surveys should always be made before, during and after each exposure and when loading and/or unloading an radiographic projector.

15.1.5 Source Changes

The ID-RPO or authorized individual appointed by the ID-RPO, will be responsible for supervising or conducting radioactive source changes for equipment owned or in the custody of Saudi Aramco. Changing sources will be performed in accordance with the manufacturer's or vendor's approved procedures and equipment.

16 Emergency Procedure

- 16.1 An incident is any conditions of loss of immediate control of the radiation source, lost Equipment producing ionizing radiations or radioactive material; or radiation exposures (or potential of radiation exposure) to radiation workers and/or members of the general public in excess of permissible limits. All incidents must be reported in accordance with the requirements of GI-0150.003. Conditions of damage or malfunctions not resulting in a radiation exposure must be reported directly to the ID-RPO.

16.2 Emergency response involving Company incidents shall be in accordance with Saudi Aramco procedure OID-N-RS-01. Emergency response involving Contractor incidents on Company property shall be in accordance with the Contractor's approved Radiation Protection Procedure and/or Emergency Response Plan. The ID-RPO or RPU/EPD reserves the right to invoke the provision of OID-N-RS-01 for any Contractor Incident.

16.3 All incidents on Company Property involving Equipment producing ionizing radiation or radioactive source owned by Inspection Department must be reported immediately to the ID-RPO or designee and through him to RPU/EPD. Initial notification may be by phone, radio, or relayed message followed by written details. The ID-RPO or designee must be directly advised when a fax or E-mail providing details of the incident is sent. Reports are subject to approval by the ID-RPO or designee. In the event ionizing radiation producing equipment or radioactive source issued to a User by the Inspection Department is involved in incident, the user must report immediately to the ID-RPO in addition to the reporting requirements set forth in GI-0150.003.

16.4 **Incident Reporting**

16.4.1 Notification

Prepare the Notification Report (Appendix 10). This form contains the required information for verbal and fax notification.

Notify ID-RPO via telephone as soon a reasonably possible regardless of the time of day or day of the week (see form for contact numbers).

Notify RPU/EPD via telephone as soon a reasonably possible during regular business hours (see form of contact numbers).

A copy of the Notification Report shall be sent to the ID-RPO and RPU/EPD via Fax as soon a reasonably possible (see form for fax numbers).

Incidents that interfere with normal Company operations, injury or debilitating overdose to radiation workers, and overdose to general public shall be reported immediately by personal contact to Loss Prevention, and other concerned organizations whose area will be affected.

Notice: Soon, new notification procedure will become electronically available through SAP system. The procedure covers all items included in this section.

16.4.2 Preliminary Reporting

Preliminary reporting shall be prepared using Appendix 11 and issued by the User RPO within 2 business days to the ID-RPO and RPU/EPD. (see form for address, fax and email information).

16.4.3 Final Reporting

The User RPO shall prepare a final report including description of the incident, circumstances, personnel and equipment involved; corrective action and preventative measures against reoccurrence. The final report shall include the following applicable documents: reports by individuals involved, Contractor RPO's report, TLD reports, ID-RPO final report, notifications, photographs (if available). In the event of an incident on Company property by contractor, a copy of the notification to KACST is to be included.

Final report shall also contain both immediate causes and root causes. The investigation team shall determine root causes using a structured root cause analysis technique; refer to the Loss Prevention Department for methodology.

Final report to be submitted to RPU/EPD within 15 working days from the date of the incident. RPU/EPD will review the report, if RPU/EPD concurs with the report, it will be forwarded to managers of ID, EPD and LPD. If RPU/EPD does not agree with the final report, then RPU/EPD will do its own investigation.

Notification and reporting to ID and RPU/EPD is the responsibility of the source licensee. Notification and reporting incidents of Saudi Aramco owned sources to KACST should be performed through RPU/EPD.

16.4.4 User Definition

For the purpose of notification and reporting, USER is defined as:

16.4.4.1 Inspection Department personnel and contractors

16.4.4.2 The ID-RPO is responsible for Notification and all reporting of incidents involving ID employees and Contractor technicians seconded to ID.

16.4.4.3 Contractor Incidents on Company Property

- 16.4.4.4 The PMT Organization for Projects on Company Property is the User of Fact for incidents involving Contract NDT Service Providers on Company Property. At the option of PMT, the ID-RPO may fulfill the notification and responsibilities of PMT. Depending on the incident circumstances, the ID-RPO may independently provide notification and reporting in addition to the User's obligation to comply with the requirements of GI-0150.003.
 - 16.4.4.5 Incidents by Users of radiation sources provided by the Inspection Department
 - 16.4.4.6 Users of radiation sources provided by the Inspection Department are required to meet the reporting requirements of this procedure and GI-0150.003. Copies of the User's Preliminary and Final reports shall be submitted to the ID-RPO when meeting these reporting requirements. The ID-RPO or designee will investigate incidents involving radiation sources provided by ID and provide preliminary and final reporting independent of the User's responsibilities.
- 16.5 Contractor organizations providing radiographic services on Saudi Aramco Property shall maintain all necessary equipment for emergency recovery at a location whereby the transport of such would not exceed 6 hours unless otherwise specifically authorized. Emergency equipment is subject to inspection and approval by the ID-RPO or his designated representative.
- 16.6 The ID-RPO or designee shall be responsible for compliance with the requirements of GI-0150.003 for notification of industrial inspection related incident on Company property or involving Company employees working outside of Company property.

17 Requirements Specific to Contract Radiographic Services

The following requirements specific to Contract Radiographic Services on Company Property are in addition to the overall requirements of this procedure.

17.1 Regulatory Authority

The contractor shall maintain full compliance with the National Radiation Protection regulations (issued 1997) and current revisions thereto and subsequent requirements issued by the Saudi Arabia Government's Regulatory Authority.

17.2 Procedure Approval

The contractor is not permitted to use, store, or transport Equipment producing ionizing radiation on Saudi Aramco Property without an approved Radiation Protection Procedure. The Contractor's Radiation Protection procedure for Industrial Radiography shall be reviewed and approved by the ID-RPO. Contractor Radiation Protection Procedures are reviewed for approval at least every 6 months or at other intervals required by the ID-RPO. The ID-RPO shall submit all approved Contractor Radiation Protection Procedures once per two (2) years or on demand to RPU/EPD. RPU/EPD may endorse approval, revoke approval pending specified revisions, or require specific revisions prior to subsequent approvals. Approval of the contractor's Radiation Protection procedure may be withdrawn and subsequent activity involving the use and handling of radioactive material and X-ray generators immediately suspended if personnel are found to be in violation of Government Regulations, the Contractor's procedure, comments contained in the Document Review or Saudi Aramco Radiation Protection Procedure SAEP-1141.

17.2.1 Evaluation of compliance at the time of field assessment is at the sole discretion of the ID-RPO, Area RPO, designated representative or RPU/EPD Representative. Violations resulting in stoppage of work shall be reported to RPU/EPD.

17.2.2 In the event violations warrant work to be stopped, resumption requires the approval of the Area RPO, ID-RPO, designated representative or RPU/EPD.

17.3 Radiographic Work, Fax Notification

Prior to the commencement of a project, the Contractor is required to give notification of the intended work including information such as scope of work, location, duration, location of storage facilities, and personnel involved. A Radiographic Work, Fax Notification form (appendix 4) is included herewith. Only one submission of this form is required unless a change in the project requires updating of the information provided. Failure to submit this notification shall give cause to require work involving Equipment producing ionizing radiation to cease until notification is made. The contractor shall provide written explanation for the absence of notification and such explanation shall be taken into consideration for the approval to resume work.

17.4 Contractor RPO

17.4.1 Contractor RPO personnel duly licensed by the Regulatory Authority, KACST are subject to approval by the Inspection Department RPO.

- 17.4.2 The contractor shall submit and receive Plant Access approval for the Contractor's RPO(s) for each site where the Contractor's radiation workers will be assigned.

18 Violations and Incidents – Administrative Response

Violations and incidents occurring on Saudi Aramco property may, at the discretion of the ID-RPO, RPU/EPD Representative, or Inspection Department Manager, warrant administrative response and/or action depending on the severity of the situation and circumstances. Primary response to violations preserving safety standards should be supported and counseling to avoid unnecessary interruption to work and to preserve and salvage individuals that may otherwise be a benefit to the Company.

Incidents are typically the result of violations. In addition to the response required for the incident as defined in this procedure, action taken in response to the violation may, depending on the severity of the incident, warrant stricter response.

Caution must be exercised when taking punitive action. Assessor must keep in mind that Industrial Radiography is, for the most part, an unsupervised activity and that technicians may be inclined to attempt to conceal the occurrence of an incident to avoid punitive action. For this reason, all rumors or indications of a possible incident must be fully investigated. When taking action, it must be fair and constructive to be perceived that the action is for the best interest of the technicians and general public.

18.1 Violations by Individual Technicians

Incidents are typically the result of violations. Some of typical violations are expired radiation safety permit, failure to control radiation area, failure to use survey meter, insufficient safety awareness of technicians and procedures errors especially the safety procedures of contractor provided radiography & NDT service. In addition to the response required for the incident as defined in this procedure, action taken in response to the violation may, depending on the severity of the incident, warrant stricter response and may include one or more of the following depending on the circumstances, severity of the violation and findings of the ID-RPO.

- 18.1.1 Record of the violation and action taken be included in the individual's permanent data record.
- 18.1.2 Conditional release to return to work. A conditional release is indicated by cutting of the corner of the individual's RPP. Additional violations within 6 months of conditional release may warrant further action.

- 18.1.3 Suspension of the RPP with the period of suspension depending on the severity of the violation and the judgment of the ID-RPO.
- 18.1.4 Be required to attend additional radiation protection training.
- 18.1.5 Surrendering of the RPP and requirement to re-take the examination.
- 18.1.6 Permanent revocation of the RPP.
- 18.1.7 Action and/or disposition of the individual and the RPP shall be as follows:
 - a) For minor violations that are field correctable, notification is to be sent to RPU/EPD.
 - b) For moderate violations, individual(s) may require counseling and subsequent action by the ID-RPO. Notification is to be sent to RPU/EPD regarding the suspension and action taken.
 - c) For significant violations, the individual(s) and RPP along with a violation report will be referred to RPU/EPD for further action and disposition.

RPU/EPD has the authority to concur or reject actions taken in item a and b.

18.2 Violation by Contract NDT Service Provider

A Contract NDT Service Provider who by company policy, attitude, practice, or absence of effective application of radiation protection administration found to be either in violation of these procedures or a significant contributor to violations by individual technicians may be subject to one or more of the following:

- 18.2.1 Investigation by the Contractor's Senior Management of the root cause for the violation and to take the necessary corrective action subject to assessment of effectiveness. Reports such investigation, corrective action and schedule of implementation are required.
- 18.2.2 Revision of Radiation Protection Procedure to address violations inclusive of means to measure and verify implementation.
- 18.2.3 Required to organize and conduct radiation protection meeting involving the entire Contractor's radiographic technicians addressing the issues of the violations.

- 18.2.4 Conducting of Radiation Protection Training to a syllabus approved by the ID-RPO.
- 18.2.5 Revise the Contractor's Radiation Protection Procedure and/or safety training provided to the technicians.
- 18.2.6 Be required to provide details of all radiographic exposures on Company property to an extent identified by the ID-RPO.
- 18.2.7 Suspend work at a particular site pending identification of extent of violation, required corrective and follow-up action.
- 18.2.8 Suspension or Cancellation of a Contractor's Radiation Protection Procedure Approval resulting in suspension of all work on Company property involving the use, handling, storage, and transportation of radiation sources.
- 18.2.9 Be requested to remove all radiation sources from Company Property and not allowed to return until cleared to do so by the ID-RPO

18.3 Violation by Company Operating Facilities

Organizations that receive radiation sources from the Inspection Department or that utilize radiation sources (e.g., X-ray equipment) owned by the facility, are required to meet the requirements herein, GI-0150.003 and the National Regulations. Depending on the severity of the violations, Operating Facilities are subject to one or more of the following:

- 18.3.1 Identification of the violation, corrective action and implementation plan. The significance of the implementation plan and schedule is directly proportional to the likelihood that the violation could result in an excess radiation dose to the technician or members of the general public at the facility.
 - 18.3.2 Attendance of personnel related to industrial radiography, but not directly involved hands-on, may be required to attend radiation protection awareness, regardless of prior attendance.
 - 18.3.3 In situations whereby it is determined with reasonable certainty that the continuance of the violation will occur and that the result of the violation is a provable excess exposure to the technicians or members of the general public, the ID-RPO or designated representative may remove radiation sources from the facility that belong to the Inspection Department and to restrict use of Facility owned equipment until corrective action is complete.
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- 18.3.4 Cancellation or suspension of the radioactive material storage permit and lockout of the storage facility until corrective action is complete.

19 Records

The following records shall be maintained and secured in such a manner to rule out alteration, omissions or additions. The records shall be entered in the format, contain the data and maintained for the duration specified by the Saudi Government regulatory authority (KACST). These records are:

- 19.1 Record of Equipment producing ionizing radiation, sealed and unsealed radioactive sources.
- 19.2 Record of employees' personal radiation doses (including daily dose logs).
- 19.3 Record of employees' physical fitness examinations.
- 19.4 Record of employees' training.
- 19.5 Record of work location radiation surveys.
- 19.6 Record of radioactive waste disposal.
- 19.7 Record of instruments' calibration and testing.
- 19.8 Records of leak testing of sealed sources and devices containing depleted uranium.
- 19.9 Records of inspection and maintenance of radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments.
- 19.10 Records of receipt and transfer of sealed sources.
- 19.11 Records showing the receipts and transfers of sealed sources and devices using DU for shielding shall be maintained and retained for 10 years after it is made.

Records must include the date, the name of the individual making the record, radionuclide, activity Bq. (or Ci) or mass (for DU), and manufacturer, model, and serial number of each sealed source and/or device, as appropriate

20 Record Responsibility

The following defines the responsible organizations and retention for maintaining records. While subject to change from time to time, the general rule for record retention is:

Dose Data:	30 years
Summary Data:	30 years
Equipment Data:	10 years
Calibration Data:	10 years

(Refer to KACST Regulations for details) Records are to be kept in active files (not achieved) in a manner that will assure ready access, security from loss, fire, and mishap, and clearly identifiable.

20.1 Inspection Department (ID)

ID shall maintain relevant records as defined above for work under the control and direction of ID, for technicians employed by ID (employee or Contractor) and for all equipment and sources (owned or hired) and used by ID or issued to others.

20.2 Proponent Organization

Any organization that has radiation sources (gamma or X-ray) whether secured independently or through the Inspection Department and/or technicians classified, as radiation workers must maintain relevant records defined above. This shall include, but not necessarily limited to, receipt, return and daily utilization of sources, daily dosimetry records, instruments and calibration data for survey instruments issued to purchased and used by the Proponent Organization, and radiation surveys of work location.

Proponent Organizations utilizing radiation sources provided by ID shall forward copies of the Daily Utilization Log to the ID-RPO no later than the 15th of each month following the month of activity.

20.3 NDT Contractor (Manpower, Equipment, Materials, and Services) to Saudi Aramco

The NDT Contract organizations under contract to Saudi Aramco for the purpose of providing manpower, equipment, materials and services are required as a Licensee to the Government Regulatory Authority to maintain all records relevant to the manpower (radiation workers), equipment (exposure devices,

associated equipment, dose monitoring & alarm, radiation survey, etc.) and sources independent from those that may be kept by Saudi Aramco.

NDT Contractors providing manpower, equipment, materials, and services directly to Saudi Aramco shall provide in addition to other reports described herein, the following reports no later than the 15th of the month following the month or quarter as applicable.

20.3.1 Monthly Roster of all personnel classified as radiation worker that includes:

20.3.1.1 Last Name, Middle Initial, First Name

20.3.1.2 Saudi Aramco Badge Number

20.3.1.3 RPP Number & expiration date

20.3.1.4 Location and Saudi Aramco Organization Code of assignment

20.3.1.5 Principal assignment (RT Level-II, OSI, Multi-Discipline, etc.)

20.3.2 Monthly and Quarterly Radiation Dose Reports

Reports shall be prepared in the standard KACST format and include individuals Saudi Aramco ID and RPP number.

20.4 **NDT Service Provider (3rd Party)**

NDT Service Providers licensed by the Regulatory Authority for the possession and use of radiation sources are required to maintain all reporting and records as an issue between the Licensee and Regulatory Authority. In addition, any NDT Service Provider who works on Saudi Aramco Property shall make available all records of the licensee for audit/assessment. This includes all radiation protection related records regardless if the records pertain to actual work on Saudi Aramco property or not as a matter of evaluating the NDT Service Providers' Radiation Protection Program.

When a NDT Service Provider works on Saudi Aramco property during any Calendar Year, said NDT Service Provider shall provide Quarterly Summary Reports to the Saudi Aramco ID-RPO on or before the 15th of the month following each quarter that includes:

- 20.4.1 Number of Industrial Radiographic operations conducted during the quarter.
- 20.4.2 Saudi Aramco facilities, projects, property where radiography was performed.
- 20.4.3 Number of radiation workers performing radiography on Saudi Aramco property and the name of the RPO.

21 ID-Personnel Duties and Responsibilities

21.1 Inspection Department Manager

With respects to the National Regulations, the Inspection Department Manager or in representation of, the Operations Inspection Division Superintendent, is the Facility Management for all matters dealing with Radiation Protection. The Facility Management is fully responsible for all practices and activities leading to radiation exposure under normal circumstances or in case of accidents involving:

- 21.1.1 Protection of employees, the public at large and the environment from radioactive exposure that exceed approved limits.
- 21.1.2 Compliance with all requirements related to protection from radiation and safety of radioactive sources provided for in the regulations.

21.2 ID-RPO / Assistant ID-RPO Responsibilities

In addition to the responsibilities of RPO stated in GI-0150.003, the following specific duties should be fulfilled by ID-RPO and his assistant:

- 21.2.1 Supervises directly or through the Area RPO indirectly all activities involving the use, transportation, handling, and storage of ionizing radiation producing material and/or equipment.
 - 21.2.2 Makes sure that practiced optimization is observed in the Department to minimize radiation exposures As Low As Reasonably Achievable (ALARA)
 - 21.2.3 Handles documentation and procedures related to the import and export of radioactive sources and maintains inventory records of radioactive sources within the Department.
 - 21.2.4 Ensures compliance with this procedure and the Division procedures for the inspection and maintenance of exposure devices.
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- 21.2.5 Promptly alerts the Manager, Inspection Department and RPU/EPD of any violations of Company radiation protection regulations and procedures and assists responsible organizations such as Loss Prevention and Occupational Medicine in investigating incidents, accidents or any abnormal situations involving radiation within the Department.
 - 21.2.6 Develops and assures implementation of radiation protection procedures and practices.
 - 21.2.7 Prepares and issue Radiation Protection Advisories addressing specific issues of radiation protection.
 - 21.2.8 Maintains close cooperation with the Regulatory Authority (KACST) through RPU/EPD.
 - 21.2.9 Approves and issues permits for all temporary Radioactive Source storage facilities used by sub-contract NDT companies working on Company property.
 - 21.2.10 Radiation Protection Assessment
 - 21.2.10.1 By development and implementation of procedures and practices, assures compliance of the National Regulations issued by the Regulatory Authority.
 - 21.2.10.2 Conducts Radiation Protection Assessments and Area implementation of procedures and practices.
 - 21.2.10.3 Reviews and monitors Radiation Protection Assessments of field operations performed by the Area RPOs.
 - 21.2.10.4 Reviews and monitors Radiation Protection Assessments of sub-contractor radiographic operations on Company property by the Area RPOs.
 - 21.2.10.5 Investigates and Implements follow-up corrective actions to adverse assessment results.
 - 21.2.10.6 Coordinates with sub-contract radiographic service providers, corrective action to adverse assessment results.
 - 21.2.10.7 Issues "Stop Work Notification" where required and enforces no return to work until completion of assessment findings.
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- 21.2.11 Directly or through the Area RPO, implements the necessary measures to prevent and/or stop any activity which could lead to potential overexposure of the radiation worker or general public.
 - 21.2.12 Qualifies, assigns, and supervises specific individuals performing task including, but not limited to:
 - 21.2.12.1 Performance testing of radiation survey instrumentation.
 - 21.2.12.2 Scheduling and implementation of annual calibration of radiation survey instrumentation by approved agency.
 - 21.2.12.3 Inspection and maintenance of radiographic exposure device (projector) and associated equipment.
 - 21.2.12.4 Collection and distribution of personnel dosimetry devices (TLD).
 - 21.2.12.5 Inventory control of radioactive material and Equipment producing ionizing radiation.
 - 21.2.12.6 Preparation of records required by the regulations, recording of all data therein and follow-up on delivery to the competent Regulatory Authority.
 - 21.2.13 Conducts or supervises directly loading and unloading of radiographic exposure devices (source replacement).
 - 21.2.14 Training
 - 21.2.14.1 Conducts and/or Organizes Radiation Protection training and/or seminars for radiation workers.
 - 21.2.14.2 Conducts Radiation Protection Awareness seminars for non-radiation workers.
 - 21.2.14.3 Conducts and/or facilitates through the Area RPO, regular radiation protection meetings.
 - 21.2.15 Emergency Response
 - 21.2.15.1 Establishes procedures and practices for response to radiation incidents.
 - 21.2.15.2 Responds and directs recovery efforts for all incidents.
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21.2.15.3 Investigates, evaluates cause, and implements corrective and preventative measures.

21.2.15.4 Reports incidents to the RPU/EPD.

21.2.16 Personal Dosimetry

21.2.16.1 Reviews monthly TLD dosimetry reports and distributes to the Area RPOs for posting for the radiation workers.

21.2.16.2 Reviews and records circumstances of Investigation Level Dose and implement directly and/or indirectly actions necessary to reduce dose levels of individual.

21.2.16.3 Reports through the RPU/EPD any individual dose levels exceeding permissible limits set by the competent Regulatory Authority.

21.2.16.4 Assures monitoring of the daily dosimetry of radiation workers by the Area RPO.

21.2.16.5 Alerts occupational workers approaching or exceeding the permissible exposure limits, identification of reasons and taking all the necessary actions such as medical follow up and notification of the competent Regulatory Authority.

21.2.17 Transfers the expertise of sound practices in radiation and protection matters to employees, furnishing them with guidelines on an ongoing basis, exchanging views with them on the best methods for achieving protection and safety for personnel, patients or the public. Preparation and distribution of protection instructions to employees.

21.3 **Assistant ID-Radiation Protection Officer - Responsibilities**

21.3.1 Under the direct supervision of the ID-RPO. Assists in the daily fulfillment of the duties and responsibilities of the ID-RPO.

21.3.2 Under the direction of the ID-RPO. Conducts Radiation Protection Assessments of Area operations.

21.4 **Area Radiation Protection Officer (Area-RPO) - Responsibilities**

21.4.1 Conducts activities involving the use, transportation, handling, and storage of ionizing radiation producing material and/or equipment in an area under direction of the ID-RPO.

- 21.4.2 Assures compliance of the approved Radiation Protection procedures and practices under the direction of the ID-RPO.
 - 21.4.3 Inspects and reports findings of inspections of temporary radioactive source storage facilities used by sub-contract NDT companies working on Company property prior to issuing a permit by the Radiation Protection Officer.
 - 21.4.4 Radiation Protection Assessment
 - 21.4.4.1 Conducts Radiation Protection Assessments of Area assigned personnel, facilities and contractor (and sub-contractor) activities and reports results to the ID-RPO.
 - 21.4.4.2 Conducts follow-up radiation protection assessments to assure completion of corrective action.
 - 21.4.5 Under the direction of the ID-RPO implements the necessary measure to prevent and/or stop any activity which could lead to potential overexposure of the radiation worker or general public.
 - 21.4.6 Provides follow-up on corrective and preventative measures under the direction of the ID-RPO, Maintains Area records.
 - 21.4.7 Conduct radiation protection meetings and conducts and/or coordinates field on-the-job training.
 - 21.4.8 Provides initial response to radiation incidents and assist in recover.
 - 21.5 **Assistant Area Radiation Protection Officer (Assistant Area –RPO)**
(Administrative Assistant)
 - 21.5.1 Under the direct supervision of the Area RPO, assists in the daily fulfillment of the duties and responsibilities of the Area RPO.
 - 21.5.2 Under the direction of the Area RPO, conducts Radiation Protection Assessments of field operations.
 - 21.6 **Issuer/Receiver**
(or Area RPO)
 - 21.6.1 Together with the Radiographic Crew, performs the daily equipment check.
 - 21.6.2 Verifies Radiographic Crews have correct dosimetry and radiation survey instruments.
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- 21.6.3 Issues designated radiographic exposure device (projector) to the Radiographic Crew.
- 21.6.4 Logs out the projector.
- 21.6.5 Together with the Radiographic Crew, performs the daily inspection of the projector.
- 21.6.6 Receives the projector from the Radiographic Crew after use.
- 21.6.7 Together with the radiographer, performs a survey of the projector as well as a visual examination.
- 21.6.8 Stores the projector in the appropriate cell/pit with the radiographer.

21.7 **Radiographer**

- 21.7.1 Receives Assignment
- 21.7.2 Dosimetry
 - 21.7.2.1 Verifies correct dosimetry is in use and if start of day, zeros quartz fiber pocket dosimeter, or electronic equivalent
 - 21.7.2.2 Verifies survey meters (minimum one per radiographer) are on, calibrated and functioning properly.
- 21.7.3 Receives radiographic exposure device (projector)
 - 21.7.3.1 Together with the designated Issuer/Receiver, collects the projector from the storage cell/pit.
 - 21.7.3.2 Verifies Source Serial Number.
 - 21.7.3.3 Verifies that the vehicle has the required associated equipment, radiographic accessories, and safety equipment.
 - 21.7.3.4 With the Issuer/Receiver conducts an "Daily Inspection" of the projector and conducts radiation survey.
 - 21.7.3.5 Assures that the Issuer/Receiver has logged out the projector with the correct data and destination.
- 21.7.4 Prepares/confirms transport vehicle requirements

- 21.7.4.1 Attaches the required radiation warning signs to the transport vehicle prior to loading of the projector.
 - 21.7.4.2 Assures that current revision of the Radiation Protection procedure is in the vehicle and readily accessible for reference.
 - 21.7.4.3 Assures that emergency contact information is readily available and visible not only to himself but in the event of an emergency, to response personnel.
 - 21.7.5 Loads Projector
 - 21.7.5.1 Secures the projector as required by the Protection procedure and any current Radiation Protection (Safety) Advisories in the transport vehicle.
 - 21.7.5.2 Performs a survey of the exterior of the transport box, exterior of the vehicle and the passenger compartment.
 - 21.7.5.3 Transports the projector to the designated work assignment site without detour or route deviation not exceeding the posted speed and/or limit established by the Radiation Protection procedure (whichever is less).
 - 21.7.6 Site Setup and Exposure
 - 21.7.6.1 Establishes barrier to projected distances. Assures that the minimum numbers of warning signs are sufficient to cover all possible areas on ingress. Erects additional signs, ropes or barrier tape where necessary to assure that all possible approaches to the area are provided with the required warning.
 - 21.7.6.2 Performs set-up of the projector and associated equipment in accordance with the radiation Protection procedure and current Radiation Protection Advisories.
 - 21.7.6.3 Upon connection of the controls, performs a check of the projector selector ring and controls. Any indication of malfunction or sluggish operation shall give cause for immediate stop of work and return of the projector to the point of issue.
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- 21.7.6.4 Conducts a verification exposure to evaluate dose levels at the established barrier limits and adjust distances where required.
- 21.7.6.5 Performs radiographic assignment in accordance with the Radiographic Procedure and Radiation Protection procedure as well as any current Radiation Protection Advisories.
- 21.7.6.6 Frequently monitors pocket dosimeter throughout the performance of radiography.
- 21.7.7 Completion of Assignment
 - 21.7.7.1 Secures all equipment and loads transport vehicle.
 - 21.7.7.2 Performs a survey of the exterior of the transport box, exterior of the vehicle and the passenger compartment.
 - 21.7.7.3 Verifies that required vehicle warning signs are in place.
 - 21.7.7.4 Transports the projector to the next assigned work site or point of issue without detour or route deviation not exceeding the posted speed and/or limit established by the Radiation Protection procedure (whichever is less).
- 21.7.8 Return of Projector to the storage site
 - 21.7.8.1 Returns the projector to the designated Issuer/Receiver
 - 21.7.8.2 Together with the Issuer/Receiver, performs a survey of the projector as well as a visual inspection.
 - 21.7.8.3 Assures that the source is logged in by the Issuer/Receiver with the correct data.
 - 21.7.8.4 With the Issuer/Receiver, stores the projector in the appropriate cell/pit.
 - 21.7.8.5 Records dosimetry data and proceeds to remaining radiographic activity including processing of film, report preparation, etc.

Appendix 1 – Definitions and Abbreviations

ALARA: Acronym for "As Low As Reasonably Achievable" which means making every reasonable effort to maintain exposures to ionizing radiation as far below the dose limits as practical, consistent with the permitted utilization of the radiation source, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to the benefits to public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of radiation based technologies in the company's interest.

Alarm Rate Meter: Personal Radiation Alarm that provides audible signal ("chirp") indicating the presence of ionizing radiation. Alarms are set at a preset level typically 2 mSv/hr (200 mRem/hr) or 5 mSv/hr (500 mRem/hr) depending on the application and are not user adjustable.

Authorized Radiographer: An individual specifically authorized by the ID-RPO to perform Industrial Radiography for or on behalf of Saudi Aramco.

Becquerel (Bq): SI unit of the disintegration rate (activity) of radioactive nuclei. One Becquerel equals one disintegration per second.

Collimator: A radiation shield made of lead or other heavy metal which is used to limit size, shape and direction of the primary radiation beam. *Note:* For application of Ir-192 gamma-ray radiography, only Tungsten Collimators shall be used unless specifically approved by the ID-RPO or his Assistant.

Contamination: Deposition or presence of radioactive material in any place where it is not desired, and particularly in any place where its presence may be harmful. The harm may be in violating the validity of an experiment or procedure, or in being a source of danger to persons.

Controlled area: Any area in which specific protective measures or radiation protection provisions are or could be required for controlling normal exposures or preventing the spread of contamination during normal working conditions, and preventing or limiting the extent of potential exposures. Any area should be classified as a "Controlled Area" if radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 7.5 micro Sv in 1 hour.

Curie (Ci): Old unit (Imperial Unit) of activity (the disintegration rate) of a radioactive nuclide. One Curie = 37 billion Becquerel (3.7×10^{10} Bq).

Electronic Pocket Dosimeter: Personal Radiation Alarm that provides the display functionality of the pocket dosimeter and audible signal ("chirp") indicating the presence of ionizing radiation. Alarms are set at a preset level typically 2 mSv/hr (200 mRem/hr) or 5 mSv/hr (500 mRem/hr) depending on the application and are not user adjustable.

EPD: Saudi Aramco Environmental Protection Department.

Exposure Device (radiographic projector): A Class "B" container specifically designed to contain and for the exposure of radioactive material for industrial radiography. Any shielded sealed source that may be moved or changed from the shielded to unshielded position for purposes of making a radiographic exposure.

General Public: Any individual, employee or otherwise not specifically authorized to work as a radiation worker. Further, for the purpose of access to facilities or location where radioactive material is stored, in use, or transported, any duly authorized radiation worker not in possession of required personal dosimetry shall be classified for the purposes of at that time as General Public with the applicable radiation dose limits.

High Radiation Area: Any area, with levels of radiation in which a major portion of the human body could receive a dose in excess of 1 mSv/hr (100 milli-Rem) in any one hour.

ID-RPO: Inspection Department Radiation Protection Officer

Inspection Department: As used in this procedure applies to the Saudi Aramco Inspection Department.

Isotope: An interchangeable term with "source" that is used to describe a radioactive material that produces ionizing radiation.

NDT: Nondestructive Testing (same as NDE which is Nondestructive Examination).

Non-radiation worker: Any individual who may or may not be associated with the radiographic operation not authorized to be in the radiation area. Such individuals are not monitored (TLD) and therefore are not classified as a radiation worker.

Personal Radiation Alarm: An electronic device capable of detecting ionizing radiation and providing an audible alarm at a prescribed threshold. There are two basic types being the Rate Alarm Meter and Electronic Pocket Dosimeter. The Rate Alarm Meter is a device with alarm only whereas the Electronic Pocket Dosimeter provides the functionality of a pocket dosimeter with dose display and alarm.

Radiation Incident: An occurrence which is not part of the planned operational activities associated with the use, storage, handling or transportation of a radiation

source and has the potential of causing loss of control of a radiation source, compromising integrity of a radiation source, causing radioactive contamination or exposing humans to radiation.

Radiation Worker: Any individual who by nature of his work has the potential of exceeding 10% of the maximum permissible occupational radiation dose. Such individuals must be monitored by the required personal dosimetry.

Radiation Protection Officer (RPO): An individual designated by the Inspection Department, certified by KACST and approved by the RPU/EPD.

Radiation Protection Advisory: A mandatory compliance radiation protection advisory issued by the Inspection Department, NDT Unit, Supervisor or ID-RPO.

Radiation Protection Alert: A mandatory compliance radiation protection advisory issued by the Inspection Department, NDT Unit, Supervisor, ID-RPO.

Radiography: The examination of materials by nondestructive methods utilizing radioactive nuclides or radiation generating equipment.

Radiographic Operation: A radiographic operation means all tasks associated with radiography including the actual exposure, handling of radioactive material, transportation, storage, and stand-by.

Radiographer: Any certified and authorized individual who performs industrial radiography using radioactive sources or x-ray radiation generating equipment.

Radiation Area: A common industrial radiography term designating an exclusion zone for the purpose of carrying out radiographic works. The maximum permissible dose rate at the boundary of the Radiation Area shall be 7.5 $\mu\text{Sv/hr}$ averaged over any one hour. Further to this, an unmarked area boundary having a maximum of 2.5 $\mu\text{Sv/hr}$ shall be considered, as the Observed Area whereby any non-radiation workers are present shall be closely monitored to assure that they do not enter the Radiation Area.

Regulatory Authority: King Abdulaziz City for Science and Technology (KACST)

Rem: Old unit for equivalent dose and effective dose.

Removable contamination: The contamination that can be removed off a surface during normal handling processes and it can rub from a surface onto another on contact.

RPP: Radiation Protection Permit (radiographer permit) issued by Radiation Protection Unit of Environmental Protection Department for industrial radiographers working on Saudi Aramco properties. The RPP is obtained after passing an exam by RPU/EPD and it is valid for two years.

RPU: Saudi Aramco Radiation Protection Unit of Environmental Protection Department/EPD

Transport Index: is a number representing the maximum radiation dose in mrem unit (or $\mu\text{Sv}/10$) at a distance of 1 m from the surface of the package.

Saudi Aramco Property: For the purpose of radiation protection, Saudi Aramco Property shall include Saudi Aramco facilities, sites, concessionary areas, and facilities or property under exclusive lease, hire or contract. Facilities and/or sites whereby a high presence of Saudi Aramco employee and Saudi Aramco contract personnel work, may, at the discretion of the ID-RPO or his designated representative, be considered as Saudi Aramco property.

Sealed Source: Any radioactive material encased in a capsule designed to prevent leakage or escape of any radioactive substance.

Sievert: The SI unit for equivalent dose and effective dose. $1 \text{ Sv} = 100 \text{ rem}$.

Source: An interchangeable term with "isotope" that is used to describe a radioactive material that produces ionizing radiation.

Storage Container: A device in which sealed sources are transported or stored.

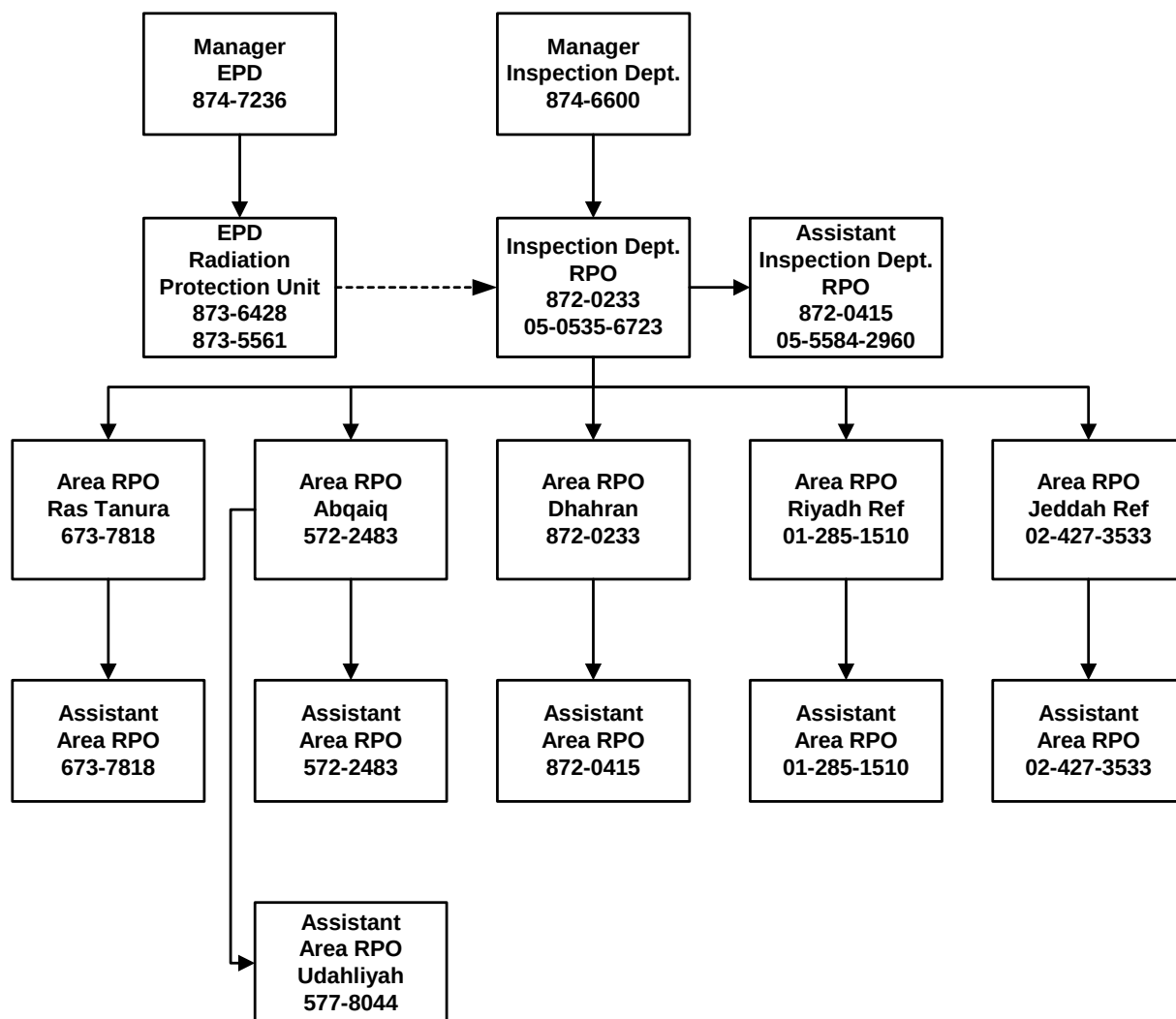
X-ray Equipment: Any electrical device that generates x-ray radiation for industrial radiography.

Abbreviations

EPD	Environmental Protection Department
EAD	Electronic Alarming Dosimeter
FQD	Fiber Quartz Dosimeter
LPD	Loss Prevention Department
NDT	Nondestructive Testing
OID	Operations Inspection Division
PD	Pocket Dosimeter
PMT	Project Management Team
RPO	Radiation Protection Officer
RPP	Radiation Protection Permit (radiographer permit)
RPU	Radiation Protection Unit of Environmental Protection Dept.
RSO	Radiation Safety Officer
RT	Radiographic Testing

TI Transport Index
TLD Thermoluminescence Dosimeter
TIS Technical Inspection Services (Contract)

Appendix 2 – ID-Radiation Organizational Structure



Appendix 3 – Units Conversions

Dose Equivalent Units

Sv to rem

$$\begin{aligned} 1 \mu\text{Sv} &= 0.1 \text{ mrem} \\ 1 \text{ mSv} &= 100 \text{ mrem} \\ 1 \text{ Sv} &= 100 \text{ rem} \end{aligned}$$

rem to Sv

$$\begin{aligned} 1 \text{ mrem} &= 10 \mu\text{Sv} \\ 1 \text{ rem} &= 10 \text{ mSv} \end{aligned}$$

Activity Units

$$\begin{aligned} 1 \text{ Becquerel} &= 1 \text{ dps (disintegration per second)} \\ 1 \text{ Curie} &= 37 \text{ Billion } (37 \times 10^9) \text{ dps} \end{aligned}$$

Curies to Becquerel

$$\begin{aligned} 1 \mu\text{Ci} &= 37 \text{ kBq} \\ 1 \text{ mCi} &= 37 \text{ MBq} \\ 1 \text{ Ci} &= 37 \text{ GBq} \\ 1 \text{ kCi} &= 37 \text{ TBq} \\ \text{TBq} &= 27 \text{ Ci} \end{aligned}$$

Becquerel to Curies

$$\begin{aligned} 1 \text{ Bq} &= 27 \text{ pCi} \\ 1 \text{ kBq} &= 27 \text{ nCi} \\ 1 \text{ MBq} &= 27 \mu\text{Ci} \\ 1 \text{ GBq} &= 27 \text{ mCi} \end{aligned}$$

SI Units: prefixes

Submultiples	Prefix	Symbol	Multiples	Prefix	Symbol
10^{-3}	milli	m	10^3	kilo	k
10^{-6}	micro	μ	10^6	mega	M
10^{-9}	nano	n	10^9	giga	G
10^{-12}	pico	p	10^{12}	tera	T

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Appendix 4 – Radiographic Work Fax Notification

From:	To: Saudi Aramco Inspection Department Operations Inspection Div. NDT Unit Attn: Supervisor NDT Unit cc: Inspection Dept. RPO Fax: 03-873-4288
-------	---

Date: _____

Project Data

Title: _____ Saudi Aramco BI/JO Ref: _____
Location: _____
Scope of Work: _____
Duration Estimate: From: _____ To: _____

Principal Contractor

Company Name: _____ Contact Name: _____
Address: _____ Phone: _____
Fax: _____

NDT Contractor

Company Name: _____ Contact Name: _____
Address: _____ Phone: _____
Fax: _____
RSO/RPO Name: _____ Phone: _____

Job Data

Projector: _____ Planned Quantity: _____ Storage Location: ☐ Off-Site ☐ On-Site Permit: _____
Radiographic Crews: Planned Quantity: _____ Supervisor(s): _____
Work Locations: ☐ Pipelines ☐ In-Plant ☐ Lay-Down Yard ☐ Fabrication Yard

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Appendix 5 – Requests for Temporary Radioactive Source Storage Permit

To: NDT Unit Supervisor
Inspection Department

Date: _____

Cc: Inspection Dept. Radiation Protection Officer

Fax: 873-4288

Project Title:	_____
BI/JO:	_____
Project Location:	_____
Contact Name	_____
Phone:	_____ Fax: _____
Expected Duration:	_____

Prime Contractor:	_____
Contact Name	_____
Phone:	_____ Fax: _____

Storage Location:	_____
NDT Contractor:	_____
Address:	_____
1 st Emergency Contact	_____
Phone:	_____ Alt: _____
2 nd Emergency Contact	_____
Phone:	_____ Alt: _____

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Appendix 6 – Personal Radiation Exposure Record

Name:					ID:		Month of:	
	DOSIMETER			TLD BADGE	PRINCIPAL CO-WORKER		REVIEWED	
DATE	OUT	IN	DOSE REC'D	COLOR	NAME	ID	BY	DATE
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
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25								
26								
27								
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29								
30								
REVIEWED BY:					ID:		DATE:	

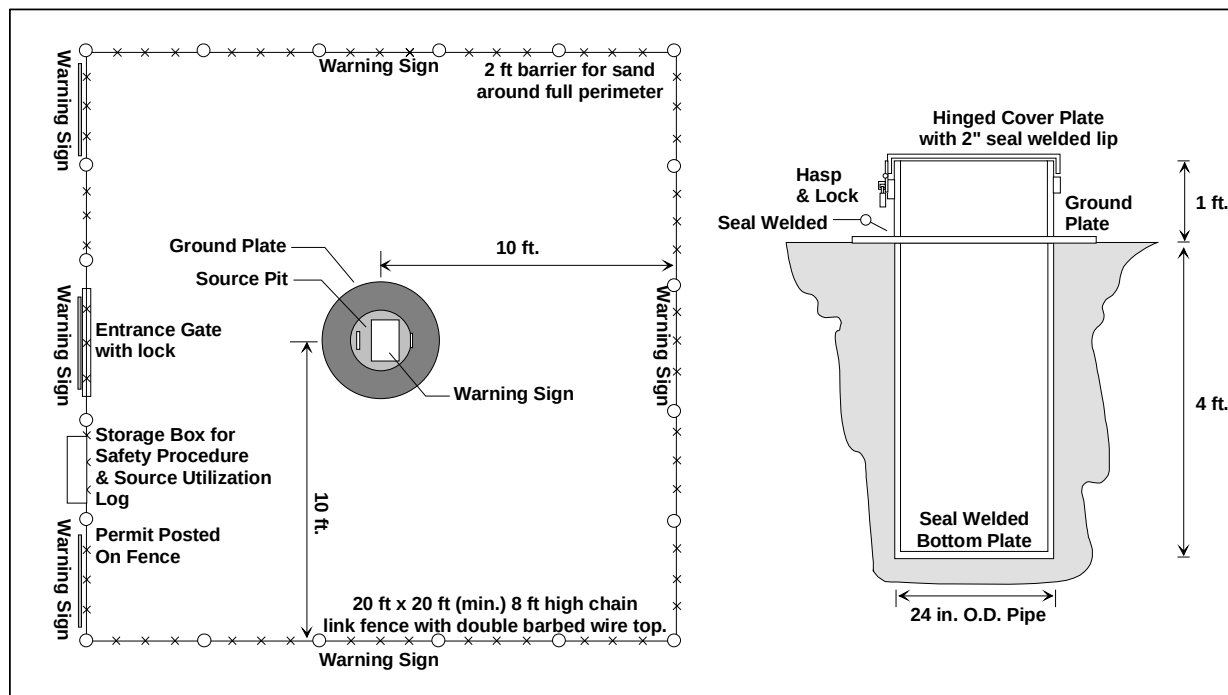
Ionizing Radiation Producing Equipment / Material Utilization and Tracking Log

Page: _____ of _____

[illegible]

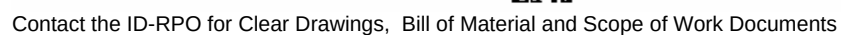
Review by: _____ ID: _____ Date: _____

Appendix 8 – Saudi Aramco Temporary Radioactive Source Storage Pit

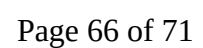


- Maximum Content:** 3 Projectors with a combined maximum source activity of 200 Ci.
- Sand Barrier:** Physical barrier 2 ft. high affixed directly to the fence around the full perimeter including gate.
- Cover Plate:** With 2" seal welded lip to minimize sand ingress into pit
- Coating:** Primer coat & top coat both inside and outside.
- Security:** Heavy duty hinges welded between cover and pipe. Hinge pin should be non removable. Keys maintained only by authorized Radiographic Technicians with valid permits. Pit shall be located in a secured area unless otherwise specifically approved.
- Warning signs:** Radiation warning signs to be in both Arabic and English Languages.
- Location Guidelines:** Temporary radioactive storage pit shall be located in a restricted area, at least 1,000 ft (305 m) from plant facilities, located crosswind, away from vehicular traffic, in a fenced and locked area within Saudi Aramco facilities.

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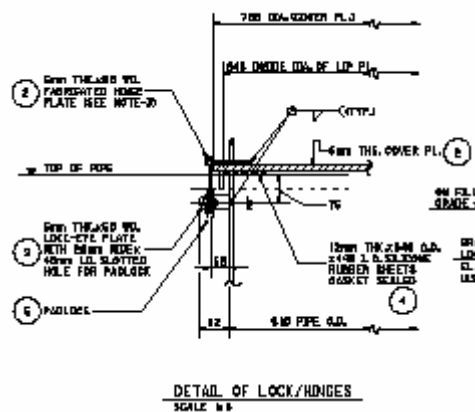
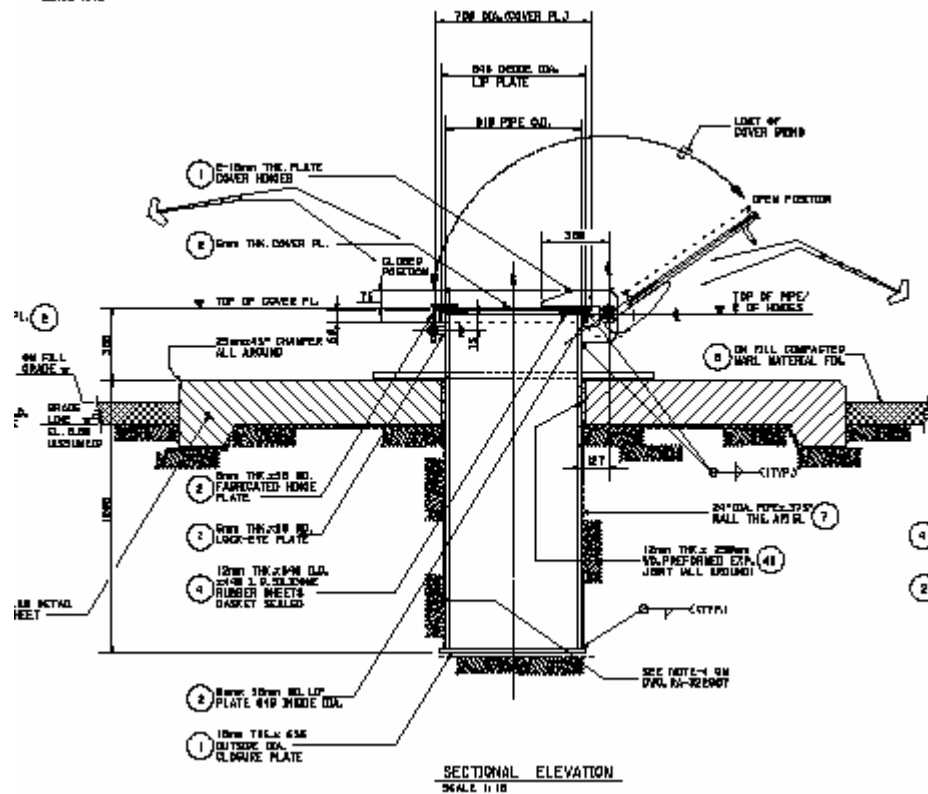


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Appendix 9 (Cont'd)

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Appendix 10 – Radiation Incident Notification Industrial Radiography

Incident date:		Time:		Area:	
Incident Type: ☐ Personal Radiation Exposure ☐ Source Stuck (Hang-up) ☐ Source Disconnect ☐ Malfunction ☐ Damaged Exposure Device (Projector) ☐ Damaged Radiation Monitoring Equipment ☐ Lost ☐ Fire ☐ Vehicle Accident while transporting a radioactive source					
Technicians: ☐ Saudi Aramco Employee ☐ Service Order Technician ☐ 3 rd Party NDT Co.					
Name:		ID:	Permit	Emp:	Dose
Name:		ID:	Permit	Emp:	Dose
Name:		ID:	Permit	Emp:	Dose
Name:		ID:	Permit	Emp:	Dose
Source data:		Type:		Activity:	
		Owner Co:		S/N	
				Phone:	
Projector data:		Type:		S/N	
Incident Location					
Brief Description of Incident					
Brief Description of Action Taken					
Notification by:		Name:		ID:	Phone:
		Employer/Org:		Date/Time	
Instructions: • Complete notification form (Clear Print or Type) • Report by phone to the Inspection Dept. Radiation Protection Officer (ID-RPO) RPO Pager 1982-3276 Mobile 05-535-6723 Asst. RPO Pager 03-870-2498 Mobile 05-558-42960 • Report by phone to the RPU/EPD Representative 03-873-5561, 03-873-6428, or 03-874-7236 • Send Notification by Fax to RPU/EPD 03-873-8200 AND 03-873-2013					

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Appendix 11 – Radiation Incident Preliminary Report

Inspection Department Inspection Department Radiation Protection Officer Operations Inspection Division / NDT Unit Tel: 872-0415/ 872-0233 Fax: 873-4288				
Incident date:		Time:		Area:
Type Of Practice: ☐ Industrial Radiography ☐ Nuclear Gauges ☐ Well Logging ☐ Medical ☐ Other (Specify): _____				
Incident Type: ☐ Personal Radiation Exposure ☐ Source Stuck (Hang-up) ☐ Source Disconnect ☐ Malfunction ☐ Damaged Exposure Device (Projector) ☐ Damaged Radiation Monitoring Equipment ☐ Lost ☐ Fire ☐ Vehicle Accident while transporting a radioactive source				
Source Data:	Type:	Activity:	S/N	☐ Sealed ☐ Unsealed
Licensed To:				
RPO in Charge	Name:		Phone:	
SA Proponent Organization (If different than owner)	Name: Contact: Org Code:		Phone: Fax:	
Projector data:	Type:		S/N	
Personnel Involved				
Name:		ID:	Emp:	Dose
Name:		ID:	Emp:	Dose
Name:		ID:	Emp:	Dose
Name:		ID:	Emp:	Dose
Contamination Area (if occurs)				
Brief Description of Incident				
Brief Description of Action Taken				
Notification by:	Name:	ID:	Phone:	
	Employer/Org:		Date/Time	
Instructions: Fax Report Within 2 Working Days to: Inspection Department Radiation Protection Officer 873-4288 Radiation protection Unit of EPD : 873-8200 Email Address: Inspection Dept: thomas.scales@aramco.com motairms@aramco.com osama.fageeha@aramco.com falah.abujarad@aramco.com ahmed.siari@aramco.com Environmental Protection Dept.				

Appendix 12 – Transport Box

The design of the Transport Box should be according to the recently approved design by KACST and RPU/EPD as shown in Appendix 12. The Transport Box should be affixed to the vehicle by welding, bolts, wire rope, cargo transport straps, etc. such that the transport box will remain with the vehicle in the event of an accident.

