





# Standardized Task Evaluation Program

*The Standardized Task Evaluation (STE) program promotes a work-ready workforce through the standardization of common tasks by defining the knowledge and skills required to perform a given task. Subject Matter Experts (SMEs) analyze the task and generate lesson plans, knowledge examination, and performance evaluation elements. These elements are combined to create an STE package.*

*The Electric Power Research Institute (EPRI) facilitates the development, oversees the quality, and programmatically implements each STE. EPRI STE members have access to these materials and permission to implement these STEs in accordance with their site training and qualification procedures.*

# Provide Job Coverage for Radiography Overview

- This training provides instructions to Radiation Protection personnel for establishing boundaries, postings, and controls in support of on-site radiography.
- It only contains the specific requirements as they apply to Supplemental RPT providing job coverage. Site procedures will contain other actions for site RP personnel.
- If not controlled properly, Radiography presents a risk of personnel receiving significant, possibly even lethal exposures.



# Terminal Objective

- When working as a senior RP technician at a US nuclear utility, individual will be able to provide all necessary radiation protection job coverage and support for safe conduct of radiography in accordance with the standards of NISP-RP-009, Nuclear Industry Standard Process for Radiography.



# Enabling Objective

1. Identify key components of Radiography Shot Plan.
2. State when the 10CFR37 requirements apply
3. State the items Boundary Guards are to briefed on.
4. Identify the requirements for approving the start of radiography.
5. State the items to be monitored during a radiography shot.

# Enabling Objective

6. State the steps required for restoring an area following radiography.
7. Identify the immediate actions required in response to a source failure.
8. Identify the individual responsible for developing a recovery plan following a source failure.
9. Identify the individual who approves the recovery plan following a source failure.

# Radiographers

- The radiographer is the licensed individual for the use and storage of a radiography source and shall always maintain overall responsibility of radiography activities. Conducting radiography on a nuclear plant site introduces overlapping responsibilities with the site Radiation Protection program.
- The radiographer shall comply with site specific procedures as required.
- The radiographer shall establish locked access controls in conjunction with site RP and Security as required by site procedures and 10CFR37.

# Radiographers

- The radiographer shall be accompanied by at least one other qualified radiographer assistant or higher to discharge the duties of 10 CFR 34.41(a). While station personnel may assist in the control of unauthorized entry, the radiographer shall **not** delegate this responsibility to RP personnel. Radiography shall **not** be performed if only one qualified individual is present.
- Radiographer shall have direct control over any movement of the source.
- The radiographer is responsible for establishing the location of boundaries, postings, and access points using input from the site RP organization.



# Radiography Shot Plan

- A Radiography Shot Plan is developed by RP, then reviewed and approved by the site RPM.
- The purpose of the plan is to provide a high level of communication and coordination to ensure the process is conducted error free.
- The Radiography Shot Plan is a collaborative effort among the radiographer, RP, Security, Operations, Engineering (NDE) and Planning & Scheduling.
- If possible, 48 hours before the start of radiography review the radiography shot plan with Operations and Security to verify that all potential impacts have been accounted for.

# Radiography Shot Plan

- Radionuclide and activity of the source
- Number, direction, and duration of exposures
- Determination if the source will be collimated or a free air exposure
- Projected boundary locations delineated on plant map or survey
- Location of source and personnel during exposure
- Impacts to plant equipment including radiation and process monitors
- Number and location of boundary guards



# Radiography Shot Plan

- Communication plans between radiography personnel, control room, boundary guards, radiation protection and plant personnel including announcements over the plant paging system.
- Type of communication devices (cell phones, radios) should be defined.
- Dose reduction actions including identification of low dose waiting areas.
- Use of remote monitoring devices to indicate radiation levels while the radiography source is exposed

# Radiography Shot Plan

- Impacts to security, operations and emergency response personnel and actions to be taken in emergency situations where they need to enter the area
- Contingency actions to be taken if source malfunction should occur
- Develop a specific RWP which contains the following
  - Stop work criteria including immediate actions that are to be taken when stop work orders are issued.
  - Alarming dosimeter set points and expected response to alarms
  - Contingency actions should the source malfunction during operation.

# 10 CFR 37 Requirements

- Ensure plant Security personnel are engaged in establishing security zones for the use and storage of the radiography source if 10CFR37 requirements apply.
- 10 CFR 37 requires **additional physical protection measures and security zones** if a source exceeds **OR** an aggregate of sources in an area exceed Category 1 **OR** Category 2 limits.
- 10CFR37 will be applicable if the **aggregate** of the sources stored in the area meets the following thresholds:
  - 8.1 Ci or 0.3 TBq of Co-60
  - 21.6 Ci or 0.8 TBq of Ir-192
  - 54.0 Ci or 2 TBq of Se-75
- The values specified are Category 2 limits.
- Category 1 limits are a factor of 100 **higher**.





# Boundary Guards

- **The Boundary Guard assures that no personnel enter the area once established unless approved by Lead Radiographer and RP Supervisor**
- The number and location of boundary guards is specified in the Radiography Shot Plan
- All Boundary Guards must be briefed on their responsibilities
- Boundary Guards must also attend a high risk radiological brief



# Boundary Guard Briefings

1. **NO ONE** is allowed to reach **OVER** or **UNDER** the RT boundary at **ANY** time for **ANY** reason during radiography unless authorized and under the direct surveillance of Radiation Protection.
2. Boundary Guards **WILL NOT** engage in **IDLE** conversation with anyone as this can pose a distraction.
3. Boundary Guards **WILL NOT** leave the site at the end of the scheduled shift unless released by the RP Supervisor.

# Boundary Guard Briefings

4. Boundary Guards will normally be scheduled for a **rotation** at the guarded location that does not result in mental fatigue that would challenge boundary surveillance.
5. Boundary Guards should be positioned such that visual surveillance of the boundary can be implemented and in the lowest dose rate possible.
6. Boundary Guards **WILL NOT** use cell phones (texting, etc.) except for use in plant emergency.

# Boundary Guard Departing Post

Boundary Guards **WILL NOT** leave the area or request to move for any reason unless relieved by an individual assigned by the RP Supervisor. This includes site assembly, site evacuation, etc.

There are **two exceptions** to this rule:

- Imminent danger to self; notify the RP Supervisor and retreat to a safe position.
- Someone approaches on the wrong side of the boundary **OR** an individual decides to cross after being challenged. In this situation the Boundary Guard shall:
  - Notify radiography team to stop work
  - Get the individual on the safe side of the boundary:
  - Notify the RP Supervisor
  - Obtain information from the individual inclusive of name, work group, supervisor and badge number.

# Starting Radiography

- Survey the radiographic exposure device for the following:
  - Contact radiation levels
  - Radiation levels at 30 cm
  - Radiation levels at 1 m
  - Removable contamination on the external surface of the device
  
- **Stop, secure the area, and notify RP supervision** if any of the following conditions exist:
  - Contact radiation levels  $\geq 200$  mrem/hour
  - Radiation levels at 1 m  $\geq 10$  mrem/hour
  - Removable contamination from the exterior of the device  $\geq 1,000$  dpm/100 cm<sup>2</sup>

# Starting Radiography

- RP shall provide the final approval for the start of radiography after having completed the requirements established in the RT checklist and high risk brief.
- Radiography shall not proceed until both the site RP organization and the radiographer concur on the location of boundaries and the manner in which they are controlled.
- Radiography licenses typically prohibit unauthorized personnel from being in the radiography area without approval of the radiography license, i.e. the radiographer and trained assistants. Approval for RP to be inside the radiography boundary must be obtained from the radiographer prior to the start of work activities.

# Starting Radiography

- Any removal and transit of source from a storage area must be under the direct control of the radiographer and monitored by site Radiation Protection personnel.
- The RPM is responsible for review and approval of the radiography shot plan prior to implementation.
- The Radiographer and Radiation Protection shall both ensure all unauthorized personnel have been removed from inside the posted area prior to the start of radiography.

# Monitoring Radiography

- RP has overall responsibility in determining how boundaries will be controlled through locked access and/or boundary monitoring.
- Notify operations, security, and plant site (site announcement) that radiography is about to commence.
- Perform boundary surveys when the source has been exposed.
  - Notify RP supervision if the dose rate external to the posted Radiation Area is  $> 2$  mrem/hour above initially established dose rates in the area.

# Monitoring Radiography

- RP Supervision providing oversight for radiography should have no other responsibilities while radiography is taking place.
- If telemetry or a remote monitoring instrument has been set up, verify when the source has been retracted to a fully shielded position.
  - Ensure the coverage team has been informed when the source is no longer exposed.
  - RP surveys do **NOT** alleviate the requirement for the radiographer to survey the camera to verify the source has been fully retracted into the camera.

# Restoring Area Following Radiography

- Check doses received by the radiographer and assistant(s) to ensure unplanned doses have not occurred.
- Remove boundaries, posting, and barrier guards.
  - Ensure boundaries and postings required due to plant radiological conditions remain in place. Document a survey of current radiological conditions.
- Perform a radiation survey of the exterior of the storage device to verify the source is fully shielded and physical damage is not apparent.
  - Document the survey per site procedures.
  - Notify RP supervision if acceptable conditions are not verified.

# Restoring Area Following Radiography

- Inform the Operations Shift Manager that the radiography shot has been completed and access into the area has been restored.
  
- Provide escort of the source to the storage location with the radiographer.
  - Survey the storage area and document the results per site procedures.

# Source Failure – Immediate Actions

- Radiography sources are mechanical devices which can fail.
  
- In the event of a source failure the following actions should be taken immediately:
  - Stop work and place source in safe condition if possible.
  - Ensure personnel are not in an area of increased dose rates due to the failure of the device
  - Validate personnel dose
  - Validate radiological boundaries and ensure boundary guards are alert to maintaining security of the area
  - Notify RPM and Site Management as defined by the communications plan

# Source Failure – Recovery Plan

- The radiography licensee has the responsibility for recovery of the device
- The Radiographer Radiation Safety Officer has the responsibility for the development of a recovery plan.
- The site Radiation Protection Manager will concur with the plan and provide support as necessary.

# Operating Experience – SEN 260

## Radiation Overexposure at an International Nuclear Plant

In October 2005, at the Laguna Verde Nuclear Power Plant in Mexico, station personnel discovered that a contract radiographer potentially received a dose in excess of the regulatory limits of 5 rem/year during radiography activities in September 2005. The whole-body thermoluminescent dosimeter (TLD) that the contract radiographer had worn read 7.8 rem. It is unknown if the radiographer actually received this dose; however, in the absence of contradictory information, it is assumed that the individual did receive the dose of 7.8 rem.

- Two contract personnel performed radiographic examinations inside a labyrinth bunker room designed for such examinations on September 17, 19, and 20, 2005. The bunker is adjacent to the mechanical and electrical maintenance shop inside the plant protected area and is not considered a permanent radiological control area (RCA). The radiography was performed using a 67-curie iridium-192 radiography source to inspect pipe welds. On these days, the contractors worked independently in the bunker and were expected to wear their own TLDs and electronic dosimeters, as required by their license. However, they inappropriately omitted using their own TLDs, relying on station TLDs to measure cumulative dose. This allowed the utility to identify the unexpected TLD reading.

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# Provide Job Coverage for Radiography Training

## Conclusion:

- Questions:
- Feedback:
- Conclusions:



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