



Radiological Risk Management

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Outline

- Definition
- Identification
- Planning
- Implementation

Process

- Panel composed of Fleet and single unit Radiation Protection Managers, INPO, EPRI, and NEI
- Meet weekly (almost)
 - Best Practices under development
 - Operating Experience/Round table
 - Other Industry Topics – such as ANI criteria
- Panel reviews the current practices and selects best practices
- Once reviewed and approved the best practice is posted on the INPO Web Site

Status

- Four industry best practices have been completed and posted on the INPO web page:
 - Alpha Monitoring
 - Stop Work
 - Radiological Risk
 - Storage of Radioactive Materials

Screen Shot of INPO Web Page

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RP mission statement: To consistently promote the highest standards in radiological safety. We identify gaps to excellence and provide assistance to foster continuous improvement.

2020 (RP 2020)

- [Position Paper 06-01, RP Survey Map Comparison \(DOC\)](#)
- RPM-Identified Best Program Elements
 - [Alpha Monitoring \(pdf\)](#)
 - [Identification and Controls for Work with Radiological Risk \(pdf\)](#)
 - [Stop Work Authority \(pdf\)](#)

Contacts

- Industry
 - [Benchmarking](#)
 - [Corporate RP](#)
 - [Plant AI ARA](#)

Evaluation References

Focus Areas

- [Collective Radiation Exposure](#)
- [Dose Control \(pdf\)](#)

Meetings & Seminars

- [Calendar](#)
- [First-Line Leadership Seminar](#)
- [Meeting Summaries](#)
- [Next-Level Leadership Seminar](#)
- [Online Registration](#)

Nuclear Network Forums



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RP-AA-401-1002 - RADIOLOGICAL RISK MANAGEMENT

- Establishes the administrative controls, responsibilities, duties for direction, control, conduct, and oversight of radiological risk significant work conducted inside a Radiologically Controlled Area (RCA)
- Ensures sufficient preparation and resources for the work.
- Ensures adequate management and supervisory oversight and control during conduct of the work.

Radiological Risk

- **High Risk:** Radiological work where detailed planning and multiple, diverse barriers are essential to prevent radiological events involving significant radiation levels, threats to individual regulatory radiation exposure limits, or may result in the unanalyzed effluent release pathways to the environment or exposure to members of the public.

Radiological Risk

- **Medium Risk:** Radiological work where planned barriers are desirable to; prevent inadequately controlled radiation levels, reduce threats for unplanned/unmonitored dose, minimize potential for EPRI level 2 or level 3 personnel contamination events or potential contamination of non-radiological facilities or the environment within the protected area

RESPONSIBILITIES

- Shift Manager or Plant Manager/Duty Station Manager or designee or the Station ALARA Committee (SAC)
 - reviewing and approving all HIGH Radiological Risk Work
- Single Point of Contact (SPC):
 - Oversight and management of the HIGH Radiological Risk Work.
 - Implementing Pre-Job Briefings- Heightened Level of Awareness, Infrequent Plant Activity and Post-Job Briefings”
- Radiation Protection Manager or designee:
 - Reviewing and approving ALL High Radiological Risk Work.
- RP Planners/RWP Writer/Radiological Engineering:
 - Participate in planning meetings
 - Verifying planned or on-going maintenance work and operational evolutions will not create a radiological environment greater than the limits specified for the risk classification assigned to the work

RESPONSIBILITIES

- **Radiation Protection Supervision (RPS)**
 - Providing dedicated oversight for HIGH Radiological Risk Work
 - Participating in HIGH Radiological Risk Work pre-job briefs
 - Participating in HIGH Radiological Risk Work planning meetings
- **Work Group Director or Senior Manager:**
 - Sponsoring the HIGH Radiological Risk Work
 - Reviewing and approving all HIGH Radiological Risk Work
- **Work Group Supervision (WGS):**
 - Establishing compensatory actions for HIGH Radiological Risk Work
 - Reviewing and approving all HIGH Radiological Risk Work
 - Assigning a SPC

IDENTIFICATION

- RP - performs an initial screening
- **If** work is determined to be of MEDIUM or HIGH Radiological Risk or **if** radiological conditions **or** job scope change during the job that would result in an increase in the Radiological Risk **Then COMPLETE** Attachment 1
- RPS shall **REVIEW** Attachment 1 for each task classified as MEDIUM or HIGH Radiological Risk(s)
- When activities are verified as HIGH Radiological Risk **CONTACT:**
 - Work Group Supervision (WGS) designates a single point of contact
 - **NOTIFY** Work Management to implement the requirements “Integrated Risk Management” for High Radiological Risk work.

RP-AA-401-1002, Attachment 1

Attachment 1 Radiological Risk Assessment Worksheet

ALL "NO" answers to the Risk questions indicate the work poses LOW Risk to Radiological Safety.
Any "YES" answers requires Attachment 1 to be physically completed and reviewed by RPS.
If more than one (1) "YES" answer select the highest risk level for controls.

		Radiological Risk Level
1. Initial entry into TIP Room (BWR), Incore Thimble Areas (PWR) and VHRAs	YES / NO	High
2. Initial Steam Generator Entry (may be downgraded to Medium Risk based on plant historical conditions)	YES / NO	High
3. Work performed in a plant area in which the airborne concentration (in DACs), not due to noble gas, is estimated to result in greater than or equal to 10 total DACs or > 40 DAC-hrs.	YES / NO	High
4. Work performed in a plant area in which general area or whole body dose rate is greater than or equal to 1500 mR/hr or work is estimated to result in personnel exposure greater than or equal to 500 mrem/entry.	YES / NO	High
5. Work that has potential for exposure for shallow dose equivalent rate to skin in excess of 10 rads per hour or individual directly handling items will contact dose equivalent rate (beta plus gamma exceeding 10 rads per hour.	YES / NO	High
6. Work performed in a hot particle zone which contains hot particles with dose rate > 750 nrad/hr, open window ion chamber reading.	YES / NO	High
7. Diving activities in radiologically controlled areas such as the Suppression Pools, Torus, Spent Fuel Pools, Reactor Cavities, or Transfer Canals.	YES / NO	High
8. Radiography (may be classified as Medium Risk if conducted in a controlled area, such as a vault, specifically designed for this activity).	YES / NO	High
9. Work that will involve "at Power" entries to a BWR Drywell/Primary Containment or PWR Primary Containment Inside Bioshield (Inside Missile Barrier) Areas.	YES / NO	High
10. Work that creates a non-design based opening in a building to the environment that provides a potential contamination release pathway to the public/environment.	YES / NO	High
11. Work in an alpha Level 3 area or areas where alpha contamination exceeds 200 dpm/100 cm ² .	YES / NO	High
12. Radioactive material shipment classified as High Risk in accordance with RP-AA-601.	YES / NO	High
13. Removal (or the potential for removal) of IRMs, TIPs, CRDMs or SRMs in undervessel areas (Activity may be downgraded to Medium Risk as specified in RP-AA-460-1006).	YES / NO	High
14. Cavity Decontamination (Based on plant history and thorough understanding of expected radiological conditions (i.e. absence of hot particles), this may be downgraded to Medium Risk)	YES / NO	High
15. Work area contamination levels are greater than or equal to 1 rad per hour/100 cm ² on a smear as measured with an open window ion chamber.	YES / NO	High
16. Designated by the Radiation Protection Manager to control as High Radiological Risk.	YES / NO	High
17. Work is to be performed in a plant area in which the airborne concentration (in DACs), not due to noble gas, is estimated to result in greater than or equal to 1 total DACs or 4 DAC-hrs.	YES / NO	Medium
18. Work is to be performed where contamination levels are greater than 200,000 dpm/100 cm ² (beta/gamma) or alpha contamination > 20 dpm/100 cm ² .	YES / NO	Medium
19. Work involving grinding, cutting, welding, or machining on contaminated material greater than 50,000 dpm/100cm ² or suspect potential for fixed alpha contamination.	YES / NO	Medium
20. Work in a plant area that requires entry into a Discrete Radioactive Particle (DRP) Control Area with a personnel survey frequency < 2 hours.	YES / NO	Medium
21. Flushing, draining, or venting of a highly contaminated or high activity system (i.e. direct reactor coolant interface) that has the potential or has previous history to cause a spread of contamination or personal contamination event.	YES / NO	Medium
22. Work or system operation that creates new/different flow paths that could cause dose rates to change in other areas.	YES / NO	Medium
23. Work performed in areas where multiple whole body dosimetry is required.	YES / NO	Medium
24. Work involving retrieval of items from the Suppression Pools, Torus, Spent Fuel Pools, Reactor Cavities, or Transfer Canals. (CM-1)	YES / NO	Medium
25. Disassembly, inspection and/or handling of components with the potential for high smearable contamination, high radiation levels, and/or potential for changing radiological conditions. (CM-2)	YES / NO	Medium
26. Initial postings for controlling areas during fuel movement and forced oxidation.	YES / NO	Medium
27. Workers are expected to be exposed to external dose rates exceeding 100 mrem (gamma plus neutron) per hour and the planned exposure per individual entry is greater than 200 mrem.	YES / NO	Medium
28. Involves radiological work outdoors or in buildings not designed for radiological work (such as machining a radioactive pump seal in a non radiological machine shop) or activity can result in radioactive spills contacting soil.	YES / NO	Medium

Job Description: _____ RWP # _____

Risk Assessment By: _____ Date: _____

Radiation Protection Supervision: _____ Date: _____

PLANNING

- For Medium and High Radiological Risk activities that have specific RP controlling documents follow the planning requirements in those procedures
 - RPAA- 460-002, “Additional High Radiation Exposure Controls”,
 - RP-AA-461 “Radiological Controls for Contaminated Water Diving Operations”,
 - RP-AA-462, “Controls for Radiographic Operations”
 - RP-AA-601, “Surveying Radioactive Material Shipments”.
 - Long term plans are to have a specific procedure to control all high radiological risk activities
- Prior to the start of any work the Task Manager for MEDIUM Radiological Risk Work and the SPC for Radiological HIGH Risk Work and the RPS shall **ENSURE:**
 - The work is within the scope approved by the work order and described in the controlling RP procedure or micro-ALARA/ALARA Plan.
 - Conditions and hazards are within planning assumptions in the micro-ALARA/ALARA Plan.
 - Requirements and actions to manage the work are identified in the micro-ALARA/ALARA Plan.
 - The RWP is appropriate for the work.
 - All required reviews and approvals are obtained prior to starting the work.

RP-AA-401-1002, Attachment 2

Attachment 2 Required Reviews and Approvals

Job Description: _____

RWP # _____

Risk Level	Required Controls and Approvals ¹ Regardless of ALARA Category	Additional Actions
Low Radiological Risk	<ul style="list-style-type: none"> RWP 	None
Medium Radiological Risk	<ul style="list-style-type: none"> RWP, and Micro-ALARA plan, or ALARA plan, or Task specific RP controlling procedure, examples include: (RP-AA-460-002, "Additional High Radiation Exposure Controls", RP-AA-461 "Radiological Controls for Contaminated Water Diving Operations", RP-AA-462, "Controls for Radiographic Operations", RP-AA-601, "Surveying Radioactive Material Shipments"). Approved by a Manager that reports to the RPM (at a minimum). _____ Name/Signature 	None
High Radiological Risk	<ul style="list-style-type: none"> Specific RWP, and Micro-ALARA plan, or ALARA plan, or Task specific RP controlling procedure, examples include: (RP-AA-460-002, "Additional High Radiation Exposure Controls", RP-AA-461 "Radiological Controls for Contaminated Water Diving Operations", RP-AA-462, "Controls for Radiographic Operations", RP-AA-601, "Surveying Radioactive Material Shipments"). <p>And the following approvals: Name/Signature</p> <ul style="list-style-type: none"> Radiological Engineer _____ Work Group Supervisor _____ Radiation Protection Supervisor _____ RPM _____ Work Group Mgr/Director _____ Shift Manager or Plant Manager/Duty Station Manager or designee or the Station ALARA Committee (SAC) _____ 	<ul style="list-style-type: none"> Requires Lead per HU-AA-1211 Requires briefing in accordance with HU-AA-1211 Requires Compensatory Measures Post-Job Critique/Review

Note 1: Approvals may be obtained as part of the Technical Rigor Certification meetings, Station ALARA Council meetings, or Outage Scope Control meetings.

IMPLEMENTATION

- All HIGH Radiological Risk Work **REQUIRES** a Pre-job briefing Heightened Level of Awareness, Infrequent Plant Activity and Post-Job Briefings”
- **If** radiological conditions or job scope change during the job that would result in an increase in the Radiological Risk Level (i.e. Low to Medium or High Radiological Risk or Medium to High Radiological Risk) **then**
 - Discontinue work.
 - Initiate a revised Radiological Risk Assessment starting at step 4.1.
 - Work may be restarted after the required planning is complete and approval signatures are obtained.
- Post-Job Critique/Review
 - Upon completion of any HIGH Radiological Risk Work, the SPC shall **ENSURE** a Post-Job Critique is conducted

Radiological Risk (High)

- Implements plant response to INPO SOER 01-1, Unplanned Radiation Exposure, for dose and dose rate limits. For example, worker will be exposed to 1500 mrem per hour **OR** may receive 500 mrem in a single entry.
- Involves entry into boiling water reactor (BWR) drywell or pressurized water reactor (PWR) “bioshield” with reactor critical.
- Involves removal (or the potential for removal) of BWR intermediate range monitors (IRMs), traversing incore probes (TIPs), control rod drive mechanisms (CRDMs) or source range monitors (SRMs) or PWR incore detectors or other potentially irradiated components in under vessel areas.

Radiological Risk (High)

- Involves initial surveys and validation of worker protective controls in areas that operating experience has shown to be subject to rapid increases in radiation level. For example, BWR TIP drive area, PWR incore detector, and under vessel areas. (May be reclassified as medium radiological risk)
- Has potential for exposure to airborne radioactivity concentration (excluding noble gas) exceeding 10 DAC **OR** an individual to receive 40 DAC-hours in a single entry.
- Has potential for exposure for shallow dose equivalent rate to skin in excess of 10 rads per hour **OR** individual directly handling items with contact dose equivalent rate (beta plus gamma) exceeding 10 rads per hour.

Radiological Risk (High)

- Work area contamination levels are greater than or equal to 1 rad per hour on a smear as measured with an open window ion chamber.
- Has potential for worker exposure to radioactive particles that exceeds 750 mrad per hour as measured with an open window ion chamber (no correction factor applied).
- Involves radiography.
- Involves entry to areas or work activities where alpha contamination levels meet the criteria for EPRI alpha level III areas.
- Involves diving activities in radiologically controlled areas such as suppression pools, torus, spent fuel pools, reactor cavities, or transfer canals.

Radiological Risk (High)

- Creates a potential radioactive effluent pathway that is not evaluated in accordance with the site's offsite dose calculation manual or equivalent. High risk radiological work planning shall identify additional radiological effluent monitoring and initiating triggers to order planned mitigating actions to minimize and monitor releases.
- Involves transportation of radioactive materials classified as higher risk in accordance with INPO SER 02-9, Recurring Events, Radioactive Shipments Exceed Regulatory Limits.
- Any activity that the radiation protection manager deems prudent to control as a high risk radiological activity.

Radiological Risk (Medium)

- Workers are expected to be exposed to external dose rates exceeding 100 mrem (gamma plus neutron) per hour **AND** the planned exposure per individual entry is greater than 200 mrem.
- Involves handling any irradiated materials underwater or removal of any items from radioactive pools such as BWR suppression pool, reactor cavity/transfer canal and spent fuel pools
- Has potential for exposure to airborne radioactivity concentration (excluding noble gas) exceeding 1 DAC **OR** for an individual to receive 4 DAC-hours in a single entry.

Radiological Risk (Medium)

- Involves work in areas where general contamination levels are greater than 200,000 dpm/100 cm² **OR** any area meeting criteria for EPRI level II alpha area (With the actual presence of alpha contamination).
- Work activity involves abrasive or aggressive mechanical action beta-gamma contamination levels greater than 50,000 dpm/100 cm² **OR** any potential fixed alpha contamination.
- Involves work in non-uniform radiation fields where multiple dosimetry is used **OR** where the worker's primary dosimeter is moved to a location other than the front of the torso **AND** any use of effective dose equivalent-external (EDEex) with or without personal shielding vests.

Radiological Risk (Medium)

- Disassembly, inspection and/or handling components with the potential for contamination levels to exceed 200,000 dpm/100 cm².
- Involves activities subject to changing and elevated radiological conditions (examples include, establishing initial controls and postings for fuel transfer, forced oxygenation of RCS and primary resin transfers).
- Involves radiological work outdoors or in buildings not designed for radiological work (such as machining a radioactive pump seal in a non radiological machine shop or activity can result radioactive spills contacting soil).
- A potential for exposure to radioactive particles that are greater than 50,000 counts per minute as measured with a standard frisker



Comments and Questions?