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## 2R-29 Radiation Protection PCE Mitigation Guide



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## **Purpose and Scope**

The purpose of this guide is to identify actions to be taken to reduce and minimize the number of Personnel Contamination Events during 2R29. This plan is built upon lessons learned from previous ANO outage performance, Entergy Fleet outage performance, and industry benchmarks in order to implement an aggressive approach to contamination control for PCE prevention.

## **High Risk Work**


Mitigation controls for the high-risk activities are covered in the body of the plan

The following list identifies items flagged as presenting high potential risk for PCE's:

1. Containment Exit Control Point
2. Spent Fuel Pool and Refuel Canal Activities
3. Under Vessel Inspections
4. Incore Cut Up/Change-out of Incores
5. Laser Peening
6. RCP Seal Replacement

## **Lessons Learned / Concerns**

1. Orex Ultra coveralls are proven effective in reducing PCE's and will be used for all entries into contamination areas.
2. The spent fuel pool floor area will be posted as a contamination area for work on the spent fuel bridge.
3. Removing items from the spent fuel pool will require the outer set of protective clothing to be water repellant.
4. Safety Harnesses racks will be established in the reactor building. Harnesses will be surveyed by RP shiftly, if harnesses are greater than 500 ccpm/las attempt to decon the harness. If the harness cannot be deconned then dispose of the harness.
5. Specifically, designated Decon personnel will be trained in the removal of AS-400's/Optim Air. Decon personnel will assist with removal process at the reactor building side of the personnel hatch.
6. Reactor Building Control Point improvements will ensure that crowding does not occur at the SOP and during the undress process. This will be accomplished by establishing marked sections on the floor and posters communicating undress sequence.
7. RBC's will be required to wear Orex Ultra and Orex Deluxe protective clothing when carrying items in the reactor building per RP supervisor discretion.
8. Detergent 8 or equivalent will be used to decon canal.
9. All concrete surfaces inside the containment building will be maintained <20kdpm/100cm<sup>2</sup>. Routine decon (wet mopping) will be performed per RP Supervisor direction as required to maintain desired contamination levels.


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10. Undress area will be deconned at a minimum one time per shift or more as needed on both the clean and contaminated sides of the SOP. Rhino cloth or equivalent will be used to cover the floor on the contaminated side of exit point and will be vacuumed once per shift or as needed.
11. Orex mats will be stocked in the dress out area and inside the reactor building for easy access by workers.
12. Knee pads/Orex mats are required for personnel who will be crawling or working in a kneeling position.
13. Safety gloves used in containment building will be stored in a designated container at exit points. The gloves will be inspected and surveyed once per shift and discarded when damaged or when removable contamination levels reach 5kdpm/100cm<sup>2</sup>.
14. Sticky rollers will be used for discrete particle surveys in areas of concern such as the Spent Fuel and Refuel floors.
15. Scaffold material surveys will be performed as it is being loaded into the reactor building and placed into storage racks. Material should be deconned if the activity level reaches 30kdpm/100cm<sup>2</sup>.
16. Tools in the containment building hot tool room will be surveyed weekly and any item greater than 10kdpm/100cm<sup>2</sup> loose surface will be decontaminated.
17. Telephones in containment will be surveyed shiftly to verify <100 ccpm/LAS.
18. Hand and shoe contamination monitors will be used at the containment exit point.
19. Increased supervisor/management oversight of containment egress control point activities.
20. Frisk "sticky pads" from containment egress area to monitor effectiveness of contamination control measures.
21. More conservative protective clothing requirements for work involving carrying material / equipment requiring body contact with anything other than hands (e.g. – scaffold poles on shoulders, boxes against chest, etc.)
22. Targeted job observation cards (or WILL sheet) designed specifically for radiation worker behaviors will be used.
23. Increased Supervisory tours and oversight in the Reactor Building (focused coaching area).
24. An area will be established inside containment for workers to remove their outer set of protective clothing.
25. Radiation Protection will post a graphic of current Personnel Contamination (PCE) locations on mannequin or poster at CA-2 to increase awareness.
26. Perform specific stand-down with scaffold and insulation personnel to reduce personnel contamination events.
27. Consider the use of downdraft booths at the exit points of High Contamination Areas and/or Discrete Particle Areas.

## Process Improvements

### 1.1 Aux Building/Spent Fuel Floor:

- 1.1.1 The Aux building spent fuel pool will be posted and controlled as a contamination area prior to starting refuel work that involves large items needing to be manipulated in and out of the water.

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## 1.2 Safety Harness and Life Vest


- 1.2.1 Safety Harness Racks will be constructed in containment on 426' north and south side, 354' and 335 elevations. The radworker will be required to return their harnesses to one of these storage locations after use. The harnesses will be surveyed and documented once per shift by RP for contamination levels. Harnesses will be removed for disposal by RP when contamination levels reach 500 ccpm/LAS if the harness cannot be decontaminated to less than 500 ccpm/LAS. An activity has been placed in the outage schedule for the racks to be constructed.
- 1.2.2 Life Vests will have designated storage areas on 404' elevation. Vests will be surveyed and documented once per shift by RP for contamination levels. Vests will be removed for disposal when contamination levels reach 1000 ccpm/LAS.

## 1.3 Air Stream 400, Optim Air, and Delta Suits:

- 1.3.1 Air Stream 400/Optim Air respirators will be used for activities associated with refuel, insulation removal, and decon activities.
  - 1.3.1.1 The following improvements were implemented during previous outages and will be carried over to 2R-29:
    - 1.3.1.1.1 Battery pack and belt will be bagged across SOP separate from the actual respirator and taken to decon.
    - 1.3.1.1.2 Battery packs and belts will be direct frisked before reissue to check for fixed contamination and potential embedded particles.
- 1.3.2 Delta Suit/Optim Air use will be required for jobs presenting a significantly increased risk of personnel contamination. Examples include:
  - 1.3.2.1 Refuel Canal Deep End Entries (PAPR and plastics with RPM approval).
  - 1.3.2.2 Under vessel inspections.

## 1.4 Reactor Building Control Point

- 1.4.1 Trash bags will be transported to designated trash sealand on 354 elevation equipment hatch docking station.
- 1.4.2 When setting up the containment egress point, ensure there is a rail-to-floor divider physically separating the contaminated area from the clean area approaching the step off pad.
- 1.4.3 Establish a schedule for vacuum and mopping the control point once per shift or more as needed. This is to include a signoff sheet for providing accountability for task performance.
- 1.4.4 Ensure "sticky pads" are established downstream of the step off pad and ensure they are changed out frequently. Sticky pads are to be frisked upon removal of each sheet in order to evaluate contamination control effectiveness.
- 1.4.5 Provide workers with a visual aid describing protective clothing removal sequence and a no passing sign.
- 1.4.6 Decontamination Technicians will be stationed INSIDE the Reactor Building air lock to assist Radiation Workers with the donning and removal of PAPR's and face shields.
  - 1.4.6.1 PAPR: Decon technicians will perform gross decontamination, then the PAPR will be bagged and taken to the step off pad at the control point. At the control point they will be double-bagged and sent to the decon room for decontamination and necessary refurbishing to prepare for reissue.


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1.4.6.2 Face shields: Decon techs will remove all smearable contamination. Following decon, the face shields will be surveyed by a Radiation Protection technician then placed into a bin inside the Reactor Building air lock for reissue.

- 1.4.7 Assist workers in removal and decontamination of headsets.
- 1.4.8 Install down draft booths at the point of the doffing sequence that the coverall is removed by the Radworker. This was proven effective during 2R-21, 2R-22, 2R-23, 1R-24, 1R-25, 2R-24, 1R-26, 2R-25, 1R-27 and 2R-26.
- 1.4.9 Install hand and shoe monitors at the containment exit point.
- 1.5 Containment Closeout Activities:
  - 1.5.1 Containment building close out activities will require Orex Ultra single PC's and/or double PC's.
- 1.6 Draining and Venting systems:
  - 1.6.1 Conduct briefing for those operators that will be involved in venting and draining activities. The intent of the briefing is to establish RP expectations with regards to contamination control requirements. Investigate incorporation of this information into pre-outage training for Operations personnel (PCE Prevention/Dose Reduction).
- 1.7 Refuel Canal Decon:
  - 1.7.1 An initial refuel canal decon will be performed after drain down.
  - 1.7.2 Following canal decon with detergent 8 or equivalent, install Rhino Rug in the shallow end of the Refuel Canal.
  - 1.7.3 Establish controls per EN-RP-141-02 "Discrete Radioactive Particle Control" if applicable.
  - 1.7.4 Consider the use of downdraft booth for undress area.
- 1.8 Discrete Particle Control:
  - 1.8.1 Oil cloth or Rhino Rug use is essential in areas where the potential for discrete particles exist. Areas for this application include (but not limited to) the access and egress point for the refuel canal, spent fuel floor spaces, and Incore tank work. This material greatly reduces the spread of discrete particles and contamination. Ensure undress areas from discrete particle areas have adequate buffer zones to prevent the spread of particles.
  - 1.8.2 RP will periodically perform open window scans and sticky roller surveys of the laydown areas and request decon to apply new layers as needed. Refer to EN-RP-141-02.

## Engineering Controls

Ensure appropriate containment ventilation configuration during activities that present a significantly increased risk of spreading contamination or generating airborne radioactivity (e.g., refueling canal decontamination).


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### Worker Behavior Improvements

1. Improved General Employee Practical Factors training (e.g., same Anti-Cs used for training as used in the plant, all workers must demonstrate proficiency in donning and doffing Anti-Cs, proper dosimetry placement, and knowledgeable of radiological conditions in area.).
2. Level 1 PCE's are report only. Level 1 PCE's that are deemed to be poor radworker practices will have the individual barred from the RCA, until cleared by the RPM. Level 2 or 3 PCE's will have the worker barred from the RCA and worker and their supervisor will have to meet with RPM to discuss PCE cause prior to individual being allowed back in RCA.
3. Workers with 2 or more PCE's are required to meet with the General Manager prior to release from RCA restriction.
4. Provide workers with aggressive contamination control coaching both while working and upon containment egress.
5. Workers are given practical training in the use of respiratory protection.
6. Ensure adequate supply of sweat bands are available for use and used by the Radworker.
7. Direction in control and storage of Safety Harness/Life Vest will be provided to Radworker. For example:
  - a. Do not leave harness/vest lying in work areas.
  - b. Do not store harnesses/vest in toolboxes.
  - c. Return harness/vest to designated storage areas after use, etc.
8. If an individual is observed working in a contamination area with a body part contacting a contaminated surface without an additional layer of protection (OREX mat, knee pads, etc.) between the worker and the surface the worker will be ask to exit the contamination area and proceed to CA-1 for monitoring prior to being granted access back into a contamination area.
9. If a radiation worker is observed touching his/her face with gloves, hood, or any other potentially contaminated item, or the worker is observed to potentially contaminate his or her face in any other way (e.g., adjust safety glasses); the worker is immediately sent out of the area to be monitored for facial contamination before being allowed to re-enter the area.

### Performance Measures and Communications

1. Managers and Supervisors are given regular (i.e., daily) updates on performance against outage goals.
2. Managers and Supervisors are given regular (i.e., daily) analysis of PCE's.
3. Charts are displayed that demonstrate PCE performance against goals to keep workers informed.
4. A database is maintained for PCE's to facilitate analysis and reporting.
5. Observed behaviors that are not meeting standards for contamination control are communicated during POD meetings. The Technical Support Manager communicates the same message to the OCC. This message will be expected to be given to all craft during turnover.

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6. A rotation schedule ensures supervisor oversight is maintained in the field on all shifts.

#### **Previous Outage(s) PCE History**

##### ANO 1R-27 PCE Statistics

6 Carpenter  
 6 Fuel Services  
 5 RP/Decon  
 5 Mechanical  
 3 Insulator  
 2 Maint. Support  
 2 Ironworker  
 1 Engineering  
 1 I&C  
 1 NDE  
 1 Firewatch  
 1 RBC  
 1 NFPA 805

**35 Total**

##### ANO 1R-26 PCE Statistics

12 Maintenance Support  
 11 Entergy Maintenance  
 5 Operations  
 3 Fuel Services  
 3 Westinghouse  
 2 Miscellaneous  
 1 Laser Peening

**37 Total**

##### ANO 1R-25 PCE Statistics

13 Maintenance Support  
 5 Fuel Services  
 4 Mods  
 1 Electrical Mntc  
 1 Fukushima

**24 Total**

##### ANO 2R-26 PCE Statistics

24 Fuel Services  
 5 Control Worx  
 2 RP/Decon  
 2 Operations  
 2 Tool Room  
 1 S/G  
 1 Mechanical Maintenance  
 1 NDE  
 1 Electrical Maintenance  
 1 Westinghouse RVCH

**40 Total**

##### ANO 2R-25 PCE Statistics

12 Fuel Services  
 7 Pipefitter  
 4 RP/Decon  
 3 Carpenter  
 3 Electrical Mntc  
 1 Mechanical Mntc  
 1 RBC  
 1 NDE  
 1 Maintenance Support  
 1 Operations

**34 Total**

##### ANO 2R-24 PCE Statistics

15 Fuel Services  
 7 Maintenance Support  
 5 Decon  
 3 Mechanical Maintenance  
 2 Electrical Maintenance  
 1 RP  
 1 Welding  
 1 Engineering/NDE  
 1 Operations

**36 Total**

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