RADIATION WORK PERMIT SUMMARY 122-5021

PLANT CODE	YEAR	RWP NUMBER	REV.	RWP START	TYPE	CATEGORY	RWP EXPIRATION
1	22	122-5021	0	01-MAR-2022 00:00	S	OP	31-DEC-2022 23:59

RWP DESCRIPTION

Mechancial Maintenance Work Activities

Work to include:

Pre / post job walk-downs, tours, inspections, general housekeeping / cleaning.

Preventative maintenance of plant equipment including valve packing adjustments and re-torques.

Contaminated system breaches.

TASK SUMMARY

			DOSE ALARM	DOSE RATE ALARM	TIME INTERVAL
1	Mech. Maint. Activities	RA / CA / RP Brief / MED Risk	20	80	
2	Mech. Maint. Activities	HRA / HCA / HRA Brief / MED Risk	30	200	

ALARA INFORMATION

ALARA Review No.	Hours-Estimated	Person-mrem
WAIVER	1350	1060

SPECIAL INSTRUCTIONS:

THE FOLLOWING INSTRUCTIONS APPLY TO ALL TASKS (UNLESS NOTED OTHERWISE)

AS LOW AS REASONABLY ACHIEVABLE (ALARA) REQUIREMENTS:

Review the recent radiological survey for the area you are entering / performing work.

Know your expected accumulated dose for the task you are performing.

Use the pre-determined low dose waiting areas to maintain dose ALARA. Contact Radiation Protection (RP) for specific locations.

Notify Radiation Protection (RP) prior to performing any work in overhead areas (i.e. greater than 7 feet).

Maximize distance from and minimize time when working around Hot Spots and Piping / Components / Equipment with elevated radiation levels.

Notify Radiation Protection (RP) prior to the start of each work evolution.

Do not move or remove any installed lead shielding unless directed by Radiation Protection (RP).

STOP WORK CRITERIA:

When Directed by Radiation Protection (RP) to STOP.

Any worker receives a Dose Alarm or an unanticipated Dose Rate Alarm.

Any Radiation Monitor Alarm occurs.

If the Containment EVACUATION ALARM sounds.

If the job / work scope changes.

A spill occurs that spreads contamination to a clean area.

RWP Prepared: JAMES SATTLER DATE: 01-18-22
RP Approval: DATE: 1-21-22
RWP Terminated: DATE:

ALARA Review: N/A DATE: 1-19-22
RP Manager: DATE: N/A

ORIGINAL

VALID FROM	01-MAR-2022 00:00	TO	31-DEC-2022 23:59	RWP	122-5021-1	REV. NO	0

DOSE RATE ALARM:	80	mrem/Hr	BUDGETED DOSE:	120	mrem
DOSE LIMIT ALARM:	20	mrem	ALARA EVALUATION NO:	WAIVER	

JOB LOCATIONS:
- CONTAINMENT

JOB DESCRIPTION: Mech. Maint. Activities RA / CA / RP Brief / MED Risk

THE MAXIMUM POSTED AREA THAT CAN BE ENTERED:
RADIATION AREA
CONTAMINATED AREA
ALPHA LEVEL 2 AREA

RADIOLOGICAL CONDITIONS: *Indicates estimated value for RWP Preparation. See survey forms for details

GENERAL AREA RADIATION LEVELS (mrem/hr):
0.2 to 5.0 mR/Hr

CONTACT/HOT SPOT RADIATION LEVELS (mrem/hr):
See current survey data

CONTAMINATION LEVELS (dpm/100cm2):
<1000 to 40,000 dpm/100cm2 Beta/Gamma
<20 dpm/100cm2 Alpha

AIRBORNE RADIOACTIVITY (DAC):
<0.3 DAC

REQUIRED JOB COVERAGE:
INTERMITTENT

COVERAGE COMMENTS:

None.

DOSIMETRY REQUIREMENTS:
DLR AND SRD

DOSIMETRY COMMENTS:

A Dosimeter of Legal Record (DLR) and a Self-Reading Dosimeter (SRD).

If you receive a DOSE ALARM or an UNANTICIPATED DOSE RATE ALARM, IMMEDIATELY place work in a SAFE condition, EXIT the area along with coworkers in the immediate area and notify Radiation Protection (RP).

Check your SRD at approximately 15 minute intervals. Personnel shall place work in a safe condition and exit the Radiological Controlled Area (RCA) upon reaching 80% of the dose alarm set-point which is 16 mRem.

PROTECTIVE CLOTHING REQUIREMENTS:

**** Contaminated Area (CA) Dress:**

Coveralls, hood, cotton liners, rubber gloves and wrist cuffs or long sleeved gloves, shoe liners, and rubber shoe covers.

**** Additional / Alternative Protective Clothing Requirements:**

Knee pads required when kneeling.

Face shield required when performing aggressive work on contaminated or potentially contaminated system when respiratory protection is not being used.

Face shield required during breach of a contaminated or potentially contaminated system with pipe diameter greater than 1 inch.

Additional protective clothing may be specified by Radiation Protection (RP) based on radiological conditions and work to be performed.

RESPIRATORY REQUIREMENTS:

PAPR	Respirator use is conditional and is determined by the TEDE (Total Effective Dose Equivalent) evaluation based on current radiological conditions.
UELITE	If a PAPR is not available, an Ultra Elite full face respirator may be used a substitute / alternative.

A RWP PRE-JOB BRIEFING IS REQUIRED:

RP BRIEF

WORKER INSTRUCTIONS:

HOLD POINT:

Prior to breaching a primary system, ensure system is isolated and drained / vented.

Radiation Protection (RP) shall be present for initial breach of a contaminated or potentially contaminated system then survey pipe internals / components.

Contact Radiation Protection (RP) prior to performing any agressive work on a contaminated or potentially contaminated system.

Contact Radiation Protection (RP) prior to breaching a contaminated or potentially contaminated system boundary for specific directions for capturing / controlling radioactive fluids.

STOP WORK:

Internal contamination of primary systems is equal to or greater than 200,000 dpm/100cm2 Beta-Gamma and / or 20 dpm/100cm2 Alpha.

CONTAMINATION CONTROL:

Avoid rubbing against contaminated objects (floor, walls, pipes, etc.) to minimize leaching contaminants through protective coveralls. Utilize a clean barrier such as a plastic bag between the worker and the contaminated surface when necessary.

Contact Radiation Protection (RP) prior to breaching a contaminated system boundary and for specific directions for capturing / controlling radioactive fluids.

During decontamination and cleaning activities, maintain wet surfaces to minimize airborne radioactivity.

Utilize rags and / or bags, or equivalent, to control the spread of contamination when connecting / disconnecting hoses used on a radioactive system.

Utilize a portable High Efficiency Particulate Air (HEPA) ventilated vacuum cleaner, as necessary, to minimize the spread of contamination and / or to maintain plant cleanliness.

If a spill involving a radioactive system occurs, secure work in a safe condition, contact Radiation Protection (RP), control access to the area (preferably from a low dose area) until relieved by a Radiation Protection (RP) Technician.

After exiting a Contaminated Area (CA) perform a hand and foot frisk at the nearest frisker and then proceed to the nearest Personnel Contamination Monitor (PCM) for whole-body monitoring. If a PCM is closer than a frisker, utilize the PCM. Hand and foot frisk not required.

AGGRESSIVE WORK (CUTTING, GRINDING, WELDING, ETC.) REQUIREMENTS (#1):

Aggressive work (grinding, cutting, welding, etc.) on a contaminated system / component with an expected contamination level (fixed or loose) of less than 20,000 dpm/100cm2 Beta-Gamma and less than 20 dpm/100cm2 Alpha:

- Work Area Air Sample required
- Prior to allowing aggressive work, verify surface contamination, request decon of surface to the lowest level as reasonable if required.
- A High Efficiency Particulate Air (HEPA) ventilation unit, minimum 250 cubic feet per minute, is required to prevent the spread of contamination.
- Respiratory requirements as determined by the TEDE Evaluation.

AGGRESSIVE WORK (CUTTING, GRINDING, WELDING, ETC.) REQUIREMENTS (#2):

Aggressive work (grinding, cutting, welding, etc.) on contaminated systems / components with an expected activity level (fixed or loose) is greater than 20,000 to 200,000 dpm/100cm2 Beta-Gamma and / or 20 to 50 dpm/100cm2 Alpha:

- Work Area Air Sample required
- Breathing Zone Air Sample required
- Prior to allowing aggressive work, verify surface contamination, request decon of surface to the lowest level as reasonable if required.
- A High Efficiency Particulate Air (HEPA) ventilation unit, minimum 250 cubic feet per minute is required to prevent the spread of contamination.
- Respiratory requirements as determined by the TEDE Evaluation.

CONTAMINATED SYSTEM BREACH (#1):

Pipe diameter greater than 1 inch and expected internal contamination level is less than 50,000 dpm/100cm2 Beta-Gamma and less than 20 dpm/100cm2 Alpha:

- Work Area Air Sample required.

CONTAMINATED SYSTEM BREACH (#2):

Pipe diameter greater than 1 inch and expected internal contamination level is between 50,000 to 200,000 dpm/100cm2 Beta-Gamma and greater than 20 to 50 dpm/100cm2 Alpha:

- Breathing Zone Air Sample required.
- Work Area Air Sample required.
- A High Efficiency Particulate Air (HEPA) ventilation unit, minimum 125 cubic feet per minute
  is required to prevent the spread of contamination.

BRIEFED / ANTICIPATED DOSE RATE ALARM(S):

A dose rate alarm may occur when working within 30 cm of Primary System Piping.
When briefing for anticipated dose rate alarm, the individual / work group will be briefed on specific components with detailed contact and 30 cm dose rates. Details of brief will be documented in ESOMS.

Actions for briefed Dose Rate Alarm(s):

Upon receiving a dose rate alarm, the individual / work group shall stop work, back away from the suspected source, verify that the dose rate alarm has cleared and monitor cumulative dose received from the Self Reading Dosimeter (SRD).

The individual / work group is allotted two (2) dose rate alarms. Upon receiving a second dose rate alarm, the individual / work group shall place work in a safe condition, exit the Radiologically Controlled Area (RCA), and contact Radiation Protection (RP). Prior to turning the Self-Reading Dosimeter (SRD) off, inform Radiation Protection (RP) of received dose rate alarm(s).

HEALTH PHYSICS INSTRUCTIONS:

Briefed dose rate alarms shall be documented in the ESOMS narrative log.

Survey areas not readily accessible or when routine surveys do not provide adequate information of radiological conditions of the work area.

Survey pipe internals after breach of a primary system.

Radiation Protection (RP) shall analyze at least 10 percent, 3 at a minimum, of smears for Alpha in an Alpha Level II area when removable contamination levels are greater than 20,000 dpm/100cm2.

Air Sampling Requirements:

See guidance within specific task based on radiological conditions and job scope.

Utilize lapel air samples in Alpha Level II areas when Alpha exposure is a concern (e.g., aggressive work, dry / dusty conditions).

Stop Work if Radiological conditions change:

If General Area (G/A) dose rates are greater than 64 mR/Hr.

If the General / Work Area Airborne Activity Level is equal to or greater than 0.3 DAC when respiratory protection is not being utilized.

If General Area (G/A) Beta-Gamma contamination is equal to or greater than 50,000 dpm/100cm2.

If General Area (G/A) Alpha contamination is greater than 20 dpm/100cm2.

Internal contamination of primary systems is equal to or greater than 200,000 dpm/100cm2 Beta-Gamma and / or 20 dpm/100cm2 Alpha.

VALID FROM	01-MAR-2022 00:00	TO	31-DEC-2022 23:59	RWP	122-5021-2	REV. NO	0

DOSE RATE ALARM:	200	mrem/Hr	BUDGETED DOSE:	940	mrem
DOSE LIMIT ALARM:	30	mrem	ALARA EVALUATION NO:	WAIVER	

JOB LOCATIONS:
- CONTAINMENT

JOB DESCRIPTION: Mech. Maint. Activities HRA / HCA / HRA Brief / MED Risk

THE MAXIMUM POSTED AREA THAT CAN BE ENTERED:
HIGH RADIATION AREA
HIGHLY CONTAMINATED AREA
ALPHA LEVEL 2 AREA

RADIOLOGICAL CONDITIONS: *Indicates estimated value for RWP Preparation. See survey forms for details

GENERAL AREA RADIATION LEVELS (mrem/hr):
0.2 to 5.0 mR/Hr
I/S D-rings: 0.2 to 65 mR/Hr

CONTACT/HOT SPOT RADIATION LEVELS (mrem/hr):
See current survey data

CONTAMINATION LEVELS (dpm/100cm2):
<1000 dpm/100cm2 to 40,000 dpm/100cm2 Beta/Gamma
<20 dpm/100cm2 Alpha

AIRBORNE RADIOACTIVITY (DAC):
<0.3 DAC

REQUIRED JOB COVERAGE:
INTERMITTENT

COVERAGE COMMENTS:

None.

DOSIMETRY REQUIREMENTS:
DLR AND SRD

DOSIMETRY COMMENTS:

A Dosimeter of Legal Record (DLR) and a Self-Reading Dosimeter (SRD).

If you receive a DOSE ALARM or an UNANTICIPATED DOSE RATE ALARM, IMMEDIATELY place work in a SAFE condition, EXIT the area along with coworkers in the immediate area and notify Radiation Protection (RP).

Check your SRD at approximately 15 minute intervals. Personnel shall place work in a safe condition and exit the Radiological Controlled Area (RCA) upon reaching 80% of the dose alarm set-point which is 24 mRem.

PROTECTIVE CLOTHING REQUIREMENTS:

**** Contaminated Area (CA) Dress:**

Coveralls, hood, cotton liners, rubber gloves and wrist cuffs or long sleeved gloves, shoe liners, and rubber shoe covers.

**** Highly Contaminated Area (HCA) Dress:**

Double coveralls, hood, cotton liners, double rubber gloves and wrist cuffs or long sleeved gloves, double shoe liners, and double rubber shoe covers.

**** Additional / Alternative Protective Clothing Requirements:**

Knee pads required when kneeling.

Face shield required when performing aggressive work on contaminated or potentially contaminated system when respiratory protection is not being used.

Face shield required during breach of a contaminated or potentially contaminated system with pipe diameter greater than 1 inch.

Additional protective clothing may be specified by Radiation Protection (RP) based on radiological conditions and work to be performed.

RESPIRATORY REQUIREMENTS:

PAPR	Respirator use is conditional and is determined by the TEDE (Total Effective Dose Equivalent) evaluation based on current radiological conditions.
UELITE	If a PAPR is not available, an Ultra Elite full face respirator may be used as a substitute / alternative.

A RWP PRE-JOB BRIEFING IS REQUIRED:

HIGH RADIATION BRIEF

WORKER INSTRUCTIONS:

HIGH RADIATION AREA (HRA) REQUIREMENTS:

Individual(s) entering a High Radiation Area (HRA) shall:

Obtain a High Radiation Area (HRA) Access Brief from Radiation Protection (RP) prior to the entry.

Obtain a computerized trip ticket validated by Radiation Protection (RP) prior to initial and subsequent entries.

Utilize a Self-Reading Dosimeter(SRD).

HOLD POINT:

Prior to breaching a primary system, ensure system is isolated and drained / vented.

Radiation Protection (RP) shall be present for initial breach of a contaminated or potentially contaminated system then survey pipe internals / components.

Contact Radiation Protection (RP) prior to performing any agressive work on a contaminated or potentially contaminated system.

Contact Radiation Protection (RP) prior to breaching a contaminated or potentially contaminated system boundary for specific directions for capturing / controlling radioactive fluids.

STOP WORK:

Internal contamination of primary systems is equal to or greater than 500,000 dpm/100cm2 Beta-Gamma and / or 20 dpm/100cm2 Alpha.

CONTAMINATION CONTROL:

Avoid rubbing against contaminated objects (floor, walls, pipes, etc.) to minimize leaching contaminants through protective coveralls. Utilize a clean barrier such as a plastic bag between the worker and the contaminated surface when necessary.

Contact Radiation Protection (RP) prior to breaching a contaminated system boundary and for specific directions for capturing / controlling radioactive fluids.

During decontamination and cleaning activities, maintain wet surfaces to minimize airborne radioactivity.

Utilize rags and / or bags, or equivalent, to control the spread of contamination when connecting / disconnecting hoses used on a radioactive system.

Utilize a portable High Efficiency Particulate Air (HEPA) ventilated vacuum cleaner, as necessary, to minimize the spread of contamination and / or to maintain plant cleanliness.

If a spill involving a radioactive system occurs, secure work in a safe condition, contact Radiation Protection (RP), control access to the area (preferably from a low dose area) until relieved by a Radiation Protection (RP) Technician.

After exiting a Contaminated Area (CA) perform a hand and foot frisk at the nearest frisker and then proceed to the nearest Personnel Contamination Monitor (PCM) for whole-body monitoring. If a PCM is closer than a frisker, utilize the PCM. Hand and foot frisk not required.

AGGRESSIVE WORK (CUTTING, GRINDING, WELDING, ETC.) REQUIREMENTS (#1):

Aggressive work (grinding, cutting, welding, etc.) on a contaminated system / component with an expected contamination level (fixed or loose) of less than 20,000 dpm/100cm2 Beta-Gamma and less than 20 dpm/100cm2 Alpha:

- Work Area Air Sample required
- Prior to allowing aggressive work, verify surface contamination, request decon of surface to the lowest level as reasonable if required.
- A High Efficiency Particulate Air (HEPA) ventilation unit, minimum 250 cubic feet per minute, is required to prevent the spread of contamination.
- Respiratory requirements as determined by the TEDE Evaluation.

AGGRESSIVE WORK (CUTTING, GRINDING, WELDING, ETC.) REQUIREMENTS (#2):

Aggressive work (grinding, cutting, welding, etc.) on contaminated systems / components with an expected activity level (fixed or loose) is greater than 20,000 to 200,000 dpm/100cm2 Beta-Gamma and / or 20 to 50 dpm/100cm2 Alpha:

- Work Area Air Sample required
- Breathing Zone Air Sample required
- Prior to allowing aggressive work, verify surface contamination, request decon of surface to the lowest level as reasonable if required.
- A High Efficiency Particulate Air (HEPA) ventilation unit, minimum 250 cubic feet per minute is required to prevent the spread of contamination.
- Respiratory requirements as determined by the TEDE Evaluation.

CONTAMINATED SYSTEM BREACH (#1):

Pipe diameter greater than 1 inch and expected internal contamination level is less than 50,000 dpm/100cm2 Beta-Gamma and less than 20 dpm/100cm2 Alpha:

- Work Area Air Sample required.

CONTAMINATED SYSTEM BREACH (#2):

Pipe diameter greater than 1 inch and expected internal contamination level is between 50,000 to 200,000 dpm/100cm2 Beta-Gamma and greater than 20 to 50 dpm/100cm2 Alpha:

- Breathing Zone Air Sample required.
- Work Area Air Sample required.
- A High Efficiency Particulate Air (HEPA) ventilation unit, minimum 125 cubic feet per minute
  is required to prevent the spread of contamination.

BRIEFED / ANTICIPATED DOSE RATE ALARM(S):

A dose rate alarm may occur when working within 30 cm of Primary System Piping.
When briefing for anticipated dose rate alarm, the individual / work group will be briefed on specific components with detailed contact and 30 cm dose rates. Details of brief will be documented in ESOMS.

Actions for briefed Dose Rate Alarm(s):

Upon receiving a dose rate alarm, the individual / work group shall stop work, back away from the suspected source, verify that the dose rate alarm has cleared and monitor cumulative dose received from the Self Reading Dosimeter (SRD).

The individual / work group is allotted two (2) dose rate alarms. Upon receiving a second dose rate alarm, the individual / work group shall place work in a safe condition, exit the Radiologically Controlled Area (RCA), and contact Radiation Protection (RP). Prior to turning the Self-Reading Dosimeter (SRD) off, inform Radiation Protection (RP) of received dose rate alarm(s).

HEALTH PHYSICS INSTRUCTIONS:

Briefed dose rate alarms shall be documented in the ESOMS narrative log.

Survey areas not readily accessible or when routine surveys do not provide adequate information of radiological conditions in the work area.

Survey pipe internals after breach of a primary system.

Radiation Protection (RP) shall analyze at least 10 percent, 3 at a minimum, of smears for Alpha in an Alpha Level II area when removable contamination levels are greater than 20,000 dpm/100cm2.

Air Sampling Requirements:

See guidance within specific task based on radiological conditions and job scope.

Utilize lapel air samples in Alpha Level 2 areas when alpha exposure is a concern (e.g., aggressive work, dry / dusty conditions).

Stop Work if Radiological conditions change:

If General Area (G/A) dose rates are greater than 160 mR/Hr.

If the General / Work Area Airborne Activity Level is equal to or greater than 0.3 DAC when respiratory protection is not being utilized

If General Area (G/A) Beta-Gamma contamination is equal to or greater than 50,000 dpm/100cm2 in a posted Contaminated Area (CA).

If General Area (G/A) Beta-Gamma contamination is equal to or greater than 200,000 dpm/100cm2 in a posted Highly Contaminated Area (HCA).

If General Area (G/A) Alpha contamination is equal to or greater than 20 dpm/100cm2 in a posted Contaminated Area (CA).

If General Area (G/A) Alpha contamination is greater than 50 dpm/100cm2 in a posted Highly Contaminated Area (HCA).

Internal contamination of primary systems is equal to or greater than 500,000 dpm/100cm2 Beta-Gamma and / or 20 dpm/100cm2 Alpha.

ALARA DAC Evaluation

ALARA Plan #:NA **Rev. #:NA**
Work Order #:Various **RWP #:122-5021 Task 1&2**
NOP-OP-4107-15 Rev. 00

TEDE/ALARA DAC Evaluation Aggressive Work (#1) on contaminated systems / components via grinder, cutting, flapping and welding on piping in preps for welding and welding *components having < 20K dpm/100cm^2 Beta-Gamma and no Alpha.*

STEP 1
Calculate the expected DAC and DAC-hrs per entry without respiratory protection.

$$\overset{1}{\frac{(20{,}000)\ dpm}{100\ cm^2}} x \frac{1\ \mu Ci}{2.22x10^6\ dpm} x \overset{2}{\frac{(1E-5)}{cm}} x \overset{3}{\frac{cm^3\ DAC}{(3E-9)\ \mu Ci}} = \frac{0.3\ DAC}{} x \overset{4}{\frac{(1.0)hrs}{entry}} = 0.3\frac{DAC-hrs}{entry}$$

Where:
1. = Enter the surface contamination levels either β, γ, or α.
2. = Enter one of the re-suspension factors given below.
   For high energy work: hydrolazing, rotopeening, sandblasting, etc over a surface area > 500 cm^2 use 1 x 10^{-4}/cm
   For high energy work: rotopeening, grinding, cutting, over a surface area < 500 cm^2 use 1 x 10^{-5}/cm
   For unknown and moderate energy work use 1 x 10^{-6}/cm
   For light work, inspections, walkdowns use 1 x 10^{-7}/cm
3. = Enter the DAC value from 10 CFR 20 appendix B, (unknown β, γ use 3 x 10^{-9} uCi/cm^3)
   (unknown α use 2 x 10^{-13} uCi/cm^3) (Co-60=1x10^{-8}, Co-58=3x10^{-7}, Cs-137=6x10^{-8}, I-131=8x10^{-8} uCi/cm^3)
4. = Enter the stay time per entry (unknown use 3 hrs)

$$\overset{1}{\frac{(NA)\ dpm}{100\ cm^2}} x \frac{1\ \mu Ci}{2.22x10^6\ dpm} x \overset{2}{\frac{(NA)}{cm}} x \overset{3}{\frac{cm^3\ DAC}{(NA)\ \mu Ci}} = \frac{DAC}{} x \overset{4}{\frac{()hrs}{entry}} = \frac{DAC-hrs}{entry}$$

Note: 10CFR61 site sample analysis identifies Americium-241 (DAC= 3E-12 uCi/cm^3) as the predominant Alpha source.

Calculate the total CEDE using the formula below for the job/task if the DAC is ≥ 0.1.

$$\frac{0.3\ \ DAC-hrs}{entry} x \frac{2.5\ mrem}{DAC-hr} = \underline{\quad 0.8 \quad} \text{ Total CEDE mrem}$$

Is the DAC-hr per entry < 0.5? ☒ Yes ☐ No
Is the Total CEDE < 10 mrem for the job/task? ☒ Yes ☐ No
If No continue with step 2. If Yes, then respiratory protection is not warranted based solely on internal dose, however, step 2 may be evaluated further for contamination control or potential airborne risk.

Repeat specifically for alpha the above step, and perform reanalysis for changes in contamination values and ratio's or Airborne actual results.

STEP 2
Evaluate the following to control airborne contamination or internal dose. Include cost and TEDE dose to set-up and implement.

- **Decontamination (source term removal)**
  Perform gross decon / wipe down of exposed contaminated surface areas with a damp /wet rag to prevent spreading of contamination.

- **Local ventilation (HEPA) or area ventilation (room or compartment)**
  A minimum of a 250 cfm HEPA ventilation should be utilized in the immediate area when performing aggressive work on a contaminated system / component via grinder, flapping in preps for welding and /or welding to prevent spreading contamination to a clean area or creating potential airborne area.

  Note : The only exception for not using a HEPA ventilation unit would be during welding activities due to the HEPA impacting the method of welding due to a cover gas being used for welding.

ALARA DAC Evaluation

ALARA Plan #:NA **Rev. #:NA**
Work Order #:Various **RWP #:122-5021 Task 1&2**

- **Use of fixatives**
  Mist wet / wipe down exposed contaminated surfaces prior to any decon to minimize airborne activity and spreading of contamination.

- **Use of containments/Other**
  Utilize a collection device for any potential water leakage at breach of system.

Estimate the TEDE dose implementing any of the above options. If the total TEDE dose estimate using the above controls exceeds the total TEDE dose estimate without the controls, or does not meet cost benefit criteria, then consider not using the above controls or document why the controls should be used.
TEDE dose to implement engineer controls < 1 mRem

After evaluating/taking the actions in "STEP 2, is the DAC-hr per entry < 0.5 or is the Total CEDE < 10 mrem for the job/task ☐ Yes ☒ No
If No continue with step 3. If Yes, then respiratory protection is not warranted based solely on internal dose, however, step 3 may be evaluated further for potential airborne risk.

ALARA DAC Evaluation

ALARA Plan #:NA **Rev. #:NA**
Work Order #:Various **RWP #:122-5021 Task 1&2**
NOP-OP-4107-15 Rev. 00

STEP 3
Calculate the breakeven DAC value. . ☐ Not Applicable
For "light work". (Inspections, walkdowns, measurements, surveys) use the formula below:

$$\frac{2}{hr}\ DDE_{DR}\ mrem \times \frac{.08}{} \times \frac{DAC-hr}{2.5\ mrem} = \quad 0.06\ DAC$$

Where:
DDE_{DR} = Work area Deep Dose Rate in mrem/hr
0.08 = Loss of worker efficiency under light work
2.5 mrem = Conversion of 1 DAC-hr to dose equivalent

For "heavy work". (lifting/moving objects, climbing, torquing nuts, deconning) use the formula below:

$$\frac{2}{hr}\ DDE_{DR}\ mrem \times \frac{.15}{} \times \frac{DAC-hr}{2.5\ mrem} = \quad 0.12\ DAC$$

Where:
DDE_{DR} = Work area Deep Dose Rate in mrem/hr
0.15 = Loss of worker efficiency under heavy work (Reg. Guide 8.15, section 2.1.3)
2.5 mrem = Conversion of 1 DAC-hr to dose equivalent

STEP 4
Conclusion(s).
This evaluation is for aggressive work activities on contaminated systems / components <500 cm^2 utilizing a grinder and / or tooling to clean / prep contaminated surfaces in preps for welding identified as having contamination > 1000 to ≤ 20,000 dpm/100cm 2 beta - gamma and no alpha.

Based on this TEDE Evaluation and engineer controls to be implemented to control contamination and the radiological conditions as identified respirator protection is not warranted.

Prior to any aggressive work on a contaminated system / component an emery cloth smear or equivalent survey should be performed to evaluate the fixed material being removed. Decon of surface area should be performed to reduce loose surface contamination when possible. A HEPA unit should be utilized in the immediate work area where aggressive work is being performed having a minimum of 250 cfm.

The exception of a HEPA not being used would be if the HEPA ventilation impacts the method of welding if a cover gas is used during welding. This will need to be reviewed on individual basis to determine whether respiratory protection is needed.

The least aggressive tooling should be utilized for the performance of aggressive work activities on contaminated systems / components.

If aggressive work contamination levels are projected to be greater than this TEDE evaluation a separate TEDE DAC evaluation needs to be performed to re-evaluate respiratory and enhancements to engineering controls.

Based on this TEDE/ALARA evaluation workers performing heavy work can be in a 0.12 DAC field or workers performing light work can be in a 0.06 DAC field without respiratory protection.

OR

Based on this TEDE/ALARA evaluation respiratory protection is recommended. In order not to exceed 1 DAC inside the face piece a respirator with a protection factor of 100 is recommended.

ALARA DAC Evaluation

ALARA Plan #:NA **Rev. #:NA**
Work Order #:Various **RWP #:122-5021 RWP Task#1 & 2**

TEDE/ALARA DAC Evaluation *Contaminated System Breach (#2)*
Piping >1 inch (Internal > 50K to ≤ 200K dpm /100 cm^2 Beta-Gamma and /or >20 to ≤ 50 dpm/100cm^2 Alpha)

STEP 1
Calculate the expected DAC and DAC-hrs per entry without respiratory protection.

$$\frac{\overset{1}{(200{,}000)\ dpm}}{100\ cm^2} x \frac{1\ \mu Ci}{2.22x10^6\ dpm} x \frac{\overset{2}{(1E-6)}}{cm} x \frac{\overset{3}{cm^3\ DAC}}{(3E-9)\ \ \mu Ci} = \frac{0.3DAC}{} x \frac{\overset{4}{(0.5)hrs}}{entry} = 0.15\frac{DAC-hrs}{entry}$$

Where:
1. = Enter the surface contamination levels either β, γ, or α.
2. = Enter one of the re-suspension factors given below.
   For high energy work: hydrolazing, rotopeening, sandblasting, etc over a surface area > 500 cm^2 use 1 x 10^{-4}/cm
   For high energy work: rotopeening, grinding, cutting, over a surface area < 500 cm^2 use 1 x 10^{-5}/cm
   For unknown and moderate energy work use 1 x 10^{-6}/cm
   For light work, inspections, walkdowns use 1 x 10^{-7}/cm
3. = Enter the DAC value from 10 CFR 20 appendix B, (unknown β, γ use 3 x 10^{-9} uCi/cm^3)
   (unknown α use 2 x 10^{-13} uCi/cm^3) (Co-60=1x10^{-8}, Co-58=3x10^{-7}, Cs-137=6x10^{-8}, I-131=8x10^{-8} uCi/cm^3)
4. = Enter the stay time per entry (unknown use 3 hrs)

$$\frac{\overset{1}{(50\ )\ dpm}}{100\ cm^2} x \frac{1\ \mu Ci}{2.22x10^6\ dpm} x \frac{\overset{2}{(1E-6\ )}}{cm} x \frac{\overset{3}{cm^3\ DAC}}{(3E-12)\ \ \mu Ci} = \frac{0.08\ DAC}{} x \frac{\overset{4}{(0.5\ )hrs}}{entry} = \frac{0.04\ DAC-hrs}{entry}$$

Note: 10CFR61 site sample analysis identifies Americium-241 (DAC= 3E-12 uCi/cm^3) as the predominant Alpha source.

Calculate the total CEDE using the formula below for the job/task if the DAC is ≥ 0.1.

$$\frac{0.19\ \ DAC-hrs}{entry} x \frac{2.5\ mrem}{DAC-hr} = \underline{\quad 0.5 \quad} \text{ Total CEDE mrem}$$

Is the DAC-hr per entry < 0.5? ☒ Yes ☐ No
Is the Total CEDE < 10 mrem for the job/task? ☒ Yes ☐ No
If No continue with step 2. If Yes, then respiratory protection is not warranted based solely on internal dose, however, step 2 may be evaluated further for contamination control or potential airborne risk.

Repeat specifically for alpha the above step, and perform reanalysis for changes in contamination values and ratio's or Airborne actual results.

STEP 2
Evaluate the following to control airborne contamination or internal dose. Include cost and TEDE dose to set-up and implement.

- **Decontamination (source term removal)**
  Perform post decon of area / piping for loose contamination following breach of system piping.
- **Local ventilation (HEPA) or area ventilation (room or compartment)**
  A minimum of 125 cfm HEPA ventilation will be used in the immediate area being worked during a system breach for expected internal contamination levels between > 50,000 to ≤ 200,000 dpm/100cm^2 Beta-Gamma and / or > 20 to ≤50 dpm/100cm^2 alpha to prevent spreading contamination to a clean area or creating potential airborne area.
- **Use of fixatives**
  Not Required

ALARA DAC Evaluation

ALARA Plan #:NA **Rev. #:NA**
Work Order #:Various **RWP #:122-5021 RWP Task#1 & 2**
NOP-OP-4107-15 Rev. 00

STEP 3
Calculate the breakeven DAC value. . ☒ Not Applicable
For "light work". (Inspections, walkdowns, measurements, surveys) use the formula below:

$$\frac{DDE_{DR}\ mrem}{hr} x \frac{.08}{} x \frac{DAC-hr}{2.5\ mrem} = \quad DAC$$

Where:
DDE_{DR} = Work area Deep Dose Rate in mrem/hr
0.08 = Loss of worker efficiency under light work
2.5 mrem = Conversion of 1 DAC-hr to dose equivalent

For "heavy work". (lifting/moving objects, climbing, torquing nuts, deconning) use the formula below:

$$\frac{DDE_{DR}\ mrem}{hr} x \frac{.15}{} x \frac{DAC-hr}{2.5\ mrem} = \quad DAC$$

Where:
DDE_{DR} = Work area Deep Dose Rate in mrem/hr
0.15 = Loss of worker efficiency under heavy work (Reg. Guide 8.15, section 2.1.3)
2.5 mrem = Conversion of 1 DAC-hr to dose equivalent

STEP 4
Conclusion(s).
Based on the TEDE ALARA DAC- hr. / entry Calculated (0.19 DAC -hr. / entry) and the Calculated total CEDE of 0.5 mRem. Respiratory Protection is not required.

To prevent the spread and re-suspension of contamination going airborne the following engineer controls will be utilized mist / wet exposed contaminated surfaces, perform post system breach decon of area /piping, bag / cover exposed openings.

A minimum of 125 cfm HEPA ventilation will be used in the immediate area being worked during a system breach for expected internal contamination levels between > 50,000 to ≤ 200,000 dpm/100cm^2 Beta-Gamma and / or > 20 to ≤50 dpm/100cm^2 alpha to prevent spreading contamination to a clean area or creating potential airborne area.

If contamination levels are identified > 200,000 dpm/100cm^2 (Beta-Gamma) or Alpha is greater than 50 dpm/100cm^2 a re-analysis of the TEDE ALARA DAC evaluation shall be completed.

Based on this TEDE/ALARA evaluation workers performing heavy work can be in a NA DAC field or workers performing light work can be in a N/A DAC field without respiratory protection.

OR

Based on this TEDE/ALARA evaluation respiratory protection is recommended. In order not to exceed 1 DAC inside the face piece a respirator with a protection factor of NA is recommended.

Performed By: James Lochotzki Date: 9-17-21

Reviewed By: Chris Mangan Date: 1/21/22

ALARA DAC Evaluation

ALARA Plan #:N/A **Rev. #:N/A**
Work Order #:Various **RWP #: 122-5021 Task 1&2**
NOP-OP-4107-15 Rev. 00

TEDE/ALARA DAC Evaluation Contaminated system Breach of Piping >1 inch (Internal < 50K dpm /100 cm^2 Beta-Gamma and <20 dpm/100cm^2 Alpha)

STEP 1

Calculate the expected DAC and DAC-hrs per entry without respiratory protection.

$$\frac{(50{,}000)\ dpm}{100\ cm^2}\ x\ \frac{1\ \mu Ci}{2.22x10^6\ dpm}\ x\ \frac{(1E-6)}{cm}\ x\ \frac{cm^3\ DAC}{(3E-9)\ \mu Ci} = \frac{0.08 DAC}{}\ x\ \frac{(0.5) hrs}{entry} = \frac{0.04\ DAC-hrs}{entry}$$

(1) (2) (3) (4)

Where:

1. = Enter the surface contamination levels either β, γ, or α.
2. = Enter one of the re-suspension factors given below.
   For high energy work: hydrolazing, rotopeening, sandblasting, etc over a surface area > 500 cm^2 use 1 x 10^{-4}/cm
   For high energy work: rotopeening, grinding, cutting, over a surface area < 500 cm^2 use 1 x 10^{-5}/cm
   For unknown and moderate energy work use 1 x 10^{-6}/cm
   For light work, inspections, walkdowns use 1 x 10^{-7}/cm
3. = Enter the DAC value from 10 CFR 20 appendix B, (unknown β, γ use 3 x 10^{-9} uCi/cm^3)
   (unknown α use 2 x 10^{-13} uCi/cm^3) (Co-60=1x10^{-8}, Co-58=3x10^{-7}, Cs-137=6x10^{-8}, I-131=8x10^{-8} uCi/cm^3)
4. = Enter the stay time per entry (unknown use 3 hrs)

$$\frac{(N/A)\ dpm}{100\ cm^2}\ x\ \frac{1\ \mu Ci}{2.22x10^6\ dpm}\ x\ \frac{(\quad)}{cm}\ x\ \frac{cm^3\ DAC}{(\quad)\ \mu Ci} = \frac{DAC}{}\ x\ \frac{(\quad) hrs}{entry} = \frac{DAC-hrs}{entry}$$

(1) (2) (3) (4)

Calculate the total CEDE using the formula below for the job/task if the DAC is ≥ 0.1.

$$\frac{0.04\ DAC-hrs}{entry}\ x\ \frac{2.5\ mrem}{DAC-hr} = \underline{\quad 0.1 \quad}\ \text{Total CEDE mrem}$$

Is the DAC-hr per entry < 0.5? ☒ Yes ☐ No
Is the Total CEDE < 10 mrem for the job/task? ☒ Yes ☐ No
If No continue with step 2. If Yes, then respiratory protection is not warranted based solely on internal dose, however, step 2 may be evaluated further for contamination control or potential airborne risk.

Repeat specifically for alpha the above step, and perform reanalysis for changes in contamination values and ratio's or Airborne actual results.

STEP 2

Evaluate the following to control airborne contamination or internal dose. Include cost and TEDE dose to set-up and implement.

- **Decontamination (source term removal)**
  Perform post decon of area / piping for loose contamination following breach of system piping.
- Local ventilation (HEPA) or area ventilation (room or compartment)
  Hepa ventilation not required based on DAC-hrs / entry and CEDE results.
- Use of fixatives
  Not required
- Use of containments/Other
  Placement of a catch container under piping / component to be breached to capture any liquid.

ALARA DAC Evaluation

ALARA Plan #:N/A **Rev. #:N/A**
Work Order #:Various **RWP #: 122-5021 Task 1&2**

Estimate the TEDE dose implementing any of the above options. If the total TEDE dose estimate using the above controls exceeds the total TEDE dose estimate without the controls, or does not meet cost benefit criteria, then consider not using the above controls or document why the controls should be used.
Implementation of TEDE dose controls < 1 mRem

After evaluating/taking the actions in "STEP 2, is the DAC-hr per entry < 0.5 or is the Total CEDE < 10 mrem for the job/task ☒ Yes ☐ No
If No continue with step 3. If Yes, then respiratory protection is not warranted based solely on internal dose, however, step 3 may be evaluated further for potential airborne risk.

ALARA DAC Evaluation

ALARA Plan #:N/A **Rev. #:N/A**
Work Order #:Various **RWP #: 122-5021 Task 1&2**
NOP-OP-4107-15 Rev. 00

STEP 3
Calculate the breakeven DAC value. . ☒ Not Applicable
For "light work". (Inspections, walkdowns, measurements, surveys) use the formula below:

$$\frac{DDE_{DR}\ mrem}{hr} x \frac{.08}{} x \frac{DAC - hr}{2.5\ mrem} = \qquad DAC$$

Where:
DDE_{DR} = Work area Deep Dose Rate in mrem/hr
0.08 = Loss of worker efficiency under light work
2.5 mrem = Conversion of 1 DAC-hr to dose equivalent

For "heavy work". (lifting/moving objects, climbing, torquing nuts, deconning) use the formula below:

$$\frac{DDE_{DR}\ mrem}{hr} x \frac{.15}{} x \frac{DAC - hr}{2.5\ mrem} = \qquad DAC$$

Where:
DDE_{DR} = Work area Deep Dose Rate in mrem/hr
0.15 = Loss of worker efficiency under heavy work (Reg. Guide 8.15, section 2.1.3)
2.5 mrem = Conversion of 1 DAC-hr to dose equivalent

STEP 4
Conclusion(s).

Based on the TEDE ALARA DAC- Hr / entry Calculated (0.04 DAC -hr / entry) and the Calculated total CEDE of 0.1 mRem. Respiratory Protection is not required.

To prevent the spread and re-suspension of contamination going airborne the following engineer controls will be utilized, perform post system breach decon of area /piping, bag / cover exposed openings.

If contamination levels are identified > 50,000 dpm/100cm^2 (Beta-Gamma) or Alpha is detected a re-analysis of the TEDE ALARA DAC evaluation shall be completed.

Based on this TEDE/ALARA evaluation workers performing heavy work can be in a N/A DAC field or workers performing light work can be in a N/A DAC field without respiratory protection.

OR

Based on this TEDE/ALARA evaluation respiratory protection is recommended. In order not to exceed 1 DAC inside the face piece a respirator with a protection factor of N/A is recommended.

Performed By: James Lochotzki Date: 9-17-21

Reviewed By: Cin S. Mulligan Date: 1/21/22

ALARA PLAN WAIVER FORM

NOP-OP-4107-14 Rev. 02

RWP #	
122-5021	

JOB DESCRIPTION:
Mechanical Maintenance Work Activities in Containment (CTMT).

REASON FOR WAIVER:

NOP-OP-4107 (Radiation Work Permit) requires ALARA plans to be developed for work activities identified as one of the following:

- High Risk as determined by NOP-OP-4010
- Job/task greater 1000 mrem in an outage for a PWR
- Alpha level 3 area/system

An ALARA plan waiver is being requested for this entire RWP.

- **Dose estimate is greater than 1,000 mrem for this outage work.**
- No work is high risk based on NOP-OP-4010.
- No work is allowed in an Alpha level III.

This ALARA Plan should be waived because prior to accessing a radiological area, workers will review the RWP requirements and receive a RP Radiological & a HRA brief (as applicable) prior to accessing any radiologically controlled area.

An ALARA plan adds no value over and above the RP radiological brief for the activities to be performed, they are activities that are performed on a regular basis. The RWP provides worker instructions for access to these areas.

The dose estimates were based on high person hours in mostly low dose rate areas for Task 1 & 2.
NOP-OP-4107 provides guidance for waiving these types of activities.

Prepared by : James Lochotzki DATE: 9-14-21

APPROVAL:

☐ ALARA Plan Waiver

Cris Mingus Cris J. Mingus 9/21/21
ALARA Supervisor Date

Gil Nordlund Gil A. Nordlund 9/21/2021
RPM Date