Changes “Other Than Inconsequential” Require These Additional Reviews:

**Radiological Controls:**
Central Radcon Organization

USQ # N/A-4

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<td>Rerord Steps 3.1.2. 5.1.19, 5.1.26, 5.3.9, 5.4.3, 5.7.1. Add Steps 2.2.2, 3.3.1 – 3.3.4. Struck Note under 1.2, Statement under 3.3, Global removal of “As- Applicable”; Struck Warning from Step 3.1.3 and Warning Box after 5.4.2 per RadCon Engineering.</td>
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5.0 PROCEDURE

5.1 Initial Setpoints and Alarms

5.2 Continuous Air Monitor Detector Failure

5.3 Low Sample Flow Rate Alarm

5.4 High Radiation Alarms and Interlock for Exhaust Fan

5.5 Exhaust Fan Restoration

5.6 Exhaust Stack CAM Power Failure

5.7 Restoration

5.8 Acceptance Criteria

5.9 Review

5.10 Records

AN Data Table

AP Data Table

SY Data Table

EV Data Table

Comments Sheet 1
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for functionally checking AMS-4 Continuous Air Monitors (CAM) and associated alarms that are not associated with Technical Safety Requirements.

1.2 Scope

This procedure covers functionally checking AMS-4 CAM functions.

- A CAM detector failure will be simulated and alarms checked for proper response.
- A CAM low sample flow rate will be simulated and alarms checked for proper response.
- A radioactive source will be introduced to the CAM and alarms checked for proper response.
- A CAM power failure will be simulated and alarms checked for proper response.

2.0 INFORMATION

2.1 Terms and Definitions

- cpm - counts per minute

2.2 General Information

2.2.1 For generic stack monitor designs, extreme ambient temperatures may cause local panel alarm High/Low Cabinet Temp to activate along with cabinet white strobe. IF at any time during performance of this procedure (including initial conditions) local panel alarm High/Low Cabinet Temp is activated, note discrepancy on Work Record in applicable work package. IF local panel alarm High/Low Cabinet Temp and resulting white strobe cannot be reset, note discrepancy on Work Record in applicable work package and continue with the procedure.

2.2.2 Functional check of Portable Exhauster POR107 (which uses an AMS-4 CAM) is performed per procedure 3-RM-832.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Radioactive sources emit a higher level of radiation, which can lead to increased personal exposure when handled improperly.

3.1.2 Comply with plant/facility specific lock and tag and over-tagging requirements in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

3.2 Radiation and Contamination Control

Work in radiological areas will be performed using a Radiological Work Permit following review by Radiological Control per ALARA work planning procedure TFC-ESHQ-RP_RWP-C-03.

3.3 Environmental Compliance

3.3.1 Report all planned and unplanned shutdowns of Tank Farm ventilation equipment and Evaporator Vessel Vent exhaust equipment to the appropriate shift office to be evaluated for reporting purposes per procedure TF-REC-001, “Response to Environmental Condition”.

3.3.2 Report all spills and releases to appropriate shift office to be evaluated for reporting purposes per procedure TF-REC-001, “Response to Environmental Condition”.

3.3.3 Any waste generated during performance of this procedure will be managed in compliance with procedure TO-100-052.

3.3.4 For work in radiological areas or on potentially contaminated equipment, refer to the following ALARACT(s) in TFC-ESHQ-ENV-STD-06, As Low As Reasonably Achievable Control Technology (ALARACT) Requirements Standard:

ALARACT 4.1, Tank Farm ALARACT Demonstration for packaging and Transportation of Waste.

ALARACT 16.1, Tank Farm ALARACT Demonstration for work on potentially contaminated ventilation system components.
- Pre-and Post-Job surveys are required
- Record the Radiological Survey Report (RSR) number in the Work Record.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

- Beta-Gamma Radiation Source > 10,000 counts per minute in CAM
- Two-way radio or cellular phone required for personnel inside farm
- Hearing protection
- Password for CAM "Air Monitor System-4 (AMS-4) Beta/Gamma Particle Monitor," obtained from the instrument supervisor/lead
- Vacuum grease, rags
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be required during the performance of this procedure:

- TO-060-103, Operate AN-241 Annulus Ventilation Systems (VTA)
- TO-060-240, Operate SY241-VTA-EF-003 Annulus Exhauster System
- TO-060-341, Operate 241-AP Tank Farm Annulus Exhauster System
- Data Sheets as applicable to facility
- CVI-19183 “Eberline AMS-4, Beta Continuous Air Monitor Operation and Maintenance”
- TO-620-040, Operate 242-A Vessel Vent System

4.3 Field Preparation

The following conditions must be completed before this procedure may commence:

4.3.1 Personnel in affected facility have been notified of expected alarms that could be initiated by this procedure and appropriate responses identified.

4.3.2 The Shift Manager has been notified of the scope of this procedure and is aware of alarms that will be affected.
5.0 PROCEDURE

NOTE - Annulus exhaust fan(s) and Evaporator Vessel Vent exhaust fan may shut down unexpectedly during performance of this procedure. Exhaust fan(s) may be restarted per applicable operating procedure (see Section 4.2 Performance Documents).

- The AMS-4 has two different sets of menus:
  - The main menu, when scrolled through using up or down arrow, will give you different parameter data. Pushing ENTER at any of these parameters will give you the parameter — i.e., “Fast Alarm Setpoint, or Slow Alarm Setpoint”.
  - To change the existing parameters, enter the maintenance menu by pushing MENU key and entering a password. Arrows will scroll through various pages of parameters. ENTER key must be pushed to access a page that holds desired parameter.

- For detailed information on parameters and menus, consult the vendor info. (Ref. CVI-19183 "Eberline AMS-4, Beta Continuous Air Monitor Operation and Maintenance.")

- Sections of this procedure may be performed in any logical order, or not at all.

5.1 Initial Setpoints and Alarms

NOTE - Some existing Conditions in field that will stop testing are locked in High Radiation Alarms, or facility is presently in an LCO (Limiting Condition of Operation).

- All discrepancies shall be reported to the Shift Manager upon completion of this procedure and noted on Work Record in applicable work package. If equipment is found out of service, Shift Manager must be notified.

5.1.1 RECORD existing alarm panel conditions in Comment section of Data Sheet AND

ENSURE present conditions will not stop testing of CAM.

5.1.2 RECORD serial number and calibration due date of each CAM being checked on Data Sheet.
5.1 Initial Setpoints and Alarms (Cont.)

Verify Alarm Setpoints

5.1.3 PRESS number [5] key on CAM keypad.

5.1.4 RECORD As-Found “SLOW ALARM SETPOINT” as displayed on top line of CAM, on Data Sheet.

5.1.5 IF As-Found Slow Alarm Setpoint is equal to 300 DPM/ft$^3$, PROCEED to Step 5.1.8.

5.1.6 IF As-Found Slow Alarm Setpoint is not equal to 300 DPM/ft$^3$, RESET slow alarm setpoint to 300 DPM/ft$^3$ as follows:

5.1.6.1 PUSH MENU key.

5.1.6.2 TYPE IN numeric password.

5.1.6.3 PUSH ENTER key.

5.1.6.4 ENTER “ALARM PARAMETERS”.

5.1.6.5 ENTER “SLOW ALARM SETPOINT”.

5.1.6.6 PRESS EDIT key.

5.1.6.7 ENTER value 300 DPM/ft$^3$.

5.1.6.8 PRESS ENTER key to accept value.

5.1.6.9 PRESS MENU twice to reset.

5.1.7 PRESS number [5] key on CAM keypad.

5.1.8 RECORD As-Left Slow Alarm Setpoint on Data Sheet.
5.1 Initial Setpoints and Alarms (Cont.)

5.1.9 PRESS number [6] key on CAM's keypad.

5.1.10 RECORD “FAST ALARM SETPOINT” as displayed on top line of CAM, on Data Sheet.

5.1.11 IF As-Found fast alarm setpoint is “EQUAL” to 7,000 DPM/ft\(^3\), PROCEED to Step 5.1.14.

5.1.12 IF As-Found Fast Alarm Setpoint is not equal to 7,000 DPM/ft\(^3\), RESET fast alarm setpoint to 7,000 DPM/ft\(^3\) as follows:

5.1.12.1 PUSH MENU key.

5.1.12.2 TYPE IN numeric password.

5.1.12.3 PUSH ENTER key.

5.1.12.4 ENTER “ALARM PARAMETERS”.

5.1.12.5 ENTER “FAST ALARM INTERVAL”.

5.1.12.6 ENTER “FAST ALARM SETPOINT”.

5.1.12.7 PRESS EDIT key.

5.1.12.8 ENTER value 7,000 DPM/ft\(^3\).

5.1.12.9 PRESS ENTER key to accept value.

5.1.12.10 PRESS MENU twice to reset.


5.1.14 RECORD As-Left Fast Alarm Setpoint on Data Sheet.
5.1 Initial Setpoints and Alarms (Cont.)

5.1.15 **PRESS** number [7] key on CAM keypad.

5.1.16 **RECORD** As-Found “NET ALARM SETPOINT” (Beta Net Count Rate) as displayed on top line of the CAM, on Data Sheet.

5.1.17 **IF** Beta Net Count Rate setpoint value (As-Found) is equal to 3,000 counts per minute, **PROCEED** to Step 5.1.22.

5.1.18 **IF** Beta Net Count Rate setpoint value (As-Found) is less than 10,000 counts per minute, **PROCEED** to Step 5.1.20.

5.1.19 **IF** Beta Net Count Rate setpoint value (As-Found) is greater than 10,000 counts per minute, **PROCEED** as directed by Shift Manager AND **RECORD** directions on Comments Sheet 1.

5.1.20 **RESET** setpoint to 3,000 counts per minute as follows:

5.1.20.1 **PUSH** MENU key.

5.1.20.2 **TYPE IN** numeric password.

5.1.20.3 **PUSH** ENTER key.

5.1.20.4 **ENTER** “ALARM PARAMETERS”.

5.1.20.5 **ENTER** “NET ALARM INTERVAL”.

5.1.20.6 **ENTER** “NET ALARM SETPOINT”.

5.1.20.7 **PRESS** EDIT key.

5.1.20.8 **ENTER** value 3000 cpm.

5.1.20.9 **PRESS** ENTER key to accept value.

5.1.20.10 **PRESS** MENU twice to reset.
5.1 Initial Setpoints and Alarms (Cont.)

5.1.21 PRESS number [7] key on CAM keypad.

5.1.22 RECORD As-Left “NET ALARM SETPOINT” (Beta Net Count Rate) on Data Sheet.

5.1.23 ESTABLISH communications between personnel in CAM location and applicable alarm location(s).

5.1.24 ENSURE alarm/status indicators are in status listed in “Initial Conditions” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).

5.1.25 IF any of the status indicators or panel alarm lights are not in status listed, NOTIFY Field Work Supervisor.

5.1.26 PROCEED as directed by Shift Manager AND

RECORD directions on Comments Sheet 1.
5.2 Continuous Air Monitor Detector Failure

5.2.1 INITIATE failure of CAM detectors by adjusting Beta high voltage of beta detector to zero as follows:

5.2.1.1 PUSH MENU key.

5.2.1.2 TYPE IN numeric password.

5.2.1.3 PUSH ENTER key.

5.2.1.4 ENTER “DETECTOR PARAMETERS”.

5.2.1.5 ENTER “BETA HIGH VOLTAGE”.

NOTE - The value found in Step 5.2.1.6 will be used to reset the voltage in Step 5.2.5.6.

5.2.1.6 RECORD As-Found Beta high voltage on Data Sheet.

5.2.1.7 PRESS EDIT AND

TYPE “0” to change voltage to zero.

5.2.1.8 PRESS ENTER on keypad to accept changed voltage.

5.2.1.9 PRESS MENU twice to return CAM to operation.

5.2.2 WHEN alarm is received, PRESS “Alarm Ack” pushbutton to acknowledge annunciator and silence horn.

NOTE - It may take 1-5 minutes for CAM “MALFUNCTION” light to go out after acknowledgement of alarm (Step 5.2.3).

5.2.3 PRESS red “Alarm Ack” button on CAM to clear audible alarm.

5.2.4 ENSURE alarm and status indicators are in status listed in “Fail Test” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).
5.2 Continuous Air Monitor Detector Failure (Cont.)

5.2.5 RETURN CAM’s Beta high voltage to the recorded As-Found value as follows:

5.2.5.1 PUSH MENU key.

5.2.5.2 TYPE IN numeric password

5.2.5.3 PUSH ENTER key.

5.2.5.4 ENTER “DETECTOR PARAMETERS”.

5.2.5.5 ENTER “BETA HIGH VOLTAGE”.

5.2.5.6 PRESS EDIT AND

TYPE IN recorded As-Found value on Step 5.2.1.6 from Data Sheet.

5.2.5.7 RECORD As-Left Beta high voltage on Data Sheet.

5.2.5.8 PRESS ENTER on keypad to accept changed voltage.

5.2.5.9 PRESS MENU twice to return CAM to operation.

NOTE - It may take 1-5 minutes for CAM “MALFUNCTION” light to go out after acknowledgement of alarm (Step 5.2.6).

5.2.6 PRESS “Alarm Ack” button on local alarm panel (if applicable) in CAM cabinet to reset Alarm Relays.

5.2.7 ENSURE alarm and status indicators are in status listed in “Reset 1” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).
5.3 Low Sample Flow Rate Alarm

5.3.1 **TURN** CAM sample pump OFF, either by unplugging sample pump or by use of a hand switch.

5.3.2 **WHEN** alarm is received, **PRESS** “Alarm Ack” pushbutton to acknowledge annunciator and silence horn at applicable alarm location(s).

**NOTE** - It may take 1-5 minutes for CAM “MALFUNCTION” light to go out after acknowledgement of alarm (Step 5.3.3).

5.3.3 **PRESS** red “Alarm Ack” pushbutton located on CAM.

5.3.4 **ENSURE** alarm and status indicators are in status listed in “Low Sample Flow” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).

5.3.5 **TURN ON** CAM sample pump (either by unplugging sample pump or by use of a hand switch) **AND**

**ALLOW** flow to stabilize.

5.3.6 **RECORD** “AS-FOUND” sample flow on CAM display, on Data Sheet.
5.3 Low Sample Flow Rate Alarm (Cont.)

5.3.7 PRESS number [2] on key pad to Display flow on CAM.

NOTE Minimum flow rate for CAMs listed above is 1.0 cfm (28 lpm) for OPERABLE condition.

5.3.8 IF flow rate is at least 1.0 cfm (28 lpm) but is less than 1.8 cfm (51 lpm), RECORD discrepancy on Work Record of work package.

5.3.9 IF flow rate is less than 1.0 cfm, PROCEED as directed by Shift Manager AND

RECORD directions on Comments Sheet 1.

5.3.10 IF Masstron is currently operable in Facility, PERFORM the following:

5.3.10.1 ENSURE sample flow on CAM and Masstron are reading in same range of 1.8 - 2.2 cfm.

5.3.10.2 ENSURE the two readings are within ± 0.2 cfm of each other.

5.3.11 RECORD “AS-LEFT” sample flow on CAM display on Data Sheet.

NOTE - It may take 1-5 minutes for CAM “MALFUNCTION” light to go out after acknowledgement of alarm (Step 5.3.12).

5.3.12 PRESS “Alarm Ack” button on local alarm panel in CAM cabinet, to reset Alarm relays.

5.3.13 ENSURE alarm and status indicators are in status listed in “Reset 2” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).
5.4 High Radiation Alarms and Interlock for Exhaust Fan

5.4.1 PREPARE for a HIGH alarm status on CAM as follows:

5.4.1.1 PUSH MENU key.
5.4.1.2 TYPE IN numeric password.
5.4.1.3 PUSH ENTER key.
5.4.1.4 ENTER “INSTRUMENT PARAMETERS”.
5.4.1.5 ENTER “GAMMA SUBTRACT FACTOR”.

NOTE - Value As-Found in Step 5.4.1.6 will be used in Step 5.5.3.6 to reset the “GAMMA SUBTRACT FACTOR” to its new value.

5.4.1.6 RECORD As-Found Gamma Subtract Factor value on Data Sheet.
5.4.1.7 PRESS EDIT AND

TYPE “0” to change value to zero.
5.4.1.8 PRESS ENTER on keypad to accept changed value.
5.4.1.9 PRESS MENU twice to return CAM to operation.

5.4.2 ENSURE exhaust fan is running.

5.4.3 USING an extension handle/rod, PLACE AND HOLD gamma source at Beta/Gamma Detector Head, pointing toward beta detector located at stack in Radiation Monitor Enclosure.

OR

For using Evaporator AMS-4, PLACE AND HOLD gamma source at OPT7 In-Line Head located in Vessel Vent Cabinet.
5.4 High Radiation Alarms and Interlock for Exhaust Fan (Cont.)

5.4.4 AFTER CAM alarms, PRESS ACKNOWLEDGE pushbutton to acknowledge annunciator and silence bell at applicable alarm locations.

5.4.5 REMOVE source from CAM detector head.

5.4.6 PRESS red “Alarm Ack” pushbutton on CAM to silence horn.

5.4.7 ENSURE alarm and status indicators are in status listed in “High Radiation” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).

5.4.8 ENSURE exhaust fan has SHUT DOWN.

5.4.9 ENSURE record sample vacuum pump has SHUT DOWN.

5.4.10 PRESS RESET button on local alarm panel in CAM cabinet.

NOTE Due to CAM averaging circuit, it may take 1 to 5 minutes before CAM is in READY mode, enabling restart of fan.

5.4.11 START Exhaust Fan per appropriate operating procedure (see Section 4.2, Performance Documents).

5.4.12 WAIT until “READY” green light on CAM is LIT.

5.4.13 ENSURE alarm and status indicators are in status listed in the “Reset 3” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).

5.4.14 ENSURE record sample vacuum pump has RESTARTED.
5.5 Exhaust Fan Restoration

5.5.1 ENSURE exhaust fan is running.

5.5.2 ENSURE record sample vacuum pump is OPERATING.

5.5.3 RESET “GAMMA SUBTRACT FACTOR” to its previous value as follows:

5.5.3.1 PUSH MENU key.

5.5.3.2 TYPE IN numeric password.

5.5.3.3 PUSH ENTER key.

5.5.3.4 ENTER “INSTRUMENT PARAMETERS”.

5.5.3.5 ENTER “GAMMA SUBTRACT FACTOR”.

5.5.3.6 PRESS EDIT AND

TYPE previously recorded As-Found value on Step 5.4.1.6 from Data Sheet.

5.5.3.7 RECORD As-Left Gamma Subtract Factor value on Data Sheet.

5.5.3.8 PRESS ENTER on keypad to accept changed value.

5.5.3.9 PRESS MENU twice to return CAM to operation.
5.6 Exhaust Stack CAM Power Failure

5.6.1 TURN CAM power switch to OFF.

5.6.2 CHECK Chamber and Detectors clear AND RECORD on Data Sheet.

5.6.3 CHECK AND LUBE O-rings AND RECORD on Data Sheet.

5.6.4 WHEN alarm is received, PRESS “Alarm Ack” pushbutton to acknowledge annunciator to silence horn.

5.6.5 ENSURE alarm and status indicators are in status listed in “Power Off” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).

NOTE - There is a power surge (spike) when CAM is powered up and may trip the High Radiation alarm, causing a fan shutdown.

5.6.6 AFTER power has been off for approximately one (1) minute, TURN CAM Power switch to ON.

5.6.7 IF fan shuts down, RESTART AND CONTINUE procedure.

NOTE - When “READY” green light is on, CAM is LIT. Alarm and status indicators may be verified.

5.6.8 PRESS “Alarm Ack” button on CAM cabinet to reset alarm relays.

5.6.9 ENSURE alarm and status indicators are in status listed in “Reset 4” line of applicable Data Table (AN, AP, SY Farm, or EV Evaporator).

5.6.10 PRESS number [9] on key pad to return CAM to operating Mode.
5.7 Restoration

5.7.1 IF any problems were encountered with Functional Test, INFORM FWS.

5.7.2 DISCONNECT AND REMOVE Test Equipment as necessary.

5.7.3 RECORD the Test Equipment information and calibration status on Data Sheet.

5.7.4 IF any changes other than inconsequential changes are made, NOTIFY RadCon Management at 509-376-7686 or 509-619-3588.

5.7.5 NOTIFY Operations that testing is complete and facility may be returned to original condition, or as directed by Shift Manager.

5.8 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and As-Left values meet the specifications and tolerance(s) per the Data Sheet.
5.9 Review

5.9.1 INFORM FWS test is complete.

5.9.2 FWS REVIEW AND ENSURE the following:
- Completed Data Sheets meet the acceptance criteria.
- Comments sections are filled out appropriately.
- Comments Sheet 1 is properly completed.
- Work requests needed as a result of this procedure are identified and generated.
- Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the Data Sheet, as applicable.
5.10 Records

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.

The record custodian identified in the Company Level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
## Functional Check for AMS-4 Continuous Air Monitors

### AN Data Table

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# Functional Check for AMS-4 Continuous Air Monitors

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## Functional Check for AMS-4 Continuous Air Monitors

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## Comments Sheet 1

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Record any comments encountered during performance of this test below: *

* If no comments are made, a signature is not required.

_________________________ / _________________________ / _________________
Signature                  Print (First & Last)          Date

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