ANSI N13.1 Compliance for Portable Exhausters

Tank Farm Maintenance Procedure

Portable Exhausters

USQ # N/A-4

CHANGE HISTORY (LAST 5 REV-MODS)

<table>
<thead>
<tr>
<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
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<td>E-2</td>
<td>06/15/2017</td>
<td>Maintenance Request</td>
<td>Changed Step 5.3.1 to Modify Lock and Tag.</td>
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<tr>
<td>E-1</td>
<td>02/21/2017</td>
<td>Inconsequential change</td>
<td>Reference removal of TO-060-006 and Records statement update</td>
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<tr>
<td>E-0</td>
<td>05/23/2016</td>
<td>Periodic Review</td>
<td>Inconsequential Change</td>
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<td>D-3</td>
<td>08/27/2015</td>
<td>Maintenance Request</td>
<td>Changed &quot;exhauster&quot; to &quot;sampling system&quot; in section 5.1.8, 5.1.14.1 and 5.1.15.</td>
</tr>
<tr>
<td>D-2</td>
<td>03/03/2015</td>
<td>Operations request-Jim Foster Company driven change WRPS- PER-2014-2120. Environmental is requiring that any RSR generated during the performance of this procedure is recorded in the procedure.</td>
<td>Delete the reference to TO-060-010 &amp; H-14-106244 Added Restoration Sub Section. Record Radiological Survey Report (RSR) number or N/A in new Table.</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure ensures portable exhausters are within ANSI N13.1 compliance.

1.2 Scope

This procedure provides instructions for inspecting and leak testing the stack flow elements and test sample nozzles of the portable exhausters along with checking the sample flow response to comply with ANSI N13.1 requirements.

This procedure is performed to ensure compliance with ANSI N13.1 as mandated by 40 CFR 61.93.

2.0 INFORMATION

2.1 General Information

2.1.1 The subsections within Section 5.0 (and the associated tables) are intended to be worked as independent activities. The subsections within 5.0 can be worked independently, concurrently, or in parallel with other sections as directed by the field work supervisor. When this procedure is being performed to support maintenance activities the necessary sections of this procedure will be indicated in the work package, data sheets or other maintenance procedures. Any sections that are not required may be skipped with concurrence of the field work supervisor.

2.1.2 Sections of this procedure may be performed in whole or part in support of an ATP or OTP. In the event the sections are not performed together, the technician may line out the sections not performed and initial the page with concurrence of the responsible engineer.

2.1.3 To support maintenance/training and testing activities under a released ATP or OTP when equipment is not physically attached to a tank or contaminated ducting, or the operation will not impact any tank intrusive zones, the portable exhauster may be operated under the direction of the Test Director utilizing engineering drawings, electrical and valve line up tables or attachments.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

**WARNING** - Fan must be powered down and locked out to avoid possible injury to personnel.

3.1.1 Verify pressure media (gas, water, chemicals, steam, etc.) and take necessary precaution to prevent personnel injury or damage to equipment when relieving pressure.

3.1.2 Lockouts, tagouts, or over-tagging requirements shall be performed in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure, as applicable.

3.2 Equipment Safety

**CAUTION** - Use of a metal wire brush to clean the nozzle or transport tubing may cause damage or impair proper air flow after re-assembly.

3.3 Radiation and Contamination Control

3.3.1 When disconnecting, breaching or opening systems or system components that are currently or previously connected to waste tanks or waste transfer systems:
- Continuous HPT coverage is required
- Pre-job and post-job surveys are required
- A wet rag will be used to contain the breach until radiological verifications have been performed.

3.3.2 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.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies maybe needed to perform this procedure. Refer to applicable section being performed for the specific supplies needed for that section:

- Adjustable-angle inspection mirror with handle
- Calculator
- Calibrated mass flow meter, capable of measuring 0-2 scfm in 0.01 scfm increments
- Calibrated pressure gauge capable of measuring 0 to 2 psi in 0.1 psi increments
- Calibrated pressure measurement device capable of measuring -35 to 0 in WG in 0.1 in WG increments
- Tool capable of removing a 3” test port cap
- Portable exhauster GEMS sample line pressure test adapter (see Figure 3)
- Portable exhauster shrouded probe plug (see Figure 3)
- Pressure source, with appropriate relief, capable of producing a minimum of 2 psi and a maximum of 120 psi
- SWAGELOK plug, 1/2-inch (SS-810-P)
- Timing device, i.e., stopwatch (commercially available accuracy)
- Tygon tubing \( \frac{1}{2} \) ID
- Vacuum source capable of producing -35 in WG (maximum -150 in WG)
- Calibrated timing device capable of showing the seconds position after a 24-hour period
- Laptop computer equipped with Allen-Bradley RSLogix 500 software
- Allen-Bradley RS-232 cable (P/N 1747-CPS) or equivalent
- Other tools, equipment, and supplies as identified by Shift Manager/OE/FWS/User.
4.2 Performance Documents

The following documents may be needed to perform this procedure:

- DOE-0336, Hanford Site Lockout/Tagout Procedure
- TO-060-045, “Operate POR06 Exhauster”
- H-2-829116, 500 CFM Portable Exhauster Piping & Instrumentation Diagram
- H-14-102610, 1000 CFM Port Exhstr Piping & Instrumentation Schematic Diagram
- H-14-105672, Portable Exhauster POR-008 P&ID

4.3 Field Preparation

4.3.1 CONFIRM Operations personnel have configured system/equipment to allow performance of this procedure.

4.3.2 CONFIRM applicable lock and tag or over-tagging requirements have been satisfied in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

4.3.3 CONFIRM approved scaffolding has been erected to allow access to air flow test ports.
5.0 PROCEDURE

5.1 Record Sample/CAM Flow Response Test

5.1.1 **CONFIRM** the following supplies are available prior to performing Section 5.1.
- Calculator
- Calibrated mass flow meter capable of measuring 0-2 scfm in 0.01 scfm increments
- Tygon tubing, ½” diameter.

5.1.2 **RECORD** MT&E data of test equipment used in this section in Table 2.

5.1.3 **IF** exhaust fan EF-001 is running, **SHUT DOWN** exhauster per applicable operating procedure, test procedure, or work package instructions **AND**

**CHECK** sample pumps are not running.

5.1.4 **INSTALL** inline mass flow meter in place of the metal flex hose in pump cabinet (ENCL-302) upstream of sample pumps (see Figure 1).

5.1.5 **ENSURE** valves V-304 and V-307 are CLOSED.

5.1.6 **ENSURE** record sample valve V-301 and CAM valve V-302 are fully OPEN.

5.1.7 **ENSURE** valves V-308 and V-305 are fully OPEN.

5.1.8 **START** sampling system per applicable operating procedure, test procedure, or work package instructions.

5.1.9 **POSITION** pump 1/2 control selector switch SS-102 is in pump P-301 or P-302 position.

5.1.10 **POSITION** fan control hand switch HS-103 is in “ENABLE” position.

5.1.11 **CHECK** selected vacuum pump P-301 or P-302 is running.
5.1 Record Sample/CAM Flow Response Test (Cont.)

NOTE - Sample cabinet (ENCL-301) door should remain closed and latched except when isolation valves (V-301 and V-302) are being operated in order to keep instruments within allowable temperature range.

5.1.12 IF testing Record Sample flow control valve (FCV-301), PERFORM the following:

5.1.12.1 CLOSE CAM isolation valve (V-302) in sample cabinet (ENCL-301).

5.1.12.2 WAIT for flow rate to reach steady-state.

5.1.12.3 RECORD Record Sample flow measurements in FCV-301 section of Table 3.

5.1.12.4 OPEN CAM isolation valve (V-302) in sample cabinet (ENCL-301).

5.1.12.5 CALCULATE percent difference AND

RECORD “Pass” or “Fail” determination in Table 3.

NOTE - Sample cabinet (ENCL-301) door should remain closed and latched except when the isolation valves (V-301 and V-302) are being operated in order to keep instruments within allowable temperature range.

5.1.13 IF testing the CAM flow control valve (FCV-302), PERFORM the following:

5.1.13.1 CLOSE Record Sampler isolation valve V-301 in the sample cabinet (ENCL-301).

5.1.13.2 WAIT for flow rates to reach steady-state.

5.1.13.3 RECORD CAM sample flow measurements in FCV-302 section of Table 3.

5.1.13.4 OPEN Record Sampler isolation valve V-301 in the sample cabinet (ENCL-301).

5.1.13.5 CALCULATE percent difference AND

RECORD “Pass” or “Fail” determination in Table 3.
5.1 Record Sample/CAM Flow Response Test (Cont.)

5.1.14 IF percent difference calculation fails (for either flow control valve), PERFORM the following steps:

5.1.14.1 SHUT DOWN sampling system per applicable operating procedure, test procedure, or work package instructions.

5.1.14.2 REPLACE failed flow control valve with calibrated flow control valve.

5.1.14.3 GO TO Step 5.1.8.

5.1.15 SHUT DOWN sampling system per applicable operating procedure, test procedure, or work package instructions.

5.1.16 REMOVE test equipment AND

RESTORE to original configuration.
5.2 Inspect/Leak Test Stack Flow Element FE-184

5.2.1 CONFIRM the following supplies are available prior to performing Section 5.2:
- Adjustable-angle inspection mirror with handle
- Calculator
- Calibrated pressure gauge capable of measuring 0 to 2 psi in 0.1 psi increments
- Pressure source capable of producing a minimum of 2 psi and maximum 120 psi
- Timing device, i.e., stopwatch (commercially available accuracy).

5.2.2 RECORD MT&E data of test equipment used in this section in Table 2.

5.2.3 IF exhaust fan EF-001 is running, SHUT DOWN exhauster per applicable operating procedure, test procedure, or work package instructions.

5.2.4 VISUALLY INSPECT pressure ports on flow element FE-184 (see Figure 2).

5.2.4.1 IF unable to visually inspect in place, DISCONNECT tubing from FE-184.

5.2.4.2 REMOVE flow element FE-184 from the stack.

5.2.5 INSPECT flow element FE-184 for deposits or damage.

5.2.6 RECORD “Pass” or “Fail” determination in Table 4.

5.2.7 IF visual inspection fails, REPLACE flow element FE-184 AND GO TO Step 5.2.2.

5.2.8 If flow element FE-184 was previously disconnected, REINSTALL AND RECONNECT tubing.
5.2 Inspect/Leak Test Stack Flow Element FE-184 (Cont.)

5.2.9 ISOLATE tubing runs between pressure transmitter FT-184 and flow element FE-184 (see Figure 2).

5.2.9.1 CLOSE valves V-155 and V-156.

5.2.9.2 ENSURE valve V-157 is closed.

5.2.9.3 CLOSE valves V-154 and V-153.

5.2.10 ATTACH a pressure source test apparatus to PTP-150 (see Figure 8 for typical setup).

5.2.11 PRESSURIZE line to minimum 1 psi and maximum 2 psi AND ISOLATE supply line.

5.2.12 RECORD initial line pressure ($P_i$) in Table 5 AND IMMEDIATELY START timer.

5.2.13 RECORD final line pressure ($P_f$) at 15 seconds in Table 5.

5.2.14 CALCULATE differential pressure (dP) in Table 5.

5.2.15 RECORD “Pass” or “Fail” determination in Table 5.

5.2.16 IF dP reading fails, REPAIR leak(s) AND GO TO Step 5.2.9.

5.2.17 RELEASE pressure AND REMOVE pressure source and gauge.

5.2.18 REINSTALL cap on PTP-150.
5.2 Inspect/Leak Test Stack Flow Element FE-184 (Cont.)

5.2.19 **ATTACH** a pressure source and gauge to PTP-151.

5.2.20 **PRESSURIZE** line to minimum 1 psi and maximum 2 psi **AND**

**ISOLATE** supply line.

5.2.21 **RECORD** initial line pressure (\(P_i\)) in Table 5 **AND**

**IMMEDIATELY START** timer.

5.2.22 **RECORD** final line pressure (\(P_f\)) at 15 seconds in Table 5.

5.2.23 **CALCULATE** differential pressure (\(dP\)) in Table 5.

5.2.24 **RECORD** “Pass” or “Fail” determination in Table 5.

5.2.25 **IF** \(dP\) reading fails, **REPAIR** leak(s) **AND**

**GO TO** Step 5.2.20.

5.2.26 **RELEASE** pressure **AND**

**REMOVE** pressure source and gauge.

5.2.27 **REINSTALL** cap on PTP-151.

5.2.28 **RESTORE** tubing runs between pressure transmitter FT-184 and flow element FE-184 multiport flow sensor.

5.2.28.1 **OPEN** valves V-155 and V-156.

5.2.28.2 **ENSURE** valve V-157 is CLOSED.

5.2.28.3 **OPEN** valves V-154 and V-153.
5.3 **Sample Transport System Visual Inspection and Leak Test**

5.3.1 **CONFIRM** the following supplies are available prior to performing Section 5.3:

- Adjustable-angle inspection mirror with handle
- Calculator
- Calibrated pressure measurement device capable of measuring -35 to 0 in WG in 0.1 in WG increments
- Tool capable of removing a 3” test port cap
- Portable exhauster GEMS sample line pressure test adaptor (see Figure 4)
- Portable exhauster shrouded probe plug (see Figure 3)
- SWAGELOK plug, ½-inch (SS-810-P)
- Timing device, i.e., stopwatch (commercially available accuracy)
- Vacuum source capable of producing -35 in WG and maximum -150 in WG.

5.3.2 **IF** exhaust fan EF-001 is running, **SHUT DOWN** exhauster per applicable operating procedure, test procedure, or work package instructions.

5.3.3 **RECORD** MT&E data of test equipment used in this section in Table 2.

**WARNING**

Fan must be powered down and locked out to avoid possible injury to personnel.

5.3.4 **PRIOR** to fan shaft guard removal, **APPLY** Authorized Worker Lockout (AWL) per DOE-0336, Hanford Site Lockout/Tagout Procedure.

5.3.5 **REMOVE** exhaust fan EF-001 housing cover plate (see Figure 5).

**NOTE** - Condensate drain is covered to prevent accidental loss of dropped instruments, etc., into the condensate drain line.

5.3.6 **COVER** condensate drain at bottom of fan housing.
5.3 Sample Transport System Visual Inspection and Leak Test (Cont.)

5.3.7 REMOVE test port caps FTP-011 and FTP-012 (Figure 5).

5.3.8 REMOVE CAM sample head RE-301.

**Visually Inspect Nozzle for Damage**

5.3.9 VISUALLY INSPECT nozzle for damage.

5.3.10 RECORD “Pass” or “Fail” determination in Table 6.

5.3.11 IF nozzle fails, PROCEED as directed by FWS.

**Visually Inspect Nozzle and Sample Line for Deposits**

5.3.12 VISUALLY INSPECT nozzle for deposits of foreign material.

5.3.13 VISUALLY INSPECT sample line where CAM was removed, for deposits of foreign material.

5.3.14 RECORD “Pass” or “Fail” determination in Table 7.

**CAUTION**

Use of a metal wire brush to clean the nozzle or transport tubing may cause damage or impair proper air flow after re-assembly.

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NOTE - Any suitable means may be used to clean sample lines (see following two examples).
- One method could be sucking or blowing string through the lines, then using it to pull cleaning swab(s) through.
- Another method could be to use a non-metal bottle brush.

5.3.15 IF nozzle/sample line fails, CLEAN nozzle and sample line.

5.3.16 REINSPECT nozzle for deposits of foreign material.

5.3.17 REINSPECT sample line where CAM was removed, for deposits of foreign material.

5.3.18 RECORD “Pass” or “Fail” determination in Retest section of Table 7.

5.3.19 IF re-inspection fails, PROCEED as directed by FWS.
5.3 Sample Transport System Visual Inspection and Leak Test (Cont.)

Perform Leak Test

5.3.20 INSERT shrouded probe plug in tip of stack sample probe TP-301 (see Figure 3 and Figure 5).

5.3.21 DISCONNECT AND CAP sample line immediately upstream of flow control valve FCV-301 (see Figure 6).

5.3.22 ATTACH test adaptor to sample tube where CAM was removed (see Figure 4 and Figure 6).

5.3.23 ATTACH vacuum test apparatus to test adaptor (Figure 7).

5.3.24 APPLY a minimum of -30 in WG and maximum -35 in WG to sample line AND ISOLATE line.

5.3.25 RECORD initial vacuum \( h_i \) in Table 8 AND IMMEDIATELY START timer.

5.3.26 RECORD final vacuum \( h_f \) at 15 seconds in Table 8.

5.3.27 CALCULATE differential height \( dh \) in Table 8.

5.3.28 RECORD “Pass” or “Fail” determination in Table 8.

5.3.29 IF \( dh \) is greater than 5.0 in WG, REPAIR leak(s) AND GO TO Step 5.3.23.

5.3.30 RELEASE vacuum AND REMOVE vacuum test apparatus.

5.3.31 REMOVE test adaptor from sample line.

5.3.32 REMOVE plug from stack sample probe TP-301.

5.3.33 REINSPECT nozzle tip for damage.

5.3.34 RECORD “Pass” or “Fail” determination in Table 6.
5.3 Sample Transport System Visual Inspection and Leak Test (Cont.)

5.3.35 IF nozzle fails, REPLACE AND
      GO TO Step 5.3.9.

5.3.36 INSTALL CAM sample head RE-301.

5.3.37 REMOVE cap from sample line (near FCV-301).

5.3.38 RECONNECT sample line to FCV-301.

5.3.39 REINSTALL 3-inch caps (located on stack).

5.3.40 REMOVE cover from condensate drain in fan housing.

5.3.41 REINSTALL fan housing cover plate.

5.3.42 REMOVE AWL to exhaust fan motor disconnect DS-102 per DOE-0336, Hanford Site Lockout/Tagout Procedure.
5.4 **Stack Flow Indicator Response Check**

5.4.1 **IF** exhauster is not running, **START** exhauster per applicable operating procedure, test procedure, or work package instructions.

5.4.2 **AFTER** exhauster fan EF-101 reaches full speed, **RECORD** stack flow element differential pressure (FT-184) as DP_ON in Table 1.

5.4.3 **SHUT DOWN** exhauster per applicable operating procedure, test procedure, or work package instructions.

5.4.4 **AFTER** exhauster fan EF-101 has come to a complete stop, **RECORD** stack flow element differential pressure (FT-184) as DP_OFF in Table 1.

5.4.5 **CALCULATE** DP_THRESHOLD in Table 1.

5.4.6 **RECORD** Pass / Fail in Table 1.
5.5 Timing Device Check

NOTE - While the actual amount of time spent performing activities related to the timing device check is small, a 24-hour period of time is required to complete this check. An initial check is made at the start and a final check is made after 24 hours. Do not start this timing device check unless a final check can be made 24 hours after the start of the procedure.

- ANSI N13.1 standard allows a 10-minute per month discrepancy for timing devices. This equals 20 seconds per day for a month with 30 days. The calculation of allowable time difference for this check is based on 15 seconds per day to account for stopwatch error. An additional 2 seconds are subtracted to account for the potential synchronization error in starting and stopping the stopwatch.

5.5.1 CONFIRM the following equipment is staged.
- Calibrated timing device capable of showing the seconds position after a 24-hour period
- Laptop computer equipped with Allen-Bradley RSLogix and RSLogix 500 software
- Allen-Bradley RS-232 cable (P/N 1747-CPS) or equivalent.

Display PLC Clock

NOTE - Time is displayed in registers S:40-42. The format is HH:MM:SS.

5.5.2 SYNCHRONIZE laptop time and date to HLAN time and date.

5.5.3 CONNECT laptop computer to portable exhauster processor using RS-232 cable.

5.5.4 OPEN RSLogix.

5.5.5 OPEN RSLogix 500.

5.5.6 ESTABLISH communication with processor using RSLogix.
5.5 Timing Device Check (Cont.)

5.5.7 PERFORM upload to capture current program loaded on CPU.

5.5.8 ENSURE laptop computer is online with processor.

5.5.9 SELECT “Processor Status”.

5.5.10 SELECT “SYNC PLC CLOCK” [F6] button on the panel view display Main menu.

5.5.11 SET stopwatch to 00:00:00.

5.5.12 AS processor SS position changes from 59 to 00, START stopwatch.

5.5.13 RECORD hour (HH) and minute (MM) stopwatch was started as PLC.Start in Table 9.

5.5.14 RECORD date in Table 9.

5.5.15 PLACE stopwatch in a location where it will not be disturbed for a 24-hour period.

NOTE - Laptop computer may be disconnected or remain connected to the processor during the 24-hour period.

5.5.16 IF warranted, DISCONNECT laptop computer from processor.

After 24 hours

5.5.17 AFTER 24 hours, PERFORM following steps.

5.5.17.1 CONFIRM stopwatch indicates at least 24 hours have passed.

5.5.17.2 IF laptop computer was disconnected from processor in Step 5.5.16, REPEAT Steps 5.5.2 through 5.5.9.

5.5.17.3 AS processor SS position changes from 59 to 00, PRESS stop button on the stopwatch.

5.5.17.4 COMPLETE Table 9.
5.6 Restoration

5.6.1 RECORD Radiological Survey Report (RSR) number(s) or N/A.

<table>
<thead>
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<th>RSR Number</th>
<th>RSR Number</th>
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<tbody>
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</table>

5.7 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.
### Table 1 - Stack Flow Indicator Response Check Data

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<thead>
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<th>Flow Transmitter FT-184</th>
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<tr>
<td>DP_ON</td>
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<tr>
<td>DP_OFF</td>
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</tr>
<tr>
<td>DP_THRESHOLD = DP_ON / 2</td>
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<tr>
<td>PASS CRITERIA:</td>
<td>PASS</td>
</tr>
<tr>
<td>DP_OFF &lt; DP_THRESHOLD</td>
<td></td>
</tr>
<tr>
<td>FAIL CRITERIA:</td>
<td>FAIL</td>
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<tr>
<td>DP_OFF ≥ DP_THRESHOLD</td>
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Comments:

Initials/Date ____________________________
### Table 2 - Instrument Calibration Data

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<th>ID. NUMBER</th>
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Comments:

Initials/Date________________________
Table 3 - Record Sample/CAM Flow Measurements

<table>
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<th>Flow Control Valve - FCV-301</th>
<th>Initial</th>
<th>Retest, if needed</th>
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<tr>
<td>Inline Mass Flow Meter (± 0.01 scfm)</td>
<td>scfm</td>
<td>scfm</td>
</tr>
<tr>
<td>Record Sampler Flow (Exhauster display *)</td>
<td>scfm</td>
<td>scfm</td>
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<tr>
<td>[ \frac{\text{Record Sampler Flow} - \text{Inline Flow Meter}}{\text{Record Sampler Flow}} \times 100 ]</td>
<td>% diff</td>
<td>% diff</td>
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**FAIL CRITERIA:** % diff ≥10%

**Comments:**

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<th>Flow Control Valve - FCV-302</th>
<th>Initial</th>
<th>Retest, if needed</th>
</tr>
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<tbody>
<tr>
<td>Inline Mass Flow Meter (± 0.01 scfm)</td>
<td>scfm</td>
<td>scfm</td>
</tr>
<tr>
<td>CAM Flow (Exhauster display *)</td>
<td>scfm</td>
<td>scfm</td>
</tr>
<tr>
<td>[ \frac{\text{CAM Flow} - \text{Inline Flow Meter}}{\text{CAM Flow}} \times 100 ]</td>
<td>% diff</td>
<td>% diff</td>
</tr>
</tbody>
</table>

**FAIL CRITERIA:** % diff ≥10%

**Comments:**

* Flow will be displayed on alarm panel view AP-001 for portable exhauster’s.

Initials/Date ____________________________
## Table 4 - Visual Inspection of Flow Element FE-184

<table>
<thead>
<tr>
<th>Initial Pass (no deposits or damage)</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Comments:

<table>
<thead>
<tr>
<th>Retest, if needed Pass (no deposits or damage)</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Comments:

Initials/Date ________________________________
### Table 5 - Stack Flow Measurement Tubing Leak Test Data

<table>
<thead>
<tr>
<th>PTP-150</th>
<th>Initial Test</th>
<th>Retest, if needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial pressure ($P_i$)</td>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>Final pressure ($P_f$) at 15 seconds</td>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>Calculate Differential Pressure ($dP$)</td>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>$P_i - P_f = dP$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pass/Fail</td>
<td>($dP \leq 0.2$)</td>
<td>($dP &gt; 0.2$)</td>
</tr>
<tr>
<td></td>
<td>PASS</td>
<td>FAIL</td>
</tr>
</tbody>
</table>

**Comments:**

<table>
<thead>
<tr>
<th>PTP-151</th>
<th>Initial Test</th>
<th>Retest, if needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial pressure ($P_i$)</td>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>Final pressure ($P_f$) at 15 seconds</td>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>Calculate Differential Pressure ($dP$)</td>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>$P_i - P_f = dP$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pass/Fail</td>
<td>($dP \leq 0.2$)</td>
<td>($dP &gt; 0.2$)</td>
</tr>
<tr>
<td></td>
<td>PASS</td>
<td>FAIL</td>
</tr>
</tbody>
</table>

**Comments:**

Initials/Date ____________________________
### Table 6 - Nozzle Visual Inspection

<table>
<thead>
<tr>
<th>Prior to Leak Test</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial (Step 5.3.10)</td>
<td></td>
</tr>
<tr>
<td>Pass:</td>
<td></td>
</tr>
<tr>
<td>• No damage</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>After Leak Test</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial (Step 5.3.34)</td>
<td></td>
</tr>
<tr>
<td>Pass:</td>
<td></td>
</tr>
<tr>
<td>• No damage</td>
<td></td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

Initials/Date __________________________

---

**ANSI N13.1 Compliance for Portable Exhausters**

**Type** CONTINUOUS  
**Document No.** 6-FCD-569  
**Rev/Mod** E-2  
**Release Date** 06/15/2017  
**Page** 26 of 38
Table 7 - Sample Transport Line Visual Inspection

<table>
<thead>
<tr>
<th>Step 5.3.14</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass (no deposits) ______________</td>
<td>Fail ___</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Retest, if needed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass (no deposits) ______________</td>
<td>Fail ___</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

Initials/Date____________________
# Table 8 - Sample Transport System Leak Test Data

<table>
<thead>
<tr>
<th></th>
<th>Initial Test</th>
<th>Retest, if needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial vacuum (h_i)</td>
<td>in WG</td>
<td>in WG</td>
</tr>
<tr>
<td>Final vacuum (h_f) at 15 seconds</td>
<td>in WG</td>
<td>in WG</td>
</tr>
<tr>
<td>Calculate Differential Height (dh)</td>
<td>in WG</td>
<td>in WG</td>
</tr>
<tr>
<td>h_i - h_f = dh</td>
<td>in WG</td>
<td>in WG</td>
</tr>
<tr>
<td>Pass/Fail</td>
<td>(dh \leq 5.0)</td>
<td>(dh &gt; 5.0)</td>
</tr>
<tr>
<td></td>
<td>PASS</td>
<td>FAIL</td>
</tr>
<tr>
<td></td>
<td>(dh \leq 5.0)</td>
<td>(dh &gt; 5.0)</td>
</tr>
<tr>
<td></td>
<td>PASS</td>
<td>FAIL</td>
</tr>
</tbody>
</table>

Comments:

Initials/Date____________________________
# Table 9 - Timing Device Check Test Data

<table>
<thead>
<tr>
<th></th>
<th>Start Time on the PLC</th>
<th>Date</th>
<th>Stop Time on the PLC</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Start</strong></td>
<td>PLC_Start</td>
<td>HH:MM:00</td>
<td>/ / YYYY</td>
<td>DD MM YYYY</td>
</tr>
<tr>
<td></td>
<td>Stopwatch_Start</td>
<td>00:00:00:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stop</strong></td>
<td>PLC_Stop</td>
<td>HH:MM:00</td>
<td>/ / YYYY</td>
<td>DD MM YYYY</td>
</tr>
<tr>
<td></td>
<td>Stopwatch_Stop</td>
<td>HH:MM:00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Calculations

\[
\text{PLC\_Run} = (\text{PLC\_Stop} - \text{PLC\_Start})
\]

\[
\text{PLC\_Min} = [(\text{PLC\_Run HH} \times 60) + (\text{PLC\_Run MM})]
\]

\[
\text{ALLOW} = (\text{PLC\_Min} \times 0.0137) - 2
\]

\[
\text{DIFF} = |\text{PLC\_Run - Stopwatch time}|
\]

PASS/FAIL (circle one)

<table>
<thead>
<tr>
<th>DIFF (\leq) ALLOW</th>
<th>PASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIFF &gt; ALLOW</td>
<td>FAIL</td>
</tr>
</tbody>
</table>

## Comments:

Start Initials/Date: _____________________________ Stop Initials/Date: _____________________________
### Table 10 - Approval Signatures

<table>
<thead>
<tr>
<th>DISPOSITION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Work Supervisor (FWS) ensures appropriate work has been performed correctly and completely. Ventilation system has been restored to operating configuration. Sign when complete.</td>
<td></td>
</tr>
<tr>
<td>Supervisor/FWS (Signature)</td>
<td>Supervisor/FWS (Print Name First &amp; Last)</td>
</tr>
<tr>
<td>Environmental reviews for completeness. Review will include verification of documentation completion.</td>
<td></td>
</tr>
<tr>
<td>Environmental (Signature)</td>
<td>Environmental (Print Name First &amp; Last)</td>
</tr>
<tr>
<td>System Engineer ensures appropriate tables are filled out correctly and are accurate, complete, and legible. Sign when complete.</td>
<td></td>
</tr>
<tr>
<td>System Engineer (Signature)</td>
<td>System Engineer (Print Name First &amp; Last)</td>
</tr>
</tbody>
</table>

Comments:
Figure 1 - Enclosures ENCL-301 & ENCL-302
Figure 2 - Flow Element
Figure 4 - Test Adaptor

![Diagram of Test Adaptor]

- **½" x ¼" BUSHING**
- **¼" SWAGELOK CONNECTOR**
- **¼" TUBE X ¼" MNPT (SS-400-1-4)**
- **1" X ½" BELL REDUCER**
- **SWAGELOK CONNECTOR 1" MNPT X 1 ¼" TUBE (SS-2000-1-16)**
- **1 ¼" EXST SAMPLE LINE**
Figure 5 - Typical Portable Exhauster
Figure 6 - Typical GEMS Sample Cabinet

Break Here
(Test Adaptor Installation)

Break Fitting Here and Cap Line

Break Fitting Here and Cap Line
Figure 7 - Typical Vacuum Test Apparatus

- Isolation Valve
- Vacuum Gauge
- 5' to 10' Flexible Hose
- Swage Coupling, ¼"
Figure 8 - Typical Pressure Test Apparatus

- Isolation Valve
- Pressure Gauge
- 5' to 10' Flexible Hose
- Swage Coupling, ¼"