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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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Characterization	E.J. Waldo	N/A
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E.J. Waldo Eric Waldo 3/10/98 Signature of EDT Originator Date	J.S. Lee 3.10.98 Authorized Representative for Receiving Organization Date	J.S. Schofield 3/10/98 Design Authority/ Cognizant Manager Date	[ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

System Acceptance and Operability Test Report for the RMCS Exhauster C on Flammable Gas Tanks

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U.S. Department of Energy Contract DE-AC06-96RL13200

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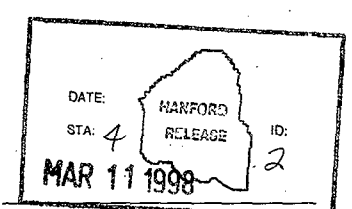
Abstract: This test report documents the completion of acceptance and operability testing of the rotary mode core sampling (RMCS) exhauster C, as modified for use as a major stack (as defined by the Washington State Department of Health) on flammable gas tanks.

Release Approval 3/11/98 Date



Release Stamp

Approved for Public Release

HNF-1932 REV. 0

SYSTEM ACCEPTANCE AND OPERABILITY TEST REPORT

FOR THE

RMCS EXHAUSTER C

ON FLAMMABLE GAS TANKS

E. J. WALDO

CHARACTERIZATION FIELD ENGINEERING

LOCKHEED MARTIN HANFORD COMPANY

MARCH, 1998

1.0 PURPOSE

This test report documents the completion of acceptance and operability testing of the rotary mode core sampling (RMCS) Exhauster C, as modified for use as a major stack on flammable gas tanks. Previous flammable gas modification acceptance testing is documented in WHC-SD-WM-ETP-182, Rev 2.

2.0 TEST RESULTS

Testing was performed under work package ES-97-00021 during February, 1998. Attachment A contains the completed copy of HNF-1931 Rev 0 *System Acceptance and Operability Testing for the RMCS Exhauster C on Flammable Gas Tanks.* Sections 7.0 and 8.0 of the test procedure contain the completed test data. Section 9.0 contains the test equipment calibration data. Personnel involved with the performance of the test procedure are documented in section 10.0.

3.0 TEST VARIANCES

The exceptions to this procedure are documented on page A-30 of Attachment A. All exceptions were satisfactorily resolved, as indicated by the approval initials for each item. No further action is necessary for resolution of these items.

4.0 TEST SUMMARY

Acceptance and operability testing of the RMCS Exhauster C was successfully completed during February, 1998. All exceptions were satisfactorily resolved (page A-30 of Attachment A). Completion of the testing is documented on the "Test Completion Sign-Off" sheet (page A-29 of Attachment A).

ATTACHMENT A

SYSTEM ACCEPTANCE AND OPERABILITY TESTING FOR THE RMCS EXHAUSTER C ON FLAMMABLE GAS TANKS (HNF-1931 REV 0)

E. J. WALDO

CHARACTERIZATION FIELD ENGINEERING

LOCKHEED MARTIN HANFORD COMPANY

DECEMBER, 1997

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1.0 PURPOSE

The purpose of this acceptance and operability procedure is to provide instructions for system acceptance and operability testing of the rotary mode core sampling (RMCS) exhauster C, as modified for use as a major stack (as defined by the Washington State Department of Health) on flammable gas tanks. This testing fulfills the applicable requirements of HNF-SD-WM-ETP-230, Section 3.6; and HNF-PRO-446 (see section 4.3 of this document for complete references).

2.0 SCOPE

System acceptance and operability testing of the RMCS exhauster C will verify that system design requirements, as well as functional and operational requirements, have been met. Previous flammable gas modification acceptance testing is documented in WHC-SD-WM-ETP-182, Rev 2. Testing will be completed in two phases. The first phase of testing (section 7) will involve a visual inspection of the exhauster labeling and a pressure decay test of the heater and HEPA filter housings. The second phase of testing (section 8) will involve operating the RMCS exhauster C to demonstrate acceptable operation of systems modified for use on flammable gas tanks. Testing will primarily be conducted behind the 2704HV building. Some portions of the testing may be conducted at a simulated tank farm environment at the "Rock Slinger" test site, located just south of U-Plant in the 200 West Area.

3.0 RESPONSIBILITIES

Safety, QA, Characterization Project Operations (CPO), Characterization Equipment Design (CED), Design Authority, and Characterization Field Engineering (CFE) shall approve this test procedure (hereafter referred to as the OTP), prior to its release. Responsibilities are as follows:

Operations Test Director

Responsible for the overall performance of the OTP. Responsible for the proper conduct of operations for the entire test site as well as all personnel involved in the testing. Ensures the execution of all testing activities are within the scope of the OTP. Exercises stop work authority for unsafe activities or activities not conforming to this OTP. Directs the overall conduct and sequencing of testing activities. Ensures configuration management is properly maintained. Directs actions to be taken to prevent injury to employees or damage to equipment. Acts through the core sampling PIC for the proper performance of all operations at the test site. Receives technical advice from CED and CFE engineers on system and equipment design parameters. Maintains cognizance of test exceptions as documented by the CFE Cognizant engineer and the resolution of same. Concurs with all changes and with the acceptability and reliability of the equipment by signing the OTP.

Core Sampling PIC

Responsible for the assignment of personnel and directing the operation of the various systems. Controls configuration and access to the test area in order to maintain a safe environment. Aids the Cognizant Engineer in maintaining configuration control. Approves changes to the OTP in terms of operational steps or equipment configuration with concurrence of CED and CFE cognizant engineer and Operations Test Director. Conducts a pre-job safety meeting at the start of each shift during the performance of the OTP. Briefs the personnel on testing to be performed that day and associated hazards.

CFE Cognizant Engineer

Provides on site technical expertise and advice to the PIC and Test Director as required. Controls the sequence in which the OTP is conducted through the Test Director and with concurrence of CED. Maintains configuration control during testing. Approves any changes to the OTP. Notes exceptions to testing on the "Exception / Resolution Data Sheet." Resolves exceptions with the concurrence of CED, DA and the assigned Quality Engineer for those exceptions relating to items which initially required Quality verification. Concurs with the acceptability and reliability by signing the OTP.

Design Authority (DA)

Approves any changes to the OTP. Approves test procedure and test report. Concurrence resolution of exceptions. Concurs with the acceptability and reliability by signing the OTP.

Characterization Equipment Design (CED)

Provides on site technical expertise and advice to the PIC and Test Director as required. Advises Cog. Engineer and Test director on equipment capabilities, recommended test sequence changes, and test requirements. Responsible for issuing any Engineering Change Notices (ECN's) required to support maintaining configuration control during testing. Approves any changes to the OTP. Responsible for obtaining additional support from engineering. Reviews and approves test procedure and test report. Resolves any design or project related deficiencies.

Core Sampling Operations Management

Responsible through the Operations Test Director for the overall testing program. Reviews and approves test procedure. Ensures effective safety meeting is held prior to test start. Monitors testing to extent approval may be given for satisfactory equipment operability and reliability.

Core Sampling Operators

Conducts testing according to the OTP procedure as directed by the Operations PIC. Notifies the PIC of concerns, exceptions and off-normal conditions during testing.

Quality Assurance

Reviews and approves test procedure to assure compliance with appropriate regulations. Resolves exceptions requiring quality verification jointly with CFE Cognizant Engineer. Quality verification of exceptions is only necessary for those exceptions relating to items which initially required Quality verification or any changes to acceptance criteria.

Safety

Reviews and approves test procedure to assure compliance with applicable regulations. Monitors testing as appropriate.

CPO Radiological Control

Supports testing according to the OTP procedure as directed by the Operations PIC. Notifies the PIC of concerns, exceptions and off-normal conditions during testing. Ensures work performed is within the scope of the applicable Radiological Work Permit (RWP).

4.0 INFORMATION

4.1 TEST GUIDANCE

Authorization for the implementation of this document is controlled by the associated Engineering Data Transmittal. Approval indicates that the testing called out in this procedure will verify the required performance of the equipment and provide the required protection of personnel.

Acceptance and operability testing will be completed in two phases. The first phase of testing (section 7) will involve a visual inspection of the exhauster labeling and a pressure decay test of the heater and HEPA filter housings. The second phase of testing (section 8) will involve operating the RMCS exhauster C to demonstrate acceptable operation of systems modified for use on flammable gas tanks, and all common fault alarms and shutdown interlocks.

Initial instrument calibrations shall be conducted prior to Operability testing. Calibrations will not be reconfirmed for OTP testing as no advantage will be realized.

Discrepancies, deviations, or irregularities involving the test procedure or equipment performance are to be noted, as they occur, on the "Exception / Resolution Data Sheet". An exception number shall be noted in the procedure margin, next to the related test section or step. These exceptions shall be jointly resolved between the Cog Engineer, the Design Authority, the Test Director, and the assigned Quality Assurance Representative. Quality verification of exceptions is only necessary for those exceptions relating to items which initially required Quality verification. All resolutions to the exceptions must be agreed upon by the responsible personnel, documented on the exception list, and initialed. Hand written exception sheets may be replaced, if replacement sheets are initialed.

No testing shall be done which directly involves faulty equipment. However, at the discretion of the Cog Engineer and with the concurrence of the Test Director, CED and the PIC, tests may proceed on equipment which is not affected by faulty equipment. Any test exceptions caused by equipment failure not associated, directly or indirectly, with the system modifications for flammable gas tank sampling, will be dispositioned as "general maintenance" on the Exception / Resolution Data Sheet.

If, due to testing circumstances, on-site modifications of the test procedures are warranted, written changes ("redlines") may be made by the core sampling PIC with the written approval (initialing in the left margin) of the Test Director, Cog Engineer and CED. These changes must also be documented on the Exception / Resolution Data Sheet prior to test completion sign-off. Amendments shall be per instructions in HNF-PRO-446, "Testing Requirements".

Operating procedures, written for RMCS operations in flammable gas tanks, are referenced for use as directional information within this OTP. Sections and steps in those procedures may be worked out of sequence or skipped if needed to support this testing activity. Approval by the PIC, Test Director or Cog engineer of these changes is required.

4.2 TERMS AND DEFINITIONS

CE or COG	- Core Sampling Cognizant Engineer
CED	- Characterization Equipment Design
CFE	- Characterization Field Engineering
CPO	- Characterization Project Operations
DA	- Design Authority
DT	- Electrical Power Distribution Trailer
FGWL	- Flammable Gas Watch List
HEPA	- High Efficiency Particulate Air
OP	- Operator
OTP	- Operability Test Procedure
OTR	- Operability Test Report
PIC	- Person In Charge
QA	- Quality Assurance
QC	- Quality Control (inspection)
RMCS	- Rotary Mode Core Sampling
RWP	- Radiological Work Permit
SCFM	- Standard Cubic Feet per Minute
TD	- Test Director
TWRS	- Tank Waste Remediation System
VAC	- Volts, Alternating Current
VFD	- Variable Frequency Drive

4.3 REFERENCES

HNF-SD-WM-ETP-230, Rev. 2	*Engineering Task Plan for the Field Deployment of Two Core Sampling Exhausters Utilizing Basis for Interim Operation Technical Specification Requirements*
HNF-SD-WM-FDC-025, Rev. 2	*Functional Design Criteria for the Rotary Mode Core Sampling Exhauster*
HNF-SD-WM-OTP-223, Rev. 0	*System Acceptance and Operability Testing for Rotary Mode Core Sampling in Flammable Gas Tanks*
WHC-SD-WM-ETP-182, Rev. 2	*Engineering Task Plan for the Rotary Mode Cores Sampling Exhauster Flammable Gas Upgrades*
WHC-SD-WM-SAD-035, Rev. 0b	*Safety Assessment of RMCS in Flammable Gas Single Shell Tanks*
WHC-SD-WM-TSR-006, Rev. 0	*Tank Waste Remediation System Technical Safety Requirements*
HNF-PRO-446	*Testing Requirements*
HNF-IP-0842	*TWRS Administration*

4.4 SAFETY ISSUES

To reduce the possibility of injury, all persons in the vicinity of the test equipment must be made aware of the following concerns:

Warning - Personal protective equipment should be used during testing, such as safety glasses, gloves, hearing protection and safety shoes, when appropriate.

Warning - Be aware of tripping hazards such as cables and duct work.

4.5 RADIATION AND CONTAMINATION CONTROL

All testing will be non-radioactive. Any work performed at the "Rock Slinger" test site must comply with the requirements listed in RWP issued for testing activities at that site.

4.6 QUALITY ASSURANCE

Quality Assurance shall approve this test procedure prior to its release. A Quality Control representative shall verify all steps requiring QC verification during testing or any changes to acceptance criteria.

4.7 AUTOMATIC EXHAUSTER SYSTEM SHUTDOWNS

The exhauster is designed to shut down automatically when any of the following conditions occur:

- Tank pressure falls below -3 inches water gauge (wg).
- Exhauster stack flow exceeds 250 scfm for 5 minutes or falls below 150 scfm.
- Total pressure drop across the HEPA filters exceeds 5.5 inches wg.
- Common Fault Alarm is received when exhauster is in UNATTENDED OPERATION mode.

All of these shutdowns will be forced to occur during performance of this test procedure.

4.8 EXHAUSTER COMMON FAULT ALARMS

The exhauster is equipped with six alarms which will trigger a common fault alarm strobe on the top of monitoring cabinet. Upon operator acknowledgement the alarm strobe will extinguish until another new alarm is received. These alarms are generated by the data logger which monitors exhauster functions. In the event of a data logger system error, the alarm strobe will become lit. A system error cannot be acknowledged and will require the alarming condition to be rectified in order to extinguish the alarm beacon. The exhauster conditions which will activate the common fault alarm light are listed below:

- HEPA filter inlet humidity above 70%.
- HEPA filter inlet temperature above 150 °F.
- Record sample flow variance above ± 10%.
- Beta sample flow variance above ± 10%.
- Beta CAM high radiation alarm.
- Beta CAM failure alarm.

All of these alarms will be forced to occur during performance of this test procedure.

4.9 ACCEPTANCE CRITERIA

The acceptance criteria for this OTP is based on operability and reliability of the exhauster when used as if it were in the field. Each step shall be evaluated and signed off by the cognizant engineer and operations to verify that the exhauster is acceptable for field use. Acceptable reliability based on this testing shall be determined by the judgement of the cognizant engineer and the operation manager. The acceptance of the overall reliability of the system shall be documented by signatures on the Test Completion Sign-Off Sheet.

5.0 RECORDS

Pertinent operating conditions will be documented where requested in this OTP. Records for the testing of the exhauster will be recorded within the procedure. The operator, and other personnel requested to do so, will initial in the space provided in the left hand margin upon satisfactory completion of the designated tasks.

All test data will be released, as an Operability Test Report, after the conclusion of OTP testing.

6.0 PREREQUISITES

6.1 EQUIPMENT AND SUPPLIES

The following equipment and supplies will be required during testing:

- RMCS exhauster C and associated equipment.
- Portable electric generator.
- Electrical power distribution trailer.
- Stop Watch.
- Fluke model 701 test device, or equivalent.
- Air Neutronics model MP205 Digital Manometer, or equivalent.
- Hand operated pressure/vacuum pump and associated tubing.
- Test pressure flange for heater inlet.
- Pressure and vacuum sources for pressure decay test.

6.2 PROCEDURES

The following procedures will be required during testing:

- TO-020-451, Setup and Takedown of Core Sample Systems
- TO-020-825, Katolight Model D200FRJ4 Standby Power System Operation
- TO-020-900, Onan 150DGFA Generator Set Operation
- TO-060-347, Operate RMCS Exhauster on Passively Ventilated Tanks
- 6-TF-155T, Core Sampling Exhauster 296-P-34 Air Flow Test
- 6-TF-156PC, Core Sampling Exhauster 296-P-34 HEPA Filter Aerosol Test

6.3 CONDITIONS

The following conditions must be signed off as complete prior to the beginning of exhauster testing (Section 8):

- A Job Hazard Analysis has been performed.

PIC Sign/Date

- Calibrations and PM's are current and complete prior to testing of affected equipment.

Planner Sign/Date

- All work packages for installation/functional check of flammable gas and major stack modifications are field work complete prior to related testing.

Planner Sign/Date

7.0 EXHAUSTER INSPECTION

7.1 EXHAUSTER LABELING INSPECTION

7.1.1 **VERIFY** the exhauster labels called out in the following table are present.

Component Number	Description	CF INITIAL	QC INITIAL
	Inlet End of Exhauster		
VTP-HTR-2203C	GLYCOL TANK HEATER		
VTP-TK-2201C	GLYCOL EXPANSION TANK		
VTP-P-2204C	GLYCOL PUMP		
VTP-P-2205C	SEAL POT PUMP		
VTP-DS-2202C	HTR DISCONNECT 480V 3 PH		
VTP-PB-2211C	SEAL POT PMP SW		
VTP-HS-2201C	HEATER PWR SW		
VTP-IL-2201C	HEATER ON		
VTP-IL-2202C	PUMP ON		
VTP-IL-2203C	LOW HTR FLUID		
VTP-SG-2201C	SEAL POT LVL		
VTP-SG-2202C	HTR FLUID LVL		
VTP-V-2232C	HEPA 2 COND DRN VLV		
VTP-V-2233C	HEPA 1 COND DRN VLV		
VTP-V-2234C	PREFILTER COND DRN VLV		
VTP-V-2235C	STACK COND DRN VLV		
VTP-V-2236C	HTR COND DRN VLV		
VTP-V-2258C	SEAL POT FUNNEL VLV		
VTP-V-2259C	HEATER FLD OUT VLV		
VTP-V-2260C	SEAL POT OUT VLV		
VTP-TE-2203C	HEPA FLT TEMP PROBE		
	FILTER TRAIN SIDE OF EXHAUSTER		
VTP-HTR-2202C	FLT SYS INLET HTR		
VTP-HUM-2201C	HEPA FLT HUMIDITY PRB		
VTP-V-2228C	FLT BANK INLET ISO VLV		

Component Number	Description	CF INITIAL	QC INITIAL
VTP-FLT-2201C	PREFILTER		
VTP-FLT-2202C	HEPA 1		
VTP-FLT-2203C	HEPA 2		
VTP-PDS-2203C	HEPA FLT D/P SW		
VTP-PDI-2203C	HEPA FLT TOTAL D/P		
VTP-PDI-2204C	NO 1 HEPA FLT D/P		
VTP-PDI-2205C	NO 2 HEPA FLT D/P		
VTP-V-2203C-1	VTP-PDI-2203C HS ISO VLV		
VTP-V-2203C-2	VTP-PDI-2203C LS ISO VLV		
VTP-V-2204C-1	VTP-PDI-2204C HS ISO VLV		
VTP-V-2204C-2	VTP-PDI-2204C LS ISO VLV		
VTP-V-2205C-1	VTP-PDI-2205C HS ISO VLV		
VTP-V-2205C-2	VTP-PDI-2205C LS ISO VLV		
VTP-PRT-2201C	SAMP PORT NO 1		
VTP-PRT-2202C	INJECTION PORT		
VTP-PRT-2203C	SAMP PORT NO 3		
VTP-V-2229C	FLT BANK OUTLET ISO VLV		
VTP-DS-2201C	VAR FREQ DISCONNECT 480V 3PH		
	Discharge End of Exhauster		
VTP-PNL-2202C	VAR FREQ DR CONTROL PNL		
VTP-PB-2204C	EXHAUSTER START		
VTP-PB-2205C	EXHAUSTER STOP		
VTP-DP-2201C	DIST PNL FOR VENT EQUIPMENT		
	EXHAUST STACK		
VTP-CAM-2202C	BETA CAM DETECTOR HEAD		
VTP-FLT-2205C	RECORD SAMPLE HOLDER		
VTP-TE-2201C	STACK TEMP PROBE		
VTP-V-2214C	STACK SAMP PORT ISO VLV		
VTP-PRT-2204C	SAMP PORT NO 4		
VTP-PRT-2205C	SAMP PORT NO 5		
VTP-PRT-2206C	SAMP PORT NO 6		

Component Number	Description	CE INITIAL	QC INITIA
VTP-PRT-2207C	SAMP PORT NO 7		
	Air Monitor Cabinet		
VTP-PB-2201C	VAC PUMP START SW		
VTP-PB-2202C	SWAP VAC PUMP		
VTP-PB-2203C	VAC PUMP RESET SW		
VTP-FIC-2206C	STACK FLOW CONTROLLER		
VTP-SS-2204C	AIR COND NO 1 PWR SW		
VTP-V-2211C	RECORD SAMP FCV INLET ISO VLV		
VTP-V-2212C	CAM SAMPLE FCV INLET ISO VLV		
VTP-FCV-2202C	RECORD FLOW CONT VLV		
VTP-FCV-2204C	CAM FLOW CONT VLV		
VTP-V-2217C	RECORD SAMP FCV OUTLET ISO VLV		
VTP-V-2218C	CAM SAMPLE FCV OUTLET ISO VLV		
VTP-TE-2202C	SAMPLE TEMP PROBE		
VTP-PCV-2217C	SAMP PMP SUCT REG VLV		
VTP-PI-2206	MANIFOLD VACUUM		
VTP-MOV-2215C	VAC PUMP INLET ISO VLV		
VTP-MOV-2216C	VAC PUMP OUTLET ISO VLV		
VTP-P-2201C	PUMP 1		
VTP-P-2202C	PUMP 2		
VTP-PS-2207C	PP1 PRESS SWITCH		
VTP-PS-2208C	PP2 PRESS SWITCH		
VTP-SS-2206C	VAC Pp CONT CKT PWR SW		
VTP-FT-2201C	STACK FLO XMITTER		
VTP-FT-2202C	RECORD FLO XMITTER		
VTP-FT-2204C	CAM FLO XMITTER		
VTP-PIT-2205C	SAMP SYS PRES XMITTER		
VTP-SS-2208C	AUTO SHUT DOWN BYP SW		
VTP-SS-2207C	FCV CKT PWR SW		
VTP-SS-2211C	SAMP FLO INST		
VTP-SS-2210C	MONITORING EQUIP PWR SW		

Component Number	Description	CE INITIAL	QC INITIAL
VTP-R-2201C	PROCESSING RECORDER		
VTP-CAM-2201C	BETA CAM		
VTP-HC-2201C	INST PNL HTR CONT		
VTP-SS-2205C	AIR COND NO 2 PWR SW		
	Instrument Stand		
VTP-PI-2202C	TANK PRESS		
VTP-PS-2202C	TANK PRESSURE SW		

7.2 PRESSURE DECAY TEST

OP/CE ___ / EJW 7.2.1 Maintenance **INSTALL** the test pressure flange with a neoprene gasket to the heater housing inlet.

OP/CE ___ / EJW 7.2.2 Maintenance **TORQUE** the test pressure flange bolts to 30 (25-35) ft-lbs.

OP/CE MRC / EJW 7.2.3 **ENSURE** that the following valves are CLOSED:

- ✓ VTP-V-2232C HEPA 2 COND DRN VLV
- ✓ VTP-V-2233C HEPA 1 COND DRN VLV
- ✓ VTP-V-2234C PREFILTER COND DRN VLV
- ✓ VTP-V-2236C HTR COND DRN VLV
- ✓ VTP-V-2204C-1 VTP-PDI-2204C HS ISO VLV
- ✓ VTP-V-2204C-2 VTP-PDI-2204C LS ISO VLV
- ✓ VTP-V-2203C-1 VTP-PDI-2203C HS ISO VLV
- ✓ VTP-V-2203C-2 VTP-PDI-2203C LS ISO VLV
- ✓ VTP-V-2205C-1 VTP-PDI-2205C HS ISO VLV
- ✓ VTP-V-2205C-2 VTP-PDI-2205C LS ISO VLV
- ✓ VTP-V-2229C FLT BANK OUTLET ISO VLV

OP/CE MRC / EJW 7.2.4 **ENSURE** VTP-V-2228C FLT BANK INLET ISO VLV is OPEN.

OP/CE ___ / EJW 7.2.5 Instrument Technician **INSTALL** a digital manometer to the test pressure flange.

OP/CE ___ / EJW 7.2.6 **INSTALL** an air pressure source to the test pressure flange.

OP/CE ___ / EJW 7.2.7 **PRESSURIZE** the housings to 12 ± 2 in. w.g..

OP/CE ___ / EJW 7.2.8 **LOCATE** leaks (using a suitable bubble solution) **AND SEAL** as practical.

OP/CE ___ / EJW 7.2.9 **DISCONNECT** the air pressure source from the test pressure flange.

OP/CE ___ / EJW 7.2.10 **SLOWLY RELIEVE** pressure from the housings.

OP/CE ___ / EJW 7.2.11 Instrument Technician **REMOVE** thermocouple wires from VTP-TE-2203C HEPA FLT TEMP PROBE.

OP/CE ___ / EJW 7.2.12 Instrument Technician **CONNECT** type K thermocouple wire and reading device to terminals on VTP-TE-2203C HEPA FLT TEMP PROBE.

OP/CE ___ / EJW 7.2.13 **CONNECT** a vacuum source to the test pressure flange.

OP/CE ___ / EJW 7.2.14 **DECREASE** the heater/filter train housing internal pressure to -26 ± 2 in. w.g..

OP/CE EJW 7.2.15 **MAINTAIN** constant pressure (-26 ± 2 in. w.g.) until the housing temperature remains constant within ± 1.0 °F for a minimum of 10 minutes.

OP/CE EJW 7.2.16 **ISOLATE** the vacuum source from the filter housing **AND**

DISCONNECT the vacuum source from the test pressure flange.

NOTE: Barometric pressure readings in the following step may be obtained by calling the Hanford weather station (373-2716). Only initial (0 min.) and final (15 min.) barometric pressure readings are required.

OP/CE/QC EJW 7.2.17 **START** stopwatch **AND**

RECORD data requested into the table below at one minute intervals.

MINUTE	HOUSING PRESSURE (in. w.g.)	HOUSING TEMPERATURE (°F)	BAROMETRIC PRESSURE (in. Hg)
0	-25.20	39.8	28.753
1	-25.20	39.8	
2	-25.20	39.8	
3	-25.19	39.8	
4	-25.18	39.8	
5	-25.15	39.8	
6	-25.13	39.8	
7	-25.09	39.8	
8	-25.08	39.8	
9	-25.07	39.8	
10	-25.07	39.8	
11	-25.07	39.8	
12	-25.07	39.8	
13	-25.09	39.8	
14	-25.09	39.8	
15	-25.09	39.8	28.713

OP/CE/QC EJW RA 7.2.18 **PERFORM** the following leak rate calculations:

V = Volume of housings to be pressurized = 36.4 ft^3

SAV = Specified Acceptance Value = 0.0182 cfm (3% of housing volume per hour).

RA = Gas Constant for air = 53.35

Δt = elapsed time of test = 15 min.

Q = Average leak rate of housing in cfm.

P_{fm} = Final manometer pressure P_{im} = Initial manometer pressure

P_{fB} = Final barometric press. P_{iB} = Initial barometric press.

Finish Temp. (°F) 39.8 + 459.7 = T_f = 499.5

Start Temp. (°F) 39.8 + 459.7 = T_i = 499.5

$P_f = P_{fm}$ -25.09 x 5.204 + P_{fB} 28.713 x 70.73

P_f = -130.57 + 2,030.87

P_f = 1,900.30

$P_i = P_{im}$ -25.20 x 5.204 + P_{iB} 28.753 x 70.73

P_i = -131.14 + 2,033.70

P_i = 1,902.56

$Q = [(P_f / T_f) - (P_i / T_i)] \times [V / (RA \times \Delta T \times 0.075)]$

$Q = [(P_f / T_f) - (P_i / T_i)] \times [36.4 / (53.35 \times 15 \times 0.075)]$

$Q = [(P_f / T_f) - (P_i / T_i)] \times 0.6065$

P_f 1,900.30 / T_f 499.5 = 3.804

P_i 1,902.56 / T_i 499.5 = 3.809

Q = (3.804 - 3.809) x 0.6065

Q = -.005 x 0.6065

Q = -.003 cfm SAV = 0.0182 cfm

OP/CE/QC EJW RA 7.2.19 **VERIFY** that Q < SAV.

OP/CE EJW 7.2.20 **SLOWLY RETURN** housings to atmospheric pressure.

OP/CE EJW 7.2.21 **REMOVE** all test equipment.

OP/CE 7/1 EJW 7.2.22 Instrument Technician **REPLACE** thermocouple wires to VTP-TE-2203C HEPA FLT TEMP PROBE.

OP/CE 7/1 EJW 7.2.23 **OPEN** the following valves:

- VTP-V-2204C-1 VTP-PDI-2204C HS ISO VLV
- VTP-V-2204C-2 VTP-PDI-2204C LS ISO VLV
- VTP-V-2203C-1 VTP-PDI-2203C HS ISO VLV
- VTP-V-2203C-2 VTP-PDI-2203C LS ISO VLV
- VTP-V-2205C-1 VTP-PDI-2205C HS ISO VLV
- VTP-V-2205C-2 VTP-PDI-2205C LS ISO VLV

OP/CE 7/1 EJW 7.2.24 **CLOSE** VTP-V-2228C FLT BANK INLET ISO VLV.

8.0 EXHAUSTER TEST PROCEDURE

8.1 EXHAUSTER SETUP AND STARTUP

OP/CE ~~EJW~~ EJW 8.1.1 **SETUP** exhauster per applicable portions of sections 5.3, 5.4, and 5.5 of procedure TO-020-451.

OP/CE EJW 8.1.2 **PERFORM** section 5.6 of TO-020-451 **AND**

VERIFY that the following tasks are successfully completed.

TASK	OPS INIT	COG INIT
Seal-Pot filled to correct level.		EJW
Air flow test performed.		EJW
Aerosol test performed.		EJW
Gamma factor count performed.		EJW
Source check of Beta CAM performed.		EJW

2/3/98 EJW 2/3/98 2/3/98

OP/CE EJW EXC#1 8.1.3 **PLACE** exhauster into STANDBY MODE per procedure TO-060-347, Section ~~5.2~~ 5.1

2/3/98 OP/CE EJW 2/3/98 EJW 2/3/98 8.1.4 **PLACE** exhauster into ATTENDED OPERATION MODE per procedure TO-060-347, Section ~~5.3~~ 5.2,

8.2 DATA LOGGER OPERATION

NOTE: The data logger's initial display mode is PLANT SUMMARY. All exhauster information is contained within 4 groups, titled OPERATION STATUS, EQUIPMENT STATUS, RUN TIME LOG, and COMMON FAULT ALARMS. In the MULTI-GROUP display mode, all exhauster channel values can be viewed simultaneously. Channel numbers are displayed on the chart printout and on the ALARM SUMMARY display screen, but not on the MULTI-GROUP display screen. Channels on the MULTI-GROUP display screen are identified by a descriptive tag and units.

OP/CE EJW 8.2.1 **ENSURE** exhauster is in ATTENDED OPERATION mode, and that the exhaust fan has run for at least 5 minutes before proceeding.

OP/CE/QC 8.2.2 EXC #2

RECORD values for the OPERATION STATUS group into the following table **AND**

VERIFY values are acceptable.

OPERATION STATUS						
TAG	UNITS	CH	DESCRIPTION	RANGE	ACCEPTABLE	VALUE
STACK	SCFM	1	Stack Flow Rate	0 - 391	200 ± 10	200
RECORD	SCFM	3	Recrd Samp Flow Rate	0 - 3.00	1.53 ± .10	1.56
BETA	SCFM	5	Beta Samp Flow Rate	0 - 3.00	1.53 ± .10	1.53
PUMP	in wg	7	Pump Static Pressure	0 - (-136)	-100 ± 10	-98
STACK	°F	2	Stack Temperature	0 - 150	0 - 150	71
SAMPLE	°F	6	Sample Temperature	0 - 150	0 - 150	60

OP/CE/QC 8.2.3

RECORD values for the EQUIPMENT STATUS group into the following table **AND**

VERIFY values are acceptable.

EQUIPMENT STATUS					
TAG	CH	DESCRIPTION	RANGE	ACCEPTABLE	VALUE
STACK	14	Stack Fan (On-Off)	ON, OFF	ON	ON
PUMP P1	15	Pump P1 (On-Off)	ON, OFF	One pump ON, and other pump OFF	OFF
PUMP P2	18	Pump P2 (On-Off)	ON, OFF		ON
PMPFAIL	19	Pump Fail	NORMAL, FAILED	NORMAL	NORMAL
HEATER	22	Heater (On-Off)	ON, OFF	ON	ON

OP/CE/QC 8.2.4 **RECORD** values for the COMMON FAULT ALARMS group into the following table **AND**

VERIFY values are acceptable.

COMMON FAULT ALARMS						
TAG	UNITS	CH	DESCRIPTION	RANGE	ACCEPTABLE	VALUE
HUMID	%	23	HEPA Inlet Humidity	0 - 100	0 - 70	16
TEMP	°F	24	HEPA Inlet Temp	0 - 200	0 - 150	80
REC VAR	N/A	31	Record Samp Flow Var	NORMAL, ALARMED	NORMAL	NORMAL
BETAVAR	N/A	34	Beta Sample Flow Var	NORMAL, ALARMED	NORMAL	NORMAL
CAM RAD	N/A	12	Beta CAM Rad Alarm	NORMAL, ALARMED	NORMAL	NORMAL
CAMFAIL	N/A	13	Beta CAM Fail	NORMAL, FAILED	NORMAL	NORMAL

8.3 COMMON FAULT ALARMS

NOTE: The channels which make up the COMMON FAULT ALARMS group cause the alarm strobe, on the top of the cabinet, to flash any time that they are alarmed during stack fan operation. Upon operator acknowledgement the alarm strobe will go off until another new alarm is received. When a channel alarms, it's icon will display a flashing red light. Upon acknowledgement the red light will either glow steadily if the condition still exists, or disappear if the alarm condition has cleared.

OP/CE EJW 8.3.1 **ENSURE** exhauster is in ATTENDED OPERATION mode, and that the exhaust fan has run for at least 5 minutes before proceeding.

8.3.2 **TEST** the HEPA Inlet Humidity alarm as follows:

OP/CE EJW 8.3.2.1 Instrument Technician **DISCONNECT** wires 133 and 134 from field wiring junction box located on right side of Air Monitor cabinet.

OP/CE EJW 8.3.2.2 Instrument Technician **APPLY** a 15.52 mA current to wires 134 (+) and 133 (-).

OP/CE/QC 2/ EJW/ RC 8.3.2.3 **RECORD** value displayed for HUMID in COMMON FAULT ALARMS group **AND**

VERIFY that the value is acceptable.

TAG	UNITS	CH	DESCRIPTION	ACCEPTABLE	VALUE
HUMID	%	23	HEPA Inlet Humidity	70 - 74	72

NOTE: The HEPA inlet humidity common fault alarm has a 5 minute delay.

OP/CE 2/ EJW 8.3.2.4 **WAIT** 5 minutes before proceeding.

OP/CE 2/ EJW/ RC 8.3.2.5 **VERIFY** that the external alarm strobe and the HUMID icon within the COMMON FAULT ALARMS group are flashing.

OP/CE 2/ EJW 8.3.2.6 Instrument Technician **RECONNECT** wire 133 to terminal 5 and wire 134 to terminal 6.

8.3.3 **ACKNOWLEDGE** alarm(s) on the data logger as follows:

OP/CE MRC/ EJW 8.3.3.1 **PRESS** Common Fault Alarms group anywhere in box. Outside of box will turn yellow.

OP/CE MRC/ EJW 8.3.3.2 **PRESS** GO TO key. Common Fault Alarms group will occupy entire screen.

OP/CE MRC/ EJW 8.3.3.3 **PRESS** ACK key located at top right of screen.

OP/CE MRC/ EJW 8.3.3.4 **VERIFY** that external alarm strobe has turned OFF.

OP/CE MRC/ EJW 8.3.3.5 **PRESS** MULTI-GROUP key to return screen to normal appearance.

8.3.4 **TEST** the HEPA Inlet Temperature alarm as follows:

OP/CE 2/ EJW 8.3.4.1 Instrument Technician **DISCONNECT** thermocouple wires from HEPA Inlet thermocouple probe.

OP/CE 2/ EJW 8.3.4.2 Instrument Technician **APPLY** 155 °F Type K temperature signal to thermocouple wires.

OP/CE/QC [illegible] EJW BC

8.3.4.3 **RECORD** value displayed for TEMP in COMMON FAULT ALARMS group **AND**

VERIFY that the value is acceptable.

TAG	UNITS	CH	DESCRIPTION	ACCEPTABLE	VALUE
TEMP	°F	24	HEPA Inlet Temp	150 - 160	151

OP/CE [illegible] EJW RA

8.3.4.4 **VERIFY** that the external alarm strobe and the TEMP icon within the COMMON FAULT ALARMS group are flashing.

OP/CE [illegible] EJW

8.3.4.5 Instrument Technician **RECONNECT** thermocouple wires to thermocouple probe.

OP/CE MRC EJW

8.3.4.6 **ACKNOWLEDGE** alarm on data logger per step 8.3.3.

8.3.5 **TEST** the Record Sample Flow Variance, Beta Sample Flow Variance, and Beta CAM Failure alarms as follows:

OP/CE MRC EJW

8.3.5.1 **PRESS** VTP-PB-2201C VAC PUMP START SW **AND**

VERIFY button returns to OUT position.

NOTE: The Record Sample Flow Variance, Beta Sample Flow Variance, and Beta CAM Failure alarms have a 5 minute delay.

OP/CE MRC EJW

8.3.5.2 **WAIT** 5 minutes before proceeding.

OP/CE MRC EJW RA

8.3.5.3 **VERIFY** that the external alarm strobe and the REC VAR, BETAVAR, and CAMFAIL icons within the COMMON FAULT ALARMS group are flashing.

OP/CE MRC EJW

8.3.5.4 **PRESS** VTP-PB-2201C VAC PUMP START SW **AND**

VERIFY button locks into IN position.

OP/CE MRC EJW

8.3.5.5 **ACKNOWLEDGE** alarm on data logger per step 8.3.3.

8.3.6 **TEST** the Beta CAM Radiation alarm as follows:

OP/CE [illegible] EJW

8.3.6.1 Instrument Technician **REMOVE** wire from terminal 2 on back of Beta CAM.

OP/CE [illegible] EJW RA

8.3.6.2 **VERIFY** that the external alarm strobe and the CAM RAD icon within the COMMON FAULT ALARMS group are flashing.

OP/CE EJW

8.3.6.3 Instrument Technician **RECONNECT** wire to terminal 2 on back of Beta CAM.

OP/CE MRC/EJW

8.3.6.4 **ACKNOWLEDGE** alarm on data logger per step 8.3.3.

8.4 UNATTENDED OPERATION INTERLOCK

NOTE: The unattended operation interlock allows the exhauster to run when unattended by interlocking the common fault alarm light to the stack fan.

OP/CE EJW

8.4.1 **ENSURE** exhauster is in ATTENDED OPERATION mode, and that the exhaust fan has run for at least 5 minutes before proceeding.

OP/CE MRC/EJW

8.4.2 **PLACE** VTP-SS-2208C AUTO SHUTDOWN BYP SW to UNATTENDED.

NOTE: The data logger on/off switch is located behind the swing out front video display.

OP/CE MRC/EJW

8.4.3 **TURN OFF** the data logger.

OP/CE MRC/EJW

8.4.4 **VERIFY** that the external alarm strobe is flashing and that the exhauster fan has stopped.

OP/CE MRC/EJW

8.4.5 TURN ON the data logger.

OP/CE MRC/EJW

8.4.6 PLACE VTP-SS-2208C AUTO SHUTDOWN BYP SW to ATTEND.

EJW Exc #3 OP/CE EJW

8.4.7 RESTART exhauster per steps ~~8.1.3~~. 5.2.8 and 5.2.9 of TO-060-347.

4/98

EJW 4/14/98

8.5 EXHAUSTER AUTOMATIC SHUTDOWNS

OP/CE EJW

8.5.1 **ENSURE** exhauster is in ATTENDED OPERATION mode, and that the exhaust fan has run for at least 5 minutes before proceeding.

NOTE: The exhauster will automatically shut down if the tank pressure falls below -3" wg.

OP/CE EJW

8.5.2 Instrument Technician **APPLY** a gradually increasing vacuum to the low port of VTP-PS-2202C TANK PRESSURE SW **UNTIL** exhaust fan stops.

OP/CE/QC 2/ EJW RQ 8.5.3 **RECORD** the pressure at which the exhaust fan shuts down **AND**

EXC#4

VERIFY the value is acceptable.

DESCRIPTION	UNITS	ACCEPTABLE	VALUE
Tank Pressure	in. wg	-3.20 - (-2.80)	~~-3.0~~

2-4-98 EJW

OP/CE 2/ EJW 8.5.4 Instrument Technician **RETURN** VTP-PS-2202C TANK PRESSURE SW to it's original configuration.

-JW 2/4/98 EXC#3

OP/CE 2/ EJW 8.5.5 **RESTART** exhauster per steps ~~8.1.3.~~ 5.2.8 and 5.2.9 of TO-060-347.

2/4/98

OP/CE 2/ EJW 8.5.6 **WAIT** 5 minutes before proceeding.

NOTE: The exhauster will automatically shut down if the HEPA differential pressure exceeds 5.5" wg.

OP/CE 2/ EJW 8.5.7 Instrument Technician **APPLY** a gradually increasing pressure to the high port of VTP-PDS-2203C HEPA FLT D/P SW **UNTIL** exhaust fan stops.

OP/CE/QC 2/ EJW RQ 8.5.8 **RECORD** the pressure at which the exhaust fan shuts down **AND**

VERIFY the value is acceptable.

DESCRIPTION	UNITS	ACCEPTABLE	VALUE
HEPA Filter DP	in. wg	5.30 - 5.70	5.56

OP/CE 2/ EJW 8.5.9 Instrument Technician **RETURN** VTP-PDS-2203C FILTER TRAIN DP SW to it's original configuration.

EXC#3

-JW 2/4/98 OP/CE MRC/ EJW 8.5.10 **RESTART** exhauster per steps ~~8.1.3.~~ 5.2.8 and 5.2.9 of TO-060-347.

2/4/98 OP/CE MRC EJW 8.5.11 **WAIT** 5 minutes before proceeding.

NOTE: The exhauster will automatically shut down if the stack flow falls below 150 SCFM.

OP/CE MRC / EJW 8.5.12 **CLOSE** VTP-V-2228C FLT BANK INLET ISO VLV gradually **UNTIL** exhaust fan stops.

OP/CE/QC MRC / EJW / R 8.5.13 **RECORD** the flow displayed on VTP-FIC-2206C STACK FLOW CONTROLLER when the exhaust fan shuts down **AND**

VERIFY the value is acceptable.

DESCRIPTION	UNITS	ACCEPTABLE	VALUE
Stack Flow	SCFM	145 - 155	149.8

OP/CE EJW 8.5.14 **OPEN** VTP-V-2228C FLT BANK INLET ISO VLV.

EXC #3 OP/CE EJW 8.5.15 **RESTART** exhauster per step ~~5.1.3~~ 5.2.8 and 5.2.9 of TO-060-347.

OP/CE EJW 8.5.16 **PLACE** VTP-HS-2201C HEATER PWR SW to OFF.

OP/CE EJW 8.5.17 **WAIT** 15 minutes before proceeding.

NOTE: The exhauster will automatically shut down if the stack flow exceeds 250 SCFM for 5 minutes.

OP/CE EJW 8.5.18 Instrument Technician **PLACE** VTP-FIC-2206C STACK FLOW CONTROLLER into MANUAL mode by pressing the A/M key.

OP/CE EJW 8.5.19 Instrument Technician **INCREASE** the exhaust stack flow to 250 - 260 SCFM using the ▲ and ▼ keys on VTP-FIC-2206C STACK FLOW CONTROLLER.

NOTE: The high flow shutdown interlock has a 5 minute delay.

OP/CE EJW 8.5.20 **WAIT** 5 minutes before proceeding.

OP/CE/QC EJW KA 8.5.21 **RECORD** the flow displayed on VTP-FIC-2206C STACK FLOW CONTROLLER when the exhaust fan shuts down **AND**

VERIFY the value is acceptable.

DESCRIPTION	UNITS	ACCEPTABLE	VALUE
Stack Flow	SCFM	> 250	252.8

OP/CE EJW 8.5.22 Instrument Technician **PLACE** VTP-FIC-2206C STACK FLOW CONTROLLER into AUTOMATIC mode by pressing the A/M key.

8.6 EXHAUSTER SHUTDOWN AND TAKEDOWN

OP/CE EJW EXC #1 8.6.1 **PLACE** exhauster into STANDBY MODE per procedure TO-060-347, Section ~~5.4~~ 5.5.3

OP/CE EJW 8.6.2 **PLACE** exhauster into SHUTDOWN MODE per procedure TO-060-347, Section ~~5.5~~ 5.5.4

NOTE: Completion of operability testing does not require performance of the following step. The exhauster may be left in place for training or other program requirements. The following step is provided as information to facilitate removal of the exhauster from the test site.

8.6.3 **REMOVE** RMCS exhauster C per applicable portions of section 5.12 of procedure TO-020-451.

9.0 INSTRUMENTATION CALIBRATION DATA

All portable instrumentation used by maintenance personnel within this procedure shall be recorded in the table below.

DESCRIPTION	SERIAL #	CAL DATE	DUE DATE	PROCEDURE STEPS WHICH DEVICE WAS USED
Fluke 701	819-13-20 -007	1/9/98	1/9/99	7.2.15, 7.2.17, 8.3.2.2, 8.3.4.2
DPI 601	819-35-40 -001	4/4/97	4/4/98	7.2.7, 7.2.14, 7.2.15, 7.2.17
Neotronics Micromanometer MP205	819-28-09-002	3/24/97	3/24/98	8.5.2, 8.5.7

10.0 SIGNATURE LOG

All persons initialing or signing within this procedure (including all data sheets and the test completion sign-off sheet) shall record their signature, initials, and printed name in the table below.

Name (Print)	Company/Organization	Signature	Initial
For Record Only			
CHAD A ESVELT	LMHC	Chad A Esvelt	CAE
RON COWGILL	LMHC	Ron Cowgill	
RONALD ARNDT	LMHC QC	Ronald Arndt	RA
Eric Waldo	LMHC	Eric Waldo	EJW
M.R. CHUNN	FDH	M R Chunn	MRC
TD SANDELL	LMHC		
J.D. CRIDDLE JR.	SESC (CED)		
M.L. McELROY	LMHC	M. L. McElroy	MLM
J.A. Ranschau	LMHC	Jeff Ranschau	JR
V.S. Lee	LMHC		VS
John Schofield	LMHC	John Schofield	JSS
Jim KRISKOVICH	LMHC	Jim Kriskovich	JRK

11.0 TEST COMPLETION SIGN-OFF

All system acceptance and operability tests have been completed as delineated in this ATP/OTP. All exceptions have been documented and resolved as indicated on the Exception / Resolution Data Sheet(s). RMCS exhauster C and associated equipment can be operated in a safe manner and are accepted as meeting all test criteria required for initial RMCS operations in flammable gas tanks.

Signature	Date
for Dan Hartley Operations PIC	2-8-98
Truck Sampling Manager	2-20-98
M. L. McElroy - CPQA Quality Assurance	2/18/98
Safety	2/19/98
Eric Waldo Cognizant Engineer	2/18/98
CFE Engineering Manager	2/20/98
Design Authority	3-3-98
Operations Test Director	2/18/98

EXCEPTION / RESOLUTION DATA SHEET

NOTE: THIS SHEET IS AN EXAMPLE AND MAY BE REPLACED WITH A SIMILAR SHEET CONTAINING THE REQUIRED INFORMATION.

Exception Number	Step Number(s)	DESCRIPTION OF PROBLEM	RESOLUTION TO PROBLEM	APPROVAL INITIALS
1	8.1.3, 8.1.4, 8.6.1, 8.6.2	Steps refer to section numbers within POP TO-060-347 which were changed since the OTP was written.	Correct section numbers were redlined into the test procedure.	EJW
2	8.2.2	Performance of the test procedure was halted at this point due to a failed Control Module within the air sampling control system.	The faulty control module was replaced and testing was resumed.	EJW RA
3	8.4.7, 8.5.5, 8.5.10, 8.5.15	Steps instruct operator to restart exhauster per step 8.1.3. The structure of section 8.1 was changed prior to release of the OTP, causing these steps to be incorrect.	Correct steps referenced from POP TO-060-347 were redlined into the test procedure.	EJW
4	8.5.3	1. The exhaust fan did not shut down within the acceptance range for tank pressure. 2. A data value from the HEPA DP test was inadvertently entered into the tank pressure data entry box.	1. The pressure switch was found to be out of calibration. Calibration of the switch was performed and the test successfully completed. 2. The misplaced value was scratched out and initialed by QC.	EJW RA